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# Preventing PTSD and Depression and Reducing Health Care Costs in the Military: A Call for Building Resilience Among Service Members

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**ABSTRACT** The present study investigates the role of psychological resilience in protecting against the development of post-traumatic stress disorder (PTSD), depression, and comorbid PTSD and depression; and estimates the percent reductions in incidence of, and associated treatment cost savings for, each condition as a function of increasing resilience. A retrospective cohort of mental health care–seeking service members ($n$ = 2,171) completed patient-reported outcome measures approximately every 10 weeks as part of the Psychological Health Pathways program. Patients with low resilience were at significantly greater odds for developing physical, behavioral, and mental health conditions, particularly sleep disorder (adjusted odds ratio [AOR] = 2.60, 95% confidence interval [CI] = 1.81–3.73), perceived stress (AOR = 2.86, 95% CI = 1.05–7.75), and depression (AOR = 2.89, 95% CI = 2.34–3.57) compared to patients with moderate/high resilience. Increasing resilience across services by 20% is estimated to reduce the odds of developing PTSD, depression, and comorbid PTSD and depression by 73%, 54%, and 93%, respectively; the incidence by 32%, 19%, and 61%, respectively; and save approximately $196, $288, and $597 million in annual treatment costs, respectively, or approximately $1.1 billion total (a 35% reduction in costs). Using resilience as a preventive model may reduce health care utilization and costs in an already overtaxed health care system.

## INTRODUCTION

The costs of war not only include the amount of treasure spent and blood spilt, but also the invisible wounds with which service members and their families endure. This undetectable but palpable, psychological burden—borne from intense and repeated deployments for those who deploy and the increased operational tempo for those who do not—is an inevitable part of military service. Prolonged separation from family and friends, frequent relocations, physical fatigue, sleep deprivation, and the ever-present threat of injury or death are stressors not foreign to service members.[1,2] It is not surprising then, as a result of the cumulative effect of these stressors, that high rates of post-traumatic stress disorder (PTSD), depression, and suicide have been reported among veterans of Operations Enduring Freedom and Iraqi Freedom (OEF/OIF).[3–5] It is estimated that approximately one-third of all OEF/OIF veterans reported symptoms of a mental health or cognitive condition.[6] The remaining majority, however, exhibited remarkable psychological resilience, an ability to recover from negative and stressful experiences and find positive meaning in seemingly adverse situations.[7] Understanding the factors and processes underlying this phenomenon may help to inform interventions with which to build resilience and prevent psychopathology among service members.[8]

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Numerous articles have been written defining and examining resilience. In the 1970s, a group of researchers investigated the exceptional ability of some children to progress through normal development and live successful lives despite exposure to significant adversity.[9–11] The military began to embrace this concept of resilience in 2008 when Congress mandated that something be done to decrease the number of suicides among service members.[11] Although the initial impetus for resilience training in the military began with a desire to curb the suicide rate, bolstering resilience among service members may also prevent the development of mental health disorders, thereby reducing health care utilization and costs—a particular concern in a climate of tightening budgets. Psychological resilience has been shown to protect against the development of PTSD,[12] depression,[13] anxiety,[10] adjustment disorders,[10] suicidal ideation,[11] alcohol use disorder,[8] and conduct[10] and general health[7] problems; particularly among those with high combat exposure.[7,8] It is estimated that one-third of all returning service members access mental health services within their first year after deployment; 12% of whom receive a diagnosis of a mental health problem.[4] Including the medical costs associated with suicide mortality, it is estimated that the annual treatment costs for PTSD alone, depression alone, and comorbid PTSD and depression among service members amounts to approximately $0.6, $1.5, and $1.0 billion, respectively, or a total of $3.1 billion annually for these conditions alone.[14] In contrast to the traditional diagnosis/treatment-oriented model the military had taken before, wherein screening programs for psychopathology were improved and mental health services were expanded, the military is now attempting to pivot toward a prevention model which may reduce the incidence of mental health disorders and lessen the burden on an already overtaxed health care system.[1,2] Just as with physical training, it is imperative that service members improve their psychological fitness in order to ensure mission readiness, improve performance, and protect against the negative psychological consequences of war.

Although the definition and model of psychological resilience have been repeatedly redefined and reconfigured over time, there is consensus at the broadest level that resilience embodies the ability of an individual to persist in the face of challenges and to bounce back from adversity.[10,15] Using a resilience model proposed by Richardson[16] in which ever-present internal and external stressors causes one's "bio-psychospiritual balance" to fluctuate between extremes, resilience may be viewed as a measure of successful stress-coping capacity, an ability to adapt one's mind, body, spirit, and social elements to current life circumstances.[16,17] In addition to environmental influences, there is growing evidence to suggest that resilience may have underlying genetic, epigenetic, and neural etiologies[9,18]; however, even these individual characteristics may also be amenable to change under certain conditions.[8] Resilience may therefore function as both a state and a trait and may be enhanced through intervention.[7]

The objectives of the present study are to empirically estimate the protective role of resilience against the development of both physical and mental health problems; quantify the reduced risks of developing PTSD, depression, and comorbid PTSD and depression for every unit increase in resilience; determine the percent reductions in incidence for PTSD, depression, and comorbid PTSD and depression for every unit increase in resilience; and estimate the annual savings in treatment costs for PTSD, depression, and comorbid PTSD and depression for every unit increase in resilience for the Department of Defense (DoD). It is hypothesized here, as suggested in other studies,[7,8,13,15] that service members who exhibit lower resilience are at heightened risks for psychosocial and behavioral problems, physical and mental health disorders, and greater health care utilization.

## METHODS

From April 2009 to February 2013, a retrospective cohort of mental health care–seeking active duty service members from two military treatment facilities in and near San Diego, California, completed patient-reported outcome measures approximately every 10 weeks as part of the Psychological Health Pathways program. Current analyses were only performed using data from the first assessment and the first follow-up (median = 63 days, interquartile range [IQR] = 56 days). Missing data and losses to follow-up were addressed using pairwise deletion and censoring, respectively. Approval for the present study was obtained from the Naval Medical Center San Diego Institutional Review Board. Analyses were performed using SPSS Statistics 22.0 (IBM Corp., Armonk, New York).

Resilience was measured using the Responses to Stressful Experiences Scale (RSES)[19]; scores were dichotomized (low [0–49] vs. moderate/high [50–88]) using conventional cutoffs. Primary outcome measures (and their screening scales) included PTSD (PTSD Checklist [PCL] for the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition [DSM-IV]—Military Version [PCL-M][20]; cutoff of 50 and/or met cluster criteria) and depression (Patient Health Questionnaire[21]; met DSM-IV criteria); scores were dichotomized (positive vs. negative) using conventional cutoffs. Other outcome variables were also explored because of their availability within the dataset and their hypothesized association with resilience and general health. Secondary outcome measures (and their scales or items) included history of serious physical illness ("Describe any physical illnesses or head injuries you have had for which you went to a hospital, clinic, or doctor."; none vs. any), history of mental health treatment ("Previous mental health treatment?"; yes vs. no), history of a learning disability ("Have you been diagnosed with a learning disability?"; yes vs. no), history of psychiatric hospitalization ("Have you been hospitalized for mental health reasons?"; yes vs. no), history of alcohol/drug addiction treatment ("Previous treatment for alcohol/drug use?"; yes vs. no), history of partner counseling ("Have you ever requested or received professional help for problems with a partner, spouse, or girlfriend/boyfriend?"; yes vs. no), history of medical evacuation for physical health during deployment ("Were you medically

evacuated for a physical health condition?"; yes vs. no), history of medical evacuation for mental health during deployment ("Were you medically evacuated for a mental health condition?"; yes vs. no), history of mild traumatic brain injury (Brief Traumatic Brain Injury Screen[22]; endorsement of items 1 and 2), receipt of current medical treatment ("Are you under treatment for any medical conditions?"; yes vs. no), medication use ("Please list all medications ... you are currently taking."; none vs. any), sleep disorder (Pittsburg Sleep Quality Index[23]; cutoff of 5), pain (Numeric Pain Rating Scale[24]; 0 vs. $\geq$1), perceived stress (dichotomously assessed on eight domains; none vs. any), nicotine use (none vs. any), caffeine use (none vs. any), allergies (none vs. any), disability (Sheehan Disability Scale [SDS][25]; 0 vs. $\geq$1), absenteeism (SDS: "On how many days in the last week did your symptoms cause you to miss school or work, or leave you unable to carry out your normal daily responsibilities?"; 0 vs. $\geq$1), and unproductivity (SDS: "On how many days in the last week did you feel so impaired by your symptoms, that even though you went to school or work, your productivity was reduced?"; 0 vs. $\geq$1).

Descriptive statistics were performed to describe the sociodemographics of the sample, including combat exposure (Combat Experiences Scale[26]). To determine whether any of the characteristics were associated with resilience, bivariate analyses (Pearson's correlation and one-way analysis of variance) of RSES scores across sociodemographic covariates were performed; significant associations ($p < 0.05$) were later adjusted for in the logistic regression models. After controlling for covariates, logistic regression models using data from the first assessment were performed to determine the adjusted odds of developing the outcomes of interest among those with low (vs. moderate/high) resilience. Prospectively, after controlling for covariates, logistic regression models determined the adjusted odds of developing PTSD alone, depression alone, and comorbid PTSD and depression at the follow-up assessment for every one-point increase in the RSES score among patients who screened negative for each respective mental health disorder at the first assessment. The adjusted odds ratios (AOR) were then translated into percent change in incidence rates using methodology published by Liberman[27]:

$$\text{Centered RR} = \sqrt{\text{OR}}$$

$$\text{Centered } p_{\text{L}} = \frac{1}{\left(1 + \sqrt{\text{OR}}\right)}$$

$$\text{Centered } p_{\text{H}} = 1 - p_{\text{L}}$$

The difference in values for the probability pair (denoted $p_{\text{H}}$ and $p_{\text{L}}$) can then be understood to be the percent change in incidence rate for a particular mental health disorder due to a specific incremental change in resilience.[27]

Based on these results and data published by the RAND Corporation,[14] an estimate of the monetary savings for the DoD associated with increasing resilience across services and thereby preventing PTSD and depression (i.e., reducing future incurred mental health care costs) was calculated. During the height of OEF/OIF, the incidence rates for PTSD alone, depression alone, and comorbid PTSD and depression were estimated to be 7.5%, 7.2%, and 7.5%, respectively.[14] Excluding the costs associated with suicide mortality, the annual costs per case of PTSD alone, depression alone, and comorbid PTSD and depression are estimated to be $2,952, $7,731, and $6,214, respectively.[14] Including the costs associated with suicide mortality, the annual costs per case of PTSD alone, depression alone, and comorbid PTSD and depression are estimated to be $5,149, $12,879, and $8,442, respectively.[14] The percent reduction in incidence rates for PTSD alone, depression alone, and comorbid PTSD and depression for every one-point increase in the RSES score was then used to calculate savings in mental health care costs. The savings estimated here refer to the reduced incurred mental health treatment costs associated with preventing future diagnoses of PTSD, depression, and comorbid PTSD and depression; additional savings may also be attributed to the prevention of other mental health disorders and diminished symptomatology reported by current mental health care patients. To demonstrate this, bivariate analyses (Pearson's correlation) of resilience (RSES scores) with PTSD and depressive symptoms (PCL-M and Patient Health Questionnaire scores, respectively) from the follow-up assessment were performed among patients who screened positive for each respective mental health disorder at the first assessment.

## RESULTS

The sample consisted of 2,171 mental health care patients. As described in Table I, the median age and length of service were 25.0 years (3.0 IQR) and 64.0 months (24.0 IQR), respectively; and the majority were male (90.2%), White (58.5%), married (50.2%), Christian (70.9%), high school graduates (52.8%), and ranked E4–E6 (61.8%). Age ($r$[2,162] = 0.11, $p < 0.001$), sex ($F$[1, 2,104] = 6.59, $p = 0.010$), race ($F$[1, 2,147] = 19.66, $p < 0.001$), religious affiliation ($F$[7, 2,024] = 8.60, $p < 0.001$), educational attainment ($F$[4, 2,159] = 3.94, $p = 0.003$), military rank ($F$[4, 2,134] = 8.75, $p < 0.001$), and combat exposure ($r$[1,719] = 0.05, $p = 0.030$) were significantly associated with resilience and therefore were adjusted for in all logistic regression models.

The distribution of RSES scores was normal (mean = 49.03, standard deviation [SD] = 17.55), with the majority (50.5%) exhibiting low resilience, followed by moderate (38.1%) and high (11.4%) resilience. For the purposes of this study, those with moderate and high resilience were aggregated into 1 group (moderate/high, 49.5%).

Patients with low resilience are at significantly greater odds for perceived pain (AOR = 1.24, 95% confidence interval [CI] = 1.00–1.54), receipt of current medical treatment (AOR = 1.29, 95% CI = 1.04–1.59), nicotine use (AOR = 1.34, 95% CI = 1.08–1.66), history of medical evacuation for physical health during deployment (AOR = 1.43, 95% CI = 1.00–2.04), history of mental health treatment (AOR = 1.51, 95% CI = 1.22–1.87), medication use (AOR = 1.52, 95% CI = 1.14–2.03), disability (AOR = 1.52, 95% CI = 1.16–1.97), absenteeism (AOR = 1.58, 95% CI = 1.26–1.98), history of

**TABLE I.** Pearson's Correlation and One-Way Analyses of Variance of RSES Score Across Characteristics of a Sample of Mental Health Care-Seeking Patients in a Military Population ($n$ = 2,171)

| Characteristics | $n$ (%)[a] | RSES Score | | | | |
|---|---|---|---|---|---|---|
| | | Mean | SD | Pearson's $r$ | $F$ Statistic | $p$ Value |
| Age (Median, IQR)[b] | 25.0 (3.0) | | | 0.11 | | <0.001 |
| Sex[b] | | | | | 6.59 | 0.010 |
| Female | 206 (9.8) | 45.98 | 18.05 | | | |
| Male | 1,900 (90.2) | 49.28 | 17.44 | | | |
| Race[b] | | | | | 19.66 | <0.001 |
| Non-White | 891 (41.5) | 51.07 | 18.84 | | | |
| White | 1,258 (58.5) | 47.69 | 16.35 | | | |
| Marital Status[b] | | | | | 2.12 | 0.076 |
| Married | 1,059 (50.2) | 49.43 | 17.69 | | | |
| Divorced | 204 (9.7) | 50.03 | 17.25 | | | |
| Separated | 231 (10.9) | 46.10 | 17.06 | | | |
| Widowed | 2 (0.1) | 59.50 | 3.54 | | | |
| Never Married | 615 (29.1) | 48.78 | 17.54 | | | |
| Religious Affiliation[b] | | | | | 8.60 | <0.001 |
| Christian | 1,441 (70.9) | 50.72 | 17.60 | | | |
| Jewish | 9 (0.4) | 37.00 | 14.52 | | | |
| Hindu | 2 (0.1) | 35.50 | 14.85 | | | |
| Muslim | 2 (0.1) | 9.50 | 13.44 | | | |
| Mormon | 35 (1.7) | 47.77 | 12.67 | | | |
| Buddhist | 15 (0.7) | 50.53 | 17.12 | | | |
| Other | 112 (5.5) | 48.35 | 17.36 | | | |
| None | 416 (20.5) | 44.34 | 16.98 | | | |
| Educational Attainment[b] | | | | | 3.94 | 0.003 |
| High School/GED | 1,142 (52.8) | 48.15 | 17.59 | | | |
| Some College or Technical/Trade School | 883 (40.9) | 49.47 | 17.53 | | | |
| Bachelor's Degree | 90 (4.2) | 51.81 | 17.60 | | | |
| Graduate Degree (Masters or Doctorate) | 32 (1.5) | 56.47 | 14.01 | | | |
| Professional | 8 (0.4) | 61.88 | 12.44 | | | |
| Military Rank[b] | | | | | 8.75 | <0.001 |
| E1–E3 | 596 (27.9) | 46.90 | 18.80 | | | |
| E4–E6 | 1,321 (61.8) | 48.87 | 16.99 | | | |
| E7–E8 | 149 (7.0) | 55.54 | 16.36 | | | |
| W1–W4 | 16 (0.7) | 55.31 | 19.20 | | | |
| O1–O6 | 57 (2.7) | 53.07 | 13.48 | | | |
| Length of Active Duty Service, Months (Median, IQR) | 64.0 (24.0) | | | 0.10 | | <0.001 |
| Combat Exposure (CES; Mean, SD)[b] | 6.1 (4.6) | | | 0.05 | | 0.030 |

CES, Combat Experiences Scale; GED, general educational development. [a]Percentages are based on the population size for each group but exclude individuals with missing data; percents may not sum to 100. [b]Missing data for age ($n$ = 7), sex ($n$ = 65), race ($n$ = 22), marital status ($n$ = 60), religious affiliation ($n$ = 139), educational attainment ($n$ = 10), military rank ($n$ = 32), and combat exposure ($n$ = 235).

psychiatric hospitalization (AOR = 1.66, 95% CI = 1.23–2.25), PTSD (AOR = 1.68, 95% CI = 1.36–2.07), and unproductivity (AOR = 2.48, 95% CI = 1.97–3.12) compared to patients with moderate/high resilience. Interestingly, patients with low resilience are at nearly three times the odds for sleep disorder (AOR = 2.60, 95% CI = 1.81–3.73), perceived stress (AOR = 2.86, 95% CI = 1.05–7.75), and depression (AOR = 2.89, 95% CI = 2.34–3.57) compared to patients with moderate/high resilience. Of note, patients with low resilience were not at greater odds for history of serious physical illness; learning disability; alcohol/drug addiction treatment; partner counseling; medical evacuation for mental health during deployment; mild traumatic brain injury, caffeine use, or allergies compared to patients with moderate/high resilience.

The adjusted odds of developing PTSD alone, depression alone, and comorbid PTSD and depression at the follow-up assessment for every one-point increase in RSES score among those who screened negative for each respective mental health disorder at the first assessment are depicted in Figures 1A to 1C, respectively. Among patients for whom follow-up data were available and screened negative for PTSD alone ($n$ = 208), depression alone ($n$ = 207), and comorbid PTSD and depression ($n$ = 161) at the first assessment based on DSM-IV criteria, 7.7% ($n$ = 16) developed PTSD alone, 14.5% ($n$ = 30) developed depression alone, and 12.4% ($n$ = 20) developed comorbid PTSD and depression at follow-up. As shown in Figure 1A, there is an exponential decrease in the adjusted odds of developing PTSD alone with every unit increase in resilience. Specifically, increasing resilience by 1,

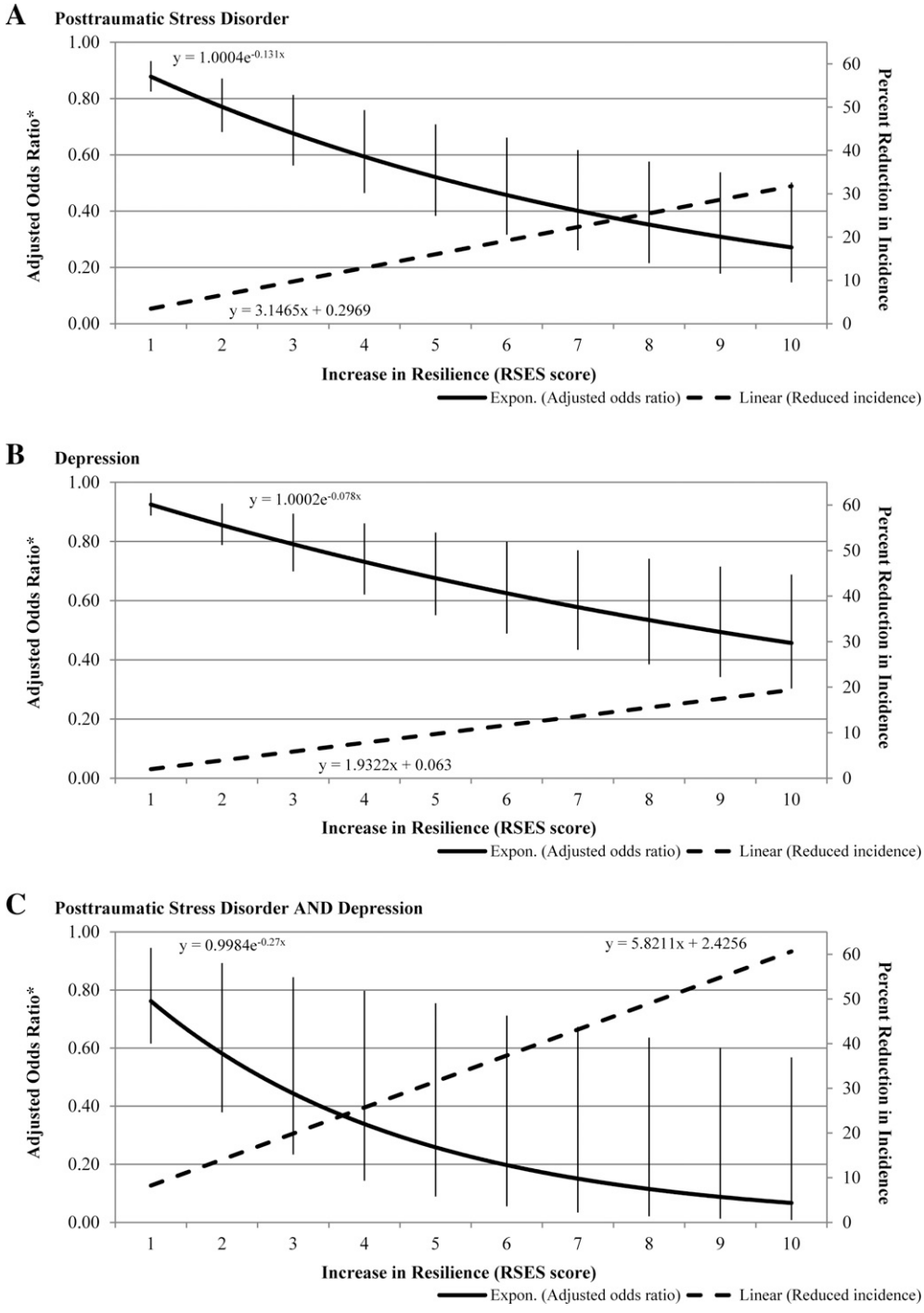


**FIGURE 1.** Adjusted odds ratios (and 95% confidence intervals) and percent reductions in incidence of PTSD and depression as functions of resilience in a sample of mental health care–seeking patients from a military population: (A) PTSD, (B) depression, and (C) PTSD and depression. *Adjusted for age, sex, race, religion, education, rank, length of service, and combat exposure ( $p \leq 0.013$).

5, and 10 points in the RSES score is associated with a 12% (AOR = 0.88, 95% CI = 0.83–0.93), 48% (AOR = 0.52, 95% CI =0.38–0.71), and 73% (AOR = 0.27, 95% CI = 0.15–0.50) reduced adjusted odds of developing PTSD alone, respectively. Similarly, as shown in Figure 1B, there is an exponential decrease in the adjusted odds of developing depression alone with every unit increase in resilience. In other words, increasing resilience by 1, 5, and 10 points in the RSES score is associated with a 7% (AOR = 0.93, 95% CI = 0.89–0.96), 32% (AOR = 0.68, 95% CI = 0.55–0.83), and 54% (AOR = 0.46, 95% CI = 0.30–0.69) reduced adjusted odds of developing depression alone, respectively.

Likewise, as shown in Figure 1C, there is an exponential decrease in the adjusted odds of developing comorbid PTSD and depression with every unit increase in resilience. Specifically, increasing resilience by 1, 5, and 10 points in the RSES score is associated with a 24% (AOR = 0.76, 95% CI = 0.62–0.95), 74% (AOR = .26, 95% CI = 0.09–0.75), and 93% (AOR = 0.07, 95% CI = 0.01–0.57) reduced adjusted odds of developing comorbid PTSD and depression, respectively.

Using methodology published by Liberman,[27] an estimate of the percent reduction in incidence of PTSD alone, depression alone, and comorbid PTSD and depression as functions of resilience are depicted in Figures 1A to 1C, respectively. As shown in Figure 1A, there is a linear increase in the percent reduction in incidence of PTSD alone with every unit increase in resilience. Specifically, increasing resilience by 1, 5, and 10 points in the RSES score is associated with a 3.4%, 16.0%, and 31.8% reduction in incidence of PTSD alone, respectively. Similarly, as shown in Figure 1B, there is a linear increase in the percent reduction in incidence of depression alone with every unit increase in resilience. In other words, increasing resilience by 1, 5, and 10 points in the RSES score is associated with a 2.0%, 9.7%, and 19.4% reduction in incidence of depression alone, respectively. Likewise, as shown in Figure 1C, there is a linear increase in the percent reduction in incidence of comorbid PTSD and depression with every unit increase in resilience. Specifically, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an 8.3%, 31.5%, and 60.6% reduction in incidence of comorbid PTSD and depression, respectively.

Using data from the RAND Corporation,[14] an estimate of the annual savings in treatment costs as a result of pre vented diagnoses of PTSD alone, depression alone, and comorbid PTSD and depression as functions of resilience are depicted in Figure 2. As shown, there is a linear increase in the annual savings in treatment costs for PTSD alone with every unit increase in resilience. Excluding suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $12, $57, and $112 million in treatment costs for PTSD alone, respectively. Including suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $21, $99, and $196 million in treatment costs for PTSD alone, respectively. Similarly, there is a linear increase in the annual savings in treatment costs for depression alone with every unit increase in resilience. Excluding suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $18, $87, and $173 million in treatment costs for depression alone, respectively. Including suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $30, $144, and $288 million in treatment costs for depression alone, respectively. Likewise, annual savings in treatment costs for comorbid PTSD and depression as a function of resilience follow a second-order polynomial equation. Excluding suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $49, $243, and $440 million in treatment costs for comorbid PTSD and depression, respectively. Including suicide mortality, increasing resilience by 1, 5, and 10 points in the RSES score is associated with an annual savings of $67, $331, and $597 million in treatment costs for comorbid PTSD and depression, respectively.

Prospectively, among patients who screened positive for PTSD at the first assessment, resilience was inversely associated with PTSD cluster B ($r[376] = -0.25$, $p < 0.001$), cluster C ($r[376] = -0.30$, $p < 0.001$), and cluster D ($r[376] = -0.24$, $p < 0.001$) severity scores and overall post-traumatic stress symptoms ($r[376] = -0.34$, $p < 0.001$). Similarly, among patients who screened positive for depression at the first assessment, resilience was inversely associated with depressive symptoms ($r[418] = -0.35$, $p < 0.001$) at the follow-up assessment.

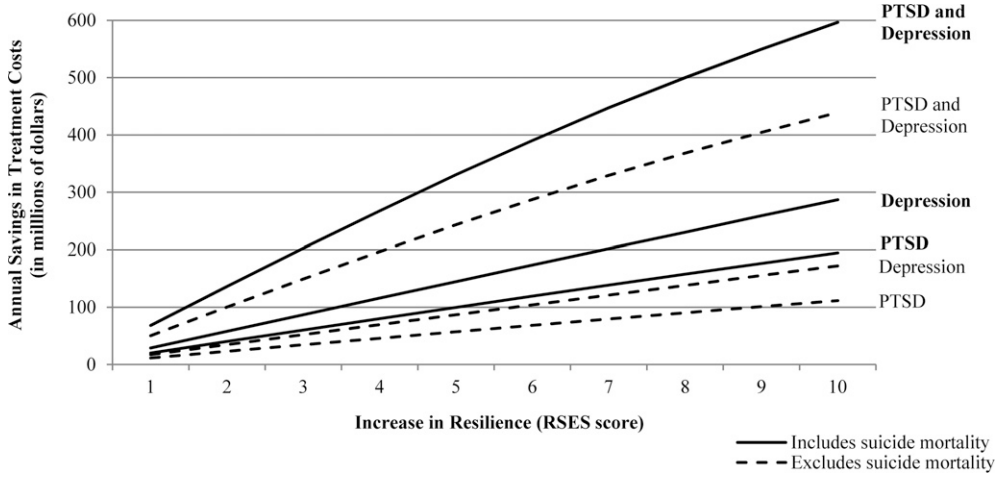


**FIGURE 2.** Annual savings in treatment costs for PTSD and depression as functions of resilience in a sample of mental health care–seeking patients from a military population.

## DISCUSSION

The present study is an in-depth investigation into the role of resilience in protecting against negative health outcomes, particularly mental health disorders, and an analysis into its possible role in reducing mental health care costs for the DoD. It is the first study to empirically quantify the odds of developing PTSD, depression, and comorbid PTSD and depression as functions of increasing resilience. It is also the first to assess how bolstering resilience may reduce the incidences of PTSD, depression, and comorbid PTSD and depression, and demonstrate the cost savings associated with preventing future diagnoses of each condition. Novel findings demonstrate the cost-effectiveness of using resilience as a preventive model enterprise wide and may help inform how resilience programs are designed and conducted.

It is important to note that the mean RSES score (49.03, 17.55 SD) is significantly lower and exhibits greater variation than mean RSES scores reported in other military populations (Navy corpsmen: 67.3, 11.0 SD; active duty Army National Guard and Marines: 60.2, 12.4 SD; OEF/OIF veterans: 55.7, 14.8 SD),[19] reflecting the fact that the sample used in the present study consisted of mental health care–seeking patients. Giving further credence to the resilience model put forth by Richardson,[16] results indicate that individuals who are unable to successfully cope with daily life and military-specific stressors may develop health problems in all four domains of resilience—mind, body, spirit, and social—including physical, behavioral, and mental health conditions[16,28]; thereby increasing health care utilization and costs. Improving resilience across services is bound to have dramatic effects on the incidence of mental health disorders and their associated treatment costs. To demonstrate, increasing resilience across services by 10 points on the RSES (a 20% increase in this sample) is estimated to reduce the odds of developing PTSD, depression, and comorbid PTSD and depression by 73%, 54%, and 93%, respectively; the incidence of each condition by 32%, 19%, and 61%, respectively; and, including suicide mortality, an annual cost savings for treatment of $196, $288, and $597 million, respectively, or approximately $1.1 billion total (a 35% reduction in costs). As shown in our analyses, however, the financial benefit of increasing resilience across services plateaus gradually with every unit increase in the RSES score, particularly in its ability to protect against comorbid PTSD and depression; therefore, a cost-benefit analysis is needed to determine the extent to which funds are appropriated to enterprise wide resilience training programs to offset the costs of mental health treatment. Nevertheless, our analyses show that increasing resilience may not only reduce the odds of developing mental health disorders, but it may also reduce symptomatology among patients with existing mental health problems; thereby further reducing health care utilization and costs.

Despite the focus on pathological outcomes in the current study, psychological resilience is more than just the absence of mental health problems; it should be understood as a strength-based construct, composed of such measures as well-being, positive affect, self-regulation, and mindfulness.[29] However, existing resilience training programs in the military place significant emphasis on mental health, as opposed to providing a holistic and comprehensive intervention that also addresses physical, spiritual, and social content.[2,29] Moreover, empirical evidence supporting the effectiveness of these programs in military samples is promising but limited.[2] Additional longitudinal research is needed on the stability of resilience variables, specifically its inherently fluctuating nature in the face of daily internal and external stressors, as well as the long-term sustainability of the benefits of receiving resilience training.[8] Nonetheless, it is highly plausible that such programs, when incorporated into existing strength training structures,[29] may have demonstrable effects on not only the mental health of service members but also their performance and mission readiness; particularly when introduced at recruitment or early in their military careers.[8]

The results presented only demonstrate proof of concept; several limitations of the data and analyses must be considered. Although the present study demonstrates that there is a significant association between resilience and mental health outcomes, namely PTSD and depression, causation cannot be concluded and therefore the ramifications of introducing an intervention to bolster resilience are still poorly understood. The sample consisted of mental health care–seeking service members, particularly Sailors and Marines, and therefore the generalizability of the results to other populations is limited and the protective effects of increasing resilience may be overestimated. The mental health outcomes of interest were assessed at short intervals using survey-based screening measures; they were not clinically diagnosed and may partly be statistical artifacts due to the nature of the data. Furthermore, because of the methodological requirements of the analyses, dichotomization of many of the outcome variables was necessary, potentially resulting in a significant loss of information and reduced power of statistical tests. Secondary outcomes that consisted of health problems in a patient's medical history may be subject to recall bias. The reference health care cost and incidence data used in the analyses were reported at the height of OEF/OIF and therefore improving resilience may have less demonstrable effects among current service members. The high rate of attrition between assessments (64%) may suggest nonresponse bias. Other than receiving treatment, an explanation as to why resilience and outcome scores changed at all between assessments cannot be determined. Finally, due to unavailable data, the present study does not address the benefits of increasing resilience for mental health disorders other than PTSD and depression, and does not accurately address how increasing resilience may benefit patients with existing mental health problems and save in their treatment costs. Because of these limitations, the results of this study should be understood as exploratory in nature and should be interpreted with caution. Further research is needed to better elucidate the role of psychological resilience in protecting service members from developing mental health disorders.

A cost-benefit analysis and a longitudinal evaluation of existing resilience training programs are needed to determine

how to best appropriate limited DoD funds and best implement a robustly designed, population-based resilience intervention for the military. Nonetheless, building psychological resilience among service members may not only improve performance and mission readiness, but may also strengthen all four domains of their stress-coping capacity, therefore conferring protection against the development of mental health disorders and simultaneously reducing health care utilization and costs in an already overtaxed health care system.

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