



# Do trauma type, stressful life events, and social support explain women veterans' high prevalence of PTSD?

Keren Lehavot<sup>1,2,3</sup> · Simon B. Goldberg<sup>1,3</sup> · Jessica A. Chen<sup>1,3</sup> · Jodie G. Katon<sup>1,3</sup> · Joseph E. Glass<sup>2,4</sup> · John C. Fortney<sup>1,2,3</sup> · Tracy L. Simpson<sup>2,5</sup> · Paula P. Schnurr<sup>6,7</sup>

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## Abstract

**Objectives** To examine factors that account for women veterans' higher prevalence of past-year DSM-5 posttraumatic stress disorder (PTSD) compared to women civilians and men veterans.

**Methods** Cross-sectional analyses of the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III). Face-to-face interviews with 379 women veterans, 20,007 women civilians, and 2740 men veterans were conducted. Trauma type (child abuse, interpersonal violence, combat or war zone, and other), number of trauma types, past-year stressful life events, current social support, and DSM-5 PTSD were assessed using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5. Generalized linear models were used that accounted for the complex survey design.

**Results** Women veterans had a higher unadjusted prevalence of past-year PTSD (11.40%) compared to their civilian (5.96%) and male (5.19%) counterparts. Individual predictor models indicated that the difference between women veterans' and civilians' prevalence of PTSD was attenuated when adjusting for number of trauma types, whereas the difference between men and women veterans was attenuated when adjusting for child abuse, interpersonal violence, and stressful life events. Nonetheless, while full adjustment in a multiple predictor model accounted for the difference in PTSD between women veterans and civilians, gender differences between men and women veterans remained.

**Conclusions** Number of trauma types, type of trauma, and social factors may together help explain women veterans' higher PTSD prevalence compared to women civilians, but do not fully account for differences between men and women veterans. Results highlight a need to explore additional explanatory factors and evaluate associations with longitudinal data.

**Keywords** Veterans · Women veterans · Gender differences · Posttraumatic stress disorder · Trauma

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✉ Keren Lehavot  
keren.lehavot@va.gov

<sup>1</sup> Health Services Research and Development (HSR&D) Center of Innovation (COIN), VA Puget Sound Health Care System, 1660 South Columbian Way, Seattle, WA 98108, USA

<sup>2</sup> Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle, WA, USA

<sup>3</sup> Department of Health Services, University of Washington, Seattle, Washington, USA

## Introduction

Posttraumatic stress disorder (PTSD) is a mental health disorder that can occur after exposure to trauma or a life-threatening event. PTSD is associated with multiple negative

<sup>4</sup> Kaiser Permanente Washington Health Research Institute, Seattle, WA, USA

<sup>5</sup> Center of Excellence in Substance Abuse and Treatment (CESATE), VA Puget Sound Health Care System, Seattle, WA, USA

<sup>6</sup> National Center for PTSD, White River Junction, VT, USA

<sup>7</sup> Geisel School of Medicine at Dartmouth, Hanover, NH, USA

health outcomes, including significant mental health comorbidities, poor physical health, reduced quality of life, and early mortality [1–5]. The lifetime prevalence of PTSD in the adult US population ranges from 4 to 6% for men and 8 to 13% for women [6–10].

Within the veteran population, PTSD is of particular concern due to trauma exposures that may occur during service-members' participation in the military. While the veteran demographic has traditionally been predominantly male, women's representation is steadily increasing; they currently make up one of the fastest growing groups of new veterans [11]. In national studies of both Vietnam-era and Iraq/Afghanistan veterans, prevalence of PTSD did not differ between women and men veterans [12–14]. Nonetheless, two recent studies using nationally representative samples of the US population found higher prevalence of PTSD among women veterans, echoing gender differences in PTSD previously found in the general population [15, 16]. For example, a study using a nationally representative sample of the general population from the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) assessed differences in PTSD prevalence by both gender and veteran status [15], using Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition (DSM-5) criteria [17]. Findings indicated that women veterans reported significantly higher prevalence of age- and race-adjusted lifetime and past-year PTSD (13.4 and 11.7%, respectively) than both women civilians (8.0 and 6.0%) and men veterans (7.7 and 6.7%) [15]. The current study builds on these findings to examine possible factors that may explain these gender and veteran status differences in PTSD in the NESARC-III.

Possible reasons for women veterans' heightened PTSD risk remain unexplored. Compared to men, potential explanatory factors likely include a combination of biological, psychological, and social influences [18]. Some hypotheses have focused on gender differences in rates and types of trauma exposures [19]. For example, exposure to certain types of trauma (e.g., sexual and physical assault, combat) is associated with higher risk of PTSD than others (e.g., natural disasters and motor vehicle accidents) [20, 21]. Women veterans are more likely to be exposed to traumas of an interpersonal nature, such as child abuse or sexual assault [22], which some evidence suggests is associated with greater risk of PTSD compared to other trauma types [23, 24]. Researchers have noted, however, that while the high rates of sexual victimization in women likely account for some of the variance in their greater prevalence of PTSD relative to men, it does not account for all of it [25–28]. Even so, a similar hypothesis might be extended to understand women veterans' higher prevalence of PTSD compared to women civilians, as the recent NESARC-III study indicated that women veterans had greater exposure to interpersonal

violence than women civilians [15]. In addition to differences in trauma-type exposure, the same study indicated that women veterans experienced a significantly greater number of trauma types compared to women civilians. It is thus possible that this increased exposure to trauma types may further explain women veterans' elevated prevalence of PTSD relative to women civilians.

Additional potential risk factors for women veterans' higher PTSD prevalence may include stressful life events and reduced social support. Some research indicates that compared to men veterans, women veterans report greater life stressors and work stress and less general and deployment-specific social support [14, 29–32]. Interviews with VA providers have demonstrated their consistent perceptions of women veteran patients' clinical complexity (i.e., greater social instability and/or increased stressors) [33]. Stressful life events, such as problems with work, relationships, or finances, can exacerbate PTSD [34, 35], and low social support has also been found to be one of the most robust predictors of PTSD in one meta-analysis of civilian- and war zone-related PTSD predictors [35]. If women veterans are more likely than their male and civilian counterparts to report stressful life events and lack of social support, this may partly explain their higher prevalence of PTSD. No prior research to our knowledge has compared women veterans to their male counterparts on these factors using a nationally representative sample, nor have these comparisons been made between women veterans and civilians.

The main objective of this study was to examine factors that may account for women veterans' higher prevalence of DSM-5 PTSD in the NESARC-III compared to women civilians and men veterans. Specifically, we examined how the unadjusted odds of past-year PTSD for women veterans compared to the other two groups changed with adjustment for total number of trauma types, exposure to specific trauma types, past-year stressful life events, and current perceived social support. We hypothesized that adjusting for differences in traumatic events, stressful life events, and social support would attenuate the PTSD prevalence disparity between women veterans and the other two groups.

## Methods

All procedures for NESARC-III data collection were approved by the Institutional Review Boards of the National Institutes of Health and Westat, Inc. The current study was approved by the Institutional Review Board at VA Puget Sound Health Care System in Seattle, Washington.

## Participants

NESARC-III used multistage probability methods to randomly select a representative sample of non-institutionalized US residents 18 years and older who were not current active duty military during 2012–2013 [36, 37]. This sampling strategy included the selection of primary sampling units, which were either individual counties or groups of contiguous counties; the selection of secondary sampling units consisting of groups of census-defined blocks; the selection of households within the sampled secondary sampling units; and finally the random selection of eligible adults within the sampled households. Full details regarding the sampling strategies used in NESARC-III are described elsewhere [36]. The total sample size was 36,309 and the overall response rate was 60.1%, comparable with other national surveys [38, 39].

Veteran status was assessed using the question: “Have you ever served on Active Duty in the U.S. Armed Forces, Military Reserves, or National Guard?” Respondents answering “Yes, on active duty in past, but not now” were classified as veterans. Those who indicated only having training in the National Guard/Reserve without having ever served as active duty military ( $n=200$ ) or with unknown veteran status ( $n=8$ ) were excluded as were civilian men ( $n=12,975$ ), resulting in a final sample of 23,126.

## Assessment

The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-5 Version (AUDADIS-5) is a structured, in-person diagnostic interview designed for use by non-clinician interviewers [40]. This instrument operationalizes DSM-5 criteria for psychiatric disorders including PTSD and includes extensive assessments of risk factors for psychiatric diagnoses.

## Traumatic events

Participants were queried about 20 potentially traumatic personally experienced events and 14 they may have witnessed or learned about. If a participant reported more than four event types, only the four most severe events were recorded. A count of the total number of trauma types was computed, ranging from a minimum of 0 to a maximum of 4, with 0–3 representing exposure to 0–3 distinct trauma types, and 4 representing exposure to 4 or more trauma types. This count included both personally experienced events as well as those that were witnessed or learned about.

For the four most severe recorded events, we organized the 20 personally experienced events thematically to examine the following: child abuse (physical or sexual abuse before 18 years); interpersonal violence (sexual assault as

an adult, beaten up by spouse/partner or by someone else, mugged/threatened with a weapon/assaulted, stalked, kidnapped/held hostage); combat or war zone (active military combat, injured in a terrorist attack, peacekeeper/relief worker, civilian in war zone, refugee, prisoner of war); and other (serious injury or life-threatening illness, saw a dead body or body parts, natural disaster, juvenile detention or jail, and other). Age at the time of trauma was not assessed. Therefore, except for child abuse, it was not possible to assess whether the trauma occurred before or after PTSD onset for individuals with multiple traumas.

## Past-year PTSD

Participants who reported at least one traumatic event were assessed for remaining PTSD criteria concerning the event they nominated as their worst trauma. For the NESARC-derived PTSD diagnosis, participants had to report  $\geq 1$  symptom of persistent intrusion (Criterion B),  $\geq 1$  of avoidance of stimuli (Criterion C), and  $\geq 3$  each of negative mood or cognitive changes (Criterion D) and increased arousal (Criterion E). Respondents further had to report symptom duration of  $\geq 1$  month and clinically significant impairment or distress. The requirement of  $\geq 3$  D and E symptoms is higher than the 2 symptoms from each cluster required for DSM-5 criteria [17], but has been used in other studies based on NESARC-III data [8, 15, 41]. Test–retest reliability of past-year PTSD was fair (0.41) and reliability of the dimensional PTSD criteria scale was good [intraclass correlation coefficient (ICC) = 0.69] [42]. Procedural validity of PTSD assessment, evaluated as concordance between the AUDADIS-5 PTSD and the clinician-administered Psychiatric Research Interview for Substance and Mental Disorders, DSM-5 version (PRISM-5) [43, 44] in a general population sample, was fair to moderate across time frames ( $\kappa=0.34$ – $0.46$ ); concordance of dimensional criteria scales between the instruments was good (ICC = 0.69) [45].

## Past-year stressful life events

Stressful life events were measured using a 16-item scale of dichotomous questions (yes/no) that asked participants to indicate whether, in the prior 12 months, they had experienced events across four domains: health-related stress (e.g., serious illness); social stress (e.g., change in living situation); job stress (e.g., job loss); and legal stress (e.g., serious trouble with the police or the law) [46]. Participants' answers were summed to create a continuous measure (range 0–16), where higher scores indicated greater life stress in the past year. The AUDADIS measure of stressful life events has been widely used and has shown excellent reliability [47].

## Current social support

The Interpersonal Support Evaluation List (ISEL-12) measures the perceived availability of social support [48]. Questions include both positive and negative statements about social relationships (e.g., “If I needed help fixing an appliance or repairing my car, there is someone who would help me”; “I do not often get invited to do things with others”; “There is someone I can turn to for advice about handling problems with my family”). Responses are on a four-point scale (0–3) from definitely false to definitely true, with negative statements reverse coded, so that a higher total score indicates a greater degree of social support. The scale has been widely used and has shown excellent reliability [49]. All items were coded to represent increasing perceptions of social support availability and summed to create a composite score (range = 0–36).

## Statistical analysis

All analyses were conducted using R and accounted for the complex survey design of NESARC-III [50–54]. The use of weights provided by NESARC is intended to compensate for variable probabilities of selection, differential nonresponse rates, and possible deficiencies in the sampling frame, thus calibrating the weighted sample counts to “known” population totals for major subgroups defined by region, sex, age, and race/ethnicity [36].

Weighted means and frequencies were first computed for the three groups of interest (i.e., women veterans, women civilians, and men veterans). Odds ratios (ORs) or standardized mean differences were calculated comparing women veterans with women civilians and men veterans on all study variables using bivariate generalized linear models (GLMs) [52, 53]. In addition, bivariate GLMs with a logit link function (i.e., logistic regression) were used to estimate the relationship between each study variable and past-year PTSD. The intercorrelations between the factors of interest (i.e., number of trauma types, child abuse, interpersonal violence, combat or war zone exposure, other trauma, stressful life events, and social support) were computed to assess for potential collinearity.

In a separate series of multivariate GLMs (also with a logit link function) that adjusted for demographic characteristics, these variables were first entered individually to assess their independent and unique impact on the association between group status (women veterans, women civilians, men veterans) and past-year PTSD. All models entered group status as a categorical variable and used women veterans as the reference group. Model 1 examined the unadjusted association between group status and PTSD. Model 2 included adjustment for sociodemographic characteristics

including age, race/ethnicity, income, and marital status. To determine the effects of adjustment for each individual factor on the association between group status and past-year PTSD, the factors (number of trauma types, child abuse, interpersonal violence, combat or war zone exposure, other trauma, stressful life events, and social support) were entered individually into separate models (Models 3–9). Odds ratios from Model 2 comparing women veterans to their civilian and male counterparts were compared with those in Models 3–9 to assess the individual impact of adjustment for each factor on the association between group status and past-year PTSD. Finally, Model 10 consisted of a multiple predictor model in which all factors of interest (group status, sociodemographic characteristics, number of trauma types, specific trauma types, stressful life events, and social support) were included to evaluate their combined effect on attenuating the PTSD prevalence disparity between women veterans and the other two groups. Significance tests and confidence intervals were computed with design-based standard errors [54].

## Results

The analytic sample of 23,126 participants included 379 women veterans, 20,007 women civilians, and 2740 men veterans. Relative to women civilians, women veterans were older, more likely to be white, and had higher income (Table 1). They also reported higher likelihood of exposure to a greater number of trauma types, combat and interpersonal violence, other trauma, and more past-year stressful life events. Relative to men veterans, women veterans were younger, less likely to be white, and less likely to be married or living with someone. They were also more likely to report child abuse, interpersonal violence, and a greater number of past-year stressful life events, but less likely to report combat or war zone exposure and other traumas. There were no differences in current perceived social support between women veterans and either their civilian or male counterparts. Finally, women veterans reported higher unadjusted rates of past-year PTSD (11.40%) relative to both women civilians (5.96%) and men veterans (5.19%; Table 1). All potential explanatory factors (i.e., number of trauma types, specific trauma types, and social factors) were associated individually with past-year PTSD (data not shown), and there was no evidence for multicollinearity when examining the intercorrelations between these variables ( $r_s < 0.60$ ) or variance inflation factors (VIFs  $< 2.5$ ).

Table 2 displays the impact of each factor entered individually in GLMs on the association between group status and PTSD (Models 3–9) as well as their combined effect (Model 10). When examining the individual predictor models (i.e., Models 3–9), relative to women civilians, women veterans continued to have higher odds of PTSD in all

**Table 1** Comparisons between women veterans with women civilians and men veterans on main study variables

Study variable	Women Veterans (n = 379)		Women civilians (n = 20,007)		Men veterans (n = 2740)	
	n (% unadj) or M (SD)	OR (95% CI) or SMD	n (% unadj) or M (SD)	OR (95% CI) or SMD	n (% unadj) or M (SD)	OR (95% CI) or SMD
Age, n (%)						
18–29	43 (8.56)		4430 (21.21)	<b>2.88 [1.97, 4.21]</b>	111 (3.41)	<b>0.38 [0.24, 0.59]</b>
30–44	105 (26.93)		5637 (25.16)	0.91 [0.68, 1.22]	383 (13.63)	<b>0.43 [0.31, 0.59]</b>
45–64	172 (44.09)		6564 (34.75)	<b>0.68 [0.53, 0.87]</b>	1,110 (37.60)	<b>0.76 [0.59, 0.99]</b>
≥ 65	59 (20.43)		3376 (18.88)	0.91 [0.66, 1.25]	1,136 (45.37)	<b>3.23 [2.32, 4.51]</b>
Race/ethnicity, n (%)						
White, non-Hispanic	233 (73.70)		10,372 (65.57)	<b>0.68 [0.53, 0.87]</b>	1,897 (80.17)	<b>1.44 [1.10, 1.88]</b>
Black, non-Hispanic	101 (17.26)		4498 (12.41)	<b>0.68 [0.51, 0.90]</b>	504 (9.67)	<b>0.51 [0.38, 0.69]</b>
Other, non-Hispanic	11 (2.50)		1235 (7.58)	<b>3.20 [1.61, 6.34]</b>	105 (3.67)	1.49 [0.73, 3.04]
Hispanic, any race	34 (6.54)		3,902 (14.44)	<b>2.41 [1.57, 3.70]</b>	234 (6.49)	0.99 [0.63, 1.56]
Annual household income <\$20,000, n (%)	72 (13.63)		6125 (23.25)	<b>1.92 [1.40, 2.62]</b>	557 (15.15)	1.13 [0.81, 1.58]
Married/living with someone, n (%)	198 (58.96)		11,242 (55.34)	0.86 [0.67, 1.10]	1272 (68.56)	<b>1.52 [1.17, 1.97]</b>
Number of trauma types, M (SD)	2.21 (1.95)		1.65 (1.85)	<b>-0.30 [-0.40, -0.20]</b>	2.17 (1.82)	-0.02 [-0.13, 0.09]
Child abuse, n (%)	57 (12.03)		2760 (14.13)	1.20 [0.85, 1.70]	177 (7.00)	<b>0.55 [0.37, 0.81]</b>
Interpersonal violence, n (%)	102 (25.82)		4064 (19.33)	<b>0.69 [0.52, 0.92]</b>	440 (15.01)	<b>0.51 [0.37, 0.69]</b>
Combat, n (%)	44 (13.33)		104 (0.58)	<b>0.04 [0.02, 0.06]</b>	620 (22.30)	<b>1.86 [1.22, 2.85]</b>
Other trauma, n (%)	171 (44.42)		6,984 (36.30)	<b>0.71 [0.56, 0.92]</b>	1489 (55.79)	<b>1.58 [1.21, 2.05]</b>
Stressful life events, M (SD)	2.01 (2.96)		1.63 (2.24)	<b>-0.17 [-0.27, -0.07]</b>	1.29 (1.78)	<b>-0.36 [-0.47, -0.25]</b>
Social support, M (SD)	29.92 (6.73)		30.19 (6.80)	0.04 [-0.06, 0.14]	29.35 (6.91)	-0.08 [-0.19, 0.03]
Past-year PTSD, n (%)	39 (11.40)		1,214 (5.96)	<b>0.49 [0.31, 0.78]</b>	153 (5.19)	<b>0.43 [0.26, 0.70]</b>

All percentages are weighted. Reference group is women veterans for all analyses. Values in bold are significant at  $p < 0.050$  SMD standardized mean difference (i.e., mean difference between women veterans and comparison groups in standard deviation units)

**Table 2** Generalized linear models predicting past-year PTSD

Group	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9		Model 10	
	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Women veterans	Ref		Ref		Ref		Ref		Ref		Ref		Ref		Ref		Ref		Ref	
Women civilians	0.49	[0.31, 0.78]	0.45	[0.29, 0.72]	0.61	[0.38, 0.97]	0.40	[0.24, 0.68]	0.49	[0.30, 0.79]	0.55	[0.36, 0.86]	0.47	[0.30, 0.75]	0.56	[0.36, 0.88]	0.45	[0.29, 0.72]	0.65	[0.40, 1.06]
Men veterans	0.43	[0.26, 0.70]	0.56	[0.34, 0.91]	0.50	[0.30, 0.83]	0.60	[0.35, 1.05]	0.64	[0.38, 1.07]	0.48	[0.30, 0.78]	0.48	[0.29, 0.78]	0.65	[0.40, 1.06]	0.53	[0.32, 0.87]	0.57	[0.34, 0.95]
Demographics																				
Age 18–29	1.20	[1.00, 1.45]	1.20	[1.00, 1.45]	1.59	[1.30, 1.93]	1.23	[1.02, 1.49]	1.38	[1.14, 1.67]	1.19	[0.99, 1.43]	1.44	[1.19, 1.74]	0.87	[0.72, 1.06]	1.35	[1.11, 1.62]	1.29	[1.04, 1.60]
Age 30–44	1.45	[1.23, 1.71]	1.45	[1.23, 1.71]	1.62	[1.36, 1.92]	1.40	[1.18, 1.66]	1.47	[1.24, 1.74]	1.43	[1.21, 1.69]	1.61	[1.36, 1.90]	1.19	[1.01, 1.42]	1.51	[1.28, 1.79]	1.37	[1.14, 1.65]
Age 65+	0.34	[0.26, 0.43]	0.34	[0.26, 0.43]	0.53	[0.41, 0.68]	0.45	[0.35, 0.57]	0.44	[0.34, 0.57]	0.34	[0.27, 0.44]	0.37	[0.29, 0.47]	0.49	[0.38, 0.63]	0.33	[0.26, 0.43]	0.71	[0.54, 0.92]
Race: Black	0.67	[0.56, 0.80]	0.67	[0.56, 0.80]	0.85	[0.70, 1.03]	0.77	[0.64, 0.93]	0.70	[0.58, 0.85]	0.67	[0.56, 0.81]	0.72	[0.60, 0.87]	0.66	[0.55, 0.80]	0.66	[0.55, 0.80]	0.83	[0.68, 1.01]
Race: Hispanic	0.67	[0.55, 0.80]	0.67	[0.55, 0.80]	0.93	[0.77, 1.13]	0.77	[0.64, 0.93]	0.70	[0.58, 0.85]	0.67	[0.56, 0.81]	0.76	[0.63, 0.91]	0.72	[0.59, 0.86]	0.63	[0.52, 0.75]	0.88	[0.72, 1.08]
Race: Other	0.87	[0.65, 1.17]	0.87	[0.65, 1.17]	0.95	[0.70, 1.3]	1.03	[0.76, 1.38]	0.94	[0.69, 1.29]	0.84	[0.62, 1.14]	0.91	[0.67, 1.23]	0.86	[0.63, 1.19]	0.82	[0.60, 1.11]	0.94	[0.67, 1.31]
Income < \$20K	1.69	[1.46, 1.97]	1.69	[1.46, 1.97]	1.79	[1.53, 2.10]	1.59	[1.37, 1.86]	1.63	[1.40, 1.90]	1.72	[1.48, 2.00]	1.71	[1.47, 1.99]	1.45	[1.24, 1.70]	1.51	[1.30, 1.76]	1.44	[1.22, 1.70]
Married/cohabitating	0.67	[0.58, 0.77]	0.67	[0.58, 0.77]	0.73	[0.63, 0.85]	0.69	[0.6, 0.81]	0.76	[0.65, 0.88]	0.67	[0.58, 0.78]	0.68	[0.59, 0.79]	0.82	[0.70, 0.95]	0.72	[0.62, 0.84]	0.89	[0.76, 1.04]
Individual factors																				
Number of trauma types	2.25	[2.13, 2.37]																		
Child abuse							6.52	[5.65, 7.52]												
Interpersonal violence									4.93	[4.29, 5.67]										
Combat											2.87	[2.24, 3.67]								
Other trauma													3.19	[2.77, 3.69]						
Stressful life events															1.37	[1.33, 1.41]				
Social support																	0.95	[0.94, 0.96]	0.97	[0.96, 0.98]

Generalized linear models (GLMs) used a logit link function to model the binary outcome. Reference group for race is White, non-Hispanic, and age 45–64 for age. Model 1 is unadjusted group status on past-year PTSD; Model 2 includes group status and demographic variables; Models 3–9 each include group status, demographic variables, and an individual factor; and Model 10 includes all variables

models, although this association was attenuated (i.e., ORs closer to 1) in most cases. The largest change in the estimate was observed in Model 3, which included total number of trauma types as a covariate [OR = 0.45, 95% CI (0.29, 0.72) in Model 2 vs. OR = 0.61, 95% CI (0.38, 0.97) in Model 3]. In the final model, which examined the impact of all factors entered simultaneously on the association between group status with past-year PTSD, the odds ratio comparing the odds of PTSD between women veterans and women civilians was fully attenuated [OR = 0.65 (0.40, 1.06) in Model 10].

Relative to men veterans, the largest changes in the estimate for women veterans and PTSD in the individual predictor models (Models 3–9) were observed in Models 4, 5, and 8, which included child abuse [OR = 0.60, 95% CI (0.35, 1.05), Model 4], interpersonal violence (OR = 0.64, 95% CI [0.38, 1.07], Model 5), and stressful life events [OR = 0.65, 95% CI (0.40, 1.06), Model 8] as individual covariates [compared to OR = 0.56, 95% CI (0.34, 0.91) in Model 2]. In fact, after adjustment for child abuse, interpersonal violence, and stressful life events in these individual predictor models, the association comparing odds of PTSD between men and women veterans was no longer statistically significant. However, in the final, fully adjusted model which included all study variables, being a woman veteran relative to a man veteran continued to be associated with higher odds of PTSD [OR = 0.56 (0.34, 0.91) in Model 2 vs. OR = 0.57 [0.34, 0.95] in Model 10].

## Discussion

Using the NESARC-III, a nationally representative sample of the US population, we examined whether traumatic exposure and social factors might explain women veterans' higher prevalence of past-year DSM-5 PTSD compared to their civilian and male counterparts. Individual predictor models indicated that the difference in PTSD prevalence between women veterans and civilians was attenuated when adjusting for number of trauma types, whereas the difference between men and women veterans was attenuated when adjusting for child abuse, interpersonal violence, and stressful life events. However, in a multiple predictor model that included all the factors of interest, women veterans no longer differed from women civilians, but gender differences between men and women veterans remained.

In comparison with women civilians, women veterans reported greater number of trauma types, interpersonal trauma, combat or war zone exposure, other trauma, and more past-year stressful life events. When each of these factors was examined individually, number of trauma types resulted in the largest attenuation in women veterans' odds of past-year PTSD relative to women civilians, and differences between women veterans and civilians were no longer

statistically significant when all factors of interest were adjusted for. Thus, the cumulative experience of trauma and other social and environmental factors appears to explain the higher prevalence of PTSD among women veterans relative to women civilians. It is likely that military service confers additional risks to women's exposure to trauma, such as combat and military sexual trauma, although it is unknown whether women veterans' greater exposure to various trauma types can be attributed to their time in the military per se or may have occurred before or after service. Of note, studies suggest that women veterans are more likely than women civilians to experience traumatic events across their lifespan, including adverse childhood experiences and traumas in adulthood [22, 55].

In comparison with men veterans, number of trauma types did not appear to play as important a role in explaining women veterans' higher prevalence of PTSD, likely because both men and women veterans reported a similar number of trauma types. Instead, the specific trauma type itself appeared to be more influential. Women veterans reported greater exposure to child abuse and interpersonal violence (although less exposure to combat or war zone and other trauma) than their male counterparts, and both factors accounted for differences in PTSD between these groups in individual predictor models. Nonetheless, it is noteworthy that the multiple predictor model that adjusted for all factors of interest (demographics, number of trauma types, trauma types, and social factors) still demonstrated a significant gender difference in PTSD. It is possible that the gender difference was apparent in the multiple predictor but not the individual predictor models due to combat and other trauma effects going in the opposite direction than the child abuse and interpersonal violence effects. Taken together, these results echo broader findings on gender differences and PTSD that suggest that particular types of traumatic events may partially but not fully account for women's greater PTSD risk [27, 28]. Related hypotheses suggest that perhaps there are also systematic gender differences in the severity or intensity of the trauma and cognitive and behavioral responses to trauma may play a role [27, 28]. These factors, while not available in the NESARC-III, should be further explored in veteran populations. In addition, effective prevention programs for sexual assault and interpersonal violence, and subsequent legal, medical, and mental health support for veterans both in and outside of the military impacted by such traumas, are important and may reduce disparities in health and well-being for women veterans.

Another important finding was that women veterans reported more past-year stressful life events compared to both women civilians and men veterans. Unique from trauma exposures, these types of events are indicative of social instability with respect to financial, work, or relationship problems. Adjusting for stressful life events in an

individual predictor model resulted in attenuation of the difference in PTSD prevalence between men and women veterans, whereas inclusion of it in a fully adjusted, multiple predictor model contributed to attenuation between women veterans and civilians. Thus, it is possible that stressful life events may play some role in explaining women veterans' higher prevalence of PTSD compared to their civilian and male counterparts. Women veteran patients are often perceived as clinically complex [33], and this may be due not only to their high exposure to trauma and mental health comorbidities, but also due to social instability in various facets of their lives. These findings suggest that clinicians should assess and acknowledge current stressors, as these may exacerbate PTSD symptoms [34, 35, 56]. In addition, future research on how the presence of stressful life events may impact response to PTSD treatment is needed and may provide insight into whether these events serve as barriers to treatment retention or symptom reduction.

Perhaps surprisingly, perceived social support did not differ between women veterans, women civilians, and men veterans. Nonetheless, social support was consistently negatively associated with PTSD. The relationship between social support and PTSD is complex and may be reciprocal. Insufficient social support resources have been associated with greater likelihood of developing PTSD in the aftermath of trauma, particularly among women [27]. In addition, greater PTSD symptoms may also lead to the deterioration of relationships and social support [57]. Thus, while it does not appear that social support explains higher PTSD prevalence among women veterans in this sample, capitalizing on existing social support as a strength and incorporating enhancement of social support into PTSD treatment may be valuable.

While the NESARC-III is a population-based study that is representative of the US population, it is important to note that the veterans in the sample may not necessarily be representative of the veteran population at large. This may be a particular concern regarding the women veterans in the sample, given this group's limited sample size. Nonetheless, comparison with other data sources that are representative of the veteran population—such as the 2008–2009 National Survey of Women Veterans (NSVW) and 2015 data from the National Center for Veteran Analysis and Statistics (NCVAS)—ease this concern. For example, across these data sources, women veterans ages 45–64 were the most prevalent age category (40–44%), with the distribution of race/ethnicity, annual household income, and marital status also being comparable (see Online Resource 1) [58, 59]. Similar conclusions may also be made when comparing age and race/ethnicity for the men veterans in the NESARC-III compared to NCVAS data (see Online Resource 2) [59].

The current study has several limitations. Because the NESARC-III is a cross-sectional data set and some variables

of interest did not include specific information about temporality (e.g., interpersonal violence) or were assessed for the same time-period (e.g., past-year stressful life events and past-year PTSD), it is not possible to comment on the sequence of how events unfolded or influenced one another. For example, we do not know whether women veterans are more susceptible to stressful life events than their civilian and male counterparts prior to developing PTSD, which could have subsequently put them at greater risk for PTSD onset, or whether the presence of PTSD symptoms contributed to an increased likelihood of experiencing stressful life events. Longitudinal studies are thus critical in determining the sequence of events that may lead to PTSD. In addition, there were many more women civilians in the sample than both men and women veterans, with the sample size of women veterans being relatively small ( $n = 379$ ). This group was thus more likely to exhibit larger confidence intervals than the others, which may inflate Type II error.

There are also limitations with respect to the study's assessment of PTSD, with the test–retest reliability for past-year PTSD being in the fair range ( $\kappa = 0.41$ ). In comparison, the DSM-5 Field Trials, designed to evaluate the test–retest reliability of DSM-5 diagnoses, found the test–retest reliability of PTSD to be 0.67 when assessed during clinical diagnostic interviews. While better than the NESARC-III statistic, these authors found that kappas between 0.40 and 0.59 were common among the DSM-5 psychiatric diagnoses [60]. In addition, test–retest reliability for other non-psychiatric conditions have produced similar or lower kappa values than observed in NESARC-III [61–63], suggesting that the test–retest reliability for past-year PTSD diagnosis in the NESARC-III was not unusually low. Finally, the NESARC-III definition of PTSD is more restrictive than the DSM-5 definition, requiring that individuals meet three Criterion D and E symptoms each instead of two. This suggests that some mild cases of PTSD may not have been captured. Nonetheless, prior studies have found little to no differences in the direction and magnitude of associations between PTSD and sociodemographic and clinical characteristics when using a broader definition of PTSD provided in the NESARC-III, which includes the correct number of symptoms per cluster vis-à-vis DSM-5, but does not include the requirement for functional impairment or distress or a 1-month-long duration of symptoms [8, 15]. In addition, one study found no differences in sample sizes of persons meeting lifetime PTSD criteria when attempting to reclassify participants in the NESARC-III using traditional DSM-5 diagnostic algorithms compared to the narrow definition, thus increasing confidence that the estimates provided are in line with DSM-5 criteria [15].

Despite these limitations, the current study is an important step in better understanding how gender and veteran status are related to PTSD. The NESARC-III provided one



of the few opportunities to compare women veterans to both women civilians and men veterans in a representative sample of the US population using DSM-5 PTSD. Women veterans' greater prevalence of PTSD compared to women civilians appeared to be explained by experiential and environmental factors, such as greater exposure to trauma types and stressful life events. On the other hand, gender differences in PTSD prevalence were less easily explained by these factors, with the fully adjusted, multiple predictor model still demonstrating greater PTSD prevalence in women compared to men veterans. As others have noted, the issue of gender differences in trauma and PTSD is complex and likely multifaceted [27, 28]. More research is needed to understand the host of factors that likely play a role in understanding this prevalent, burdensome, and costly public health condition.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical Standards** Data based on the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) conducted by the Laboratory of Epidemiology and Biometry (LEB), Division of Clinical and Biological Research and sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) is available from NIAAA (<http://www.niaaa.nih.gov>). The Institutional Review Board at VA Puget Sound Health Care System approved this study.

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