JOURNAL OF VETERANS STUDIES

Understanding Differences Between Veterans and Civilians on a Range of Biopsychological Domains: Descriptive Report from the MIDUS II Study

RESEARCH

CHRISTINA HEJL
CHRISTINA BURNS
JANIYA CHERRY
AREON BRADFORD
YVETTE Z. SZABO

*Author affiliations can be found in the back matter of this article

VIRGINIA TECH PUBLISHING

ABSTRACT

A growing amount of literature has documented differences between United States (US) veterans of the armed services and civilians in mental and physical health outcomes. However, less is known about the correlates of these outcomes, and most studies have used samples of veterans receiving US Department of Veteran's Affairs (VA) healthcare only. Using a nationally recruited sample from the Midlife in the United States (MIDUS) II study, we examined stress exposure, mental health symptoms, and common vulnerability factors (inflammation, trauma history, emotion regulation) across veterans and civilians. The present study included data from the baseline psychosocial timepoint (Project 1), the Milwaukee subsample (n = 4,633), and the biomarker study (Project 4; n = 1,099). We found that veterans reported greater stressful and traumatic life events but fewer mental health symptoms compared to civilians. Further, analyses suggested some differences based on a history of combat or probability of using VA healthcare, with higher levels of depression among combat veterans and more head injury among those likely to use VA healthcare. Results suggest some variability in inflammatory markers but few differences in emotion regulation or health characteristics. The present study was limited by minimal available data on military service. Future research is needed on veterans outside of VA healthcare, with attention to characteristics such as the branch of service, rank, and unit cohesion. The goal of this line of research is to better understand factors that may be addressed in prevention and intervention efforts in service of best caring for those who have sacrificed for military service.

CORRESPONDING AUTHOR:

Dr. Yvette Z. Szabo

VISN 17 Center of Excellence for Research on Returning War Veterans, US

California State University, Los Angeles, US

yszabo@calstatela.edu

KEYWORDS:

biomarker; civilian; combat veteran; emotion regulation; MIDUS II

TO CITE THIS ARTICLE:

Hejl, C., Burns, C., Cherry, J., Bradford, A., Szabo, Y. Z. (2023). Understanding Differences Between Veterans and Civilians on a Range of Biopsychological Domains: Descriptive Report from the MIDUS II Study. *Journal of Veterans Studies*, 9(1), pp. 203–223. DOI: https://doi.org/10.21061/jvs.v9i1.405

In his second inaugural address, President Abraham Lincoln (1865) famously called for the government to "care for him who shall have borne the battle." Over time, identified areas of need for veterans of the armed services include mental health, head injury, and post-deployment physical health (Kornblith et al., 2020; Noël et al., 2011; Tanielian et al., 2008). Often, veterans are eligible for care related to conditions related to their military service at a United States (US) Department of Veterans Affairs (VA) hospital for no cost. According to the Veterans Benefits Association (2022) annual report, 5,417,012 veterans received service-connected compensation during the fiscal year 2022. This compensation is for conditions determined to be related to their service, with mental disabilities being the fourth most prevalent body system being compensated.

More recently, it has been identified that active-duty service members and veterans do not always respond to mental health treatment to the same degree as civilians (Jacoby et al., 2022), underscoring a need to better understand group differences and malleable correlates to improve care quality. Unfortunately, few empirical investigations exist comparing veterans and civilians, and those that do often focus on veterans receiving care at VA hospitals. The present study leverages a national dataset as a first step to explore differences between veterans and civilians on a range of outcomes and health correlates as a foundation for future research. Utilizing this dataset has the benefit of reducing the burden on participants with new data collection while clarifying hypotheses and recruiting many veterans who are likely not utilizing VA services.

President Lincoln's (1865) words have become a key part of the motto of the VA. However, nearly 60% of veterans do not seek services from the VA (Bagalman, 2014). Therefore, they are overlooked in research despite some research showing an increased risk of suicide in veterans not connected to VA care (Lemle, 2018). This current line of research might help inform the need for specialty services and services for those transitioning from service or who may be ineligible for VA care.

In comparison to their civilian counterparts, some literature suggests that veterans are at greater risk for several mental health conditions, including depression, posttraumatic stress disorder (PTSD), and other chronic medical conditions, compared to the general population (American Psychiatric Association, 2022; Fulton et al., 2015; Gros et al., 2010). The most likely explanation for this increased vulnerability is the high amounts of stress and trauma that veterans are exposed to during combat missions, the high prevalence of Military Sexual Trauma (MST), Traumatic Brain Injury (TBI), and even some evidence of high rates of pre-military trauma (Loignon et al., 2020; Pulverman et al., 2019; Stretch et al., 1998). Another unique aspect of military service is deployment, or the movement of armed forces from their home station to somewhere outside the continental US and its territories. It may involve transition stress, disruption to social networks, and separation of families (US Department of Veterans Affairs, 2015).

While trauma exposure likely contributes to the development of poor health, the effects are often small, and there are likely several mediating and moderating factors (Scott et al., 2013). One such factor for veterans may be basic training, which is a rigorous process designed to turn civilians into soldiers, sailors, airmen, marines, national guardsmen, reservists, and coast guardsmen. This training prepares individuals to serve their country through military service that includes branch-specific training in marksmanship, physical training, and psychological training, among other components (Kelley, 2005). It is possible that some aspects of military readiness, such as basic training, teach additional skills that increase resilience and physical fitness and increase social connection, leading to better health outcomes. This was supported by one study of pre-9/11 veterans and civilians from a national to sample that found no difference in symptoms of depression among veterans compared to civilians (Gould et al., 2015).

In addition to the plausibility of unique group factors that are facilitators of health or serve as vulnerability factors, existing research in the area has suggested that veterans tend to demonstrate elevated anger expression and higher levels of anxiety compared to civilians (Angkaw et al., 2013; Gould et al., 2015; MacManus et al., 2015). Further, some research suggests chronic or dysregulated inflammation, which has been proposed as one pathway through which mental and physical health problems develop following trauma (Kendall-Tackett, 2009; Sokolove et al., 2016). In a recent dissertation that examined emotional regulation as a correlate of mental health difficulties, a civilian subsample reported lower emotional regulation difficulties than a veteran subsample (Chase, 2017). While these two groups were recruited as part of different studies, it offers early evidence of group differences in emotion regulation, an important mental health mechanism connected to mental and physical health (DeSteno et al., 2013).

The present study leverages an existing data set that included select questions about military service history, combat exposure, VA benefits, and VA insurance to compare veterans of the US armed forces and civilians on a range of mental and physical health domains. The long-term objective of this line of work is to identify potential group differences that can be used to inform treatment and resource allocation. Understanding descriptive differences between these two populations is important for several reasons. First, although the US veteran population is estimated to be over 19 million, with fewer than 7-million

veterans enrolled in VA healthcare, most medical and mental health research is conducted on civilian samples or within VA settings (US Department of Veterans Affairs, 2022). As such, this study might inform whether additional research is needed for veteran-specific interventions, including those who are not eligible for VA healthcare. Second, this research may inform which outcomes veterans and military members are more at risk for and what vulnerabilities could be targeted in preventative healthcare. Third, if group differences are not found in this existing dataset, it might suggest that more specific investigation is needed to phenotype those most at risk without collecting additional data for this purpose. Additionally, although large surveys regarding veteran demographics, utilization of healthcare, self-reported health and well-being, as well as diagnosis of physical and mental health conditions, have been conducted within the VA, less is known about pathways through which these conditions develop (US Department of Veterans Affairs, 2022). Therefore, we also examined a range of potential vulnerability and protective factors, including social anxiety, trait anxiety, depression, life stress, and childhood adversity, as well as concentrations of several inflammatory biomarkers.

While this paper is largely descriptive in nature, we did have some hypotheses. Previous research has suggested veterans who have deployed have higher levels of inflammation than civilians and, among VA employees, veterans report greater mental and physical health problems and fewer health-promoting behaviors compared to civilians (Ansley & Howard, 2021; Schult et al., 2019). First, we hypothesized that veterans would report more exposure to different types of traumas that can have lasting impacts on mental health. In addition, we hypothesized that veterans would report greater anger expression, higher anxiety, more depression, and higher systemic inflammation than civilians. Moreover, we hypothesized that veterans would report higher rates of head injury and poorer sleep quality compared to civilians. Some evidence connects combat exposure with increased risk for some mental health disorders, so we also stratified follow-up analyses by combat exposure (Seal et al., 2009). Finally, given previous research in this area has focused on VA samples, we also stratified follow-up analyses by probable VA healthcare use to study differences between veterans who likely seek care through the VA healthcare system and veterans who do not.

METHOD

The present study included a subsample of those who participated in the second phase of a national longitudinal study of health and well-being, Midlife in the United States (MIDUS II). Participants in the first phase of MIDUS were recruited between 1995 and 1996 using random digit dialing. Eligible participants were English-speaking, non-institutionalized adults ages 25–74 at enrollment. MIDUS II was completed between 2004 and 2009, which included a follow-up on MIDUS participants (Project 1) and several subprojects, including a Biomarker Project (Project 4), with some biomarker assays released as recently as 2018. We used data from Project 1, the baseline time point that consisted of self-report psychosocial and health information in a large sample of adults. Participants completed self-administered questionnaires and telephone interviews regarding sociodemographic information, psychosocial functioning, life events, coping, and physical and mental health.

To partially address low ethnic and racial diversity in Project 1, an additional subsample of African American adults to were recruited in Milwaukee, Wisconsin (WI), to participate in a new phase of MIDUS II, known as the Milwaukee subsample. Because these individuals completed similar measures as Project 1, they are referred to here as part of the baseline sample. We also used data from Project 4, which collected additional health information and blood samples from a subset of participations. All participants who completed baseline assessments were eligible for Project 4. We will report baseline and Project 4 separately for clarity in procedures and sample size. However, the participants from Project 4 are also represented in baseline analyses (i.e., non-independent samples). MIDUS II includes a small number of participants from the same family. Previous studies have run sensitivity analyses to ensure findings don't change when excluding family members (e.g., Hostinar et al., 2015). Therefore, we opted to include all participants in the analyses.

BASELINE METHODS

PARTICIPANTS

Project 1 of MIDUS II was completed between 2004 and 2006, which included a follow-up on MIDUS participants (baseline). To increase diversity in MIDUS II, an additional African American sample (n = 592) was recruited from Milwaukee, WI, who completed questionnaires and procedures parallel to those in baseline. All participants eligible for the MIDUS projects were eligible for inclusion in the present study. We excluded participants who did not complete the veteran status question (n = 354).

As shown in Table 1 (below), the MIDUS II participants at baseline were primarily White, with little variability across the veteran and civilian subsample. The average age for the sample was 55.03 (SD = 12.45). While the sample was over half female (56.3%), the veteran sample was only 5.6%

	WHOLE SAMPLE *n* = 4,633	VETERANS *n* = 801	CIVILIANS *n* = 3,832
	% (*n*)	% (*n*)	% (*n*)
Gender (% female)	56.3% (*n* = 2,609)	5.6% (*n* = 45)	66.9% (*n* = 2,564)
Race*			
Asian	0.5% (*n* = 27)	0.0% (*n* = 0)	0.7% (*n* = 27)
Black	16.2% (*n* = 754)	12.2% (*n* = 98)	17.0% (*n* = 655)
Native American	5.7% (*n* = 267)	5.4% (*n* = 44)	5.8% (*n* = 223)
Native Hawaiian/Pacific Islander	0.2% (*n* = 10)	0.3% (*n* = 3)	0.1% (*n* = 7)
White	81.6% (*n* = 3,783)	86.0% (*n* = 689)	80.7% (*n* = 3,094)
Other	2.8% (*n* = 131)	2.3% (*n* = 19)	2.9% (*n* = 113)
Don't know/Refused	0.4% (*n* = 20)	0.2% (*n* = 2)	0.5% (*n* = 21)
Ethnicity			
Not Spanish/Hispanic	97.0% (*n* = 4,492)	96.3% (*n* = 771)	97.1% (*n* = 3,721)
Spanish/Hispanic	2.7% (*n* = 125)	3.1% (*n* = 25)	2.6% (*n* = 100)
Don't know/Refused	0.3% (*n* = 16)	0.6% (*n* = 5)	0.2% (*n* = 11)
Education			
No school/some grade school (1-6)	0.5% (*n* = 21)	0.2% (*n* = 2)	0.5% (*n* = 19)
8th grade/junior high school (HS;7-8)	1.4% (*n* = 67)	1.2% (*n* = 10)	1.5% (*n* = 57)
Some HS (9-12 no diploma/GED)	5.9% (*n* = 272)	4.7% (*n* = 38)	6.1% (*n* = 234)
GED	1.6% (*n* = 73)	1.7% (*n* = 14)	1.5% (*n* = 59)
Graduated from HS	26.6% (*n* = 1,232)	23.5% (*n* = 188)	27.2% (*n* = 1,044)
1 to 2 years of college, no degree yet	17.7% (*n* = 818)	18.7% (*n* = 150)	17.4% (*n* = 668)
3 + years of college, no degree yet	3.9% (*n* = 182)	4.2% (*n* = 34)	3.9% (*n* = 148)
Graduated from 2-year college, vocational school or associate degree	7.4% (*n* = 342)	8.0% (*n* = 64)	7.3% (*n* = 278)
Bachelor's degree	17.7% (*n* = 821)	20.1% (*n* = 161)	17.2% (*n* = 660)
Some graduate school	2.9% (*n* = 134)	3.9% (*n* = 31)	2.7% (*n* = 103)
Master's degree	10.0% (*n* = 462)	9.0% (*n* = 72)	10.2% (*n* = 390)
Doctorate or other professional degree	4.4% (*n* = 203)	4.6% (*n* = 37)	4.3% (*n* = 166)
Don't know/Refused	0.1% (*n* = 6)	0.0% (*n* = 0)	0.1% (*n* = 6)

Table 1 Baseline Demographics.

Note: * Participants could identify up to 4 racial identities, categories not mutually exclusive, and may total more than 100%.

female. Of the veteran subsample, 27.1% endorsed having experienced combat. In addition, MIDUS II asked about specific ethnicities, which are reported in aggregate here.

PROCEDURES

At baseline, participants completed a structured telephone interview and a series of self-administered questionnaires regarding demographic information, stressful life event exposure, and mental health, among others not reported here. In addition, participants received financial compensation for their participation.

MEASURES

Stressful Life Events

Participants completed a 27-item Stressful Life Events scale (SLE), a scale adapted from a life stress measure for use in the MIDUS II study (Turner & Wheaton, 1995). Participants indicated which events they had experienced by responding *yes/no* to each item. For the first seven items, participants were asked to indicate events they had experienced as a child or teenager (up to age 19). For the remaining 20 items, participants were asked to indicate which events had

happened at any time in their life. For the present study, we calculated a total stressful life events measure by summing each item endorsed as yes. Due to the low endorsement of four or more events, this was recoded to 0, 1, 2, and 3+ for analysis. We also created two other indices. The first was a measure of potentially traumatic life events, summing together endorsement of items potentially consistent with definitions of a traumatic event that may be used to diagnose PTSD, i.e., parental alcohol use, parental drug use, death of a parent, death of a brother or sister, death of a child, the child experienced a life-threatening accident or injury, physically assaulted or attacked, sexually assaulted, experienced combat (American Psychiatric Association, 2022). For all measures, greater scores indicate exposure to more stressful events.

Grouping Variables

Veteran status. A probable veteran variable was created using a single *yes/no* item on the SLE "entered the armed forces." Participants who endorsed yes on this item were coded as a veteran, and those who did not endorse that item were coded as a civilian.

Combat. As part of the SLE, participants indicated whether or not they had experienced combat. This item was used to create the combat veteran variable where 1 indicated the veteran had experienced combat, and 0 indicated the veteran had not experienced combat.

Probable VA healthcare. Participants were asked to indicate (a) whether they were covered by CHAMPUS, CHAMPVA, or other government health insurance for military personnel or veterans and (b) whether they received veterans' benefits. This was used to create a probable VA healthcare variable, where endorsing either of the insurance or benefit items and endorsing being a veteran was coded as likely to receive healthcare from a VA hospital. Not endorsing either of these items, but endorsing being a veteran, was coded as likely not receiving healthcare from a VA hospital. Finally, a few participants endorsed being covered by this insurance or receiving benefits but did not endorse being a veteran. Because family members can receive benefits, these were not included in the probable VA healthcare analyses.

Mental Health Symptoms

Participants were screened for depression, anxiety, and panic disorder over the phone using the Composite International Diagnostic Interview–Short Form (CIDI-SF) through a structured interview completed by trained study staff (Kessler et al., 1998; Wang et al., 2017).

When screening for depression, participants were first asked whether they had felt sad, depressed, or blue for two weeks in the past 12 months. Each participant was then asked seven items that captured symptoms of depression (e.g., "lose interest in most things, feeling down on yourself, no good, or worthless") that differed slightly in framing based on their answer to the screening question. A total score was derived from seven yes/no items with a possible range of 0–7.

When screening for anxiety, participants were first asked about the extent to which they worry compared to others, the frequency at which they worry, and how many things they worry about. Those who indicated they "worry a lot more than others," "worry every day or just about every day," and "worried about more than one thing" or "different worries at the same time" were then asked additional questions regarding anxiety. Participants reported how often they experienced ten items capturing anxiety (e.g., "were restless because of your worry" or "were keyed up, on edge, or had a lot of nervous energy") on a scale of 1 = *most days* to 4 = *never*. For the present study, a total score calculated in the parent study was used based on the number of "most day" responses, which ranged from 0–10.

When screening for panic attacks, participants were first asked whether they had experienced a panic attack in the past year. Those who endorsed having a panic attack responded yes/no to whether they experienced six items during an attack (e.g., "you have tightness, pain, or discomfort in your chest or stomach"). Finally, a total score of yes responses ranging from 0–6 was used in our analysis.

DATA ANALYSIS

There was no missing data for veteran status, combat status, stressful life events, or mental health symptoms at baseline. However, many variables were positively skewed, and log transformation (log10) did not significantly improve the distribution. Given the large sample size for the primary research questions, indicating statistical power to detect small effects, we used nonparametric tests for all analyses. Descriptive statistics used means/standard deviations or medians/interquartile ranges, as appropriate. Inferential statistics used Mann-Whitney U tests to compare median levels of trauma history and mental health symptoms. While the purpose of this paper was to be descriptive and exploratory, the large number of comparisons raised some questions about Type I errors. Therefore, the present study used $\alpha < .01$ as the criterion for statistical significance for all baseline analyses.

BASELINE RESULTS

Our first step was to compare veterans and civilians on a range of trauma measures and mental health symptom measures. The distributions in the two groups differed

significantly for all the SLE and mental health measures (See Table 2). Consistent with our first hypothesis that veterans will report more exposure to different types of traumas that have lasting impacts on mental health, the median number of stressful life events, potentially traumatic events, and childhood stressful life events was greater for veterans than civilians. Contrary to our second hypothesis that veterans will have higher anxiety and more depression in comparison to civilians, median levels of depression, anxiety, and panic symptoms were higher in civilians compared to veterans.

Next, among veterans only, we tested hypotheses one and two, comparing those who had experienced combat and those who had not (See Table 3). We removed both joining the armed forces and combat as potential response options for this measure of stressful life events. Combat veterans reported more exposure to stressful life events and greater histories of childhood adversity, but no difference was observed for traumatic life events or mental health symptoms.

Finally, a third set of analyses examined hypothesis one and hypothesis two among the 447 veterans who had responded to questions about healthcare or service-related conditions in order to determine whether there are any differences between those who were likely to be receiving care from the VA and those who were not (See Table 4). Those who were likely receiving VA healthcare reported more traumatic life events and more depression compared to those not likely to receive VA healthcare.

While findings documenting greater exposure to stressful and traumatic events were consistent with hypotheses, our baseline results of veterans experiencing lower levels of anxiety, depression, and panic symptoms than civilians were not expected. Additionally, there was no difference in mental health symptoms between combat and non-combat veterans. Finally, exploratory analyses of veterans likely using VA healthcare versus those who were not likely using VA healthcare showed that VA veterans reported more traumatic life events and higher depression. The remaining analyses examined a subset of baseline participants who are better characterized by psychosocial factors and may offer some insights into group differences.

	VETERAN MEDIAN (IQR) OR MEAN (*SD*)	CIVILIAN MEDIAN (IQR) OR MEAN (*SD*)	*p*	*U*
SLE	4.00 (3.00–6.00)	3.00 (1.00–4.00)	**<.001**	2143235.00
SLE trauma	0.00 (0.00–1.00)	0.00 (0.00–1.00)	**<.001**	1762166.00
SLE childhood	1.00 (0.00–1.00)	0.00 (0.00–1.00)	**<.001**	1714808.50
Depression*	0.41 (1.44)	0.67 (1.81)	**<.001**	1457034.00
Anxiety*	0.07 (0.68)	0.15 (0.93)	**.005**	1507490.00
Panic symptoms*	0.15 (0.75)	0.33 (1.03)	**<.001**	1438780.50

Table 2 Comparisons Between Veterans and Civilians on Life Events and Mental Health Symptoms.

Note: SLE = Stressful Life Events; *n* for veterans is 801; *n* for civilians is 3832; * We reported mean and SD for descriptive purposes because the median and IQR were all zero.

	COMBAT VETERAN MEDIAN (IQR) OR MEAN (SD)	NON-COMBAT VETERAN MEDIAN (IQR) OR MEAN (SD)	*p*	*U*
SLE	3.00 (2.00–5.00)	3.00 (2.00–4.00)	**<.001**	73405.00
SLE trauma	0.00 (0.00–1.00)	0.00 (0.00–1.00)	.09	67139.50
SLE childhood	1.00 (0.00–1.00)	0.00 (0.00–1.00)	**<.001**	75135.50
Depression*	0.52 (1.57)	0.37 (1.39)	.07	65825.00
Anxiety*	0.02 (.34)	0.09 (0.77)	.22	62679.00
Panic symptoms*	0.12 (0.68)	0.16 (0.78)	.94	63277.50

Table 3 Comparisons of Life Events and Mental Health by Combat Status.

Note: SLE = Stressful Life Events; *n* for Combat Veteran = 217; *n* for Non-Combat Veteran = 584; * We report mean and *SD* for descriptive purposes because the median and IQR were all zero.

	VA VETERAN MEDIAN (IQR) OR MEAN (*SD*)	VETERAN NOT LIKELY TO USE VA HEALTHCARE MEDIAN (IQR) OR MEAN (*SD*)	*p*	*U*
SLE	4.50 (3.00–6.00)	4.00 (3.00–6.00)	.14	26137.50
SLE trauma	1.00 (0.00–1.00)	0.00 (0.00–1.00)	**<.001**	28400.00
SLE childhood	1.00 (0.00–1.00)	1.00 (0.00–1.00)	.04	26831.50
Depression*	0.78 (1.96)	0.33 (1.29)	**.004**	26212.00
Anxiety*	0.09 (0.83)	0.07 (0.60)	.93	24222.50
Panic symptoms*	0.26 (1.04)	0.14 (0.76)	.24	24855.00

Table 4 Comparisons of Stressful Life Events and Mental Health by Probable VA Healthcare Use.

Note: SLE = Stressful Life Events; *n* for VA Veteran = 184; *n* for non-VA veteran = 263; * We reported mean and SD for descriptive purposes because median and IQR were all zero.

PROJECT 4 METHODS

PARTICIPANTS

Milwaukee and Project 1 (i.e., baseline) participants were invited to participate in several sub-projects of MIDUS II, including the MIDUS II Biomarker Project (Project 4). Participants of the present study included adults ages 35–86 who completed baseline Milwaukee measures and Project 4. Participants received financial compensation for their participation. These participants were recruited via recruitment letters and study brochures to complete a 2-day overnight study session at one of three clinical research centers in the United States. All participants eligible for the MIDUS II projects were eligible for inclusion in the present study. As part of Project 4, participants completed a physical exam, medical history assessment, and a series of self-report questionnaires, including a self-reported sleep assessment. In addition, a 12-hour to fasting blood draw was taken the following morning at approximately 7 a.m. to assay inflammatory markers (Dienberg Love et al., 2010; Ryff et al., 2019). For Project 4 analyses, we excluded participants who had a history of cancer or HIV/AIDs due to our examination of inflammatory markers and the association of the conditions with immune function (*n* = 156). As shown in Table 5, the MIDUS participants in Project 4 were primarily White, with little variability across the veteran and civilian subsamples. The average age was 53.64 (*SD* = 11.37). While the sample was over half female (56.1%), the veteran sample was only 5.8% female. In Project 4, 25% of the veterans endorsed experiencing combat. MIDUS II asked about specific ethnicities, which are reported in aggregate here.

PROCEDURES

Project 4 participants completed a 2-day overnight study session at one of three general clinical research centers. On day one, they completed a physical exam, medical history assessment, self-reported sleep assessment, and self-administered questionnaire packet. In addition, a to fasting blood draw was taken the following morning.

PROJECT 4 MEASURES

Childhood Trauma

At Project 4, participants completed the 28-item childhood trauma questionnaire, a validated measure of childhood trauma that includes five subscales to assess emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect (Bernstein, 1994). Responses to were measured on a 5-point Likert scale with 1 = *never true* to 5 = *always true* about how often each tactic occurred. Responses were summed to create 5 subscales, one for each abuse type and a total score.

Depression

Participants completed the Center for Epidemiological Studies Depression Inventory (CES-D), a 20-item measure of depression. Participants reported how often they experienced each item (e.g., "I thought my life had been a failure" and "I could not get "going") over the past week on a scale of 1 to 4 with 1 = *rarely or none of the time* to 4 = *most or all of the time* (Radloff, 1977). These items were summed in the parent study to create a total score where greater scores indicate more depression symptoms ($\alpha = .89$).

Social Anxiety Scale

A modified 9-item version of the Liebowitz Social Anxiety Scale was collected as part of Project 4. Each of the items presented a common social situation (e.g., "returning goods to a store" or "calling someone you don't know very well"; see Fresco et al., 2001). Participants rated how much fear or anxiety they experienced when faced with each of the nine situations on a scale of 1–4, with 1 = *none* to 4 = *severe*. Responses to these items were summed in the parent study to create a total score where greater scores indicate more social anxiety ($\alpha = .85$).

	WHOLE SAMPLE *n* = 1,099	VETERANS *n* = 172	CIVILIANS *n* = 927
	% (*n*)	% (*n*)	% (*n*)
Gender (% female)	56.1% (*n* = 617)	5.8% (*n* = 10)	65.5% (*n* = 607)
Race*			
Asian	0.1% (*n* = 5)	0.0% (*n* = 0)	0.5% (*n* = 5)
Black	19.3% (*n* = 213)	13.3% (*n* = 23)	20.4% (*n* = 190)
Native American	6.0% (*n* = 66)	5.2% (*n* = 9)	6.1% (*n* = 57)
Native Hawaiian/Pacific Islander	0.2 (*n* = 3)	0.5% (*n* = 1)	0.2% (*n* = 2)
White	78.9% (*n* = 868)	84.9% (*n* = 146)	77.8% (*n* = 722)
Other	3.4% (*n* = 38)	2.9% (*n* = 5)	3.5% (*n* = 33)
Don't know/Refused	0.3% (*n* = 4)	0.0% (*n* = 0)	0.4% (*n* = 4)
Ethnicity			
Not Spanish/Hispanic	96.0% (*n* = 1,055)	97.1% (*n* = 167)	95.8% (*n* = 888)
Spanish/Hispanic	3.5% (*n* = 39)	2.3% (*n* = 4)	3.8% (*n* = 35)
Don't know/Refused	0.4% (*n* = 5)	0.6% (*n* = 1)	0.4% (*n* = 4)
Education			
No school/some grade school (1–6)	0.2% (*n* = 2)	0.6% (*n* = 1)	0.2% (*n* = 2)
8th grade/junior high school (HS; 7–8)	0.9% (*n* = 10)	2.3% (*n* = 4)	1.0% (*n* = 9)
Some HS (9–12 no diploma/GED)	4.5% (*n* = 49)	2.3% (*n* = 4)	4.9% (*n* = 45)
GED	1.5% (*n* = 16)	0.6% (*n* = 1)	1.6% (*n* = 15)
Graduated from HS	20.7% (*n* = 228)	17.4% (*n* = 30)	21.4% (*n* = 198)
1 to 2 years of college, no degree yet	17.6% (*n* = 193)	16.3% (*n* = 28)	17.8% (*n* = 165)
3 + years of college, no degree yet	4.5% (*n* = 49)	5.2% (*n* = 9)	4.3% (*n* = 40)
Graduated from 2-year college, vocational school or associate degree	7.6% (*n* = 84)	12.2% (*n* = 21)	6.8% (*n* = 63)
Bachelor's degree	20.7% (*n* = 228)	23.8% (*n* = 41)	20.2% (*n* = 187)
Some graduate school	4.0% (*n* = 44)	6.4% (*n* = 11)	3.6% (*n* = 33)
Master's degree	13.3% (*n* = 146)	10.5% (*n* = 18)	13.0 % (*n* = 128)
Doctorate or other professional degree	4.3% (*n* = 47)	4.7% (*n* = 8)	4.2% (*n* = 39)
Don't know/Refused	0.5% (*n* = 3)	0.0% (*n* = 0)	0.3% (*n* = 3)

Table 5 Project 4 Demographics.

Note: * Participants could identify up to 4 racial identities, categories not mutually exclusive, and may total more than 100%.

Trait Anxiety Scale

Participants completed the Spielberg Trait Anxiety Inventory, a 20-item self-report measure of feelings of anxiety (Spielberger, 1989). Participants rated how typically they experienced each item (e.g., "I am losing out on things because I can't make up my mind soon enough" and "I worry too much over something that really doesn't matter") on a scale of 1–4, with 1 = *almost never* to 4 = *almost always*. Responses to these items were summed in the parent study to create a total score where greater scores indicate more social anxiety (α = .91).

Emotional Control

Self-control was measured during Project 4 using a 19-item Self-Control Scale, which contained subscales to measure cognition control, emotion control, and burden of consciousness (Gross & John, 2003; Markus & Kitayama, 1991) in the parent study. Participants rated items on a scale of 1–7, with 1 = *strongly agree* to 7 = *strongly disagree*, and responses were summed to create subscale scores. The cognition control subscale included six items i.e., "I can make myself do things I don't want to do," and "I can control my thoughts and desires if I need to" (α = .59).

The emotional control subscale included six items, i.e., "I keep my emotions to myself" and "when I am feeling negative emotions (e.g., to sadness or anger), I make sure not to express them" ($\alpha = .55$). The burden of consciousness subscale included seven items, i.e., "I feel very tense when I am being evaluated by others" and "I am often concerned about how other people might respond to me" ($\alpha = .64$).

Trait Anger

The Spielberg Trait Anger Inventory was collected as part of Project 4 to measure anger-related behaviors (Spielberger, 1996). Participants rated how often they engaged in each item when they were angry. Participants rated items on a scale of 1–4, with 1 = *almost never* to 4 = *almost always*. The measure from the parent study included 15 items and the responses were summed to create two subscales: angry temperament (4 items, $\alpha = .83$), anger reaction (4 items, $\alpha = .73$), and a trait anger total ($\alpha = .84$).

Sleep

The Pittsburgh Sleep Quality (PSQ) was administered as part of questionnaires collected during Project 4. This 19-item self-report questionnaire was used to measure seven domains of sleep quality: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. A global sleep score was calculated by taking a sum of the seven domain scores for participants with complete data. A global score was not calculated for those who had 100% sleep efficiency (Buysse et al., 1989).

Biomarkers of Inflammation

C-Reactive Protein (CRP) and Fibrinogen were measured utilizing a particle-enhanced immunonepholometric assay. Intracellular Adhesion Molecule (ICAM) and E-Selectin were measured using enzyme-linked immunoassays, and immunoelectrochemiluminescence technology was used for InterLeukin (IL) 6, IL-8, IL-10, and Tumor Necrosis Factor alpha (TNF-α). From MIDUS II protocols for the Project 4 subsample, laboratory intraassay and interassay coefficients of variance (CV) for all assays were in acceptable ranges (<10%; see Ryff et al., 2019). Missing data or data that fell outside the valid range for the assay, were imputed using a value one unit below the minimal or maximal detectable score. This curtails extremely high and low values, and consequently, the variance on the tails of the distribution is truncated. The following assays included values outside the detectable range values, and they were adjusted as indicated: E-Selectin values < 0.1 ng/mL were adjusted to 0.09 ng/mL; ICAM values < 45 ng/mL were adjusted to 44 ng/mL (Ryff et al., 2019).

Medical History

We also examined several health factors. First, participants completed a standardized medical history interview that inquired about participants' health-related symptoms and conditions, major health events (e.g., broken bones, surgeries, head injuries, joint injuries, motor vehicle accidents, or amputations), immune functions (e.g., allergies and immunizations), family medical history, and current health practices (e.g., diet, exercise, smoking, alcohol, health care and screening). For our analyses, we focused on the number of head injuries they had in their lifetime, the number of prescription medications they took in the past 30 days, and the number of past-year chronic conditions. Finally, as part of the physical, staff collected height and weight and calculated body mass index (BMI), which is also used in our analyses.

DATA ANALYSIS

Missing data in the present study was low (0.5% or less for childhood maltreatment, .01% or less for emotion regulation and mental health, 1.7% or less for biomarkers, and 6.6% or less for health characteristics). For the CTQ, two individuals completed the questionnaire except for sexual abuse. These were imputed as a score of 5 (the minimum on the subscale) to retain them in the total score and may reflect an underestimation. Since missing data on the scale level was generally low, all available data were utilized in each analysis. Therefore, sample sizes may differ slightly and are reported under each table. Following suggestions for handling extreme values for inflammatory variables by imputing an upper and lower limit, we replaced very high and very low values with a value of 3.29 *SD* above or below the mean (Riis et al., 2020; Szabo & Slavish, 2021; Tabachnick & Fidell, 2007). For Project 4, several variables were significantly skewed and similar to baseline. Therefore, we opted to use nonparametric tests. Descriptive statistics used means/standard deviations or medians/interquartile ranges, as appropriate. Inferential statistics used Mann-Whitney U tests to compare median levels of trauma history, psychosocial factors, and inflammatory levels. Due to the large number of tests but the lower power with the smaller sample sizes, we used a *p*-value of .03 for Project 4 analyses to balance Type I and Type II error considerations.

PROJECT 4 RESULTS

First, we compared veterans and civilians on various trauma measures, mental health symptom measures, and inflammatory markers. Project 4 had a detailed

questionnaire on childhood trauma history as part of hypothesis one. Contrary to the hypothesis, only sexual abuse differed significantly between the two groups but in the opposite direction, where levels of sexual abuse were lower among civilians than veterans (See Table 6). Hypothesis two stated that veterans would have greater anger expression, higher anxiety, and higher systemic inflammation. This hypothesis was only partially supported since there were some differences in inflammatory markers, with the median concentration of IL-10 and ICAM being higher among veterans than civilians. Further, the median levels of trait and social anxiety were higher in civilians than veterans. There was no difference between emotional factors and other health factors.

	MEDIAN (IQR) VETERAN	MEDIAN (IQR) CIVILIAN	*p*	*U*
Total CTQ	32.00 (28.00–40.00)	34.00 (28.00–43.60)	.36	75959.50
CTQ (emotional abuse)	6.00 (5.00–9.00)	6.00 (5.00–9.00)	.07	72628.00
CTQ (physical abuse)	6.00 (5.00–8.00)	6.00 (5.00–7.00)	.36	82843.50
CTQ (sexual abuse)	5.00 (5.00–5.00)	5.00 (5.00–6.00)	**.002**	70566.00
CTQ (emotional neglect)	8.50 (6.00–13.00)	9.00 (6.00–13.00)	.68	77813.50
CTQ (physical neglect)	6.00 (5.00–8.75)	6.00 (5.00–8.00)	.11	85213.50
EMOTIONAL FACTORS				
Emotion control	4.70 (4.30–5.20)	4.80 (4.20–5.30)	.91	79723.00
Burden of consciousness	4.70 (4.40–5.30)	4.90 (4.30–5.40)	.07	72336.50
Cognition control	5.20 (4.80–5.70)	5.30 (4.80–5.80)	.23	74715.00
MENTAL HEALTH SYMPTOMS				
Trait anxiety	30.50 (26.00–37.00)	33.00 (28.00–41.00)	**.001**	66862.50
Social anxiety	1.70 (1.40–2.08)	1.80 (1.40–2.20)	**.009**	69656.50
Trait anger	23.00 (20.55–26.00)	23.00 (20.00–27.00)	.81	78300.00
Angry temperament	4.00 (4.00–6.00)	4.00 (4.00–6.00)	.93	79138.00
Angry reaction	7.00 (6.00–9.00)	7.00 (6.00–9.00)	.51	76965.00
Depression	6.00 (3.00–10.00)	7.00 (3.00–12.00)	.06	71845.00
INFLAMMATORY MARKERS				
IL-10	0.25 (0.17–0.38)	0.22 (0.16–0.32)	**.02**	87058.00
sICAM	283.47 (232.98–341.24)	269.96 (213.02–334.60)	**.02**	86840.50
sIL6r	33849.00 (27045.00–41420.00)	33889.00 (26958.50–41485.50)	.96	78592.50
Fibrinogen	337.00 (279.50–381.00)	340.00 (290.00–399.00)	.16	71765.50
IL-6	0.86 (0.61–1.23)	0.80 (0.54–1.22)	.18	83272.00
CRP	1.32 (0.71–3.07)	1.43 (0.69–3.75)	.42	73966.00
SES	41.71 (28.59–52.39)	38.96 (28.21–52.58)	.29	82271.50
IL-8	12.12 (8.72–15.11)	12.30 (9.13–15.91)	.26	74014.00
HEALTH FACTORS				
Sleep quality	5.00 (3.00–8.00)	5.00 (4.00–8.00)	.29	66004.50
# Head injuries	0.00 (0.00–1.00)	0.00 (0.00–1.00)	.06	85233.50
# RX medications	1.00 (0.00–2.00)	1.00 (0.00–2.00)	.58	76778.50
BMI	28.61 (25.64–32.45)	28.62 (24.98–33.43)	.60	81658.00
# Chronic conditions	2.00 (1.00–3.00)	2.00 (1.00–3.00)	.59	77708.00

Table 6 Comparison of Veterans and Civilians on Childhood Trauma, Emotional Factors, and Health.

Note: CTQ = Childhood Trauma Questionnaire; IL-10 = Interleukin 10; sICAM = soluble intercellular adhesion molecule; sIL-6r = Soluble Interleukin 6 Receptor; IL-6 = Interleukin 6; CRP = C-reactive protein; SES = soluble E-Selectin; IL-8 = Interleukin 8; BMI = body mass index; *n* = 172 for veterans; *n* = 927 for civilians; total *n* varies from 1026–1099.

The test of hypotheses one and two was repeated among veterans, only comparing combat veterans to those without combat exposure (see Table 7). Combat veterans reported more depression, head injuries, and higher levels of E-Selectin. There was no difference in childhood maltreatment, emotional factors, or other health factors.

We also investigated hypotheses one and two with veterans likely receiving care from the VA (See Table 8). Of the 102 veterans with available data, those who were likely receiving VA healthcare reported more emotional neglect and higher levels of IL-6 compared to those not likely to receive VA healthcare. Further, they reported greater head

	COMBAT VETERAN MEDIAN (IQR)	NON-COMBAT VETERAN MEDIAN (IQR)	*p*	*U*
Total CTQ	34.00 (30.00–39.00)	32.00 (28.00–42.00)	.26	3094.50
CTQ (emotional abuse)	7.00 (5.00–9.00)	6.00 (5.00–9.00)	.15	3161.50
CTQ (physical abuse)	6.00 (5.00–8.00)	6.00 (5.00–7.00)	.19	3129.50
CTQ (sexual abuse)	5.00 (5.00–5.00)	5.00 (5.00–5.00)	.31	2596.50
CTQ (emotional neglect)	8.00 (6.00–12.00)	9.00 (5.50–13.00)	.76	2861.00
CTQ (physical neglect)	6.00 (5.00–9.00)	6.00 (5.00–8.00)	.34	3035.50
EMOTIONAL FACTORS				
Emotion control	4.70 (4.20–5.30)	4.70 (4.30–5.20)	.60	2626.50
Burden consciousness	4.70 (4.30–5.30)	4.70 (4.40–5.30)	.57	2614.00
Cognition control	5.20 (4.80–5.80)	5.30 (4.80–5.70)	.77	2691.50
MENTAL HEALTH SYMPTOMS				
Trait anxiety	33.00 (26.00–41.00)	30.00 (26.00–36.00)	.13	3197.00
Social anxiety	1.60 (1.30–1.90)	1.70 (1.40–2.10)	.09	2293.00
Trait anger	24.00 (21.00–27.00)	22.00 (20.00–26.00)	.37	3024.00
Angry temperament	5.00 (4.00–7.00)	4.00 (4.00–6.00)	.19	3113.00
Angry reaction	7.00 (6.00–8.00)	7.00 (6.00–9.00)	.61	2916.00
Depression	8.00 (4.00–13.00)	5.00 (2.00–8.00)	**.005**	3571.00
INFLAMMATORY MARKERS				
IL-10	0.32 (0.18–0.39)	0.25 (0.17–0.36)	.25	3030.00
sICAM	300.19 (242.30–367.54)	276.52 (229.44–329.32)	.19	3077.00
sIL6r	35754.00 (28906.00–41049.50)	33059.00 (26651.00–41571.50)	.35	2972.00
Fibrinogen	351.00 (288.50–397.50)	328.00 (277.00–377.75)	.21	2969.50
IL-6	0.92 (0.70–1.76)	0.80 (0.57–1.17)	.03	3307.00
CRP	1.49 (0.89–4.36)	1.27 (0.63–2.82)	.12	3044.50
SES	46.54 (36.11–63.85)	40.54 (26.63–50.94)	**.02**	3377.50
IL-8	11.15 (8.56–14.64)	12.25 (8.83–15.20)	.47	2509.00
HEALTH FACTORS				
Sleep quality	5.00 (4.00–8.00)	5.00 (3.00–8.00)	.92	2406.00
# Head injuries	1.00 (0.00–2.00)	0.00 (0.00–1.00)	**< .001**	3571.50
# RX medications	1.00 (0.00–2.00)	1.00 (0.00–2.00)	.48	2399.50
BMI	27.66 (25.40–32.55)	28.70 (25.93–32.44)	.29	2473.00
# Chronic conditions	2.00 (1.00–4.00)	2.00 (1.00–3.00)	.03	3375.50

Table 7 Comparisons of Combat and Non-combat Veterans for Childhood Trauma, Emotional Factors, and Health.

Note: CTQ = Childhood Trauma Questionnaire; IL-10 = Interleukin 10; sICAM = soluble intercellular adhesion molecule; sIL-6r = Soluble Interleukin 6 Receptor; IL-6 = Interleukin 6; CRP = C-reactive protein; SES = soluble E-Selectin; IL-8 = Interleukin 8; BMI = body mass index; *n* = 43 for combat veterans, *n* = 129 for non-combat veteran; total *n* varies from 161–172.

	VA VETERAN MEDIAN (IQR)	NON-VA VETERAN MEDIAN (IQR)	*P*	*U*
Total CTQ	35.00 (30.00–53.75)	32.00 (29.00–40.75)	.13	1482.00
CTQ (emotional abuse)	7.00 (5.00–11.00)	6.00 (5.00–9.00)	.18	1449.50
CTQ (physical abuse)	7.00 (5.00–9.00)	6.00 (5.25–8.00)	.60	1336.00
CTQ (sexual abuse)	5.00 (5.00–5.00)	5.00 (5.00–5.00)	.93	1252.00
CTQ (emotional neglect)	10.00 (7.00–14.50)	8.00 (6.00–12.00)	**.03**	1582.00
CTQ (physical neglect)	7.00 (5.00–9.00)	6.00 (5.00–8.75)	.27	1418.50
EMOTIONAL FACTORS				
Emotion control	4.70 (4.23–5.00)	4.80 (4.30–5.30)	.06	987.50
Burden consciousness	4.90 (4.10–5.33)	4.60 (4.10–5.08)	.13	1480.50
Cognition control	5.20 (4.65–5.70)	5.20 (4.80–5.80)	.53	1167.00
MENTAL HEALTH SYMPTOMS				
Trait anxiety	31.50 (26.00–40.25)	29.00 (26.00–35.00)	.18	1455.50
Social anxiety	1.70 (1.40–2.00)	1.60 (1.30–1.90)	.16	1465.50
Trait anger	23.00 (21.00–28.00)	23.00 (19.25–26.00)	.50	1359.00
Angry temperament	5.00 (4.00–7.00)	4.00 (4.00–5.00)	.21	1431.00
Angry reaction	8.00 (6.00–9.00)	7.00 (5.00–8.00)	.13	1482.00
Depression	6.50 (3.75–15.25)	5.00 (2.00–9.00)	.06	1540.50
INFLAMMATORY MARKERS				
IL-10	0.26 (0.19–0.39)	0.25 (0.16–0.36)	.71	1292.50
sICAM	277.98 (238.51–593.87)	283.84 (232.98–343.40)	.80	1275.50
sIL6r	33597.50 (26926.25–40897.00)	34088.00 (26008.00–42002.00)	.92	1223.50
Fibrinogen	345.00 (306.00–386.00)	338.00 (274.50–390.50)	.51	1281.50
IL-6	1.17 (0.80–1.57)	0.75 (0.51–1.05)	**.003**	1674.50
CRP	1.26 (0.54–3.61)	1.22 (0.70–3.10)	.85	1216.50
SES	43.33 (36.11–60.38)	37.95 (26.63–49.37)	.04	1534.00
IL-8	10.99 (9.05–14.74)	13.08 (8.93–15.77)	.29	1086.50
HEALTH FACTORS				
Sleep	5.50 (3.75–9.25)	5.00 (4.00–8.00)	.68	1118.00
# Head injuries	0.50 (0.00–1.00)	0.00 (0.00–1.00)	**.02**	1549.00
# RX medications	1.00 (1.00–3.00)	1.00 (0.00–2.00)	**.02**	1499.50
BMI	27.75 (25.30–32.51)	28.65 (25.53–32.35)	.86	1234.00
# Chronic conditions	2.50 (1.00–4.00)	2.00 (0.25–4.00)	.14	1473.00

Table 8 Comparisons of Veterans Based on Probable VA Healthcare Use.

Note: CTQ = Childhood Trauma Questionnaire; IL-10 = Interleukin 10; sICAM = soluble intercellular adhesion molecule; sIL-6r = Soluble Interleukin 6 Receptor; IL-6 = Interleukin 6; CRP = C-reactive protein; SES = soluble E-Selectin; IL-8 = Interleukin 8; BMI = body mass index; *n* = 42 VA veteran, *n* = 60 non-VA veteran; total *n* ranges from 94–102.

injuries and more prescription medications compared to veterans likely not receiving VA healthcare.

Project 4 consisted of a subsample of baseline who provided information on psychosocial and health-related issues. In this subsample, there was largely no difference in the frequency of childhood trauma, except for veterans reporting less sexual abuse than civilians. Among this subsample, Project 4 results reveal veterans having higher IL-10 and ICAM. However, civilians reported higher trait and social anxiety than veterans. Although this is inconsistent with our hypothesis, it is consistent with our baseline findings of veterans experiencing fewer mental

health symptoms than their civilian counterparts. When comparing combat versus non-combat veterans, combat veterans reported more depression symptoms, head injuries, and higher levels of E-Selectin. Veterans likely to be using VA healthcare indicated more emotional neglect, head injuries, higher IL-6, and prescription medications.

INTEGRATED DISCUSSION

During their service in the armed forces, our nation's veterans have sacrificed for the defense of our country. Previous research has documented elevated mental and physical morbidities among veterans compared to civilian samples. This is plausible because veterans are often exposed to increased stress compared to civilians. However, much of this research has been within clinical samples or those utilizing VA healthcare. The purpose of this study was to leverage a community-based sample of veterans and civilians to describe differing levels of stress, exposure, and mental health symptoms. With recent research suggesting a higher prevalence of certain health conditions and some evidence suggesting that veterans do not benefit from existing treatments to the same degree as civilians, we must ask questions about the unique vulnerability factors that veterans face and investigate whether different mechanisms need to be targeted in treatment. The present study leveraged an existing national dataset to compare veterans and civilians on a range of trauma exposure, psychosocial factors, and mental and physical health indices as an exploratory initiative into this area. While MIDUS II asked very few questions about military history, this was a foundational first step focusing on veteran status, combat exposure, and probable VA use to inform future research.

BASELINE FINDINGS

Baseline utilized primarily self-report mental health and psychosocial data in a large sample of veterans and civilians. Here, consistent with hypothesis one, we found that veterans reported more stressful and traumatic life events than civilians, consistent with some previous research (Lehavot et al., 2018). However, contrary to hypothesis two, veterans reported lower levels of anxiety, depression, and panic symptoms. Another large national study found no difference between veterans and civilians in terms of levels of depression; however, it found higher levels of anxiety (Gould et al., 2015). The present study is novel in its examination of panic symptoms and the finding of lower-than-expected levels of symptoms. Some post hoc interpretations of these findings include that this may be a result of some of the benefits of military service, i.e., the facilitation of education and economic gain and the promotion of personal growth in areas such as autonomy, emotional maturity, mastery, and leadership skills that can lead to better health and well-being (Spiro et al., 2016). These findings suggest that military service may be associated with some aspects of psychological hardiness within this cohort of veterans despite higher levels of stressful and traumatic life event exposures. It is important to note that trauma is associated with various mental and physical health conditions. Hence, consideration of how these are associated with poor health for some veterans (and civilians) is important. Further, our findings may not generalize to all cohorts of veterans.

When we compared combat veterans and non-combat veterans at baseline, combat veterans reported higher stressful and traumatic life events but no differences in mental health symptoms. Research on the benefits of military service has found that experiencing combat in moderate amounts was associated with wisdom in later life (Jennings et al., 2006). Based on participant age, most of these veterans were from conflicts or eras, including the Vietnam War, Desert Shield/Desert Storm, and other pre-9/11 conflicts. Some veterans likely served in a peacetime era, supported by a relatively low prevalence of combat exposure. However, our findings suggest that it may not be strictly combat exposure associated with negative health outcomes.

Previous research that has compared veterans and civilians, finding few differences, found that age and cohort effects contributed to variability in mental health symptoms (Gould et al., 2015). Other research has linked combat frequency with enlisted status versus commissioned officer status to greater mental symptoms, specifically PTSD (Blackburn & Owens, 2016; Ikin et al., 2007). Little is known about the military service of veterans in the MIDUS II dataset. However, it is possible that many veterans joined in an era of service where they received specialized training and education benefits. Given the high education in this sample, it's also plausible that the veterans included in the MIDUS II dataset were officers, which may be a protective factor for the negative effects of combat exposure. This underscores the need for more research to better understand how factors such as rank, service experiences, and unit cohesion might influence post-service outcomes among community samples of veterans.

Exploratory analyses of the likelihood of using VA healthcare suggested that veterans likely using VA healthcare had experienced more traumatic life events, endorsed higher depression, and, although not significant, reported more panic and anxiety symptoms. Traditionally, veterans likely to seek VA healthcare have a service-related disability, meet specific discharge requirements, or meet certain income

eligibility requirements. This could help explain why we observed higher ratings of mental health symptoms and trauma exposure among those likely connected to VA care. Notably, access to mental health resources within the VA has been a priority since the parent study was conducted, and recent evidence has suggested suicide risk has increased among veterans ineligible for VA healthcare (Eftekhari et al., 2013; Lemle, 2018). The observed differences highlight a need to understand how mental health may differ between veterans utilizing VA healthcare and veterans who do not. This could then be used to improve the availability of specialty services and inform the allocation of resources.

PROJECT 4 FINDINGS

Our second set of analyses utilized the biomarker sub-study in MIDUS II, in which participants from baseline participated in a 2-day study focused on health and biomarkers and full-length measures of several questionnaires. Similar to baseline, veterans in Project 4 reported lower mental health symptoms than civilians. However, there were few differences in the childhood trauma measure, with veterans reporting less childhood sexual abuse than civilians and less trait and social anxiety. This may indicate that this is a sample-specific finding as childhood trauma was very low in both the veteran and civilian groups (i.e., the minimum score on the CTQ is 25 and the lower end of the IQR was 28). Given previous research has noted high childhood trauma in veteran samples and the observations from Project 1, this requires additional investigation.

Analyses among combat veterans and non-combat veterans showed additional group differences—depression symptoms were greater among combat veterans. This could be explained by several factors, including emotional distress related to combat, high rates of comorbidity between depression and posttraumatic stress in combat veterans, greater difficulty in reintegration into civilian life, or social isolation (Armenta et al., 2019; Sayer et al., 2014; Wilson et al., 2018), which could be explored in future studies. It is also plausible that combat veterans had higher rates of depression due to endorsing more somatic symptoms of depression (e.g., "I felt that everything I did was an effort") as a result of a service-related injury or chronic illness which has been demonstrated in previous studies (Killgore et al., 2006). Contrary to the hypotheses, we did not find any difference in our subgroup analyses on sleep quality, contrary to the findings of some previous research suggesting more sleep problems in combat veterans (Plumb et al., 2014). The study by Plumb et al. (2014) focused on post-9/11 veterans, which may further suggest that our findings might not generalize to post-9/11 cohorts of veterans, and further study in this cohort is needed.

We observed differences in inflammatory levels that differed by analysis. First, IL-10 and ICAM were higher among veterans compared to civilians. In addition, the combat group demonstrated higher levels of IL-6 and E-Selectin. Though not statistically significant, all levels of inflammatory markers were descriptively higher among veterans than civilians, and inflammation has been linked to numerous mental and physical health issues, including depression (García-Juárez & Camacho-Morales, 2022; Villar-Fincheira et al., 2021). IL-10 has many functions, but its role as an anti-inflammatory cytokine is notable. IL-10 is produced by activated immune cells, regulates pro-inflammatory markers, and plays a role in B and T cell morphology, giving it an important role in innate immunity and the inflammatory cascade (Sabat et al., 2010).

ICAM responds to inflammation and plays a stimulatory role in the T-Cell mediated host defense system (Bui et al., 2020; Lebedeva et al., 2005). IL-6 functions in the acute phase immune response by producing acute phase proteins and stimulating T and B cells. IL-6 also has a role in transitioning from acute to chronic inflammation and chronic inflammatory proliferation by changing the nature of the T and B cells being utilized in the immune response to stress or injury (Gabay, 2006). E-Selectin functions in both chronic and acute inflammatory responses by recruiting cells to the injury site (Silva et al., 2018). Since all of these markers play a role in our immune response, they can also be health indicators. However, more research is needed to understand the chronic elevation of these inflammatory markers and what it means to veterans' health.

The veterans who participated in Project 4 reflect people who volunteered for a considerably time-consuming study that included an overnight stay and blood draw in the MIDUS study. Therefore, this sample might not be representative of all veterans or civilians. Previous research comparing those who completed baseline to those who completed Project 4 has found comparable demographic and health characteristics but notes higher education in Project 4 (Dienberg Love et al., 2010). Further, common reasons for not participating in Project 4 were reported to include other responsibilities, the need for travel, and being too busy. In addition to the smaller sample size in Project 4, some differences in findings across baseline and Project 4 may include that the general community samples of veterans may not have chosen to participate in this study. Another possibility may be sampling error, whereby this subsample of veterans coincidentally has low childhood trauma and may differ from other samples in other ways.

Contrary to hypotheses and previous research indicating high levels of anger are a concern in some samples of veterans (MacManus et al., 2015), there was no evidence of group differences in emotional factors or anger. Understanding the factors that place individuals at risk

for anger or violence will be critical next steps. Another consideration is that the measures used in the MIDUS II study differed from the Difficulties in Emotion Regulation Scale (DERS) used in previous research (Chase, 2017). The DERS consists of several subscales related to the acceptance and awareness of emotions when in distress and the ability to use regulation strategies, engage in goal-directed activity or act on impulses, which may capture more distinct aspects of emotion dysregulation (Gratz & Roemer, 2004). These conflicting findings highlight the need to extend research comparing veterans and civilians on emotion regulation and anger. For example, some research suggests that among veterans seeking treatment for PTSD, emotion regulation is associated with anger (Miles et al., 2016).

Across the two MIDUS II phases, we found evidence of some group differences in trauma exposure and mental health symptoms but few group differences in emotional factors, inflammation, health conditions, or medications. Some of these findings were contrary to hypotheses and some previous research. However, one study using the Health and Retirement Study survey data also failed to find that veterans report higher rates of TBI compared to civilians (Kornblith et al., 2020). In their study, civilians reported higher TBIs than veterans, but veterans reported more non-TBI head injuries. Our findings contribute to an observation of higher head injury rates among those who have experienced combat and those likely using VA healthcare. This may suggest that screening is needed, particularly among these populations. Previous research focused on student-veterans and women veterans and emphasized that veterans are not a monolith (e.g., Dallocchio, 2021; Vaccaro, 2015) and the lack of group differences on a broad scale supports this idea and encourages understanding of the unique needs of different subgroups of veterans. While group differences would have informed broader intervention or prevention efforts, the lack of findings here might not be surprising. It is more likely that trauma, stress, or a combination of both variables lead to dysregulated mechanisms (i.e., inflammation, poor health behaviors, and poor emotion management) in some people, which leads to more health problems, more meds, etc. More research is needed to understand who is affected by these problems and how those problems developed.

LIMITATIONS

This present study leveraged an existing data set to conduct a first step in comparing a range of psychosocial and health factors. However, there are several limitations of the present investigation. First, participants in MIDUS II are predominantly white and the veteran subsample was predominantly male. Additional research is needed to see if the findings can generalize to racially and ethnically diverse samples that include more women veterans. Additionally, the study utilized a limited assessment of veteran status. Information including the participant's branch of service, length of service, enlisted versus commissioned, rank, or discharge was not available to give us a complete picture of the veteran experience. In addition, a single item assessed combat exposure and gave very little information on the number of deployments, frequency of combat, and whether participants sustained TBI or developed PTSD. Previous research has found that the experience of combat exposure, military sexual trauma, and mental health symptoms may differ by branch of service, and examining branch of service may offer additional insights (Baker et al., 2009; Godfrey et al., 2015). Further, factors such as unit cohesion are associated with post-military mental health and may play a role in understanding post-deployment outcomes (Kanesarajah et al., 2016).

The present study leveraged questions about veteran status, veteran benefits, and VA insurance to create our probable VA healthcare use. Although a conservative estimate of those who would be most likely to use services, actual enrollment or utilization of VA services is unknown. Veterans may use services as their benefits are being determined immediately after discharge or through their civilian-sponsored insurance. Despite these limitations, the present study offers novel comparisons between veterans and civilians from a nationally recruited sample. Epidemiological studies would benefit from including branch of service and VA healthcare utilization would complement the analyses reported here. Additional future research building on these limitations will help understand the generalizability of these findings for veterans inside and outside of the VA healthcare system, veterans with varying levels of deployment, and women veterans.

While one strength of the current investigation is using a national sample of veterans and civilians, the present investigation has unknown generalizability to veterans of different eras. MIDUS II recruited adults at midlife. Therefore, these veterans likely served in conflicts before the 9/11 conflicts, such as the Gulf War or the Korean War. These results may not generalize to veterans of more recent conflicts, who often saw more combat, longer deployment, and greater reliance on reserves (Institute of Medicine, 2010). According to the VA strategic plan, there are approximately 8 million living veterans who served during the Vietnam War, Korean War, and Desert Storm conflicts (US Department of Veterans Affairs, 2022). These findings might be most applicable to these veterans but also may have some relevance for veterans of other eras. There may be cohort benefits to military service and variability within

the cohort. However, the present results are limited in that there is little understanding of military experience, nor was there an assessment of PTSD, a common consequence of trauma and labeled one of the invisible wounds of war for the most recent conflicts (Tanielian et al., 2008). Future cohort and epidemiological studies should continue to include veteran status, combat, head injury, and a question of military branch and enlistment versus commissioned status. While epidemiological studies must balance the depth of assessment with participant burden, better characterizing military service would be important. Another limitation of the baseline was the use of brief screening mental health measures that may underestimate mild symptomatology. Future research focusing on full-length, validated measures of mental health symptoms may offer additional insight into the mental health symptom burden.

IMPLICATIONS/CONCLUSION

In an effort to best serve this population, the present study leverages a nationally sampled dataset to compare veterans and civilians on several measures of mental health symptoms, as well as a range of emotion regulation measures, inflammatory markers, and health correlates. Consistent with previous research, we identified greater stressful and traumatic life events among the baseline sample. We also observed lower mental health symptoms among veterans and civilians, consistent with other research among community samples. However, among combat veterans and veterans likely receiving care from the VA, we observed greater symptoms of depression, greater head injury, and more medication use. Further research with a better characterization of military history is warranted.

Currently, the VA handbook outlines standards of care that include veterans having access to quality care for common mental health conditions, such as PTSD, depression, and anxiety (Exec Order No. 13822, 2018). Recognizing the unique risk of the transition from active service to veteran status for mental health and suicide risk, programs are in development to partner veterans with support (Geraci et al., 2022). Additionally, a 2018 executive order established veteran eligibility to receive healthcare at the VA for the first year after ending their service (Exec Order No. 13822, 2018). While a significant step forward during a critical transition, veterans who transitioned from military service prior to this time are not eligible, and many veterans eligible for care may not be seeking it at the VA.

The US Department of Veterans Affairs has also recently implemented an integrated healthcare and wellness approach called Whole Health, and both this program and a related subprogram were used to promote well-being and decrease suicide risk for veterans of all eras (Vitale et al., 2021). The present research may serve as the start of a line of research that will inform a better understanding of the unique needs of all our nation's veterans and could also help with resource allocation. For example, if we identify group differences, better treatment matching of existing treatments can be prioritized. In turn, this can reduce treatment length, morbidity, and healthcare costs. A recent review detailed clinical considerations for healthcare professionals working with veterans who are transitioning or re-integrating. As this body of research grows, we can improve matching available services to those most likely to benefit from them (Edwards et al., 2022).

DATA ACCESSIBILITY STATEMENT

The data used in the present study is publicly available. Data can be accessed here: https://doi.org/10.3886/ICPSR04652.v8.

ETHICS AND CONSENT

The MIDUS II study was reviewed and approved by the Education and Social/Behavioral Sciences Institutional Review Board at the University of Wisconsin. For the biomarker project, IRBs at each of the clinics were reviewed (UCLA, University of Wisconsin and Georgetown University) and approved as well. All participants provided informed consent. The present analyses received local approval from all the required Central Texas Veterans Health Care System Research Committees (protocol number 2021-006).

FUNDING INFORMATION

This research is supported by resources from the Central Texas Veterans Health Care System and the VISN 17 Center of Excellence for Research on Returning War Veterans. Dr. Szabo's work on this manuscript was partially supported by Career Development Award Number IK1RX003122 from the United States (U.S.) Department of Veterans Affairs Rehabilitation Research and Development (RR&D) Service. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the U.S. Government. Areon Bradford and Janiya Cherry's work on this project was made possible by the Veterans' Health Administration/ Prairie View A&M University Summer Institute, An Immersive Training Experience in Healthcare and Research.

Parts of the analyses presented here were presented as part of the Prairie View A&M Spring 2022 Research Symposium.

The present analyses were conducted from publicly available data. This data was generated through these grants: John D. and Catherine T. MacArthur Foundation Research Network, National Institute on Aging (P01-AG020166). National institute on Aging (U19-AG051426). The Milwaukee subsample was collected by a grant from the National Institute on Aging (P01-AG020166). Biomarker data collection was further supported by the NIH National Center for Advancing Translational Sciences (NCATS) Clinical and Translational Science Award (CTSA) program as follows: UL1TR001409 (Georgetown).

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

- **Christina Hejl:** Data Curation, Validation, Writing – Original Draft, Writing – Review & Editing, Project administration, Visualization.
- **Christina Burns:** Data Curation, Writing – Original Draft, Writing – Review & Editing.
- **Janiya Cherry:** Writing – Review & Editing, Visualization.
- **Areon Bradford:** Writing – Review & Editing, Visualization.
- **Yvette Szabo, PhD:** Conceptualization, Methodology, Validation, Formal analysis, Data Curation, Writing – Review & Editing, Supervision, Project administration.

AUTHOR AFFILIATIONS

Christina Hejl
VISN 17 Center of Excellence for Research on Returning War Veterans, US
Christina Burns orcid.org/0000-0001-5466-4142
VISN 17 Center of Excellence for Research on Returning War Veterans, US
Janiya Cherry
VISN 17 Center of Excellence for Research on Returning War Veterans, US; Prairie View A&M University, US
Areon Bradford
VISN 17 Center of Excellence for Research on Returning War Veterans, US; Prairie View A&M University, US
Yvette Z. Szabo orcid.org/0000-0002-5436-7081
VISN 17 Center of Excellence for Research on Returning War Veterans, US; California State University, Los Angeles, US

REFERENCES

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). DOI: https://doi.org/10.1176/appi.books.9780890425787

Angkaw, A. C., Ross, B. S., Pittman, J. O. E., Kelada, A. M. Y., Valencerina, M. A. M., & **Baker, D. G.** (2013). Post-traumatic stress disorder, depression, and aggression in OEF/OIF veterans. *Military Medicine*, *178*(10), 1044–1050. DOI: https://doi.org/10.7205/MILMED-D-13-00061

Ansley, S. D., & **Howard, J. T.** (2021). Dietary intake and elevated c-reactive protein levels in US military veterans. *International Journal of Environmental Research and Public Health*, *18*(2). DOI: https://doi.org/10.3390/ijerph18020403

Armenta, R. F., Walter, K. H., Geronimo-Hara, T. R., Porter, B., Stander, V. A., LeardMann, C. A., Bauer, L., Boparai, S., Bukowinski, A., Carballo, C., Carey, F., Davies, J., Esquivel, A., Gumbs, G., Jacobson, I., Khodr, Z., Kolaja, C., Lee, W., Lynch, G., ... & **the Millennium Cohort Study Team.** (2019). Longitudinal trajectories of comorbid PTSD and depression symptoms among US service members and veterans. *BMC Psychiatry*, *19*(1), 396. DOI: https://doi.org/10.1186/s12888-019-2375-1

Bagalman, E. (2014). *The number of veterans that use VA health care services: A fact sheet* (7-5700 No. R43579; pp. 1–4). Congressional Research Service. https://sgp.fas.org/crs/misc/R43579.pdf

Baker, D. G., Heppner, P., Afari, N., Nunnink, S., Kilmer, M., Simmons, A., Harder, L., & **Bosse, B.** (2009). Trauma exposure, branch of service, and physical injury in relation to mental health among US veterans returning from Iraq and Afghanistan. *Military Medicine*, *174*(8), 733–778. DOI: https://doi.org/10.7205/MILMED-D-03-3808

Bernstein, P. (1994). Measure of child abuse and neglect. *American Journal of Psychiatry*, *151*(8), 1132–1136. DOI: https://doi.org/10.1176/ajp.151.8.1132

Blackburn, L., & **Owens, G. P.** (2016). Rumination, resilience, and posttraumatic stress disorder symptom severity among veterans of Iraq and Afghanistan. *Journal of Aggression, Maltreatment & Trauma*, *25*(2), 197–209. DOI: https://doi.org/10.1080/10926771.2015.1107174

Bui, T. M., Wiesolek, H. L., & **Sumagin, R.** (2020). ICAM-1: A master regulator of cellular responses in inflammation, injury resolution, and tumorigenesis. *Journal of Leukocyte Biology*, *108*(3), 787–799. DOI: https://doi.org/10.1002/JLB.2MR0220-549R

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & **Kupfer, D. J.** (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Chase, T. E. (2017). *Exploring emotion regulation difficulties in samples of civilians and veterans* [Doctoral Dissertation, University of Houston].

Dallocchio, M. (2021). Women veterans: Examining identity through an intersectional lens. *Journal of Military, Veteran and Family Health*, *7*(S1), 111–121. DOI: https://doi.org/10.3138/jmvfh-2021-0028

DeSteno, D., Gross, J. J., & **Kubzansky, L.** (2013). Affective science and health: The importance of emotion and emotion regulation. *Health Psychology*, *32*(5), 474–486. DOI: https://doi.org/10.1037/a0030259

Dienberg Love, G., Seeman, T. E., Weinstein, M., & **Ryff, C. D.** (2010). Bioindicators in the MIDUS national study: Protocol, measures, sample, and comparative context. *Journal of Aging and Health*, *22*(8), 1059–1080. DOI: https://doi.org/10.1177/0898264310374355

Edwards, E. R., Goldsmith, M. M., Tran, H. N., Bulanchuk, N. K., Epshteyn, G., Wrobleski, J., May, D. G., Snyder, S., Lee, A. S., Schofield, K. F., Gorman, D., Dichiara, A., & **Geraci, J. C.** (2022). Supporting the nation's transitioning veterans: Narrative review of practices and recommendations for psychotherapy and counseling of veterans separating from military service. *Psychological Services*. Advance online publication. DOI: https://doi.org/10.1037/ser0000701

Eftekhari, A., Ruzek, J. I., Crowley, J. J., Rosen, C. S., Greenbaum, M. A., & **Karlin, B. E.** (2013). Effectiveness of national implementation of prolonged exposure therapy in Veterans Affairs care. *JAMA Psychiatry*, *70*(9), 949–955. DOI: https://doi.org/10.1001/jamapsychiatry.2013.36

Executive Order No. 13822. (2018, January 9). Supporting our veterans during their transition from uniformed service to civilian life. 83 Fed. Reg. 1513. https://www.govinfo.gov/content/pkg/FR-2018-01-12/pdf/2018-00630.pdf

Fresco, D. M., Coles, M. E., Heimberg, R. G., Liebowitz, M. R., Hami, S., Stein, M. B., & **Goetz, D.** (2001). The Liebowitz Social Anxiety Scale: A comparison of the psychometric properties of self-report and clinician-administered formats. *Psychological Medicine*, *31*(6), 1025–1035. DOI: https://doi.org/10.1017/S0033291701004056

Fulton, J. J., Calhoun, P. S., Wagner, H. R., Schry, A. R., Hair, L. P., Feeling, N., Elbogen, E., & **Beckham, J. C.** (2015). The prevalence of posttraumatic stress disorder in operation enduring freedom/operation Iraqi freedom (OEF/OIF) veterans: A meta-analysis. *Journal of Anxiety Disorders*, *31*, 98–107. DOI: https://doi.org/10.1016/j.janxdis.2015.02.003

Gabay, C. (2006). Interleukin-6 and chronic inflammation. *Arthritis Research & Therapy*, *8*(2), 1–6. DOI: https://doi.org/10.1186/ar1917

García-Juárez, M., & **Camacho-Morales, A.** (2022). Defining the role of anti-and pro-inflammatory outcomes of Interleukin-6 in mental health. *Neuroscience*, *492*, 32–46. DOI: https://doi.org/10.1016/j.neuroscience.2022.03.020

Geraci, J. C., Finley, E. P., Edwards, E. R., Frankfurt, S., Kurz, A. S., Kamdar, N., Vanneman, M. E., Lopoo, L. M., Patnaik, H., Yoon, J., Armstrong, N., Greene, A. L., Cantor, G., Wrobleski, J., Young, E., Goldsmith, M., Seim, R. W., & **Goodman, M.** (2022). Partnered implementation of the veteran sponsorship initiative: Protocol for a randomized hybrid type 2 effectiveness—Implementation trial. *Implementation Science*, *17*(1), 43. DOI: https://doi.org/10.1186/s13012-022-01212-9

Godfrey, K. M., Mostoufi, S., Rodgers, C., Backhaus, A., Floto, E., Pittman, J., & **Afari, N.** (2015). Associations of military sexual trauma, combat exposure, and number of deployments with physical and mental health indicators in Iraq and Afghanistan veterans. *Psychological Services*, *12*(4), 366. DOI: https://doi.org/10.1037/ser0000059

Gould, C. E., Rideaux, T., Spira, A. P., & **Beaudreau, S. A.** (2015). Depression and anxiety symptoms in male veterans and non-veterans: The health and retirement study: Depression and anxiety symptoms. *International Journal of Geriatric Psychiatry*, *30*(6), 623–630. DOI: https://doi.org/10.1002/gps.4193

Gratz, K. L., & **Roemer, L.** (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41–54. DOI: https://doi.org/10.1023/B:JOBA.0000007455.08539.94

Gros, D. F., Simms, L. J., & **Acierno, R.** (2010). Specificity of posttraumatic stress disorder symptoms: An investigation of comorbidity between posttraumatic stress disorder symptoms and depression in treatment-seeking veterans. *The Journal of Nervous & Mental Disease*, *198*(12), 885–890. DOI: https://doi.org/10.1097/NMD.0b013e3181fe7410

Gross, J. J., & **John, O. P.** (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. DOI: https://doi.org/10.1037/0022-3514.85.2.348

Hostinar, C. E., Lachman, M. E., Mroczek, D. K., Seeman, T. E., & **Miller, G. E.** (2015). Additive contributions of childhood adversity and recent stressors to inflammation at midlife: Findings from the MIDUS study. *Developmental Psychology*, *51*(11), 1630–1644. DOI: https://doi.org/10.1037/dev0000049

Ikin, J. F., Sim, M. R., McKenzie, D. P., Horsley, K. W. A., Wilson, E. J., Moore, M. R., Jelfs, P., Harrex, W. K., & **Henderson, S. T.** (2007). Anxiety, post-traumatic stress disorder and depression in Korean War veterans 50 years after the war. *The British Journal of Psychiatry*, *190*(6), 475–483. DOI: https://doi.org/10.1192/bjp.bp.106.025684

Institute of Medicine. (2010). Returning home from Iraq and Afghanistan: Preliminary assessment of readjustment needs of veterans, service members, and their families. National Academies Press (US). DOI: https://doi.org/10.17226/12812

Jacoby, V. M., Straud, C. L., Bagley, J. M., Tyler, H., Baker, S. N., Denejkina, A., Sippel, L. M., Kaya, R., Rozek, D. C., Fina, B. A., & **Dondanville, K. A.** (2022). Evidence-based posttraumatic stress disorder treatment in a community sample: Military-affiliated versus civilian patient outcomes. *Journal of Traumatic Stress*, *35*(4), 1072–1086. DOI: https://doi.org/10.1002/jts.22812

Jennings, P. A., Aldwin, C. M., Levenson, M. R., Spiro, A., & **Mroczek, D. K.** (2006). Combat exposure, perceived benefits of military service, and wisdom in later life: Findings from the normative aging study. *Research on Aging*, *28*(1), 115–134. DOI: https://doi.org/10.1177/0164027505281549

Kanesarajah, J., Waller, M., Zheng, W. Y., & **Dobson, A. J.** (2016). Unit cohesion, traumatic exposure and mental health of military personnel. *Occupational Medicine*, *66*(4), 308–315. DOI: https://doi.org/10.1093/occmed/kqw009

Kelley, P. (Ed.) (2005). *Textbooks of military medicine: Military preventative medicine, mobilization and deployment*. Office of the Suregon General, Deptartment of the Army. https://ke.army.mil/bordeninstitute/published_volumes/mpmVol2/PM2fm.pdf

Kendall-Tackett, K. (2009). Psychological trauma and physical health: A psychoneuroimmunology approach to etiology of negative health effects and possible interventions. *Psychological Trauma: Theory, Research, Practice, and Policy*, *1*(1), 35–48. DOI: https://doi.org/10.1037/a0015128

Kessler, R. C., Andrews, G., Mroczek, D., Ustun, B., & **Wittchen, H.-U.** (1998). The world health organization Composite International Diagnostic Interview Short-Form (CIDI-SF). *International Journal of Methods in Psychiatric Research*, *7*(4), 171–185. DOI: https://doi.org/10.1002/mpr.47

Killgore, W. D., Stetz, M. C., Castro, C. A., & **Hoge, C. W.** (2006). The effects of prior combat experience on the expression of somatic and affective symptoms in deploying soldiers. *Journal of Psychosomatic Research*, *60*(4), 379–385. DOI: https://doi.org/10.1016/j.jpsychores.2006.02.012

Kornblith, E. S., Yaffe, K., Langa, K. M., & **Gardner, R. C.** (2020). Prevalence of lifetime history of traumatic brain injury among older male veterans compared with civilians: A nationally representative study. *Journal of Neurotrauma*, *37*(24), 2680–2685. DOI: https://doi.org/10.1089/neu.2020.7062

Lebedeva, T., Dustin, M. L., & **Sykulev, Y.** (2005). ICAM-1 co-stimulates target cells to facilitate antigen presentation. *Current Opinion in Immunology*, *17*(3), 251–258. DOI: https://doi.org/10.1016/j.coi.2005.04.008

Lehavot, K., Katon, J. G., Chen, J. A., Fortney, J. C., & **Simpson, T. L.** (2018). Post-traumatic stress disorder by gender and veteran status. *American Journal of Preventive Medicine*, *54*(1), e1–e9. DOI: https://doi.org/10.1016/j.amepre.2017.09.008

Lemle, R. (2018). Choice program expansion jeopardizes high-quality VHA mental health services. *Federal Practitioner*, *35*(3), 18–24. DOI: https://doi.org/PMID:30766345

Lincoln, A. (1865). *Second inaugural address of the late President Lincoln* [Speech]. Library of Congress. https://www.loc.gov/item/2020770559/

Loignon, A., Ouellet, M. C., & **Belleville, G.** (2020). A systematic review and meta-analysis on PTSD following TBI among military/veteran and civilian populations. *Journal of Head Trauma Rehabilitation*. *35*(1), E21–E35. DOI: https://doi.org/10.1097/HTR.0000000000000514

MacManus, D., Rona, R., Dickson, H., Somaini, G., Fear, N., & **Wessely, S.** (2015). Aggressive and violent behavior among military personnel deployed to Iraq and Afghanistan: Prevalence and link with deployment and combat exposure. *Epidemiologic Reviews*, *37*(1), 196–212. DOI: https://doi.org/10.1093/epirev/mxu006

Markus, H. R., & **Kitayama, S.** (1991). Culture and self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*(2), 224–253. DOI: https://doi.org/10.1037/0033-295X.98.2.224

Miles, S. R., Menefee, D. S., Wanner, J., Teten Tharp, A., & **Kent, T. A.** (2016). The relationship between emotion dysregulation and impulsive aggression in veterans with posttraumatic stress disorder symptoms. *Journal of Interpersonal Violence*, *31*(10), 1795–1816. DOI: https://doi.org/10.1177/0886260515570746

Noël, P. H., Zeber, J. E., Pugh, M. J., Finley, E. P., & **Parchman, M. L.** (2011). A pilot survey of post-deployment health care needs in small community-based primary care clinics. *BMC Family Practice*, *12*, 79. DOI: https://doi.org/10.1186/1471-2296-12-79

Plumb, T. R., Peachey, J. T., & **Zelman, D. C.** (2014). Sleep disturbance is common among servicemembers and veterans of Operations Enduring Freedom and Iraqi Freedom. *Psychological Services*, *11*(2), 209–219. DOI: https://doi.org/10.1037/a0034958

Pulverman, C. S., Christy, A. Y., & **Kelly, U. A.** (2019). Military sexual trauma and sexual health in women veterans: A systematic review. *Sexual Medicine Reviews*, *7*(3), 393–407. DOI: https://doi.org/10.1016/j.sxmr.2019.03.002

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401. DOI: https://doi.org/10.1177/014662167700100306

Riis, J. L., Chen, F. R., Dent, A. L., Laurent, H. K., & **Bryce, C. I.** (2020). Analytical strategies and tactics in salivary bioscience. In D. Granger, D. & M.Taylor (Eds.), *Salivary bioscience* (49–86). Springer. DOI: https://doi.org/10.1007/978-3-030-35784-9_4

Ryff, C. D., Seeman, T., & **Weinstein, M.** (2019). Midlife in the United States (MIDUS 2): Biomarker project, 2004–2009. *Inter-university Consortium for Political and Social Research*. DOI: https://doi.org/10.3886/ICPSR29282.v9

Sabat, R., Grütz, G., Warszawska, K., Kirsch, S., Witte, E., Wolk, K., & **Geginat, J.** (2010). Biology of interleukin-10. *Cytokines & Growth Factor Reviews*, *21*(5), 331–344. DOI: https://doi.org/10.1016/j.cytogfr.2010.09.002

Sayer, N. A., Carlson, K. F., & **Frazier, P. A.** (2014). Reintegration challenges in US service members and veterans following combat deployment. *Social Issues and Policy Review*, *8*(1), 33–73. DOI: https://doi.org/10.1111/sipr.12001

Schult, T. M., Schmunk, S. K., Marzolf, J. R., & **Mohr, D. C.** (2019). The health status of veteran employees compared to civilian employees in veterans health administration. *Military Medicine*, *184*(7–8), e218–e224. DOI: https://doi.org/10.1093/milmed/usy410

Scott, K. M., Koenen, K. C., Aguilar-Gaxiola, S., Alonso, J., Angermeyer, M. C., Benjet, C., Bruffaerts, R., Caldas-de-Almeida, J. M., De Girolamo, G., Florescu, S., Iwata, N., Levinson, D., Lim, C. C. W., Murphy, S., Ormel, J., Posada-Villa, J., & **Kessler, R. C.** (2013). Associations between lifetime traumatic events and subsequent chronic physical conditions: A cross-national, cross-sectional study. *PloS One*, *8*(11), e80573. DOI: https://doi.org/10.1371/journal.pone.0080573

Seal, K. H., Metzler, T. J., Gima, K. S., Bertenthal, D., Maguen, S., & **Marmar, C. R.** (2009). Trends and risk factors for mental health diagnoses among Iraq and Afghanistan veterans using Department of Veterans Affairs health care, 2002–2008. *American Journal of Public Health*, *99*(9), 1651–1658. DOI: https://doi.org/10.2105/AJPH.2008.150284

Silva, M., Videira, P. A., & **Sackstein, R.** (2018). E-Selectin ligands in the human mononuclear phagocyte system: Implications for infection, inflammation, and immunotherapy. *Frontiers in Immunology*, *8*, 1878. DOI: https://doi.org/10.3389/fimmu.2017.01878

Sokolove, J., Wagner, C. A., Lahey, L. J., Sayles, H., Duryee, M. J., Reimold, A. M., Kerr, G., Robinson, W. H., Cannon, G. W., Thiele, G. M., & **Mikuls, T. R.** (2016). Increased inflammation and disease activity among current cigarette smokers with rheumatoid arthritis: A cross-sectional analysis of US veterans. *Rheumatology*, *55*(11), 1969–1977. DOI: https://doi.org/10.1093/rheumatology/kew285

Spielberger, C. D. (1989). *State–trait anxiety inventory: A comprehensive bibliography*. Consulting Psychologists Press.

Spielberger, C. D. (1996). *State-Trait Anger Expression Inventory: Professional manual*. Consulting Psychologists Press.

Spiro, A., Settersten, R. A., & **Aldwin, C. M.** (2016). Long-term outcomes of military service in aging and the life course: A positive re-envisioning. *The Gerontologist*, *56*(1), 5–13. DOI: https://doi.org/10.1093/geront/gnv093

Stretch, R. H., Knudson, K. H., & **Durand, D.** (1998). Effects of premilitary and military trauma on the development of post-traumatic stress disorder symptoms in female and male active duty soldiers. *Military Medicine*, *163*(7), 466–470. DOI: https://doi.org/10.1093/milmed/163.7.466

Szabo, Y. Z., & **Slavish, D. C.** (2021). Measuring salivary markers of inflammation in health research: A review of methodological considerations and best practices. *Psychoneuroendocrinology*, *124*, 105069. DOI: https://doi.org/10.1016/j.psyneuen.2020.105069

Tabachnick, A. B., & **Fidell, L. S.** (2007). *Using multivariate statistics* (5th ed.). Allyn & Bacon.

Tanielian, T., Jaycox, L. H., Adamson, D. M., Burnam, A., Burns, R. M., Caldarone, L. B., Cox, R. A., D'Amico, E. J., Diaz, C., Eibner, C., Fisher, G., & **Helmus, T. C.** (2008). Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery. *RAND Corporation*. DOI: https://doi.org/10.7249/MG720

Turner, R. J., & **Wheaton, B.** (1995). Checklist measurement of stressful life events. In S. Cohen, R. Kessler, & L. Underwood Gordon (Eds.), *Measuring stress: A guide for health and social sciences* (pp. 29–58). Oxford University Press.

US Department of Veteran's Affairs. (2015, September 2). *Veterans employment toolkit—What is deployment?* https://www.va.gov/vetsinworkplace/docs/em_deployment.asp#:~:text=Military%20deployment%20is%20the%20movement,enter%20into%20a%20combat%20zone

US Department of Veterans Affairs. (2022). *Fiscal year 2022–28 strategic plan*. https://department.va.gov/wp-content/uploads/2022/09/va-strategic-plan-2022-2028.pdf

Vaccaro, A. (2015). "It's not one size fits all": Diversity among student veterans. *Journal of Student Affairs Research and Practice*, *52*(4), 347–358. DOI: https://doi.org/10.1080/19496591.2015.1067224

Veterans Benefit Administration. (2022). *Annual benefits report fiscal year 2022*. US Department of Veterans Affairs. https://www.benefits.va.gov/REPORTS/abr/docs/2022-abr.pdf

Villar-Fincheira, P., Sanhueza-Olivares, F., Norambuena-Soto, I., Cancino-Arenas, N., Hernandez-Vargas, F., Troncoso, R., Gabrielli, L., & **Chiong, M.** (2021). Role of Interleukin-6 in vascular health and disease. *Frontiers in Molecular Biosciences*, *8*, 641734. DOI: https://doi.org/10.3389/fmolb.2021.641734

Vitale, A., Byma, L., Sun, S., Podolak, E., Wang, Z., Alter, S., Galfalvy, H., Geraci, J., Langhoff, E., Klingbeil, H., Yehuda, R., Haghighi, F., & **Feder, A.** (2021). Effectiveness of complementary and integrative approaches in promoting engagement and overall wellness toward suicide prevention in veterans. *The Journal of Alternative and Complementary Medicine*, *27*(S1), S-14. DOI: https://doi.org/10.1089/acm.2020.0245

Wang, Z., Caughron, B., & **Young, M. R. I.** (2017). Posttraumatic stress disorder: An immunological disorder? *Frontiers in Psychiatry*, *8*, 222. DOI: https://doi.org/10.3389/fpsyt.2017.00222

Wilson, G., Hill, M., & **Kiernan, M. D.** (2018). Loneliness and social isolation of military veterans: Systematic narrative review. *Occupational Medicine*, *68*(9), 600–609. DOI: https://doi.org/10.1093/occmed/kqy160

TO CITE THIS ARTICLE:
Hejl, C., Burns, C., Cherry, J., Bradford, A., Szabo, Y. Z. (2023). Understanding Differences Between Veterans and Civilians on a Range of Biopsychological Domains: Descriptive Report from the MIDUS II Study. *Journal of Veterans Studies*, 9(1), pp. 203–223. DOI: https://doi.org/10.21061/jvs.v9i1.405

Submitted: 15 October 2022 **Accepted:** 14 April 2023 **Published:** 03 July 2023

COPYRIGHT:
© 2023 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See http://creativecommons.org/licenses/by/4.0/.

Journal of Veterans Studies is a peer-reviewed open access journal published by VT Publishing.