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Financial Disclosure
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Mental and Physical Health Conditions in US Combat Veterans: Results From the National Health and Resilience in Veterans Study

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ABSTRACT

Objective: To identify sociodemographic and military characteristics of combat-exposed and non–combat-exposed veterans in the United States and to compare rates of mental and physical health conditions in these populations.

Methods: Data were analyzed from the National Health and Resilience in Veterans Study (NHRVS), a contemporary, nationally representative survey of 1,480 US veterans conducted September–October 2013. Poststratification weights were applied to analyses to permit generalizability of results to the US veteran population. Outcomes measured included lifetime and current psychiatric disorders and physical health conditions.

Results: A total 38% of US veterans reported being exposed to combat. Compared to noncombat veterans, combat veterans were younger, had greater household income, and served a greater number of years in the military; were more likely to be male, to have served in the Marine Corps, and to use the Veterans Affairs Healthcare System as their main source of health care; and reported a greater number of lifetime potentially traumatic events. After adjustment for these sociodemographic and military differences, combat veterans were more than 3 times as likely as noncombat veterans to screen positive for lifetime posttraumatic stress disorder (PTSD) and more than twice as likely for current PTSD and had 82% greater odds of screening positive for current generalized anxiety disorder. After additionally controlling for lifetime diagnoses of PTSD and depression, alcohol or drug use disorder, and nicotine dependence, combat veterans had 68% greater odds of having attempted suicide and 85% and 38% greater odds of being diagnosed with a stroke and chronic pain, respectively. Younger combat veterans were more likely than older combat veterans to screen positive for lifetime (30.6% vs 10.1%) and current PTSD (19.2% vs 4.9%) and suicidal ideation (18.6% vs 6.9%) and to have been diagnosed with migraine headaches (12.8% vs 2.1%), while older combat veterans were more likely than younger combat veterans to report having been diagnosed with heart disease (19.2% vs 2.6%) and heart attack (13.9% vs 2.5%).

Conclusions: Compared to noncombat veterans in the United States, combat veterans have elevated rates of PTSD, suicide attempt, stroke, and chronic pain independent of other sociodemographic, military, and mental health factors. Younger combat veterans have elevated rates of PTSD, suicidal ideation, and migraine headaches, while older combat veterans have elevated rates of heart disease and heart attack. These results characterize the population-based burden of mental and physical health conditions in combat veterans. They further underscore the importance of age- and condition-sensitive screening, monitoring, and treatment efforts in this population.

Prim Care Companion CNS Disord 2017;19(3):17m02118
https://doi.org/10.4088/PCC.17m02118

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Clinical Points

- Combat veterans have higher rates of posttraumatic stress disorder (PTSD), generalized anxiety disorder, stroke, and chronic pain compared to noncombat veterans.
- Younger combat veterans have higher rates of PTSD, suicidal ideation, and migraine headaches than older combat veterans, who had higher rates of heart disease and heart attacks.
- Results underscore the importance of age- and condition-sensitive screening, monitoring, and treatment efforts in combat veterans.

There are currently 19.2 million veterans in the United States, representing 7.8% of the population.[1] This segment of the US population is sociodemographically unique, as it is predominantly male (91.8%), white (83.3%), and older (48.6% over age 65 years).[1] Yet, not all veterans who have served in the military are combat veterans. For example, only 55% of World War II veterans and 31% of Korean War veterans experienced combat.[2] The 2010 National Survey of Veterans[3] places the overall percentage of veterans reporting service in a combat zone, including eras from World War II through post-9/11, at 33.9%.

Combat exposure is associated with increased risk for various occupational, environmental, and toxic exposures, including harsh climates, austere living conditions, and separation from family and close friends during deployment,[4] as well as the potential to endure enemy or friendly fire, to engage in active combat, and to witness death or serious injury.[5] Consequently, combat exposure is linked to increased risk for mental health problems, including psychiatric disorders such as posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD), major depressive disorder, and substance use disorder.[6,7] For example, combat exposure has been found to result in a 1.3 to 2.4–fold greater likelihood of screening positive for PTSD in soldiers and marines who have deployed to Iraq or Afghanistan compared to a reference sample who had not deployed.[8] Magnitude of combat exposure has also been linked to greater severity of PTSD symptoms in World War II veterans[9] and found to be the primary etiologic variable over military adjustment and premilitary adjustment contributing to PTSD risk in Vietnam veterans.[10]

Although there is a large body of literature linking combat exposure to PTSD and other mental health conditions, combat exposure also may be linked to increased risk of physical health conditions. For example, chronic stress in a war zone is linked to hypertension and greater risk for cardiovascular disease.[11] Further, the Centers for Disease Control's Vietnam Experience study[12,13] reported a greater prevalence of somatic symptoms, such as fatigue, dizziness, and headache, among veterans who had served in Vietnam versus those who did not. PTSD itself has been associated with greater somatic symptoms, such as back pain, pain in the limbs or joints, dizziness, and fainting spells, in Iraq war veterans[14] and with 50% greater risk of early incident cardiovascular disease.[15] While these studies help characterize some of the physical health issues linked to combat exposure, contemporary, nationally representative data comparing physical health conditions of combat and noncombat veterans are lacking. Further, we are aware of no study that has evaluated the prevalence of specific physical health conditions in this population. Such data are critical to understanding the physical health needs of veterans.

In this study, we analyzed data from a contemporary, nationally representative sample of US military veterans to evaluate 3 aims: (1) identify sociodemographic and military characteristics of combat veterans compared to noncombat veterans, (2) determine and compare the current and lifetime mental health (eg, PTSD, depression) and physical health (eg, cardiovascular disease) conditions, and (3) determine the effects, if any, of age (Vietnam or earlier war era vs post-Vietnam era) in moderating the relation between combat veteran status and mental and physical health outcomes. We hypothesized that combat veterans would have higher rates of psychiatric conditions such as PTSD, depression, and substance use disorders,[9,10,16] and due to the increased exposure to stress and potentially traumatic events, would have higher rates of cardiovascular conditions.[11,14,15] In light of data suggesting a decline in the prevalence of mental disorders[17] and increasing prevalence of physical health conditions as a function of age,[18–21] we hypothesized that certain combat-related mental disorders (eg, PTSD) would be more prevalent in younger combat veterans and that certain stress-related physical health conditions (eg, cardiovascular disease) would be more prevalent in older combat veterans.

METHOD

Sample

The National Health and Resilience in Veterans Study (NHRVS)[22] is a nationally representative survey of US veterans. In the current study, conducted September–October 2013, data were analyzed from 1,480 US veterans (a separate baseline cohort of 3,157 veterans is also being followed over time, with data collection commencing in 2011; data from this cohort were not included in the current study). Participants were compensated $15 for completing a 60-minute web-based survey. The NHRVS sample was drawn from a research panel of more than 50,000 households maintained by GfK Knowledge Networks, Inc (Menlo Park, California). GfK maintains KnowledgePanel, a probability-based, online-access survey panel of a nationally representative sample of US adults that covers approximately 98% of US households, including cell phone–only households and households with and without Internet access. Participants are provided with access to the Internet and computer hardware if needed. A total of 2,273 were sampled for the survey; of these, 1,602 completed a screener and responded "yes" to an initial screening question that confirmed veteran status, and 1,484 (92.6% of those who confirmed veteran status) participated in the NHRVS.[23] Poststratification weights were applied to all

inferential statistics based on demographic distributions (ie, age, sex, race/ethnicity, education, and census region) from the most contemporaneous 2013 US Census Bureau Current Population Survey[24] to render results representative of the entire population of US veterans. The study was approved by the Human Subjects Subcommittee of the VA Connecticut Healthcare System, and all participants provided informed consent.

Assessments

Combat and trauma exposure history. Combat exposure was assessed using the following question: "Did you ever serve in a combat or war zone?" All veterans with a positive response to this question, scored dichotomously, were classified as combat veterans for the purpose of analysis. Combat veterans were also administered the Combat Exposure Scale,[5] which assesses severity of combat exposure.

The Trauma History Screen[6] is a self-report measure that assesses the lifetime exposure to 14 potentially traumatic or high-magnitude stressor events or events associated with posttraumatic distress. These events included military combat, accidents, sudden death of close family or friend, and physical or sexual assault during either childhood or adulthood. An additional event, life-threatening illness or injury, was added in the NHRVS.

Mental health conditions. The Posttraumatic Stress Disorder Checklist for *DSM-5*[25] is a self-report instrument that assesses the 20 *DSM-5* diagnostic criteria for PTSD on a 0 to 4 scale. For this study, respondents who scored 33 or higher were identified as having probable PTSD (total range, 0–80).[26] For lifetime PTSD, participants were asked to rate the extent to which they were bothered by PTSD symptoms ever in their lifetimes; for current PTSD, they were asked to rate the extent to which they were bothered by PTSD symptoms in the past month.

Modules from the Mini-International Neuropsychiatric Interview,[27] a validated, structured psychiatric interview for clinical trials and epidemiologic studies, were administered via web-based self-report to evaluate lifetime diagnoses of major depressive disorder, social phobia, and alcohol or drug use disorder based on *DSM-IV* criteria.

Nicotine dependence was assessed using the Fagerström Test for Nicotine Dependence,[28] a 6-question survey with scores ranging from 0 to 10 points. Higher scores indicate higher dependence on nicotine; a score ≥ 5 was used to indicate lifetime nicotine dependence.

Current depression and anxiety symptoms in the 2 weeks prior to the survey were assessed using the Patient Health Questionnaire–4 (PHQ-4),[29] a 4-item self-report screening instrument that combines the PHQ-2 and Generalized Anxiety Disorder–2 (GAD-2). Scores ≥ 3 on the depression and anxiety items indicate positive screens for depression and anxiety (score ranges for both the PHQ-2 and GAD-2 are 0–6).

Current suicidal ideation was assessed using a modified question from the PHQ-9[30] to assess both passive and active suicidal ideation. Respondents were asked, "In the past 2 weeks, how often have you been bothered by thoughts you might be better off dead?" and "How often have you been bothered by thoughts of hurting yourself in some way?" Given the positively skewed distributions of responses to both items, we dichotomized them such that a response of several days (≥ 1) on either question was indicative of current suicidal ideation. Lifetime suicide attempt was assessed with the question, "Have you ever tried to kill yourself?" with the response options "no" and "yes."

Mental health treatment utilization was assessed with the following question, "Have you ever received mental health treatment (eg, prescription medication or psychotherapy for a psychiatric or emotional problem)?" A positive response was indicative of lifetime engagement in mental health treatment.

Physical health conditions. Physical health conditions were assessed via a self-report measure asking respondents, "Has a doctor or health care professional ever told you that you have any of the following medical conditions?" Medical conditions assessed included arthritis; asthma, chronic bronchitis, or chronic obstructive pulmonary disease; cancer; chronic pain; liver disease; diabetes; heart disease; heart attack; high cholesterol; high blood pressure; kidney disease; sleep disorders; migraine; multiple sclerosis; osteoporosis or osteopenia; rheumatoid arthritis; stroke; traumatic brain injury; and HIV/AIDS.

Data Analysis

Data analyses proceeded in 3 steps. First, descriptive statistics were conducted to summarize variables. Second, independent-samples *t* tests and χ^2 tests were conducted to compare sociodemographic, military, and clinical characteristics of combat and noncombat veterans. Third, a series of multivariable binary logistic regression analyses were conducted to evaluate the relation between combat veteran status and mental and physical health variables, while adjusting for sociodemographic and military characteristics that differed by combat status. Lifetime PTSD and depression, alcohol or drug use disorder, and nicotine dependence were entered as an additional fixed factors in analyses examining mental health treatment, suicidal ideation and attempts, and physical health conditions. Age moderation effects were evaluated by incorporating a combat veteran status by age (< 60 vs ≥ 60) interaction term into the regression models. Measures of effect sizes were expressed using odds ratios and 95% confidence intervals (95% CIs). All raw frequencies reported are unweighted; all means, percentages, and inferential statistics are weighted to reflect the general population of US veterans.[24]

RESULTS

A total of 564 US veterans in the sample (weighted 38.4%) reported serving in a combat or war zone; 916 (61.6%) were noncombat veterans. Of the 564 combat veterans, 274 (43.6%) served during the Vietnam War era, and the median year of last deployment was 1971 (interquartile range, 1967–1995);

224 (41.0%) served in the Army; and 151 (29.2%) suffered a combat-related injury. The median number of deployments was 1 (interquartile range, 1–2). Among combat veterans, the mean severity of combat exposure was light-to-moderate.[5]

Tables 1 and 2 show sociodemographic and military characteristics of the full sample and by combat veteran status. Compared to veterans with no combat exposure, veterans with combat exposure were younger and more likely to be male, to have served a greater number of years in the military, to have served in the Marine Corps, to have a greater household income, and to report the VA as their main source of health care. Additionally, combat veterans reported a moderately greater number of lifetime potentially traumatic events. The nature of index trauma also differed between combat and noncombat veterans, with combat veterans being more likely to report seeing something horrible or being badly scared during military service and sudden move or loss of home and possessions and less likely to report sudden death of a close family member or friend and child sexual abuse as their "worst" event on the Trauma History Screen. Combat and noncombat veterans did not differ with respect to race/ethnicity, marital status, education level, or employment.

Table 3 shows mental health variables by combat veteran status. After adjustment for sociodemographic and military characteristics, combat veterans were more than 3 times as likely as noncombat veterans to screen positive for lifetime PTSD (OR = 3.39) or current PTSD (OR = 2.20) and had 82% greater odds of screening positive for current GAD. One in 10 combat veterans (9.9%) had attempted suicide in their lifetime, which after additionally controlling for lifetime PTSD, depression, alcohol use disorder, drug use disorder, and nicotine dependence resulted in a 68% greater odds of suicide attempt relative to noncombat veterans. Sensitivity analyses revealed that these results persisted even after adjustment for Combat Exposure Scale–assessed combat exposure severity (results not shown, available from R.H.P.).

Table 4 shows physical health variables by combat veteran status. Bivariate analyses revealed that combat veterans were more likely than noncombat veterans to report being diagnosed with chronic pain; sleep disorders; stroke; asthma, chronic bronchitis, or chronic obstructive pulmonary disease; and high cholesterol but did not differ with respect to the prevalence of any of the other medical conditions assessed. Multivariable analyses controlling for sociodemographic and military characteristics and lifetime diagnoses of PTSD and depression, alcohol or drug use disorder, and nicotine dependence revealed that the only medical conditions that remained elevated among combat veterans were stroke (OR = 1.85) and chronic pain (OR = 1.38). Secondary analyses limited to combat veterans revealed that combat-related injury was significantly associated with increased risk of both of these disorders (stroke: 39.2% vs 21.3%, OR = 3.25, 95% CI, 1.52–6.94; chronic pain: 9.6% vs 3.2%, OR = 2.39, 95% CI, 1.61–3.52).

Incorporation of combat veteran status by age group interaction terms into regression models revealed that, relative to older combat veterans, younger combat veterans were more likely to screen positive for lifetime (30.6% vs 10.1%, Wald $\chi^2 = 4.43$, $P = .035$) and current PTSD (19.2% vs 4.9%, Wald $\chi^2 = 7.40$, $P = .007$) and suicidal ideation (18.6% vs 6.9%, Wald $\chi^2 = 27.22$, $P < .001$) and to report having been diagnosed with migraine headaches (12.8% vs 2.1%, Wald $\chi^2 = 9.54$, $P = .002$, OR = 5.57, 95% CI, 1.87–16.60). Older combat veterans were more likely than younger combat veterans to report having been diagnosed with heart disease (19.2% vs 2.6%, Wald $\chi^2 = 4.46$, $P = .035$) and heart attack (13.9% vs 2.5%, Wald $\chi^2 = 5.15$, $P = .023$). Combat veteran status by age group interactions were not significant for any of the other mental and physical health conditions (all Wald $\chi^2 > 3.52$, all $P > .06$).

Table 1. Sociodemographic Characteristics by Combat Veteran Status[a]

Characteristics	Total (N = 1,480)	Noncombat Veterans (n = 916)	Combat Veterans (n = 564)	Statistical Test	*P*
Age, weighted mean (SD), y	60.4 (15.3)	61.3 (14.3)	59.0 (16.6)	**$t = 2.90$**	**.004**
Age group, y				**$t = 48.23$**	**< .001**
18–29	55 (3.8)	23 (1.9)	32 (6.9)		
30–44	126 (13.5)	68 (11.8)	58 (16.2)		
45–59	327 (25.7)	235 (30.3)	92 (18.3)		
≥60	972 (57.0)	590 (56.0)	382 (58.6)		
Sex				**$\chi^2 = 10.76$**	**.001**
Men	1,322 (89.7)	795 (87.6)	527 (93.0)		
Women	158 (10.3)	121 (12.4)	37 (7.0)		
Race/ethnicity				$\chi^2 = 6.02$	.11
White, non-Hispanic	1,202 (75.4)	741 (75.0)	461 (76.1)		
Black, non-Hispanic	111 (9.6)	64 (9.5)	47 (9.8)		
Hispanic	99 (9.2)	68 (10.4)	31 (7.2)		
Other/mixed race	68 (5.7)	43 (5.0)	25 (6.9)		
Highest education				$\chi^2 = 5.94$	.11
< High school	26 (3.6)	17 (3.5)	9 (3.9)		
High school graduate	211 (29.5)	139 (31.7)	72 (25.9)		
Some college	626 (36.7)	388 (36.0)	238 (37.9)		
Bachelor's degree or higher	617 (30.2)	372 (28.8)	245 (32.4)		
Marital status				$\chi^2 = 4.39$	.22
Married/cohabitating	1,078 (70.2)	652 (69.6)	426 (71.2)		
Divorced/separated	233 (17.3)	151 (17.6)	82 (16.7)		
Never married	90 (7.6)	56 (7.0)	34 (8.4)		
Widowed	79 (5.0)	57 (5.8)	22 (3.7)		
Employment status				$\chi^2 = 2.49$	.29
Working	475 (34.2)	303 (35.6)	172 (31.9)		
Retired	716 (44.3)	434 (42.9)	282 (46.5)		
Unemployed	289 (21.6)	179 (21.5)	110 (21.7)		
Household income, US $				**$\chi^2 = 9.70$**	**.021**
< 35,000	357 (27.9)	234 (29.8)	123 (24.8)		
35,000–59,999	386 (28.7)	247 (29.8)	139 (27.1)		
60,000–84,999	306 (18.8)	188 (18.1)	118 (19.9)		
≥85,000	431 (24.6)	247 (22.3)	184 (28.3)		

[a]Values are presented as n (weighted %) unless otherwise specified. Statistically significant associations between combat veteran status and sociodemographic characteristics are highlighted in bold.

Table 2. Military Characteristics by Combat Veteran Status[a]

Military and Trauma Characteristics	Total (N = 1,480)	Noncombat Veterans (n = 916)	Combat Veterans (n = 564)	Statistical Test	*P*
Branch of service				**$\chi^2 = 14.788$**	**.005**
Army	593 (41.0)	369 (41.1)	224 (41.0)		
Navy	370 (27.0)	228 (27.1)	142 (26.8)		
Air Force	336 (20.1)	215 (21.4)	121 (18.1)		
Marine Corps	108 (7.0)	53 (5.2)	55 (10.0)		
National or Coast Guard	68 (4.8)	48 (5.3)	20 (4.0)		
No. of years in military, weighted mean (SD)	6.7 (6.9)	5.4 (5.4)	8.9 (8.3)	**$t = 9.94$**	**<.001**
Veterans Affairs is primary source of health care	295 (21.4)	151 (18.1)	144 (26.8)	**$\chi^2 = 15.61$**	**<.001**
No. of lifetime traumas, weighted mean (SD)	3.5 (3.1)	3.02 (2.8)	4.32 (3.3)	**$t = 8.11$**	**<.001**
Nature of index trauma				**$\chi^2 = 125.54$**	**<.001**
Life-threatening illness or injury	197 (14.5)	122 (15.6)	75 (12.8)		
A really bad car, boat, train, or airplane accident	81 (6.2)	50 (5.6)	31 (7.0)		
A really bad accident at work or home	26 (2.1)	15 (2.0)	11 (2.3)		
Hurricane, flood, earthquake, tornado, or fire	87 (6.2)	49 (5.8)	38 (6.8)		
Hit or kicked hard enough to injure as a child	14 (0.9)	10 (1.1)	4 (0.6)		
Hit or kicked hard enough to injure as an adult	13 (0.8)	10 (1.1)	3 (0.4)		
Forced or made to have sexual contact as a child[b]	36 (3.7)	27 (5.1)	9 (1.6)		
Forced or made to have sexual contact as an adult	11 (1.1)	8 (0.8)	3 (1.6)		
Attacked with gun, knife, or weapon	35 (3.5)	19 (3.2)	16 (3.9)		
During military service, saw something horrible or was badly scared[b]	98 (8.3)	23 (2.4)	75 (16.9)		
Sudden death of close family member or friend[b]	387 (31.2)	261 (37.3)	126 (22.4)		
Saw someone die suddenly or get badly hurt or killed	82 (6.5)	44 (5.6)	38 (7.8)		
Sudden move or loss of home and possessions[b]	28 (2.0)	15 (1.3)	13 (2.9)		
Suddenly abandoned by spouse, partner, parent, or family	87 (6.5)	56 (6.6)	31 (6.4)		
War era (combat veterans only)					
Vietnam	…	…	274 (43.6)		
Iraq/Afghanistan	…	…	91 (18.9)		
Persian Gulf	…	…	68 (15.3)		
World War II/Korean War	…	…	77 (13.9)		
Other	…	…	51 (8.3)		
No. of deployments, weighted mean (SD)	…	…	2.9 (14.5)		
Combat-related injury	…	…	151 (29.2)		
Combat Exposure Severity score, weighted mean (SD)	…	…	11.1 (10.7)		
Light (score range, 0–8)	…	…	299 (51.0)		
Light-moderate (score range, 9–16)	…	…	103 (20.7)		
Moderate (score range, 17–24)	…	…	77 (13.1)		
Moderate-heavy (score range, 25–32)	…	…	56 (9.9)		
Heavy (score range, 33–41)	…	…	29 (5.3)		

[a]Values are presented as n (weighted %) unless otherwise specified. Statistically significant associations between combat status and military characteristics are highlighted in bold.
[b]Significant difference between combat and noncombat veterans (Bonferroni-corrected $P > .0036$).

DISCUSSION

Using data from a contemporary, nationally representative sample of US military veterans, we found that combat exposure is associated with a broad range of negative psychological outcomes, including increased odds of lifetime and current PTSD and GAD. These associations remained significant and large in magnitude (OR = 1.68–3.39) after adjustment for multiple sociodemographic and military characteristics that differed by exposure status.

The finding that combat veterans are more likely than noncombat veterans to have lifetime and current diagnoses of PTSD, as well as current GAD, extends prior work linking combat exposure to increased risk for PTSD[10,31,32] and GAD[8,33,34] to a contemporary, nationally representative sample of US veterans that includes veterans of all recent war eras. One interpretation of this finding stems from etiologic models of anxiety disorders, which suggest that traumatic experiences and their associated emotional states can reinforce negative beliefs of the individual about himself or herself, in turn, predisposing trauma-affected individuals to higher levels of anxiety when facing new stressors in the future.[35] Compared to noncombat veterans, combat veterans had 68% greater odds of attempted suicide. This finding extends prior work to suggest a link between combat exposure and suicidality that is independent of psychiatric morbidities. The cross-sectional study design does not allow us to assess causality, however, and suicide attempt may have occurred before, during, or after combat exposure. Nevertheless, this finding underscores the importance of screening for suicidality in combat veterans, as a history of suicide attempt is a risk factor for future attempts.[36] Taken together, these results suggest that combat exposure, independent of other sociodemographic and military variables, is associated with elevated risk for PTSD, GAD, and suicidality. These results underscore the importance of identifying, screening, and treating combat veterans and promoting access to and use of mental health services, especially since the majority of the veteran population does not receive care in the Veterans Health Administration.

Results of the current study extend prior work[37–40] to identify specific physical health conditions associated with

Table 3. Mental Health Conditions and Treatment History by Combat Veteran Status[a]

Mental Health Variables	Total (N = 1,480)	Noncombat Veterans (n = 916)	Combat Veterans (n = 564)	Bivariate Analysis χ^2	Bivariate Analysis *P*	Multivariate Analysis Wald χ^2	Multivariate Analysis *P*	Multivariate Analysis Adjusted OR (95% CI)[b]
Lifetime PTSD	132 (10.8)	55 (6.0)	77 (18.6)	56.01	< .001	**14.63**	**< .001**	**3.39 (2.22–5.16)**
Lifetime major depressive episode	137 (10.6)	79 (8.8)	58 (13.6)	8.49	.004	0.81	.37	1.19 (0.82–1.73)
Lifetime social phobia	39 (2.8)	19 (1.8)	20 (4.6)	10.14	.001	3.68	.06	1.98 (0.99–3.98)
Lifetime alcohol use disorder	542 (37.9)	319 (35.0)	223 (42.6)	8.49	.004	0.96	.33	1.13 (0.89–1.43)
Lifetime drug use disorder	196 (14.7)	122 (13.7)	74 (16.4)	2.01	.16	0.25	.62	0.92 (0.66–1.28)
Lifetime nicotine dependence	235 (18.8)	135 (17.7)	100 (20.4)	1.65	.20	0.16	.69	0.94 (0.70–1.27)
Lifetime suicide attempt[c]	80 (6.8)	46 (4.9)	34 (9.9)	14.14	< .001	**4.56**	**.033**	**1.68 (1.04–2.70)**
Current PTSD	69 (6.1)	25 (3.0)	44 (11.1)	35.74	< .001	**7.24**	**.007**	**2.20 (1.23–3.89)**
Current depression	94 (7.1)	46 (5.9)	48 (9.0)	4.99	.025	0.05	.82	1.05 (0.67–1.67)
Current GAD	101 (6.8)	48 (4.7)	53 (10.2)	16.68	< .001	**6.08**	**.014**	**1.82 (1.13–2.93)**
Current suicidal ideation[c]	109 (8.3)	55 (6.1)	54 (11.8)	14.74	< .001	3.12	.077	1.47 (0.96–2.24)
Current alcohol use disorder	154 (12.3)	86 (10.7)	68 (15.0)	6.01	.014	1.29	.26	1.22 (0.86–1.74)
Ever received mental health treatment[c]	308 (21.2)	185 (19.4)	123 (24.2)	4.86	.028	0.17	.68	0.94 (0.68–1.29)
Currently in mental health treatment[c]	135 (10.1)	64 (7.2)	71 (14.6)	21.10	< .001	3.44	.064	1.48 (0.98–2.25)

[a]Values are presented as n (weighted %) unless otherwise specified. Statistically significant associations between combat veteran status and mental health outcomes from multivariable models are highlighted in bold.
[b]ORs (95% CIs) are adjusted for age, sex, income, number of years in military, Veterans Affairs as primary source of health care, military branch (Marine Corps vs other), and sum of traumatic life events.
[c]ORs (95% CIs) for suicidality and mental health treatment variables are additionally adjusted for lifetime PTSD and depression, alcohol or drug use disorder, and nicotine dependence.
Abbreviations: GAD = generalized anxiety disorder, OR = odds ratio, PTSD = posttraumatic stress disorder.

Table 4. Physical Health Conditions by Combat Veteran Status[a]

Mental Health Variables	Total (N = 1,480)	Noncombat Veterans (n = 916)	Combat Veterans (n = 564)	Bivariate Analysis χ^2	Bivariate Analysis *P*	Multivariate Analysis Wald χ^2	Multivariate Analysis *P*	Multivariate Analysis Adjusted OR (95% CI)[b]
Arthritis	463 (68.9)	271 (71.1)	192 (65.3)	5.43	.020	0.84	.36	1.13 (0.87–1.46)
Asthma, chronic bronchitis, or COPD	159 (11.1)	92 (11.8)	67 (10.7)	0.40	.53	0.02	.89	0.97 (0.67–1.41)
Cancer	206 (12.7)	136 (13.0)	70 (12.1)	0.25	.62	0.83	.36	0.85 (0.59–1.21)
Chronic pain	271 (19.8)	131 (15.7)	140 (26.4)	25.48	< .001	**4.39**	**.036**	**1.38 (1.02–1.86)**
Liver disease	20 (1.2)	10 (1.0)	10 (1.6)	1.05	.31	0.65	.42	1.55 (0.53–4.52)
Diabetes	257 (18.1)	165 (18.8)	92 (16.9)	0.89	.35	1.79	.18	0.81 (0.60–1.10)
Heart disease	188 (11.7)	105 (11.3)	83 (12.3)	0.37	.54	0.19	.66	0.92 (0.63–1.34)
Heart attack	111 (7.9)	64 (7.1)	47 (9.1)	1.97	.16	0.23	.63	1.11 (0.72–1.70)
High cholesterol	689 (44.8)	423 (42.5)	266 (48.4)	4.96	.026	2.77	.096	1.23 (0.96–1.57)
High blood pressure	761 (50.2)	472 (50.9)	289 (48.9)	0.55	.46	2.96	.085	0.80 (0.63–1.03)
Kidney disease	59 (4.0)	34 (3.4)	25 (4.9)	2.16	.14	0.21	.65	1.14 (0.64–2.03)
Sleep disorders	292 (21.0)	145 (17.6)	147 (26.4)	16.25	< .001	2.87	.090	1.28 (0.96–1.72)
Migraine	85 (5.7)	51 (5.3)	34 (6.5)	1.02	.31	0.39	.53	1.18 (0.71–1.96)
Multiple sclerosis	9 (0.3)	8 (.05)	1 (0.0)	3.12	.077	1.89	.17	0.04 (0.00–3.72)
Osteoporosis or osteopenia	51 (2.6)	38 (3.0)	13 (2.1)	0.97	.32	0.38	.54	0.78 (0.36–1.71)
Rheumatoid arthritis	46 (3.4)	25 (3.4)	21 (3.5)	0.02	.90	0.81	.37	0.74 (0.39–1.42)
Stroke	42 (3.6)	22 (2.7)	20 (5.1)	5.59	.018	**4.22**	**.040**	**1.85 (1.03–3.33)**
Traumatic brain injury	20 (1.6)	9 (1.2)	11 (2.3)	2.57	.11	0.06	.81	1.12 (0.45–2.80)
HIV/AIDS	3 (0.1)	3 (0.2)	0 (0.0)	1.25	.26	0.00	.99	…[c]

[a]Values are presented as n (weighted %) unless otherwise specified. Statistically significant associations between combat veteran status and physical health outcomes from multivariable models are highlighted in bold.
[b]ORs (95% CIs) are adjusted for age, sex, income, number of years in military, Veterans Affairs as primary source of health care, branch (Marine Corps vs other), sum of traumatic life events, lifetime PTSD and depression, alcohol or drug use disorder, and nicotine dependence.
[c]Not estimated due to small cell sizes.
Abbreviations: COPD = chronic obstructive pulmonary disease, OR = odds ratio.

combat exposure in a contemporary, nationally representative sample of US veterans, specifically stroke and chronic pain. In light of prior work linking psychosocial stress to elevated risk of stroke,[41] repeated episodes of acute or chronic stress, such as that endured in combat, may activate the stress response system, leading to an inflammatory and acute phase response via stress hormones and cytokines, injuring endothelium, and ultimately culminating in atherosclerosis, the leading cause of stroke.[42] A hyperactive stress response and inflammation may also contribute to chronic pain. For example, level of perceived stress during the Gulf War has been linked to the subsequent development of chronic widespread pain in Gulf War veterans,[43] and this association was found to be mediated by conditions such as PTSD and postconcussion syndrome.[44,45] Combat-related injury may also contribute to risk for both stroke and chronic pain, as combat veterans who reported having sustained an injury in combat were more than twice as likely than those who did not to be diagnosed with these conditions. The fear-avoidance model of pain and PTSD also suggests that chronic avoidance

of fearful memories may maintain functional limitations associated with PTSD and pain.[46] Combat veterans were also more likely to report using the VA as their primary source of health care, which also may account for their being more likely to receive certain diagnoses and identification of chronic pain through increased screening and awareness; however, these differences persisted after adjustment for primary source of health care. Collectively, results of this study suggest that combat veterans potentially face complex mental and physical health symptoms upon return from deployment, which may have long-term deleterious effects on functioning and quality of life.

Although combat veterans were not more likely than noncombat veterans to have been diagnosed with heart disease, this finding was most likely due to the advanced mean age of the sample and increasing overall rates of heart disease as a function of age[47] masking the link between combat exposure and this outcome. Thus, we looked at age as a moderator of combat veteran status and mental and physical health variables and did find older combat veterans were more likely to report being diagnosed with heart disease and heart attack. Relative to older combat veterans, younger combat veterans were more likely to screen positive for lifetime PTSD, current PTSD, and suicidal ideation and to report being diagnosed with migraine headaches. The older veteran subsample may represent a "survival of the fittest," having been combat-exposed decades earlier than younger combat veterans. These findings also align with the broader literature on aging and health, which suggests that the prevalence of psychiatric conditions declines[48,49] and the burden of physical illness increases[20–22] as a function of age. The results further suggest that combat exposure may compound age-specific risk for the development of these conditions. These findings underscore the importance of age- and condition-sensitive screening, monitoring, and treatment efforts among combat veterans.

This study has some methodological limitations. First, our cross-sectional design precludes the ability to ascertain temporal relationships between combat deployment and health outcomes. Second, the trauma history assessment in the NHRVS did not specifically assess whether traumas occurred before or after military service; consequently, it is unclear if a preexisting vulnerability may interact with combat exposure and contribute to risk for certain health outcomes. Third, the screening process used to select service members who deploy excludes individuals who do not meet medical or fitness criteria, such as orthopedic injuries rendering someone unable to wear ballistic protective gear or HIV infection,[50] resulting in a healthier starting cohort population prior to combat exposure. This healthier deployable starting cohort is an expansion of the bias previously labeled the "healthy soldier effect" for the subset of the population selected to serve in the military.[2,51] Mortality bias may also, at least in part, account for lack of association between combat veteran status and most of the mental and physical health measures assessed in this study. Fourth, the target population in the GfK survey panel only includes veterans with a permanent residence, thus excluding the homeless and institutionalized veterans, which represent a large percentage of veterans with mental and physical illness.[52–54]

Despite these limitations, this study is the first, to our knowledge, to evaluate mental and physical health conditions in a contemporary, nationally representative sample of US combat and noncombat veterans spanning eras from World War II to post-9/11. The key findings of this study indicate that combat exposure was independently and strongly linked to elevated risk for a broad range of health outcomes and that age may moderate risk for certain mental and physical health conditions. Psychiatric morbidities associated with combat exposure include a more than 2- to 3-fold higher rate of lifetime and current PTSD and 82% greater odds of GAD and 68% greater odds of suicide attempt independent of PTSD and depression. Physical health morbidities linked to combat veteran status included chronic pain and stroke, with these effects driven by combat-related injury. Further research will be useful to assess longer-term temporal/causal relationships between trauma exposures, combat exposure, and mental and physical health morbidities in other cohorts of veterans; evaluate effectiveness of interventions that are tailored specifically for the health needs of combat veterans; and elucidate relationships between combat-related injury and long-term health outcomes.

Submitted: February 21, 2017; accepted April 3, 2017.

Published online: June 22, 2017.

Disclosure of off-label usage: The authors have determined that, to the best of their knowledge, no investigational information about pharmaceutical agents that is outside US Food and Drug Administration–approved labeling has been presented in this article.

Financial disclosure: **Drs Harpaz-Rotem**, **Tsai**, **Southwick**, and **Pietrzak** and **Ms Thomas** have no personal affiliations or financial relationships with any commercial interest to disclose relative to the article.

Funding/support: The National Health and Resilience in Veterans Study is funded by the US Department of Veterans Affairs National Center for Posttraumatic Stress Disorder. Preparation of this report was supported by the National Institute on Aging of the National Institutes of Health under award no. T35AG049685.

Role of the sponsor: The National Institute on Aging of the National Institutes of Health had no role in the study.

Disclaimer: The content is solely the responsibility of the authors and does not represent the official views of the US Department of Veterans Affairs or National Institutes of Health.

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For the CME Posttest, see next page.

POSTTEST

To obtain credit, go to http://www.cmeinstitute.com/activities/Pages/PCC.aspx to complete the Posttest and Evaluation.

1. **Assessment of combat exposure history in veterans may help inform you regarding their risk for which of the following mental and physical health conditions?**
   a. Alcohol use disorder and liver disease
   b. Nicotine dependence and pulmonary disease
   c. Posttraumatic stress disorder (PTSD) and chronic pain
   d. Major depressive disorder (MDD) and heart disease
2. **Younger combat veterans are more likely than older combat veterans to have ___.**
   a. Heart disease and diabetes
   b. PTSD and suicidal thoughts
   c. MDD and social phobia
   d. Alcohol and drug use disorders
3. **You are evaluating Mr A, a 33-year-old combat veteran who served 2 tours in Iraq, for possible PTSD. According to the results of this study, you should assess Mr A for which of the following in addition to PTSD?**
   a. MDD
   b. High blood pressure
   c. Alcohol use disorder
   d. Suicidal thinking