



Suicide Among Soldiers: A Review of Psychosocial Risk and Protective Factors

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Suicide Among Soldiers: A Review of Psychosocial Risk and Protective Factors

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Abstract

Suicide is difficult to predict and prevent and remains a leading cause of death worldwide. Although soldiers historically have had a suicide rate well below that of the general population, the suicide rate among members of the U.S. Army has increased markedly over the past several years and now exceeds that of the general population. This paper reviews psychosocial factors known to be associated with the increased risk of suicidal behavior in general and describes how some of these factors may be especially important in understanding suicide among soldiers. Moving forward, the prevention of suicide requires additional research aimed at: (a) better describing when, where, and among whom suicidal behavior occurs, (b) using exploratory studies to discover new risk and protective factors, (c) developing new methods of predicting suicidal behavior that synthesize information about modifiable risk and protective factors from multiple domains, and (d) understanding the mechanisms and pathways through which suicidal behavior develops. Although the scope and severity of this problem is daunting, the increasing attention and dedication to this issue by the Armed Forces, scientists, and society provide hope for our ability to better predict and prevent these tragic outcomes in the future.

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Since the earliest days of recorded history, societies have established military organizations in which professional soldiers are trained and expected to use physical force to defend the society against other groups. Given this mission, there is an inherent risk of injury or death associated with becoming a soldier. Historically, this risk results from participating in wars and other conflicts in which one opens oneself to injury at the hands of an outside enemy. However, evidence has recently emerged that there is also an increasing risk of self-inflicted death among soldiers.

The goals of this paper are to: (1) briefly describe the scope of the problem of suicide among military service members, (2) review what is currently known about modifiable psychosocial risk and protective factors for suicide—highlighting the factors hypothesized to be responsible for the observed increase in suicide among U.S. soldiers and most relevant for prevention efforts in the military, (3) describe potential barriers to progress in this effort, and (4) outline what we perceive to be the most promising directions for future research and prevention efforts given current knowledge of this problem.

SUICIDE AMONG SOLDIERS: CURRENT SCOPE OF THE PROBLEM

Suicide is the 16th leading cause of death worldwide and the 10th leading cause of death in the U.S. general population, accounting for approximately 1.4% of all deaths (National Vital Statistics System, 2008; World Health Organization, 2008). Until recently, the rate of suicide in the U.S. military has been well below that of the rate among civilians of the same age and sex (see Figure 1). Potential explanations for the historically lower rate among military service members are the screening out of those with significant mental health problems or a documented criminal history, the availability of a strong social network, and ready access to health care. However, beginning in 2008 the rate of suicide among soldiers in the U.S. Army has exceeded that of the adjusted general population for the first time in decades (Kuehn, 2009), a trend not observed during prior military conflicts. The current increasing trend began in 2005, shortly after the start of Operation Iraqi Freedom (OIF) (Hill, Johnson, & Barton, 2006; Nelson, 2004) and has continued despite numerous prevention efforts by the U.S. Army (Levin, 2009). Further, in certain months and years (including the years 2010 and 2011), more soldiers died by their own hands than by those of someone else through combat (Army Human Resources, 2012; Defense Manpower Data Center, 2012a, 2012b, 2012c). It is worth mentioning that the increasing rates of suicide among Army soldiers are paralleled by increasing rates of mental disorder prevalence among this population, suggesting that perhaps suicide attempts are secondary to increasing rates of mental illness (Bachynski et al., 2012). While we might expect some people who carry vulnerability and experience extreme stressors of wartime to develop mental disorders and become suicidal, the current rate of suicide is significantly above expectations, and every effort should be made to lessen and prevent this serious behavior problem. Given the scope and seriousness of this problem, there is a desperate need to increase our understanding of the factors that may be causing this increase and how these unnecessary deaths can be prevented. As such, in this paper we focus primarily on the problem of suicide and suicidal behavior among Army soldiers.

RISK AND PROTECTIVE FACTORS FOR SUICIDE AND THEIR RELEVANCE TO SOLDIERS

Suicidal behaviors develop through complex processes in which psychological, social, neurobiological, and demographic factors combine to place individuals at risk. When searching for risk and protective factors for suicide, it is important to keep in mind that such factors may differ according to what part of the suicidal process they predict. For both scientific and clinical purposes, it is important to distinguish between *suicide ideation* (i.e., serious thoughts about killing oneself), *suicide plans* (i.e., formulation of an actual plot to kill oneself), *suicide attempts* (i.e., performance of self-injurious behavior with some intent to die), and *suicide death*. These distinctions are important because these outcomes have different base rates, courses, and correlates (Moscicki, 1999; Nock, Borges, Bromet, Cha, et al., 2008). It also is important to distinguish between self-injury with intent to die (suicidal self-injury) and self-injury with no intent to die (non-suicidal self-injury; for more information see Nock, 2009a). *Non-suicidal self-injury* (NSSI) is performed most often as a way of decreasing distressing emotions (Nock, 2009b); however, it sometimes serves as a *suicide gesture*, in which a person leads others to believe that he has just made a suicide attempt in order to communicate that he is in distress or to influence the behavior of others in some way (Nock, 2008; Nock & Kessler, 2006; Tucker & Gorman, 1967). It is meaningful to note that although a suicide gesture may be a form of NSSI if any skin tissue is damaged, a suicide gesture also may lack actual self-injury altogether (e.g., displaying an empty pill bottle to give the illusion that one has consumed a large quantity of pills). Although some researchers and clinicians dislike the term “gesture,” holding that it denotes that an individual intends to “manipulate” others (see Silverman, Berman, Sanddal, O’Carroll P, & Joiner, 2007; Tucker & Gorman, 1967), the use of the term in this paper carries no such connotation. Instead, it is utilized due to its specificity in describing the use of an action to express emotions and/or thoughts. In this section, we review evidence on risk and protective factors for both suicide death and non-fatal suicidal behaviour havior (i.e., suicide ideation, plans, and attempts), noting important differences when present among the predictors of different suicidal outcomes. Importantly, we also highlight which risk factors are expected to be of greatest potential value in helping to explain, predict, and prevent suicide among soldiers.

An Organizing Conceptual Model

A wide range of risk and protective factors influences the occurrence of suicidal behaviors, and it is difficult to understand how and why they interact. Therefore, it is useful to have a conceptual framework for organizing known risk factors and for guiding future tests of the development of suicidal behavior. Many theoretical models of suicide have been proposed in the literature, and although they differ in focus and level of analysis (e.g., biological versus environmental models), virtually all distinguish between *vulnerability* or *distal* factors that predispose some people to be at high risk for suicide (e.g., presence of mental illness, prior suicidal behavior) and *stressors* or *proximal factors* that trigger suicidal behaviors among those who are vulnerable (e.g., hopelessness, sleep issues). Given that vulnerability-stress models guide current thinking about suicidal behavior (Ingram & Luxton, 2005; Mann,

Waternaux, Haas, & Malone, 1999), such a model is used here to organize the conceptualization of risk and protective factors (Figure 2).

Vulnerability Factors

Presence of Mental Illness—The presence of a mental disorder is among the most consistently reported risk factors for suicidal behavior (Gould et al., 1998; Hyman, Ireland, Frost, & Cottrell, 2012; Kessler, Borges, & Walters, 1999; Mann et al., 1999; Nock, Borges, Bromet, Alonso, et al., 2008; Petronis, Samuels, Moscicki, & Anthony, 1990; Shaffer et al., 1996). Psychological autopsy studies reveal that 90–95% of the people who die by suicide have a diagnosable mental disorder at the time of their death (Cavanagh, Carson, Sharpe, & Lawrie, 2003), and similar (but slightly lower) rates have been found among those making non-lethal suicide attempts (Kessler, Berglund, Borges, Nock, & Wang, 2005; Nock et al., 2009). Mood, alcohol/substance, impulse-control, psychotic, and personality disorders convey the highest risks (Hawton, Houston, Haw, Townsend, & Harriss, 2003; Kessler et al., 1999; Linehan, Rizvi, Welch, & Page, 2000; Mann et al., 1999; Shaffer et al., 1996; Shafii, Carrigan, Whittinghill, & Derrick, 1985), and the accumulation of disorders (e.g., combined Axis I and Axis II disorders) is associated with especially elevated risk (Hawton et al., 2003; Kessler et al., 1999; Nock, Borges, Bromet, Alonso, et al., 2008; Shafii, Steltz-Lenarsky, Derrick, Beckner, & Whittinghill, 1988). Comorbidity of mental illness represents a major challenge for suicide prevention, as comorbid disorders can be more difficult to diagnose and to treat. In addition, recent evidence suggests that different disorders predict the transition between suicide-related outcomes. For instance, although a history of major depression is one of the strongest predictors of suicide ideation, it does not predict suicide attempts among ideators. Instead, disorders characterized by anxiety/agitation (e.g., post-traumatic stress disorder [PTSD]) and problems with aggression/impulsiveness (e.g., conduct disorder, substance disorders) best predict the transition from suicide ideation to attempt (Nock, Hwang, Sampson, & Kessler, 2010; Nock et al., 2009).

The fact that the vast majority of suicides occur among people with a current mental disorder makes this risk factor a prime target for screening and prevention efforts. One potential suicide prevention strategy would be to adopt programs aimed at preventing the first onset of mental disorder. However, given the high prevalence and early age of onset of mental disorders (Kessler, Berglund, Demler et al., 2005; Kessler, Chiu, Demler, Merikangas, & Walters, 2005), it would seem to be more feasible in the Army context to screen for pre-existing mental disorders and to target the bulk of prevention efforts to soldiers with a pre-recruitment history of mental disorder. Caution will be needed here, though, as many soldiers are in the age range in which risk for first onset of mental disorders is high, and they therefore may become ill only after joining the Army, particularly after experiencing stressors related to war (e.g., stress of basic training, sleep deprivation, loss of family support, being away from home). Indeed, recent reports indicate that as many as 25% of U.S. military personnel returning from deployments to OIF and Operation Enduring Freedom (OEF) report psychological problems, raising the possibility of elevated suicide risk among these soldiers (Hoge, Auchterlonie, & Milliken, 2006; Hoge et al., 2004). Ongoing screening for mental disorders and referral to treatment may be an effective method of detecting those at risk and decreasing the likelihood of suicidal behavior. For instance, in

a study of airmen given a Post-Deployment Health Assessment directly upon returning home from deployment and a Post-Deployment Health Reassessment (PDHRA) 90–180 days thereafter, researchers found the PDHRA to be moderately effective in detecting PTSD and depression. Interestingly, this measure demonstrated low specificity such that even individuals without acute levels of distress were identified and given access to supportive services—perhaps allowing for preventive intervention (McCarthy, Thompson, & Knox, 2012). Though screening for mental disorders is a promising avenue for reducing suicides, it is important to remember that having a mental disorder alone is not sufficient to explain or predict suicidal behavior, as the majority of people with mental disorders never engage in suicidal behavior (Nock, Borges, Bromet, Alonso et al., 2008; Nock, Borges, Bromet, Cha et al., 2008; Nock et al., 2010; Nock et al., 2009). This means that we cannot rely on the presence of a mental disorder alone to accurately predict suicidal behavior. It is important to consider other factors that may also explain the pathway to suicide.

Psychological Factors—Although mental disorders are strongly associated with suicidal behavior, it is not yet clear exactly *why* this is so. There is growing evidence that specific psychological factors that are not tied to any particular mental disorder are useful in beginning to better understand this association. For example, emotion reactivity has been shown to mediate the relationship between the presence of psychopathology and self-injury (both NSSI and suicide ideation), and it is likely only one of many psychological factors that do so (Nock, Wedig, Holmberg, & Hooley, 2008).

There are two general types of psychological factors that may convey vulnerability for suicide risk. First, subjectively reported psychological factors predict suicidal behavior. These include personality traits, temperamental factors, and other cognitive-affective states, such as: impulsiveness (Fawcett, 2001; Fawcett, Busch, Jacobs, Kravitz, & Fogg, 1997; Mann et al., 1999; Zouk, Tousignant, Seguin, Lesage, & Turecki, 2006), aggressiveness (Conner, Swogger, & Houston, 2009; Keilp et al., 2006; McGirr & Turecki, 2007; Nock & Marzuk, 2000), hopelessness about the future (Beck, Steer, Kovacs, & Garrison, 1985; Brezo, Paris, & Turecki, 2006; Brown, Beck, Steer, & Grisham, 2000), and anhedonia (Fawcett et al., 1990; Nock & Kazdin, 2002).

Second, a range of objectively measured neurocognitive factors—primarily in the domain of executive functioning—have been found in suicidal behavior, including problems with: decision-making, problem-solving, cognitive control, and verbal fluency (Jollant et al., 2005; Keilp, Gorlyn, Oquendo, Burke, & Mann, 2008; Sadowski & Kelley, 1993). One of the most important tasks for research on suicide is determining which of these factors, or more precisely which combination of these factors, is most predictive of suicidal behavior. Different theoretical models propose different combinations of factors, but this remains an open question. Most models suggest that suicide results from the aforementioned constructs interacting to: (a) elevate the distress a person feels in response to a negative situation (e.g., high reactivity), (b) decrease a person's ability to problem-solve or to seek help through an adaptive method (e.g., poor decision-making, problem-solving), or (c) increase a person's likelihood of acting on impulses to escape from the undesirable situation via suicide (e.g., impulsiveness, aggressiveness) (Baumeister, 1990; Keilp et al., 2006; Linehan, 1993; Mann et al., 1999).

As with mental disorders, in the absence of evidence to the contrary it is plausible to assume that these psychological constructs are just as likely to lead to suicidal behavior among soldiers as the general population. Here, too, it is possible that either recent changes in entrance criteria could have led to recruitment of more soldiers with high levels of these psychological factors (e.g., impulsiveness, aggressiveness, poor decision-making) or that these risk factors have increased over time in response to an increasingly stressful environment. This is an important question for future studies. In either case, psychological factors are likely to prove extremely valuable for predicting and preventing suicide because these factors can be screened and, in most cases, are modifiable and thus represent promising targets for intervention. Indeed, psychological interventions focused on modifying these kinds of factors (e.g., problem-solving, distress tolerance) are among the few interventions that have demonstrated an ability to decrease the likelihood of future suicide attempts among those at risk (Brown et al., 2005; Linehan et al., 2006).

Family History of Mental Disorder, Childhood Adversities, and Suicidal Behavior

People with a family history of mental disorders and suicidal behavior are at increased risk for suicidal behavior (Brent & Mann, 2006; Brent et al., 2002). Importantly, the associations between parental psychopathology and suicidal behavior among offspring persist even after controlling for the comorbidity of parental disorders and presence of mental disorders in the offspring (Gureje et al., 2010). This suggests that what is being transmitted cross-generationally is a predisposition for some trait that is not fully explained by the presence of mental disorders (e.g., impulsive aggression). Parental history of panic disorder, antisocial personality disorder, and suicidal behavior has proven to be especially important in the prediction of suicidal behavior among offspring, supporting the hypothesized transmission of impulsive aggression or high emotional reactivity (Gureje et al., 2011). Unfortunately, although there have been some exciting findings relating genetic factors to suicidal behaviors that could conceivably help to better understand the transmission of suicidal behavior across generations, large-scale genome-wide association studies have failed to replicate initial findings from smaller studies (Perlis et al., 2010).

A reliable association also has been found between a history of childhood adversities (e.g., childhood sexual and physical abuse, household dysfunction) and subsequent suicidal behavior (Brodsky & Stanley, 2008; Bruffaerts et al., 2010; Dube et al., 2001; Joiner et al., 2007; Nock & Kessler, 2006). This association is partially mediated by the occurrence of mental disorders among those who experience such adversities (Dube et al., 2001). This link also may be explained in part by the shared genetic and neuro-biological characteristics of parent and off-spring, in which parents who are impulsive and aggressive by nature—and as a byproduct abusive to their children—are more likely to have children who are impulsive and aggressive. Both the familial transmission of sexual abuse and/or impulsive aggression have been suggested as potential mediators in the transmission of suicidal behavior (Brent et al., 2002; Brent et al., 2003). Evidence from experimental studies of non-human primates reveals that early rearing experiences, such as being raised in a deprived social environment, contribute independently to the development of impulsive, aggressive, and self-injurious behavior, with dysfunction of the neurotransmitter serotonin appearing to mediate this relationship (Higley & Linnoila, 1997; Kraemer, Schmidt, & Ebert, 1997), suggesting that

childhood adversities (“neglect” in this instance) may be causally related to suicidal behaviors. Attachment styles also have been found to be strongly related to psychopathology; disorganized/controlling and insecure types may be of special importance (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004; Lyons-Ruth & Jacob-vitz, 2008). For instance, insecure types (e.g., unresolved, preoccupied, fearful) have been shown to have a strong association with borderline personality disorder (Agrawal et al., 2004).

Building on both animal models of early adversities and human models focused on early child-parent interactions, a growing body of work is showing that childhood adversity is associated with the epigenetic regulation of genes that play a role in the human stress response system (e.g., McGowan et al., 2009). These alterations in the stress response system could in turn lead to problems with psychological abilities, such as emotion regulation and decision making, which could increase the likelihood of suicidal behavior (Turecki, Ernst, Jollant, Labonte, & Mechawar, 2012).

Family history factors are of course not modifiable, but could be useful in the determination of who is at elevated risk for suicidal behavior and therefore can be targeted in screening programs. They have been shown to improve the prediction of 12-month suicide attempts in prior work, above and beyond the influence of other risk factors, such as a person's own mental disorder (Borges et al., 2006; Borges et al., 2010). The use of information about a family history of mental disorders as a way of assessing risk of suicidal behavior may prove particularly useful in the Army context as such information does not require asking about the soldier's own psychological state and thus may be less likely to be influenced by reporting bias. On balance, although family history factors can improve the prediction of suicidal behavior, these factors alone are unlikely to provide accurate prediction of suicidal outcomes.

Stressful Life Experiences

Suicidal behaviors most often are preceded by stressful life events that can be acute (e.g., family/romantic conflicts, bereavement, legal/disciplinary problems, military sexual trauma—especially among female soldiers) (Brent et al., 1993; M. R. Phillips et al., 2002; Ritchie, Keppler, & Rothberg, 2003; Vijayakumar & Rajkumar, 1999; Wieland, Haley, & Boudier, 2011; Yen et al., 2005) or more chronic (e.g., chronic pain, physical illness [among physical conditions, epilepsy has been shown to be most strongly related to suicidal thoughts and behaviors]) (Braden & Sullivan, 2008; Druss & Pincus, 2000; Scott et al., 2010). A wide range of traumatic events are related to suicidal outcomes (with sexual and interpersonal violence showing particularly strong associations), and a dose-response relationship between the number of events and suicidal thoughts/behaviors has been observed (Stein et al., 2010). Stressful life events may play an especially strong role in the occurrence, and potentially in the recent increase, of suicide among soldiers, given the severely stressful events associated with military training and practice in general. Soldiers experience many different forms of stressors, which can be classified as: military-related stressors (e.g., combat exposure, injury, bereavement, negative unit climate—such as feeling ostracized from one's unit, not fitting in, or feeling that one has let the unit down), family-related stressors (e.g., separation from family, marital/romantic distress or infidelity, family illness/death), and other personal

stressors (e.g., legal/disciplinary problems, physical/ sexual assault, acute health problems, financial/occupational problems). In a study of U.S. Army suicide decedents, researchers found that among the most common stress-related circumstances occurring prior to suicide death were intimate partner problems (44.6%) and military-related stress (41.1%). The most prevalent military stressors included current job-related problems and the experience of combat in the most recent deployment (Logan, Skopp, Karch, Reger, & Gahm, 2012). Similarly, the research of Hyman and colleagues (2012) supports the associations between suicide among active duty members and stressors such as separation or divorce, reduction in rank, enlisted rank, and sleep prescriptions. Other research among young adults in the military finds that sleep issues predict suicide ideation and behavior even after accounting for depression and hopelessness (Ribeiro et al., 2012). Such stressors may play an important role in the occurrence of suicide among soldiers overall, and may be a major contributor to the recent increase in suicide among soldiers (Kuehn, 2009).

Additional areas of stressors that have been cited as being particularly difficult for soldiers today include the following. First, the nature of the combat exposure associated with OIF and OEF is one that can cause significant prolonged stress, requiring many of those currently deployed to be on constant guard for improvised explosive devices, enemy fire, and other dangers while patrolling civilian areas. Second, the prolonged and repeated nature of many current deployments (and accompanying re-exposures to traumatic events) along with uncertainty about whether one's tour will be extended can create significant strain on one's family relationships. Third, advances in modern medicine that have created new life-saving interventions among those injured in combat may, paradoxically, increase the overall suicide rate via higher distress among those who survive but whose injuries have left them with serious health problems or disfigurement. Indeed, wounded soldiers in Warrior Transition Units may be at an increased risk for suicide; this remains an important area for study (Cavallaro, 2009; Dao & Frosch, 2010).

One type of stressor (in terms of a diathesis-stress model) that may have particular relevance for suicide risk in military populations is traumatic brain injury. A substantial proportion of Army personnel deployed in Iraq and Afghanistan have experienced a traumatic brain injury (Hoge et al., 2008; Schneiderman, Braver, & Kang, 2008). The high prevalence of such injuries among military personnel in these conflicts is a consequence of widespread exposure to improvised explosive devices and other non-fatal explosion or blast injuries that result in head trauma (Warden, 2006). Traumatic brain injury is associated with increased risk of depression and PTSD (Hoge et al., 2008; Kreutzer, Seel, & Gourley, 2001; Schneiderman et al., 2008), and neuropsychological consequences of traumatic brain injury include impulsivity, aggression, and disinhibition (Kim, 2002; Rao & Lyketsos, 2000). These mental health and neuropsychological sequelae of traumatic brain injury may, in turn, increase risk for suicide. Indeed, several studies have documented an increased risk of suicidal behavior among individuals with traumatic brain injury (Simpson & Tate, 2002; Teasdale & Engberg, 2001). These findings suggest that Army personnel who have experienced a traumatic brain injury may be at particularly elevated risk for suicide and therefore represent an important population to target with preventive interventions.

An important direction for future work—and one that is especially important for potential interventions—is to determine *how* and *why* these stressful life experiences lead to suicidal behavior. Are these stressors only important in the presence of specific vulnerability factors? Is it the type or accumulation of stressors that is most important? Surprisingly, it is not exactly clear how and why stress actually influences the development of suicidal behavior. Stressful life events may influence suicide risk through a variety of pathways. For example, stress exposure predicts subsequent changes in a variety of psychological processes that are associated with suicidal behavior, including emotional reactivity (Wichers et al., 2009), emotion regulation (McLaughlin & Hatzenbuehler, 2009), and hopelessness (Dixon, Rumford, Heppner, & Lips, 1992). Certain types of stressful life events, including interpersonal loss, are associated with heightened impulsivity in regards to suicide attempts (Weyrauch, Roy-Byrne, Katon, & Wilson, 2001). Stressful experiences may also influence risk for suicidal behavior through neurobiological pathways. Structural consequences of exposure to early stress include: lessened development of the left neocortex, hippocampus, and amygdala; reduction in the size of the mid-portion of the corpus callosum; and alterations in the development and functioning of the prefrontal cortex (Teicher et al., 2003). Effects on the prefrontal cortex are of particular importance in the study of suicide, as alterations to the prefrontal cortex are associated with impairments in emotion regulation and executive functioning. The prefrontal cortex has a protracted developmental trajectory extending well into adolescence (Gogtay et al., 2004) and has dense concentrations of glucocorticoid receptors (Diorio, Viau, & Meaney, 1993), both of which increase the susceptibility of the prefrontal cortex to environmental stress. The prefrontal cortex performs important control functions over reward pathways and plays a critical role in emotion regulation and decision-making (Ochsner et al., 2004; Ridderinkhof, van den Wildenberg, Segalowitz, & Carter, 2004). Prefrontal cortex deficits are associated strongly with impulsivity and aggression (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999; Best, Williams, & Coccaro, 2002; Davidson, Putnam, & Larson, 2000; Grafman et al., 1996), and evidence from both animal and human studies documents that exposure to environmental stress can disrupt inhibitory control and prefrontal cortex functioning (Pollak et al., 2010; Radley et al., 2006; Williams et al., 2006). Identifying the specific psychological and neurobiological pathways through which cumulative stress might lead to suicidal behavior represents an important area for future research. Such an approach could be useful in examining the cumulative effects of combat stress (e.g., multiple deployments), traumatic brain injury and other combat-related injuries, and interpersonal stressors (e.g., divorce, marital conflict) and the biological mechanisms through which these stressors may lead to suicidal behavior.

Other Key Risk Factors

Demographic Factors—Demographic factors such as sex, race/ethnicity, and age have strong associations with suicidal behavior; however, little research has been done to determine the extent to which these associations are due to demographic differences in pre-existing psychopathology. Notably, women are more likely to make suicide attempts, but men in the United States die by suicide at a rate four times higher than that of women (Nock, Borges, Bromet, Cha, et al., 2008), a difference often attributed to the use of more lethal methods (e.g., firearms), greater aggressiveness, and higher intent to die among men

(Beautrais, 2002; Nock & Kessler, 2006). Race/ethnicity also is strongly associated with suicide, with those identified as non-Hispanic White having a much higher rate of suicide death than other groups (Centers for Disease Control and Prevention, 2013). Among White men (who make up approximately 72% of all U.S. suicides), the rate of suicide increases markedly in late adolescence and early adulthood and remains elevated throughout the lifespan (Centers for Disease Control and Prevention, 2013). Additional demographic risk factors in the general population include being young, unmarried, unemployed, and having low education (Bertolote et al., 2005; Nock, Borges, Bromet, Alonso, et al., 2008; Platt et al., 1992). The demographic composition of the U.S. military (disproportionately young and male) in itself places soldiers at an elevated risk for suicide. Importantly, these factors also are related to diminished help-seeking behavior (Wang et al., 2005). Although not modifiable, demographic factors are important because they may serve as moderators of other risk factors that can be altered. For example, increasing support networks within the service may be helpful for those who are unmarried but not necessarily for those married with children. Thus, such factors should be borne in mind when developing, implementing, and evaluating prevention efforts.

Prior Suicidal Behavior—A history of suicidal behavior is the strongest predictor of future suicide attempts (Christiansen & Jensen, 2007; Nock, Borges, Bromet, Cha, et al., 2008) and suicide (Beautrais, 2001; Oquendo et al., 2004). Although not modifiable, knowledge of prior suicidal behavior can be valuable in determining who is most at risk for such behavior in the future. People who have made a previous suicide attempt are approximately 40 times more likely to eventually die by suicide than those without such a history (Harris & Barraclough, 1997), and the association between past attempts and current suicidal behavior remains significant even when a host of other well-established risk factors for suicidal acts are controlled (Joiner et al., 2005). Multiple suicide attempts, in particular, are associated with an increased risk of subsequent suicidal behavior (Oquendo et al., 2007), and those who make multiple attempts often do so with increasing severity (Carter, Reith, Whyte, & McPherson, 2005). Similarly, NSSI, such as superficial cutting, burning, and self-hitting, is associated with an increased risk for suicidal behavior (Dulit, Fyer, Leon, Brodsky, & Frances, 1994; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006; Prinstein et al., 2008). In fact, a history of NSSI may be an even stronger predictor of suicide attempts than a history of previous attempts as shown by 28- and 24-week follow-ups in the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT) and the Treatment of Selective Serotonin Reuptake Inhibitors–Resistant Depression in Adolescents (TORDIA) studies, respectively (Asarnow et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011). These findings emphasize the potential importance of assessing and treating NSSI in the prevention of suicide attempts.

Situational Factors—Situational factors, such as having ready access to lethal means, predict suicidal behavior. Army personnel have access to and experience with firearms, which increases suicide risk (firearms are used in more suicides than homicides each year in the U.S.) (Miller & Hemenway, 2008). Obtaining a personal firearm upon return home from deployment may represent a warning sign that could be an intervention target among soldiers (Rudd et al., 2006). Although a fairly focused and concrete factor, taking steps to

improve gun safety may be an important and easily implemented intervention strategy. In support of this suggestion, suicide among soldiers in the Israeli Army decreased by 40% following reforms in 2006 that decreased soldiers' access to firearms on weekends (Rosenbaum, 2012). Other forms of means restriction (e.g., reduced access to alcohol) also have been associated with reductions in suicide (Mann et al., 2005). The identification of additional Army-specific situational factors could guide future efforts already in place such as Unit Watch (aka Command Interest Profile), a procedure implemented at the recommendation of a clinician and carried out by a soldier's command team that can include a number of interventions, such as limiting access to dangerous items (Payne, Hill, & Johnson, 2008).

Protective Factors

Whereas risk factors increase the likelihood of suicidal behaviors, protective factors decrease their probability among those at elevated risk (i.e., among those with known risk factors). Protective factors for suicide have been less frequently examined than risk factors, and perhaps because of this lack of empirical support, they are viewed with skepticism by some researchers and clinicians. However, a number of studies in this area have reported encouraging results.

Social Support—Most protective factors tested to date have involved facets of social or familial support. For instance, religious affiliation (Dervic et al., 2004), responsibility to one's family (Oquendo et al., 2005), and being pregnant or having children in the home are all protective against suicidal behavior (Marzuk et al., 1997; Qin & Mortensen, 2003). These all are relevant to soldiers, as are other forms of social support, including that from one's unit (e.g., unit cohesion/ climate), family (e.g., frequency of contact with spouse), and friends (e.g., use of social networks). The experience of social support within one's unit may be an especially important protective factor. Prior research on unit cohesion has shown that a soldier's perception of supportive leadership and strong peer (i.e., soldier-to-soldier) relations lessens the likelihood of leaving the Army and enhances perceptions of combat readiness (Griffith, 2002; Halverson, Bliese, Moore, & Castro, 1995). More important, unit cohesion can buffer against the deleterious effects of stress, the development of PTSD and other psychiatric symptoms, and potentially against the occurrence of suicidal behavior (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Halverson et al., 1995).

Psychological Protective Factors—There has been an enormous increase in the past decade in research on psychological factors that may protect against negative outcomes. Work in this area typically is referred to as “positive psychology” given its focus on the development of favorable outcomes, and it has yielded a wide array of constructs and measures that may significantly advance the understanding of why some people respond adaptively to stressful events. Such constructs include resilience, stoicism, character strength, life satisfaction, positive moods, self-esteem, autonomy, hope (optimism), zest, gratitude, capacity to love (ability to form reciprocated relationships), and a sense of meaning and purpose. Recently, there has been a surge of interest in the construct of resilience (South-wick, Litz, Charney, & Friedman, 2012). The study of resilience is complicated by a number of factors, perhaps the most fundamental of which is a lack of

agreement on the definition of this term. Bonanno (2012, p. 755) has described resilience as “a stable pattern of healthy adjustment” following an aversive event. Similarly, the American Psychological Association (2010) has defined this construct as “the process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress.” In seeking to understand resilience, researchers have emphasized a number of points, including: (a) resilience is distinct from recovery, (b) resilience can be common, and (c) there are many different pathways to resilience (e.g., hardiness, self-enhancement, repressive coping, positive emotion and laughter) (Bonanno, 2004). In a recent review of resilience and suicidal thoughts and behaviors, researchers identified consistent buffering effects for overall positivity of attributional style and high levels of agency (Johnson, Wood, Gooding, Taylor, & Tarrier, 2011).

Research in positive psychology has demonstrated that the presence of specific characteristics—for example, positive reinterpretation and acceptance coping as well as intrinsic religiousness (Park, Cohen, & Murch, 1996)—can promote adaptive functioning following extreme stress (i.e., post-traumatic growth; PTG) (Linley & Joseph, 2004; Peterson, Park, Pole, D'Andrea, & Seligman, 2008). Among a group of service members with combat or war zone experience, greater PTG has been associated with lesser suicide ideation (Bush, Skopp, Mc-Cann, & Luxton, 2011). Other studies have found that the association between stressful life events and subsequent suicide attempt is virtually eliminated among those high on factors such as emotional intelligence (i.e., the ability to perceive, understand, and manage one's emotions) (Cha & Nock, 2009). These factors may help to explain why some soldiers exposed to extreme stress adapt fairly well, while others do not. An important point to keep in mind is that some characteristics (e.g., stoicism, autonomy) that are encouraged in military training and culture are likely to work well in improving soldiers' functioning in most situations, but paradoxically may decrease the likelihood that a soldier seeks help for a mental disorder or other problem they are having difficulty managing.

Importantly, brief interventions designed to enhance some of these constructs have shown an ability to decrease depressive symptoms (Fava et al., 2004; Seligman, Steen, Park, & Peterson, 2005), suggesting that some positive psychology-related constructs are modifiable and can be used in new prevention and intervention efforts. Such interventions are currently being tested in the military as part of a large-scale research study called Comprehensive Soldier Fitness, which “represents the Army's decision to place the same emphasis on psychological, emotional and mental strength that we give to physical strength” (Army Posture Statement, 2012, p.1; Seligman & Fowler, 2011).

There are special challenges to causal inference as it relates to the study of suicide. For ethical reasons, suicide researchers cannot experimentally increase the risk of suicidal thoughts and behaviors. Therefore, intervention studies are of particular importance in determining causal risk factors (i.e., a risk factor that can be manipulated and when manipulated can alter the risk of the outcome) for suicide.

Mental Health Treatment—One concrete strategy for attempting to decrease the rate of suicidal behaviors and maintain soldier functioning is to better understand mental health

service use among soldiers. Factors that may prove important in this regard are the type and adequacy of treatment provided to those at risk, the probability and speed of entering treatment, and the barriers to receiving and remaining in treatment (Hoge et al., 2004; Wang, Aguilar-Gaxiola, et al., 2007; Wang, Angermeyer, et al., 2007; Wang et al., 2005). A broad range of barriers may influence treatment, including structural factors (e.g., financial barriers, unavailability of services) and perceptual factors (e.g., perceived stigma, perceived ineffectiveness of treatment, low perceived need, desire to handle the problem alone) (Bruffaerts et al., 2011; Kaskutas, Weisner, & Caetano, 1997; Wang et al., 2008). Importantly, the assessment of perceived stigma related to the receipt of services for mental health problems, as well as the assessment of other potential barriers, should be considered among soldiers, squad leaders, and family members (Hoge et al., 2004; King et al., 2007). Physical health and fitness also may serve a protective function among those at risk, serving as methods of “self-treatment,” such as regular aerobic exercise and consumption of vitamins. Experiments testing the effects of aerobic exercise have shown that exercise is associated with moderate decreases in depressive symptoms, with effects similar to those seen in cognitive therapy (Mead et al., 2008). Given the stigma and other barriers to access often associated with seeking traditional mental health treatment, alternative prevention models should be given special consideration, such as peer support, improved handling of suicidal crises by unit command, media, and phone/Internet-based interventions.

There have been relatively few randomized controlled trials (RCTs) of treatments targeting suicidal thoughts and behaviors. Of the existing RCTs, only a handful has been shown to significantly reduce target thoughts and behaviors. Here, we briefly discuss three psychological treatments that have shown promising results. A first option, Dialectical Behavior Therapy (DBT), is the treatment with the most empirical support for the reduction of suicidal thoughts and behaviors (Linehan, 1993). DBT was developed to treat those with chronic suicidal thoughts and behaviors and is a comprehensive cognitive-behavioral therapy that includes principles of Zen and contemplative practices along with learning and crises theory, highly structured components for each aspect of therapy (e.g., group/individual skills training, individual therapy, phone contact with therapist), and a focus on maintaining motivation among therapists (Dimeff & Linehan, 2001). There are a number of RCTs demonstrating the usefulness of DBT in decreasing the risk of suicide re-attempt among adult attempters (e.g., Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Verheul et al., 2003), including a study conducted among female veterans meeting criteria for borderline personality disorder. Veterans receiving DBT showed significantly greater decreases in suicide ideation when compared to those receiving treatment as usual (Koons et al., 2001). A second treatment option, Cognitive Therapy (CT), views suicide attempts as dysfunctional coping strategies for dealing with feelings of severe distress (Ghahramanlou-Holloway, Brown, & Beck, 2008). A primary aim of CT, therefore, is to enhance problem-solving skills, ensuring that suicide is not the only option for distressed individuals (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012). CT has been shown to be efficacious in treating those who have made prior suicide attempts, with a 50% reduction in the recurrence of re-attempt (Brown et al., 2005). A third option for treatment is Collaborative Assessment and Management of Suicidality (CAMS) (Jobes, 2000, 2006). CAMS is an organized method for assessing and managing suicide, emphasizing

collaboration between the clinician and patient. This approach highlights the patient's own phenomenological perspectives, thereby aiming to reach an accurate assessment and simultaneously strengthening the therapeutic alliance (Ellis, 2004; Ellis, Allen, Woodson, Frueh, & Jobes, 2009). CAMS has been shown to reduce suicide ideation more quickly and effectively than treatment as usual (Jobes, Wong, Conrad, Drozd, & Neal-Walden, 2005).

MAJOR CHALLENGES FOR RESEARCH AND PREVENTION

Suicide has remained a leading cause of death—with the same rate in the United States today as it was 100 years ago (Goldsmith, Pellmar, Kleinman, & Bunney, 2002; Nock, Borges, Bromet, Cha, et al., 2008)—due to several major challenges that make it an especially difficult behavior to study. First, suicidal behavior occurs at a fairly low base rate. This means that large samples of people are needed to have a sufficient number of cases to study the behavior in a detailed manner. Unfortunately, most prior studies have used relatively small selective samples (e.g., psychiatric inpatients), and so some of even the most basic characteristics of suicidal behavior are not well known. Second, suicidal behavior often occurs without warning. Recent research indicates that most people who experience suicidal thoughts have them for the first time by their early twenties (Nock, Borges, Bromet, Alonso, et al., 2008); however, even with this information it remains very difficult to predict which people will develop such thoughts and exactly when they will occur. Importantly, once such thoughts occur, people often transition quickly to making suicide attempts, suggesting the need for rapid action when such thoughts are detected. Indeed, more than 60% of new-onset suicide attempts occur within the first year after initial onset of suicidal thoughts (Nock, Borges, Bromet, Alonso, et al., 2008). Third, because of the relatively small sample sizes used in prior studies, researchers have been unable to conduct tests of the complex models that are needed to predict suicidal behavior. Most studies have examined the effects of individual risk factors (e.g., presence of a mental disorder) on single outcomes (e.g., presence of a suicide attempt), and have not had the statistical power or multiple measurements needed to carefully examine how risk and protective factors interact to produce suicidal behavior.

Fourth, there are major barriers to studying suicidal thoughts and behaviors using current assessment methods. In studying cases of suicide death, because the person is no longer able to provide a report on risk and protective factors, researchers must try to piece together information about risk factors via the use of psychological autopsy methods (Cavanagh et al., 2003). In studying cases of non-lethal suicidal behavior, although people are alive for study, they often are unable or unwilling to accurately report on the factors leading up to their suicidal behavior. Prior research has shown consistently that people often are unable to accurately report on the factors influencing their behavior (Nisbett & Wilson, 1977), and this surely extends to the case of suicidal behavior. The use of more objective assessment methods would help to circumvent problems associated with relying on self-report; however, this becomes practically difficult considering the very large sample sizes that are needed in the study of suicide, as mentioned above. Moreover, many people are unwilling to report not only on the factors leading to their behavior—such as the presence of a mental disorder—but on the presence of suicidal behavior at all. People may fail to report on suicidal thoughts or behaviors because they do not believe they have a problem, they do not

believe there is anything or anyone that can help them, they do not want to receive any intervention, or they fear the response that others will have to learning about their suicidal thoughts and/or behaviors (Hoge et al., 2004). This last point may be particularly important among soldiers who may be dissuaded from disclosing such information for fear of having their military career hindered or discontinued. This may be especially true during a time of war when there is an expectation that each soldier will continue to perform his or her duties or risk “letting down” the other members of their unit, family, and country. Such concerns can create very real barriers that prevent those at risk from seeking help or even from reporting on their problems in screening or other assessment programs. These are only some of the many challenges facing those working to advance the understanding, prediction, and prevention of suicide. Although daunting, there remains much that can and must be done to reverse the current trend and to decrease the loss of life resulting from this devastating problem.

Key Directions for Future Research

Given what we know about the risk and protective factors for suicide in general, and among soldiers in particular, and taking into account the major challenges inherent to this area, how do we proceed? What is the best path to understanding this problem and reversing its course? We briefly outline a handful of potential hypotheses about the reason for the increasing suicide rate and then focus on describing several key directions for future research on this problem and propose that progress is needed on each if we are truly to understand and ameliorate the problem of suicide among soldiers (Table 1).

Potential Hypotheses. With an understanding of general risk factors for suicidal behaviors, as well as some more specific military factors, we now highlight potential hypotheses for why there is an increase in suicide among Army soldiers at this point in time. The following is a non-exhaustive list of possibilities. A first hypothesis is that the recent increase in military suicides is due to an increase in the rates of mental disorders among soldiers—perhaps because stressors have increased the development of mental disorders in those with a vulnerability for such outcomes or because there has been an increase in the admission to the military of those with a vulnerability for a mental disorder. Increased vulnerability is possible via increases in waivers granted to entrants with a felony conviction (Alvarez, 2008), which may bring with it an increase in the percentage of soldiers with a predisposition for aggressive or antisocial behavior—traits associated with disorders that convey a high risk for suicide (Harris & Barraclough, 1997; Nock et al., 2010; Nock et al., 2009). A second hypothesis is that the rate of suicide is increasing as stories of suicidal soldiers pervade the media, a phenomenon known as the Werther Effect (Phillips, 1974). The style and content of suicide reporting (e.g., inclusion of a description of the suicide method) have been presumed to affect the magnitude of influence (Gould, 2001; Sonneck, Etzersdorfer, & Nagel-Kuess, 1994). Therefore, in an effort to promote appropriate dissemination of information regarding suicide completions and to decrease the social contagion effect, a number of agencies have compiled guidelines for the media (e.g., Suicide Prevention Resource Center [SPRC], 2007). In further support of this hypothesis, researchers have recently found that among civilian and military newspaper articles on suicide, 99% of reviewed reports failed to comply with at least one guideline from the SPRC

(Edwards-Stewart, Kinn, June, & Fullerton, 2011). Further examination of military suicide reporting and its effects is needed. A third hypothesis is that the rate of suicide has increased among soldiers as the nature of being in the military has changed and Army structural and cultural shifts have occurred. Recent structural shifts began to take place in 2006 with the Army Force Generation (ARFORGEN) initiative, which reshapes Army formations into modular units that can be deployed more quickly and can be realigned to fit specific mission requirements (Army Posture Statement, 2010; Kenyon, 2006). The effects of this and other structural/cultural shifts deserve attention.

Description

In order to understand the nature of this problem, it is vital that we first have a comprehensive descriptive picture of suicidal thoughts and behaviors. That is, who experiences suicidal thoughts and behaviors? When do they typically begin? How and at what point do they change over time? In addition to the epidemiologic research required to answer these questions, there is a need for qualitative research aimed at better understanding the factors that lead to suicide among soldiers, and to what extent suicide among members of the military may be qualitatively different from or the same as suicide among civilians. The answers to these and other descriptive questions are essential to guiding subsequent explanatory questions about why people become suicidal. For instance, if it is learned that the risk of suicide increases immediately before deployment or shortly after one returns home from deployment, this not only suggests time periods that should be targeted by screening and prevention efforts, but points toward several potentially modifiable risk factors (e.g., concerns about leaving home and entering combat, difficulties functioning post-deployment).

Prediction—Despite decades of research, scientists and clinicians still lack the ability to accurately predict suicidal behavior. Improving the ability to predict suicidal behavior before it occurs is the primary objective of work in this area. Success in this area will depend not on identifying some magical single variable that reliably leads to suicide, but on delineating what set of factors interact to increase the risk of suicide to a point that requires intervention. Several key challenges here include: identifying a set of risk factors with high sensitivity and specificity, devising a method of feasibly screening for risk over time, and determining what type of intervention is required at each level of risk. Each of these challenges requires significant attention. Consider a concrete example. One recent study revealed that approximately 30% of deployed soldiers seen for a mental health evaluation reported suicidal thoughts in the past month, and 15% reported homicidal thoughts (Hill et al., 2006). Thoughts of suicide and homicide are significant risk factors for the associated behaviors; however, once these thoughts are identified, how should they be monitored over time? What is the appropriate intervention? At what point is the soldier fully cleared for duty? How should that person be followed over time? Questions such as these confound mental health professionals in civilian environments, but represent even greater challenges for those in deployed contexts where mental health resources are limited and demands of maintaining the force are high. Future efforts must focus on providing methods of increasing prediction accuracy that can be feasibly used in multiple military contexts (e.g., basic training, pre-deployment, in theater, post-deployment, post-active duty).

One of the most important goals for future research on the prediction of suicidal behavior is the identification of *modifiable* risk factors. Non-modifiable risk factors (i.e., “risk markers”) can certainly be useful for the prediction of who is at risk, but they are of limited value in intervention or prevention efforts. By contrast, the factors that predict suicidal behavior and can be changed via some form of intervention can be targeted experimentally in order to develop prevention programs for suicidal behavior. For instance, it is known that combat exposure is associated with a significant increase in mental disorders such as PTSD (Hoge et al., 2004) and that PTSD is modifiable (Adshead, 2000). Just as the military takes steps to reduce the physical harms of combat (e.g., through the use of body armor), it also could take steps to reduce the mental impact of combat (e.g., through intervening on many of the factors reviewed, both structural [number of repeated deployments] and psychosocial [maintaining unit cohesion]). When military planners attempt to calculate the risks and benefits of war in terms of human costs, the mental health impact of war should be part of the calculation.

Protection—The vast majority of research on suicide has focused on the identification of factors that increase the risk of this behavior. In contrast, we know very little about the factors that decrease the likelihood of suicidal behavior among those exposed to known risk factors. There has been an increasing effort to better understand protective factors for suicide, as mentioned in the prior section, and the continuation of this effort represents one of the most important directions for future research on suicide. As with risk factors, protective factors that are *modifiable* are of special importance, as they can be used to better protect soldiers from future suicide risk before any such behavior has the chance to emerge.

Prevention efforts aimed at protecting soldiers from suicide risk are currently underway. An early example of this is the Air Force Suicide Prevention Program (AFSPP). The AFSPP is a multilayered program emphasizing community and leadership involvement in the early detection and treatment of individuals at risk for suicide. Since its implementation in 1997, suicide rates in the U.S. Air Force have been significantly lower each year with the exception of 2004 (authors determined that the AFSPP program was implemented with less rigor for this year) (Knox, Litts, Talcott, Feig, & Caine, 2003; Knox et al., 2010). More recent prevention efforts include the Suicide Assessment and Follow-up Engagement: Veteran Emergency Treatment (SAFE VET), an intervention seeking to enhance the care of suicidal veterans in VA emergency departments and to provide follow-up by telephone during the transition to outpatient care. SAFE VET consists of two components: (1) a brief psychotherapeutic intervention based on principles of the Safety Planning Intervention (Stanley & Brown, 2012), with aspects from existing evidence-based suicide reduction strategies, including: (a) implementation of means restriction, (b) use of coping skills and problem-solving, (c) improvement of social support and understanding of who to call in an emergency, and (d) motivational enhancement for additional treatment; and (2) structured telephone contacts that include three components: (a) risk assessment, (b) review and revision of the safety plan, and (c) facilitation of engagement with outpatient care (Knox et al., 2012). Initial findings related to acceptability and feasibility of the intervention are promising, and further evaluation of the SAFE VET intervention versus enhanced usual care is currently underway. An additional effort, representing the first time in history that

evidence-based PTSD treatment has been examined among active duty soldiers, is the South Texas Research Organizational Network Guiding Studies on Trauma and Resilience (STRONG STAR). STRONG STAR is a multi-institutional research consortium that aims to create and evaluate effective programs for the identification, prevention, and treatment of combat-related PTSD. There currently are 14 studies underway through STRONG STAR, including treatment studies, biological studies, epidemiological studies, and preclinical research (STRONG STAR, 2012). These prevention programs emphasize the need for and potential effectiveness of multi-faceted, evidence-based prevention programs.

Exploration—Many risk factors for suicidal behavior are already known, and the focus of future research is to understand how they work together to produce suicidal behavior. However, given the inability to accurately predict suicidal behavior using known risk factors, it is likely that many as yet unknown factors also hold value in predicting these outcomes. As such, there is a strong need for efforts aimed at revealing novel risk factors for suicidal behavior. Some such factors may be included and tested in new studies based on current theories of suicidal behavior or clinical observations that have not yet undergone empirical examination. Others may emerge from exploratory or data mining analyses conducted on existing databases and through the use of qualitative approaches. Especially in the case of the latter, it is important that evidence of novel risk factors be replicated to ensure that such findings are not merely due to chance. This direction has the potential to lead to the identification of new risk factors and to new ways of conceptualizing and assessing suicide risk.

Understanding—Although many risk factors for suicide currently are known, the field lacks a firm understanding of how or why most of them predict this outcome. Understanding how and why factors work together to produce an outcome is important not only for academic purposes, but for illuminating the process through which the outcome develops, which is likely to uncover potentially modifiable risk factors. For instance, more than 90% of suicides in the United States are performed by White people and approximately 80% are performed by men, yet it is not known why this is so. Additionally, mental disorders are widely known to be one of the strongest predictors of suicide, but we do not have an understanding of why this is so.

There is a great need for theoretical models that incorporate and explain the diverse range of risk and protective factors for suicide. New studies of suicide can best advance the understanding of this behavior by carefully specifying and testing the nature of the relation between the risk factors identified. Key questions that should be considered in future studies include: Is the identified factor a vulnerability (i.e., trait) or stress (i.e., state) factor? What part of the pathway to suicide does it predict (e.g., suicide ideation, plan, attempt)? Is it modifiable? What mediates and moderates its association with the suicidal outcome? Addressing these questions will require much larger sample sizes and more complex analyses than most prior studies of suicidal behavior (e.g., tests of interactions of vulnerability and stress factors; tests of prediction for different parts of the pathway to suicide), but the results of such analyses are likely to provide significant advances in our understanding of why soldiers are killing themselves at such a high rate.

CONCLUSIONS

Suicide is an enormous public health problem in the general population, and in recent years has become an increasingly concerning problem among soldiers, with the suicide rate in the U.S. Army surpassing that for the general population for the first time in decades. Suicide is notoriously difficult to detect, predict, and prevent due to a multitude of factors, such as its low base-rate, associated stigma, and motivation to conceal suicidal thoughts or behaviors among those who have them. Each of these problems is likely to be especially at play among members in the military. Despite the daunting nature of this problem, there is reason to be optimistic. As reviewed above, significant progress has been made in recent years toward understanding risk and protective factors for suicidal behavior, conceptualizing how they may work together to produce these outcomes, and developing methods of overcoming some of the major obstacles that have faced scientific and clinical efforts in this area.

Future progress toward understanding and preventing suicide will be significantly accelerated as a result of the increased attention and resources that have been dedicated to this problem. One example of such efforts is the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). This project was developed through a partnership between the U.S. Army and the National Institute of Mental Health and is aimed specifically at identifying modifiable risk and protective factors for suicide among soldiers. The results of this study are expected to markedly advance our understanding of why soldiers kill themselves and in doing so to provide information about how these deaths can be prevented in the future.

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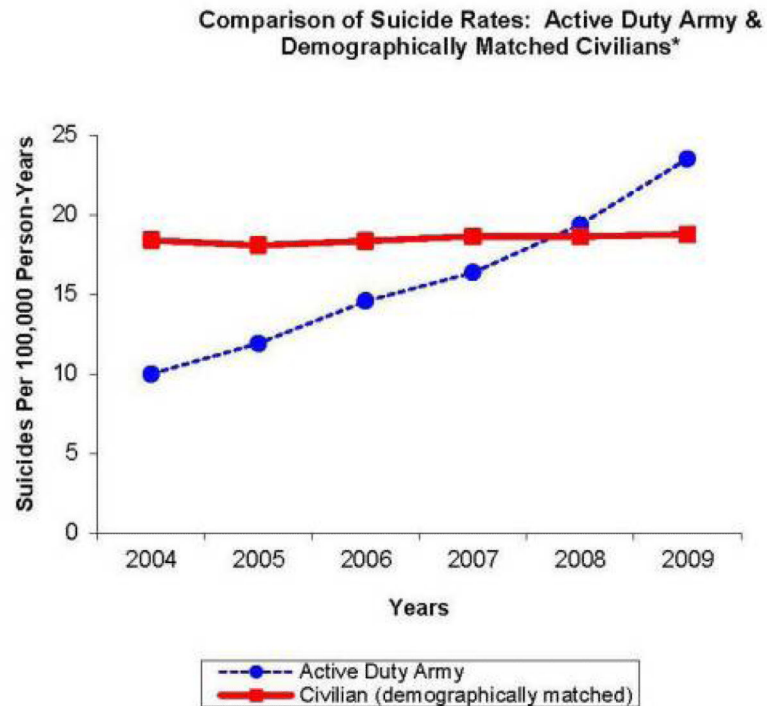


FIGURE 1.

Comparison of Suicide Rates: Active Duty Army and Demographically Matched Civilians. Army rates calculated by Army STARRS based on data provided by the Defense Manpower Data Center (<https://www.dmdc.osd.mil/appj/dwp/index.jsp>). Civilian rates calculated by Army STARRS based on data from the Centers for Disease Control and Prevention's WISQARS data system (<http://www.cdc.gov/injury/wisqars/index.html>), adjusted to reflect the age, sex and race composition of the Army.

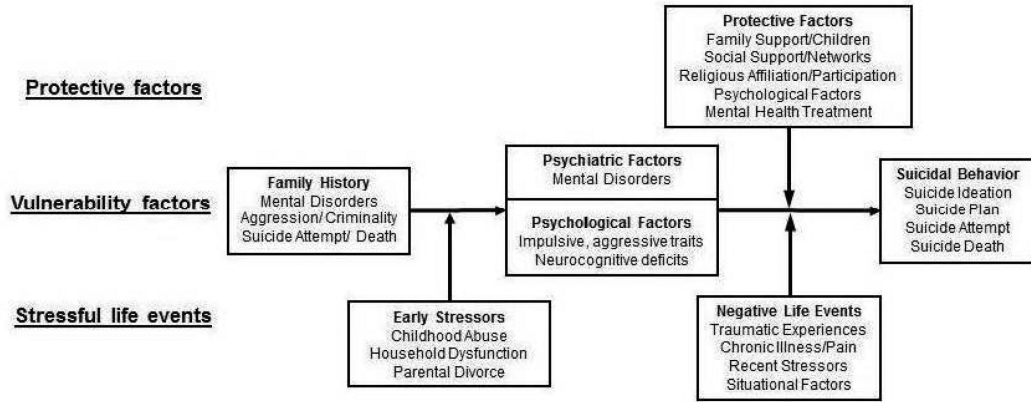


FIGURE 2.
Vulnerability-stress model of suicidal behavior.

TABLE 1

Key Directions for Future Research

Goal	Rationale	Strategy
Description	Knowledge of when, where, and among whom suicidal thoughts and behaviors occur is essential to understanding why these dangerous behaviors occur	Monitor suicidal thoughts and behaviors among soldiers across time, place, and person Use the information gained to tailor assessment, screening, and prevention efforts
Prediction	Suicide prevention is not possible without methods of accurately identifying those at the highest risk for such behavior	Develop methods of predicting suicidal behavior with high sensitivity and specificity Prediction methods must be feasibly adapted across multiple military contexts and must identify modifiable risk factors
Protection	The identification of modifiable protective factors for suicide can guide prevention efforts	Identify protective factors for suicidal behavior Create prevention programs that train soldiers to develop these factors Test the effectiveness of such programs, and if effective, disseminate to all soldiers
Exploration	Given the poor predictive ability of current risk factors, it is likely that many risk factors are unknown, highlighting the need for exploratory studies of new risk factors	Examine the predictive ability of a wide range of constructs and variables not previously linked with suicide Replicate effects of any novel risk factors that are discovered
Understanding	The development and evaluation of theoretical models that explain how and why different factors work together to produce suicidal behavior are needed to advance scientific and clinical efforts	Studies of suicide should carefully consider how each risk factor is proposed to lead to suicide (e.g., what are mediators and moderators?) and should test such relations As understanding increases, results obtained must be fed into screening and prevention efforts