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## The Economic Burden of Posttraumatic Stress Disorder in the United States From a Societal Perspective

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### ABSTRACT

**Objective:** To estimate the economic burden of posttraumatic stress disorder (PTSD) in the United States civilian and military populations from a societal perspective.

**Methods:** A prevalence-based and human capital approach was used to estimate the total excess costs of PTSD in 2018 from insurance claims data, academic literature, and governmental publications. Excess direct health care costs (pharmacy, medical), direct non-health care costs (research and training, substance use, psychotherapy, homelessness, disability), and indirect costs (unemployment, productivity loss, caregiving, premature mortality) associated with PTSD were compared between adults with PTSD and adults without PTSD, or the general population if information was not available for adults without PTSD.

**Results:** The total excess economic burden of PTSD in the US was estimated at \$232.2 billion for 2018 (\$19,630 per individual with PTSD). Total excess costs were \$189.5 billion (81.6%) in the civilian population and \$42.7 billion (18.4%) in the military population, corresponding to \$18,640 and \$25,684 per individual with PTSD in the civilian and military populations, respectively. In the civilian population, the excess burden was driven by direct health care (\$66.0 billion) and unemployment (\$42.7 billion) costs. In the military population, the excess burden was driven by disability (\$17.8 billion) and direct health care (\$10.1 billion) costs.

**Conclusions:** The economic burden of PTSD goes beyond direct health care costs and has been found to rival costs for other costly mental health conditions. Increased awareness of PTSD, development of more effective therapies, and expansion of evidence-based interventions may be warranted to reduce the large clinical and economic burden of PTSD.

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Posttraumatic stress disorder (PTSD) can develop after witnessing or experiencing a traumatic event, such as life-threatening or sexually traumatic events,<sup>1</sup> and can cause long-term disability and premature morbidity and mortality.<sup>1-3</sup> Symptoms include intrusive thoughts and nightmares related to the trauma, mental and/or physical distress to trauma-related stimuli, avoidant behaviors, negative thoughts and feelings, and hyperarousal symptoms.<sup>1</sup> Management of PTSD involves psychological and/or pharmacologic options based on clinical judgment and patient preference.<sup>4</sup> Various PTSD treatment guidelines (eg, US Department of Veterans Affairs and Department of Defense, World Health Organization) support trauma-focused psychotherapy as first-line treatment for PTSD, which aims to emotionally process the traumatic memory and integrate new information so that the trauma reminder is no longer seen as a signal of threat.<sup>1,5,6</sup> As for pharmacotherapy, barriers to treatment exist, with many individuals remaining untreated<sup>7</sup> and only two pharmacologic agents (both antidepressants) approved for the treatment of PTSD by the US Food and Drug Administration (FDA) in the past 20 years.<sup>8</sup> In addition, stigmatization of PTSD further contributes to the barriers to treatment.<sup>9,10</sup> Particularly if left untreated or only partially responsive,<sup>1,11</sup> PTSD is associated with an increased risk of substance use disorder (SUD), disability, unemployment, and premature mortality, all of which contribute to a substantial clinical burden.<sup>2,3,12,13</sup>

In line with the clinical burden, PTSD is also associated with a substantial economic burden. However, there is limited literature describing the total economic burden of PTSD in the US. Studies mostly focus on the military population and/or are limited to direct health care costs.<sup>14-18</sup> While the prevalence of PTSD in the US is higher in the military population than in the civilian population, the military population composes only a small proportion of the overall US population.<sup>19</sup> Together with the fact that PTSD is known to be underdiagnosed and undertreated,<sup>7,20</sup> existing reports of the economic burden of PTSD are likely not capturing the actual burden of the disease. To address this gap in knowledge and to inform stakeholders, this study provides a contemporary and comprehensive evaluation of the total direct health care, direct non-health care, and indirect costs associated with PTSD in both US civilian and US military (ie, active military and Veteran) populations from a societal perspective.

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### Clinical Points

- Total excess costs in the civilian population represented 81.6% of the total economic burden of posttraumatic stress disorder (PTSD), yet previous literature mostly focused on the military population.
- The economic burden of PTSD goes beyond direct health care costs and rivals that of other costly mental health conditions.
- Increased awareness of PTSD and expansion of evidence-based interventions are warranted.

## METHODS

### Data Source

IBM MarketScan Commercial, Medicare Supplemental, and Multi-State Medicaid Databases were used to obtain the direct health care costs of PTSD among the civilian population. Direct health care costs of PTSD in the military population and direct non-health care and indirect costs in the civilian and military populations were estimated based on the literature, including data from the US Census and governmental agencies. Each source was chosen in consultation with clinical experts to identify credible and accurate estimates based on a targeted evaluation of the data reported and relevance for this study. Selected estimates from the literature were those that were deemed of highest relevance to the current study in terms of population studied (eg, adult population, civilian or military patients, US-only), robustness/quality of the estimates (eg, methods, sample size), and recency of the study, compared to other available literature. For the prevalence estimates used to calculate economic burden, results from a systematic literature review were used, which was conducted to identify high-quality studies, based on the generalizability of the results to the study's targeted population, quality of the measurement of PTSD (eg, clinical interviews versus self-reported surveys), and overall quality of the methodology.<sup>21</sup>

### Excess Economic Burden of PTSD

The total excess economic burden of PTSD in the US for 2018 (the latest year for which data were available at the time of study) was evaluated from a societal perspective based on the average cost differences between an adult with PTSD and an adult without PTSD, or from the general population if the information was not available for adults without PTSD. (The term *average* represents "mean values" throughout this report.) Each cost component was estimated using a prevalence-based approach. Given that multiple data sources were used in the calculation (Table 1), estimated costs were weighted by the distribution of the relevant individual characteristics in the US population in the year 2018. For example, for publications with male and female stratification, results were reweighted based on the prevalence of PTSD by sex. An adjustment for population growth was used to account for costs derived from statistics

published before or after 2018. Cost components were calculated to be mutually exclusive.

**Direct health care costs.** Costs were weighted by the distribution of adults with each type of health plan (commercial, Medicare, and Medicaid) or no health plan coverage (Table 1). For uninsured individuals, costs were derived based on the portion of medical service costs that were covered by federal, state, and/or local institutions, as well as the private sector in 2018 (ie, uncompensated health care cost).<sup>22</sup>

For individuals in the military population, costs were estimated from the literature and calculated as the amount reimbursed by the primary payer (ie, Veterans Affairs [VA] or Department of Defense [DOD]). In cases when patients were not covered by VA or DOD plans or only sought medical services outside of the military network, excess health care costs were proxied based on the costs from commercial, Medicare, and Medicaid claims.

**Direct non-health care costs.** Direct non-health care costs were based on the literature and included costs for research and training on PTSD, SUD, psychotherapy services (ie, only psychotherapy services covered by health plans were included under direct health care costs), homelessness, and disability. Substance use disorder was included as a separate cost component since it is associated with additional costs related to crimes, prevention and research, and road traffic accidents that were not already captured elsewhere (eg, direct health care costs, unemployment) and for which reliable sources were available.<sup>13,29–31</sup>

**Indirect costs.** Indirect costs of PTSD were estimated based on the literature and governmental publications using a human capital approach, in which costs were derived using paid work compensation rates.<sup>57</sup> Components included unemployment, productivity loss at work (ie, presenteeism and absenteeism), caregiving, and premature mortality.

## RESULTS

Using one of the most recent US prevalence estimates of PTSD (civilian population: 2.6% and 6.0% for men and women, respectively; military population: 6.7% and 11.7%, respectively)<sup>19</sup> and 2018 population estimates from the Census Bureau,<sup>55</sup> VA,<sup>56</sup> and DOD,<sup>58</sup> 2,607,131 male and 7,558,833 female adults were estimated to have PTSD in the US civilian population and 1,368,925 male and 293,256 female adults in the US military population. Female adults with PTSD accounted for 66.4% of the overall PTSD population.

Based on these estimates, the total excess economic burden of PTSD in the US was estimated at \$232.2 billion for 2018, corresponding to \$19,630 in excess costs annually due to PTSD per individual with PTSD. While a larger proportion of these total excess costs is attributed to the civilian population (\$189.5 billion [81.6%]) than the military population (\$42.7 billion [18.4%]), the excess costs per individual with PTSD are lower for the civilian population (\$18,640) than for the military population (\$25,684).

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Table 1. Summary of Clinical Findings and Costs for Each Component of the Total Economic Burden of PTSD

Component	Excess due to PTSD	No. of Individuals	Unit Cost	Excess Costs due to PTSD <sup>a</sup>	Excess Costs per Individual	Reference
<b>Direct Health Care</b>				<b>\$76,120,508,222</b>	<b>\$6,436</b>	
Civilian	\$13,016 <sup>b</sup>	5,072,816	...	\$66,027,773,525	\$6,495	MarketScan, 22
Military	\$12,167 <sup>c</sup>	829,428	...	\$10,091,582,733	\$6,071	23–26
<b>Direct Non-Health Care</b>				<b>\$35,727,408,098</b>	<b>\$3,021</b>	
PTSD-related research and training						
Civilian	\$96,260,910 <sup>d</sup>	10,165,964	...	\$96,260,910	\$9	27
Military	\$39,704,705 <sup>e</sup>	1,662,181	...	\$39,704,705	\$24	27, 28
Substance use disorder <sup>f</sup>						
Civilian	...	...	...	\$1,554,081,980	\$153	
Alcohol use disorder	6.7%	679,007	\$719	\$488,142,360	...	29, 30
Drug use disorder	3.9%	399,508	\$2,668	\$1,065,939,621	...	29–31
Military	...	...	...	\$722,415,083	\$435	
Alcohol use disorder	20.9%	347,575	\$719	\$249,873,480	...	13, 29
Drug use disorder	10.7%	177,106	\$2,668	\$472,541,603	...	13, 29, 31
Psychotherapy services <sup>g</sup>						
Civilian	11.6%	123,771	\$133/visit; 10 visits/year	\$156,196,682	\$15	32–34
Homelessness <sup>h</sup>						
Civilian	0.3%	34,558	\$52/night	\$660,015,798	\$65	35–37
Military	0.7%	10,946	\$52/night	\$209,064,807	\$126	36–38
Disability						
Civilian <sup>i</sup>	...	1,028,595	\$14,074	\$14,476,769,065	\$1,424	30, 39
Military <sup>j</sup>	...	...	...	\$17,812,899,068	\$10,717	
SSA	...	168,745	\$14,074	\$2,367,016,624	...	30, 39
VA	...	587,468	\$26,292	\$15,445,882,444	...	40–42
<b>Indirect</b>				<b>\$120,335,759,446</b>	<b>\$10,174</b>	
Unemployment <sup>k</sup>						
Civilian	...	...	...	\$42,661,274,509	\$4,196	
Male	10.5%	235,284	\$47,173	\$11,099,067,487	...	12, 43, 44
Female	15.8%	932,882	\$33,833	\$31,562,207,021	...	12, 43, 44
Military	...	...	...	\$3,535,077,729	\$2,127	
Male	7.0%	53,297	\$50,000	\$2,664,865,282	...	3, 43, 45
Female	8.7%	21,755	\$40,000	\$870,212,447	...	3, 43, 45
Productivity loss at work <sup>l</sup>						
Civilian	...	...	...	\$29,224,939,723	\$2,875	
Male	...	...	...	\$11,939,483,363	...	
Absenteeism	9.7 days/year	1,536,087	\$181	\$2,708,958,410	...	44, 46
Presenteeism	33.1 days/year	1,536,087	\$181	\$9,230,524,953	...	44, 46
Female	...	...	...	\$17,285,456,360	...	
Absenteeism	9.7 days/year	3,100,732	\$130	\$3,921,910,267	...	44, 46
Presenteeism	33.1 days/year	3,100,732	\$130	\$13,363,546,094	...	44, 46
Military	...	...	...	\$5,607,747,606	\$3,374	
Male	...	...	...	\$4,533,105,033	...	
Absenteeism	9.7 days/year	53,297	\$192	\$1,028,519,629	...	45, 46
Presenteeism	33.1 days/year	53,297	\$192	\$3,504,585,403	...	45, 46
Female	...	...	...	\$1,074,642,574	...	
Absenteeism	9.7 days/year	21,755	\$154	\$243,826,466	...	45, 46
Presenteeism	33.1 days/year	21,755	\$154	\$830,816,107	...	45, 46
Caregiving <sup>m</sup>						
Civilian	176 hours/year	10,165,964	\$19	\$33,287,606,217	\$3,274	47–50
Military	111 hours/year	1,662,181	\$19	\$3,428,012,853	\$2,062	48, 50–52
Premature mortality <sup>n</sup>						
Civilian	1.2 times the mortality rate	4,602	\$13,905–\$45,139	\$1,345,423,765	\$132	2, 44, 53–55
Military	1.8 times the mortality rate	3,964	\$22,704–\$57,233	\$1,245,677,044	\$749	2, 43, 45, 53, 56

<sup>a</sup>Cost estimates are presented in 2018 US dollars and were adjusted using the Bureau of Labor Statistics Consumer Price Index inflation factor, when applicable.

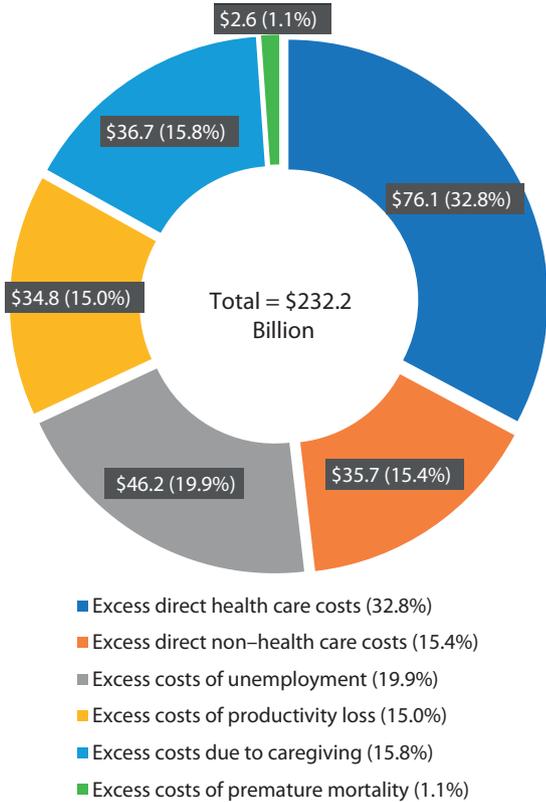
<sup>b</sup>Calculated as the average excess direct health care cost per health care plan type weighted by the PTSD population in each respective plan type. Direct health care costs included pharmacy and medical components and comprised both the payer's paid amount and the beneficiary's out-of-pocket expenses. <sup>c</sup>Calculated as the average excess direct health care cost per military health care plan type (ie, VA, DoD) and average excess direct health care cost per non-military plan type (ie, Medicare, Medicaid, commercial, uninsured) weighted by the PTSD population in each respective plan type. Direct health care costs included pharmacy and medical components. <sup>d</sup>Calculated as the National Institutes of Health PTSD-related research and training costs weighted by the PTSD population that is civilian.

<sup>e</sup>Calculated as the National Institutes of Health PTSD-related research and training costs weighted by the PTSD population that is military plus the National Center for PTSD research and training costs for Veterans. <sup>f</sup>Calculated as the excess number of adults with alcohol or drug use disorder due to PTSD multiplied by the average cost of an adult with alcohol or drug use disorder in the US. <sup>g</sup>Calculated as the excess number of uninsured adults who seek psychotherapy services due to PTSD in the US civilian population multiplied by the average number of annual psychotherapy visits for uninsured adults with  $\geq 1$  visit and the average cost for a 1-hour psychotherapy visit in the US population. <sup>h</sup>Calculated as the excess number of sheltered homeless adults due to PTSD in the respective US populations per night multiplied by the average costs of providing shelter to a homeless adult in the US population per night. <sup>i</sup>Calculated as the excess number of adults receiving disability benefits due to PTSD in the US population multiplied by the average annual disability benefit in the US population weighted by the PTSD population that is civilian. <sup>j</sup>Calculated as the excess number of adults receiving disability benefits due to PTSD in the US population multiplied by the average annual disability benefit in the US population weighted by the PTSD population that military plus the excess number of Veterans receiving VA disability benefits due to PTSD in the US military population multiplied by the excess costs of VA disability benefits due to PTSD in the US military population.

<sup>k</sup>Calculated as the excess number of unemployed adults with PTSD in the respective US populations multiplied by the median annual earnings of employed adults in the respective US populations. <sup>l</sup>Calculated as excess number of days per year lost due to PTSD-related absenteeism and presenteeism in the respective US populations multiplied by the median annual earnings of employed adults in the respective US populations. <sup>m</sup>Calculated as the excess number of hours per year devoted to PTSD-related caregiving per adult with PTSD in the respective US populations multiplied by the median hourly earnings in the US employed populations. <sup>n</sup>Calculated based on the number of excess all-cause deaths among adults with PTSD, average annual earnings in the respective US populations, the employment to population ratio per age group, and a 3.0% discount rate to estimate the excess productivity loss from all-cause deaths.

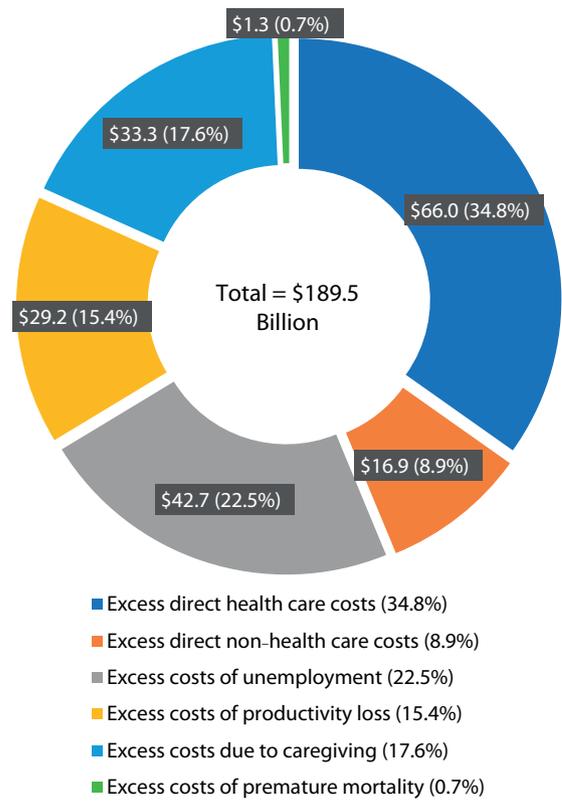
Abbreviations: DoD = Department of Defense, PTSD = posttraumatic stress disorder, SSA = Social Security Administration, VA = Veterans Affairs.

**Figure 1. Excess Economic Burden of PTSD in the Overall US Population in 2018, Billion USD**



Abbreviations: PTSD = posttraumatic stress disorder, USD = United States dollars.

**Figure 2. Excess Economic Burden of PTSD in the US Civilian Population in 2018, Billion USD**



Abbreviations: PTSD = posttraumatic stress disorder, USD = United States dollars.

**Direct Health Care Costs**

Among the civilian and military populations, the average excess direct health care costs ranged from \$12,167 to \$13,016 per individual with PTSD. Accordingly, across all individuals with PTSD, the total excess direct health care costs of PTSD were estimated at \$76.1 billion (\$66.0 billion in the US civilian population and \$10.1 billion in the US military population; Figures 1–3).

**Direct Non-Health Care Costs**

**PTSD-related research and training.** The National Institutes of Health and VA/DOD annual PTSD-related research and training costs in the US population in 2018 were estimated at \$136.0 million (\$96.3 million in the US civilian population and \$39.7 million in the US military population).<sup>19,27,28</sup>

**Substance use disorder.** Based on the literature, the proportion of civilian adults with PTSD with alcohol use disorder was estimated to be 2.2 times higher than the proportion reported in civilian adults without PTSD; this proportion was 2.4 times higher for drug use disorder.<sup>19,30</sup> In the military population, the excess SUD due to PTSD was even more pronounced, with the proportions being 5.8 times and 7.3 times higher for alcohol use and drug use disorders, respectively.<sup>13,19</sup> As a result, the excess costs of SUD due to PTSD were \$2.3 billion overall (\$1.6 billion in the US

civilian population and \$722.4 million in the US military population).

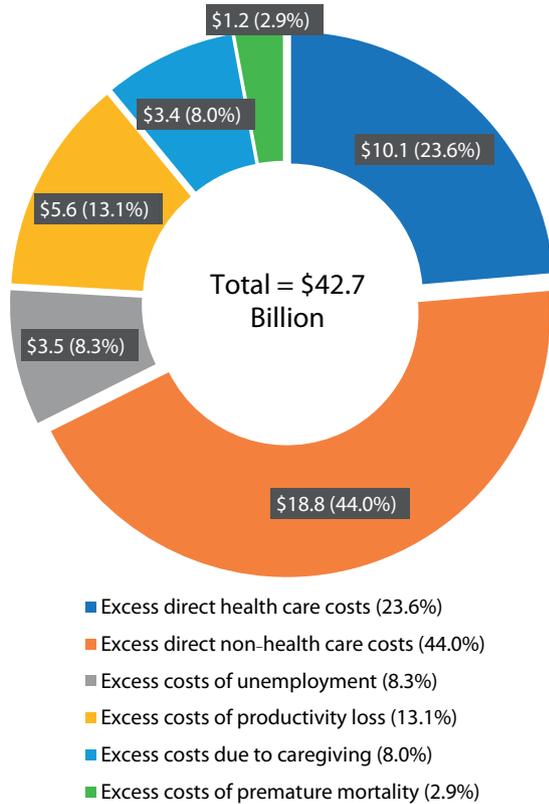
**Psychotherapy services not covered under health plans.** The excess rate of psychotherapy utilization due to PTSD was estimated to be 11.6% among uninsured adults in the civilian population, comprising a total of approximately 124,000 additional uninsured individuals seeking psychotherapy services due to PTSD.<sup>19,32,33,59</sup> Assuming an average of 10 psychotherapy visits per year for an uninsured individual who seeks psychotherapy services,<sup>34</sup> and at an average cost of \$133 per 1-hour psychotherapy visit,<sup>32</sup> this translates to an estimated \$156.2 million in excess costs of psychotherapy due to PTSD among uninsured civilian individuals.

**Homelessness.** Based on data from 2018, there were approximately 35,000 and 11,000 excess sheltered homeless adults per night in the civilian and military populations, respectively, due to PTSD.<sup>35,36,38</sup> Accordingly, the excess costs of homelessness due to PTSD were \$869.1 million overall (\$660.0 million in the US civilian population and \$209.1 million in the US military population).

**Disability.** Among 1.2 million adults receiving disability benefits for PTSD in the US, 85.9% were from the civilian population and 14.1% from the military population.<sup>39</sup> Additionally, an estimated 1.0 million Veterans received VA PTSD-related disability benefits in the US military population.<sup>41</sup> Thus, the excess costs of disability benefits

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**Figure 3. Excess Economic Burden of PTSD in the US Military Population in 2018, Billion USD**



Abbreviations: PTSD = posttraumatic stress disorder, USD = United States dollars.

due to PTSD were estimated at \$32.3 billion overall (\$14.5 billion in the US civilian population and \$17.8 billion in the US military population). Of note, disability was the single largest contributor of the excess economic burden in the US military population.

### Indirect Costs

**Unemployment.** An additional 10.5% of male adults and 15.8% of female adults were unemployed due to PTSD in the US civilian population compared to the general population without PTSD.<sup>12,19,54</sup> In the military population, a smaller excess of 7.0% of male adults and 8.7% of female adults were unemployed due to PTSD.<sup>3,19,43</sup> This translates to estimated excess costs of unemployment due to PTSD of \$46.2 billion overall (\$42.7 billion in the US civilian population and \$3.5 billion in the US military population; Figures 1–3).<sup>44,45</sup>

**Productivity loss at work.** In the general US population, 9.7 and 33.1 excess days per year were lost due to PTSD-related absenteeism and presenteeism, respectively, among adults with PTSD.<sup>19,46</sup> Based on these numbers, the excess costs of productivity loss at work due to PTSD were estimated at \$34.8 billion overall (\$29.2 billion in the US civilian population and \$5.6 billion in the US military population; Figures 1–3).<sup>44,45</sup>

**Caregiving.** In the civilian population, caregivers spent an additional 3.4 hours per week devoted to PTSD-related

care.<sup>19,48,49</sup> In the military population, an additional 2.1 hours per week were devoted to PTSD-related care.<sup>19,48,51,52</sup> As a result, the excess costs of caregiving due to PTSD were estimated at \$36.7 billion overall (\$33.3 billion in the US civilian population and \$3.4 billion in the US military population; Figures 1–3).<sup>47,50,52</sup>

**Premature mortality.** The annual all-cause mortality rate for the civilian population with PTSD was estimated to be 20% higher than that of the overall US population.<sup>2,44,60</sup> In the military population with PTSD, the annual all-cause mortality rate was estimated to be 80% higher than that of the military population without PTSD.<sup>2,43,45</sup> This resulted in estimated excess costs of all-cause premature mortality due to PTSD of \$2.6 billion overall (\$1.3 billion in the US civilian population and \$1.2 billion in the US military population; Figures 1–3).

### DISCUSSION

The \$232 billion annual economic burden of PTSD in the US demonstrated in this study is staggering and fuels the urgency for public and private stakeholders to work together to discover new and better treatments, reduce stigma, improve access to existing treatments, and expand evidence-based recovery and rehabilitation programs. The majority of the economic burden was attributed to the civilian population, which incurred \$189.5 billion, or 82% of the total costs associated with PTSD.

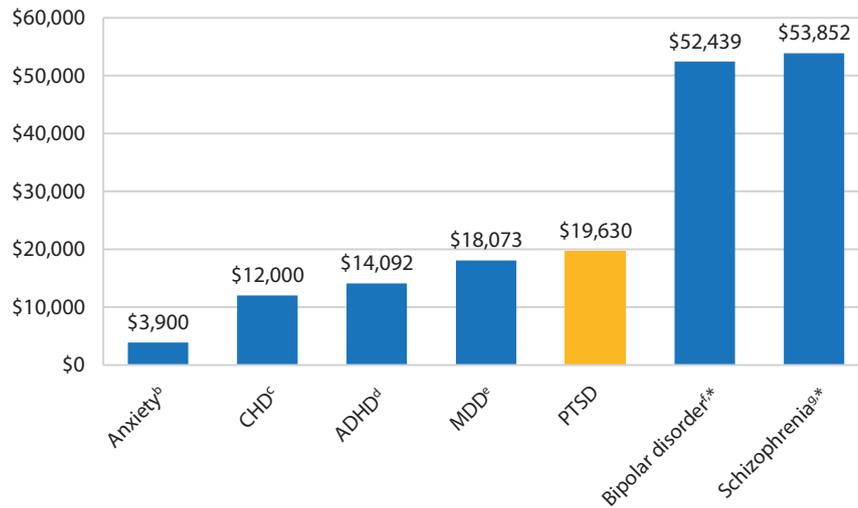
The economic burden of any illness is driven by many factors, including prevalence, severity, chronicity, access to treatment, and the trajectory of recovery. Much of the research and legislative response on PTSD has focused on combat-exposed populations due to the high prevalence of the condition among the military population.<sup>8,61,62</sup> However, the military population composed a small proportion of the overall US population with PTSD (14%), leaving 86% of the PTSD population within civilian groups. With the increasing occurrence of natural and societal traumatic events around the world, including COVID-19,<sup>63</sup> civil unrest,<sup>64</sup> and climate change,<sup>65</sup> there is mounting concern of an increase in PTSD and burden in the civilian population. As such, the current cost estimate is likely an underestimation given these recent global traumas, the effects of which would not have been captured and are likely to result in increasing negative repercussions. Therefore, further research on PTSD among the civilian population is instrumental to address this rapidly accumulating societal burden.

Women represented 66% and 74% of the overall and civilian population with PTSD, respectively, thereby contributing disproportionately to the economic burden. Haller and Chassin<sup>66</sup> found that trauma-exposed female individuals exhibit higher levels of PTSD symptoms than trauma-exposed male individuals. Furthermore, traumas such as sexual assault and domestic violence tend to affect more women than men<sup>67,68</sup> and represent important areas for prevention and intervention. Although recent public denunciation movements related to sexual assault and

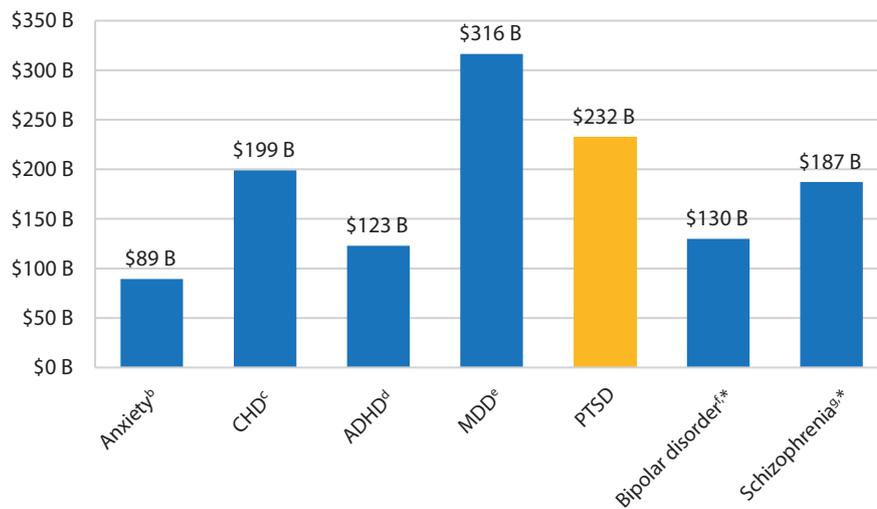
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**Figure 4. (A) Excess Economic Burden per Individual and (B) Total Excess Cost of PTSD and Other Mental and Chronic Health Conditions in the US Population in 2018<sup>a</sup>**

**A. Per-individual excess cost**



**B. Total excess cost**



<sup>a</sup>The methods, populations, and components used in the studies referenced in this figure may differ, and results might not be fully comparable. Cost estimates are presented in 2018 USD (and in billion USD in part B) and were adjusted using the Bureau of Labor Statistics Consumer Price Index inflation factor, when applicable.

<sup>b</sup>Anxiety: Costs include direct costs of health care, indirect costs of morbidity and mortality, and other costs of crime, social welfare, incarceration, and caregiving.<sup>73</sup>

<sup>c</sup>CHD: Costs include direct costs of health care and indirect costs of unemployment, productivity loss, and premature mortality.<sup>69</sup>

<sup>d</sup>ADHD: Costs include direct costs of health care, research and training, substance abuse, road traffic accidents, and disability and indirect costs of unemployment, productivity loss, caregiving, and premature mortality.<sup>74</sup>

<sup>e</sup>MDD: Costs include direct costs of health care and indirect morbidity costs of MDD in the workplace, and premature mortality due to MDD-related suicides.<sup>75</sup>

<sup>f</sup>Bipolar disorder: Costs include direct costs of health care, research and training, and substance abuse and indirect costs of unemployment, productivity loss, caregiving, direct health care costs of caregivers, and premature mortality.<sup>71</sup>

<sup>g</sup>Schizophrenia: Costs include direct costs of health care, research and training, homelessness, and law enforcement and indirect costs of unemployment, productivity loss, caregiving, and premature mortality due to suicide.<sup>70</sup>

\*Severe mental illnesses.

Abbreviations: ADHD = attention-deficit/hyperactivity disorder, CHD = coronary heart disease, MDD = major depressive disorder, PTSD = posttraumatic stress disorder, USD = United States dollars.

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domestic violence have brought more awareness to these crimes and their perpetrators, insufficient attention has been given to the impact and lasting effects of PTSD on the survivors of sexual trauma.

The economic burden of PTSD is particularly important to consider in the context of other physical and mental health conditions. The present study found that PTSD incurred higher costs per individual than coronary heart disease and non-serious psychiatric mental illnesses, including anxiety and depressive disorders (Figure 4).<sup>69-73</sup> In addition, the excess costs per individual with PTSD for several cost components were lower than those of schizophrenia (eg, direct health care costs, homelessness, unemployment) and higher than those of ADHD (eg, substance abuse, disability). Due to the high prevalence of PTSD relative to other conditions,<sup>19</sup> the per individual costs translated to higher total excess costs compared to bipolar disorder or schizophrenia, which have lower prevalence rates (Figure 4).<sup>70,71</sup>

Notably, major depressive disorder is considered one of the most burdensome mental health conditions affecting working-aged individuals on a global scale, with absenteeism/productivity loss at work being the largest contributor to total costs.<sup>75,76</sup> Together with the similar age and sex distribution as PTSD,<sup>77,78</sup> this finding suggests that more intentional public health strategies need to be implemented for PTSD, as was done for major depressive disorder, to reduce the stigma, improve treatments, and increase access to care.

The substantial excess burden of PTSD highlights the urgent and unmet need in the treatment and rehabilitation of these individuals. Experts agree that there is a long-standing crisis in pharmacologic drug development for the treatment of PTSD,<sup>79</sup> as no medication has been FDA-approved for PTSD since the only two marketed agents were approved 20 years ago.<sup>8</sup> Additionally, there is a scarcity of evidence on the impact of available pharmacologic and psychological treatments and the interplay between the two on patient-centered outcomes, such as quality of life, well-being, interpersonal relationships, and occupational functioning.<sup>4</sup> A burden that is often ignored in economic calculations is the cost for psychotherapy not covered under health plans, which represents a significant out-of-pocket excess for someone with PTSD, as demonstrated in the current study.

Currently, PTSD is underdiagnosed and even when recognized will often go untreated.<sup>7,20</sup> Patients may be reluctant to seek or accept treatment, as many individuals may not associate their symptoms with a mental illness,<sup>9</sup> or they may feel a sense of shame and fear of being negatively judged or discriminated against by others.<sup>9,10</sup> Additionally, although psychotherapy has demonstrated cost-effectiveness in the treatment of adult civilian patients with PTSD,<sup>80,81</sup> individuals may wish to avoid recalling the trauma, and while avoidance is a core symptom of PTSD, recalling the trauma is also typically a necessary component involved in psychotherapy interventions.<sup>9,10</sup> As such, there is a need for improved mental health literacy and awareness

to reduce the stigmatization and negative perceptions of trauma and PTSD, in turn facilitating the search for and use of appropriate mental health services, which may help to alleviate the burden of PTSD. Additionally, primary care providers and community providers may benefit from increased cognizance of PTSD screening tools, which require little clinical training and could be made available online, as well as treatments for their patients, especially with the recent development of new psychotherapies like written exposure therapy.<sup>82</sup>

Studies have shown that PTSD symptoms may predict subsequent drug and alcohol problems as a way to self-medicate and manage symptoms of PTSD, thus increasing the risk for SUD.<sup>66,83,84</sup> PTSD and SUD are highly correlated, with 46% of adults with PTSD also suffering from SUD.<sup>85</sup> PTSD treatment may not only improve PTSD symptoms, but also reduce the burden of comorbid SUD, which, in itself, is a debilitating condition with severe clinical and economic consequences.<sup>86,87</sup> Furthermore, given the link between mental illness, substance use, the corresponding high health care costs, and socioeconomic factors like unemployment, homelessness, and disability,<sup>35,38,87-90</sup> appropriate PTSD treatment has the potential to reduce the overlapping excess direct health care, non-health care, and indirect burden observed in the current study.

The cost impact of premature mortality associated with PTSD appears proportionally low in our calculation. However, death, particularly by suicide, is devastating to the families left behind, and the associated cost for this loss is not easily calculable. The literature on the risk predictors, interventions, and associations between PTSD and suicide has grown exponentially over the past decade<sup>2,91-93</sup>; however, research in military populations is dominant,<sup>94</sup> and more work is needed in the civilian population to understand and reduce the risk and rates of suicide in people recovering from PTSD.

Finally, the costs of unemployment and productivity loss make up 35% of the total excess economic burden of PTSD in our study. If disability costs are factored in, the proportion approaches half of the total excess economic burden of PTSD. This cost is highly modifiable, considering evidence-based rehabilitation approaches, such as Individual Placement and Support (IPS), that are successful in returning Veterans with disabling PTSD back to steady employment with better incomes, which ultimately yields higher tax revenues for society and improved individual quality of life.<sup>95-97</sup> Similar resources and efforts to provide IPS for the civilian population, and particularly women, may universally help improve employment and occupational outcomes and reduce disability for a large sector of the population. As people with PTSD return to work and achieve more independence, the need for a caregiver is also reduced, which has additional cost savings. Furthermore, disability is of particular note in the military population, as it was the single largest contributor of the excess economic burden in this population in the current study, driving the high direct non-health care costs observed. Improvements

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 in the identification and treatment of PTSD may lead to significant government savings, and more importantly, more productive lives for Veterans.

### Limitations

For the analysis of excess direct health care costs from claims data, individuals were identified based on a documented diagnosis of PTSD, which may not be representative of those who are undiagnosed. For all cost components, the method used to identify patients with PTSD may result in the misclassification of patients as PTSD case patients or non-case patients. For example, reliance on ICD codes to identify patients with PTSD may result in misclassification of some patients with PTSD as non-case patients if they do not receive a diagnostic code for PTSD and some patients without PTSD as case patients. However, for direct health care costs, patients were required to have two documented diagnoses of PTSD to avoid capturing ICD codes that were used as rule-out diagnoses and thus help to reduce the extent of misclassification in this study. The estimation of excess direct non-health care costs and indirect costs was limited by data availability in the literature. Additionally, since cost components were calculated to be mutually exclusive, the true burden of each component may have been underestimated if it was partially covered by another component. For example, the cost attributed to SUD included only the costs of crimes, prevention and research,

and motor vehicle crashes related to substance use, but did not consider incremental medical costs or unemployment that may have resulted from SUD. Moreover, the PTSD prevalence estimates used in this study were based on a narrow definition of PTSD, which may have contributed to underestimation of the total economic burden. Conversely, some cost components may also have been overestimated. For example, residual costs associated with the trauma itself, rather than with PTSD, could have been captured (eg, work loss or medical costs to treat an injury from the trauma). Lastly, since there was no single data source for costs related to PTSD, multiple data sources using different methods, study designs, and populations were combined to estimate the total economic burden of PTSD.

### CONCLUSION

The economic burden of PTSD goes beyond direct health care costs and has been found to be quite substantial, exceeding costs for other mental health conditions such as anxiety and depressive disorders. The civilian population, specifically women, has been underrecognized in the literature as a disproportional group suffering from PTSD. Increased awareness of PTSD, development of more effective therapies, and expansion of evidence-based interventions are warranted to reduce the large disease and economic burden of PTSD.

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