Original Investigation

Prevalence of Posttraumatic Stress Disorder in Vietnam-Era Women Veterans

The Health of Vietnam-Era Women's Study (HealthVIEWS)

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IMPORTANCE Many Vietnam-era women veterans served in or near war zones and may have experienced stressful or traumatic events during their service. Although posttraumatic stress disorder (PTSD) is well studied among men who served in Vietnam, no major epidemiologic investigation of PTSD among women has been performed.

OBJECTIVES To assess (1) the onset and prevalence of lifetime and current PTSD for women who served during the Vietnam era, stratified by wartime location (Vietnam, near Vietnam, or the United States), and (2) the extent to which wartime location was associated with PTSD, with adjustment for demographics, service characteristics, and wartime exposures.

DESIGN, SETTING, AND PARTICIPANTS Survey of 8742 women who were active-duty military personnel in the US Armed Forces at any time from July 4, 1965, through March 28, 1973, and alive as of survey receipt as part of Department of Veterans Affairs Cooperative Study 579, HealthVIEWS. Data were obtained from mailed and telephone surveys from May 16, 2011, through August 5, 2012, and analyzed from June 26, 2013, through July 30, 2015.

MAIN OUTCOMES AND MEASURES Lifetime and current PTSD as measured by the PTSD module of the Composite International Diagnostic Interview, version 3.0; onset of PTSD; and wartime experiences as measured by the Women's Wartime Exposure Scale–Revised.

RESULTS Among the 4219 women (48.3%) who completed the survey and a telephone interview, the weighted prevalence (95% CI) of lifetime PTSD was 20.1% (18.3%-21.8%), 11.5% (9.1%-13.9%), and 14.1% (12.4%-15.8%) for the Vietnam, near-Vietnam, and US cohorts, respectively. The weighted prevalence (95% CI) of current PTSD was 15.9% (14.3%-17.5%), 8.1% (6.0%-10.2%), and 9.1% (7.7%-10.5%) for the 3 cohorts, respectively. Few cases of PTSD among the Vietnam or near-Vietnam cohorts were attributable to premilitary onset (weighted prevalence, 2.9% [95% CI, 2.2%-3.7%] and 2.9% [95% CI, 1.7%-4.2%], respectively). Unadjusted models for lifetime and current PTSD indicated that women who served in Vietnam were more likely to meet PTSD criteria than women who mainly served in the United States (odds ratio [OR] for lifetime PTSD, 1.53 [95% CI, 1.28-1.83]; OR for current PTSD, 1.89 [95% CI, 1.53-2.33]). When we adjusted for wartime exposures, serving in Vietnam or near Vietnam did not increase the odds of having current PTSD (adjusted ORs, 1.05 [95% CI, 0.75-1.46] and 0.77 [95% CI, 0.52-1.14], respectively).

CONCLUSIONS AND RELEVANCE The prevalence of PTSD for the Vietnam cohort was higher than previously documented. Vietnam service significantly increased the odds of PTSD relative to US service; this effect appears to be associated with wartime exposures, especially sexual discrimination or harassment and job performance pressures. Results suggest long-lasting mental health effects of Vietnam-era service among women veterans.

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Posttraumatic stress disorder (PTSD) was the signature illness for men who served in Vietnam,[1] although far less is known regarding its effect on women's health. The National Vietnam Veterans Readjustment Study (NVVRS)[1] in the late 1980s, followed by the National Vietnam Veterans Longitudinal Study (NVVLS) 40 years later,[2] constitute the only population-based epidemiologic studies to assess PTSD in Vietnam-era veterans that included women. However, with an original sample of only 432 women with service in Vietnam (and 262 women in the NVVLS), knowledge of the long-term health effects of women's war zone service is limited.[2,3] Vietnam-era women veterans are now at the precipice of their life span, when illness is likely to increase markedly. Understanding the late health effects of war among this earlier cohort will also benefit the rapidly growing population of women more recently returned from war and provide evidence for planning of clinical programs.

During the Vietnam era, approximately 5000 to 7500 American women served in the US military in Vietnam,[4-6] at least 2000 were at nearby bases (in Japan, the Philippines, Guam, Korea, and Thailand), and 250 000 were in the United States. Although most of the deployed women were nurses, others filled diverse positions (eg, clerical, medical, and personnel). Although excluded from combat, women in Vietnam were still in a war theater, and many of those stationed near Vietnam were exposed to war casualties and other stressors related to being the minority sex. Research on PTSD risk factors among Vietnam-era and recent veterans for both sexes highlights the importance of accounting for combat and other wartime exposures, including military sexual trauma.[7,8] However, little is known about the exposures women experienced during Vietnam-era service, within or outside Vietnam, and the effect of these experiences on PTSD prevalence.

Given the long-term nature of many war-related disorders and their relationships with adverse mental health outcomes,[9,10] understanding how wartime service can affect the mental health of aging veterans is important. The present study examined (1) the prevalence of lifetime and current PTSD (full and subthreshold) for Vietnam-era women veterans by wartime location and (2) the extent to which wartime location was associated with PTSD, before and after adjusting for demographics, military service characteristics, and wartime exposures.

Methods

Participants

This epidemiologic investigation reports the main findings from the Department of Veterans Affairs (VA) Cooperative Study 579, the Health of Vietnam-Era Women's Study (HealthVIEWS). HealthVIEWS includes the following 3 cohorts representing a hypothesized gradient of potential exposure by wartime location: 4734 women veterans who served in Vietnam, 2062 who served near Vietnam, and 5313 who served in the United States.[11] Eligibility criteria included active duty in the Army, Navy, Air Force, or Marine Corps sometime from July 4, 1965, through March 28, 1973 (a period representing significant US military combat involvement in Vietnam), with a minimum service period of 30 days. The women identified for the 3 cohorts were compiled from (1) the original rosters developed for a 1991 study,[12] (2) the Defense Manpower Data Center's Vietnam roster from the Department of Defense, (3) self-registration, and (4) names obtained from a reproductive health outcomes study (described in the eMethods in the Supplement).[13,14] Service eligibility was confirmed using records from the National Personnel Records Center, St Louis, Missouri. To the best of our knowledge, the Vietnam cohort represents all women who served in Vietnam. For the US and near-Vietnam cohorts, the listings from the 1991 study were used.[12] The US cohort had characteristics similar to those of the Vietnam cohort for service, branch, rank, and military occupation.

A total of 9263 women met inclusion criteria and were alive for HealthVIEWS. Data were collected by mail and telephone from May 16, 2011, through August 5, 2012. Of the 9263 women, 8742 were eligible for the present study. Of those eligible, 3478 women (39.8%) did not respond, 619 women (7.1%) responded only to the mailed survey, and 426 women (4.9%) responded only to the telephone interview. In all, 4219 women completed the survey and telephone interview for the present study for an overall response rate of 48.3%. For the Vietnam, near-Vietnam, and US cohorts, the response rates were 1956 of 3572 (54.8%), 657 of 1448 (45.4%), and 1606 of 3722 (43.1%), respectively (**Figure**).

Data Collection

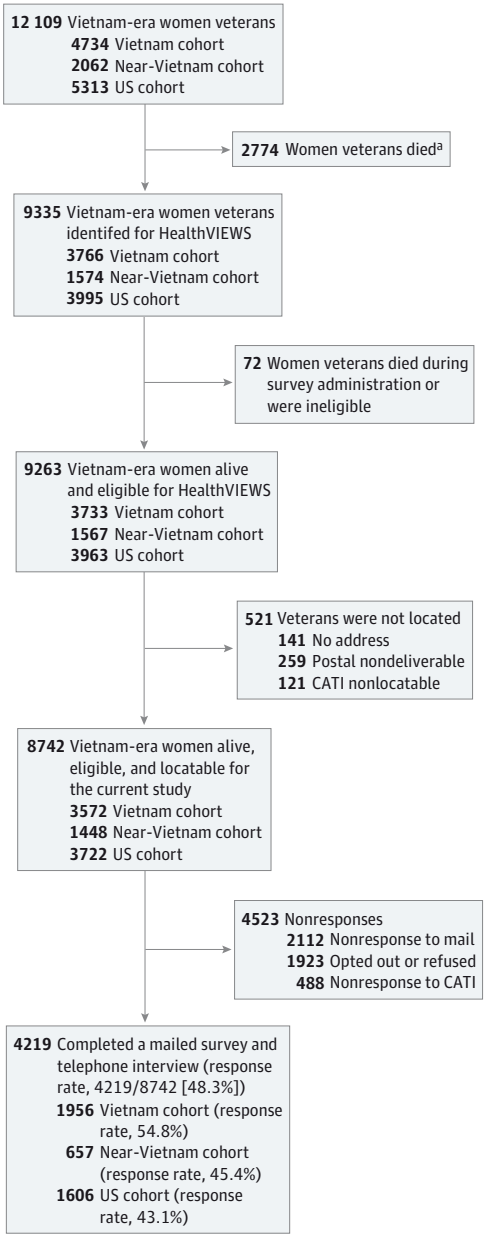
The mailed questionnaire assessed demographics, characteristics before and after the military service, and health; the telephone interview included a structured psychiatric interview (Composite International Diagnostic Interview [CIDI]).[15] All eligible women received a prenotification packet with a letter, study brochures, and an opt-out postcard. Those who did not opt out were sent a survey, stamped envelope, letter, opt-out postcard, and information sheet describing the study procedures. Nonresponders were sent a reminder postcard and as many as 2 additional mailings, spaced approximately 1 month apart. Participants who returned the mailed survey or for whom telephone numbers were available were contacted by telephone. Women received $75 for completing the mailed and telephone surveys. The study was approved by the VA central institutional review board with a waiver for written informed consent. Although we did not obtain formal oral consent, for the telephone interview we reviewed the information that would be similar to that in an informed consent document. This method was approved by the VA central institutional review board. Survey data were coded to avoid identification.

Measures

PTSD Assessment

The CIDI (version 3.0; Computer-Assisted Personal Interview, version 20) PTSD module was used to diagnose current (active within the past year) and lifetime *DSM-IV* PTSD.[16] The CIDI is designed for administration by trained lay interviewers to assess psychiatric disorders in epidemiologic studies.[15] Those who meet *DSM-IV* trauma exposure criteria are then asked about PTSD symptoms, onset, and recency in refer-

Figure. Identification of Vietnam-Era Women Veteran Cohorts



CATI indicates computer-assisted telephone interview; HealthVIEWS, Health of Vietnam-Era Women's Study.

[a] Identified before mailed survey administration only.

ence to the worst event (as selected by the participant) and a randomly selected event. The CIDI PTSD module demonstrated good diagnostic utility in a HealthVIEWS substudy,[17] with a sensitivity of 0.61 and a specificity of 0.91 for lifetime PTSD and a sensitivity of 0.71 and a specificity of 0.85 for past-year PTSD, compared with the Clinician-Administered PTSD Scale (CAPS) (modified May 2011 by Charleston, South Carolina, VA staff to include *DSM-5* criteria for use in Cooperative Study 579).[18] Subthreshold PTSD was defined as meeting *DSM-IV* criteria A and B and 1 symptom of criterion C or D, but not both.[19] Premilitary onset of PTSD was defined as occurring before the age at enlistment; military or postmilitary onset of PTSD, at or after the age at enlistment.

Wartime Exposures

A revised version of the Women's Wartime Exposure Scale (WWES-R)[20,21] was used to assess exposures related to the Vietnam-era service. Revisions included rewording items for clarity and generalizability for women who did not serve as nurses or in war zones; the revised items were reviewed by a focus group of Vietnam-era women veterans to derive final versions. The WWES-R includes 27 items with Likert-type responses and 6 items with dichotomous responses for a total of 33 (eTables 1 and 2 in the Supplement). Subscales were derived using a principal components analysis of polychoric correlations on half of the sample and cross-validated on the other half. The following 6 dimensions were identified: sexual discrimination or harassment (8 items), casualty- or environment-related stress (6 items), performance pressure (7 items), triage or death (6 items), danger or threat (4 items), and overwork (2 items). Subscale scores are the mean scores of items constituting each dimension multiplied by the number of questions in the dimension and then standardized to a mean of 50 and an SD of 10.

Demographics and Military Service

Military service characteristics were obtained from service records and included date of birth, dates of enlistment and separation, race, rank at enlistment, military occupation, branch of service, and wartime location (Vietnam, near Vietnam, or the United States). Educational level, marital status, and wartime exposures were self-reported in the mailed survey.

Statistical Analysis

Data were analyzed from June 26, 2013, through July 30, 2015. Data were weighted using a 2-tiered propensity cell method to adjust for differences between women who could and could not be located and then for responders vs nonresponders (eTable 3 in the Supplement).[22] Descriptive statistics were used to describe the respondents. We used χ^2 tests and linear regression models to test differences in categorical variables and mean differences between continuous variables, respectively. Weighted prevalences of PTSD (lifetime, current, and subthreshold) and prevalences of PTSD by timing of onset (before, during, or after military service) were calculated. Multivariable logistic regression analyses were conducted to calculate adjusted odds ratios (ORs) and 95% CIs for PTSD prevalence as a function of wartime location, adjusting for other demographic and military service variables. Unknown or missing data were removed from analyses. Analyses were conducted using SAS statistical software (version 9.3; SAS Institute, Inc). Results were considered significant at $P \leq .05$.

Results

Study Cohort Characteristics

Most of the women in the Vietnam and US cohorts were in the Army (77.4% and 83.5%, respectively), whereas most of

Table 1. Weighted Characteristics of Women Veterans From Military Service Records and Mailed Survey Completion, Stratified by Wartime Location

Characteristic	Cohort, Weighted Data (95% CI)[a]		
	Vietnam	Near-Vietnam	US
Military Record Characteristics			
Enlistment			
Mean age, y[b,c]	22.5 (22.3-22.7)	22.9 (22.5-23.2)	21.5 (21.3-21.7)
Year[c]	1964	1964	1965
Race[b]			
White	95.1 (94.0-96.1)	90.2 (87.7-92.7)	92.0 (90.5-93.5)
Nonwhite	4.9 (3.9-6.0)	9.8 (7.3-12.3)	8.0 (6.5-9.5)
Branch[b,c]			
Army	77.4 (75.5-79.4)	43.0 (39.1-46.8)	83.5 (81.6-85.4)
Navy	7.0 (5.8-8.1)	6.1 (4.2-8.0)	7.1 (5.8-8.3)
Air Force	14.8 (13.2-16.5)	50.8 (46.9-54.7)	8.8 (7.3-10.3)
Marines	0.7 (0.3-1.2)	0.2 (0.0-0.5)	0.6 (0.2-1.0)
Nurse during service[b]			
Yes	79.9 (78.0-81.8)	56.1 (55.2-60.0)	57.9 (55.4-60.4)
No	20.0 (18.2-22.0)	43.9 (40.0-47.8)	42.1 (39.6-44.6)
Mailed Survey Characteristics			
Marital status[b,c]			
Married or living with a partner	45.5 (43.2-47.7)	45.4 (41.5-49.3)	53.6 (51.1-56.1)
Divorced or separated	18.1 (16.3-19.8)	17.0 (14.1-19.9)	20.6 (18.6-22.7)
Widowed	9.3 (7.9-10.6)	8.6 (6.3-10.9)	10.4 (8.8-12.0)
Never married	27.2 (25.1-29.3)	29.0 (25.2-32.7)	15.4 (13.5-17.3)
Educational level[b,c]			
High school or less	2.2 (1.5-2.9)	2.1 (1.0-3.2)	4.9 (3.8-6.1)
Vocational school, some college, or associate's degree	7.7 (6.4-8.9)	13.9 (11.2-16.6)	15.9 (14.0-17.8)
3-y Degree or diploma	24.2 (22.3-26.2)	13.6 (10.9-16.3)	16.3 (14.5-18.1)
4-y College degree	23.0 (21.0-24.9)	22.7 (19.5-26.0)	22.4 (20.3-24.5)
Some graduate school	10.1 (8.8-11.5)	11.1 (8.6-13.7)	8.2 (6.9-9.6)
Graduate or professional degree	32.8 (30.7-35.0)	36.6 (32.7-40.4)	32.2 (29.9-34.5)
Mean WWES-R scores[d]			
Sexual discrimination or harassment[b,c]	50.6 (50.1-51.0)	50.2 (49.4-51.0)	48.6 (48.2-49.1)
Casualty- or environment-related stress[b,c]	57.0 (56.6-57.5)	45.2 (44.6-45.7)	43.2 (43.0-43.5)
Performance pressure[b]	52.5 (52.0-53.0)	47.9 (47.1-48.6)	47.1 (46.7-47.5)
Triage or death[b]	52.7 (52.2-53.2)	47.1 (46.5-47.7)	47.2 (46.9-47.6)
Danger or threat[b,c]	55.0 (54.5-55.5)	46.7 (46.1-47.2)	45.4 (45.2-45.7)
Overwork[b,c]	54.0 (53.6-54.5)	48.9 (48.2-49.7)	45.6 (45.2-46.0)

Abbreviation: WWES-R, Women's Wartime Exposure Scale–Revised.

[a] Data were collected from 2009 through 2010. Unless otherwise indicated, data are expressed as weighted percentages. Percentages have been rounded and may not sum 100.

[b] The difference between the Vietnam and US cohorts was significant ($P < .05$).

[c] The difference between the near-Vietnam and US cohorts was significant ($P < .05$).

[d] Scores range from 34.7 to 127.1, with higher scores indicating more exposure.

the women in the near-Vietnam cohort were in the Air Force (50.8%) (**Table 1**). Women in the Vietnam cohort were more likely to be nurses compared with the US cohort ($P < .001$).

In the Vietnam cohort, 90.1% of the women reported having a 3-year college degree or higher vs 84.0% and 79.1% in the near-Vietnam and US cohorts, respectively (Table 1). Mean WWES-R scores were significantly higher (indicating greater exposures) in all subscales for the Vietnam cohort compared with the US cohort ($P < .05$), whereas only scores for the subscales assessing sexual discrimination or harassment, casualty- or environment-related stress, danger or threat, and overwork were significantly higher for the near-Vietnam cohort compared with the US cohort.

Prevalence of PTSD by Wartime Location

For women in the Vietnam cohort, 20.1% (95% CI, 18.3%-21.8%) had lifetime PTSD compared with 11.5% (95% CI, 9.1%-13.9%) in the near-Vietnam cohort and 14.1% (95% CI, 12.4%-15.8%) in the US cohort (**Table 2**). The prevalence (95% CI) of current PTSD was 15.9% (14.3%-17.5%) for the Vietnam cohort compared with 8.1% (6.0%-10.2%) and 9.1% (7.7%-10.5%) for the near-Vietnam and US cohorts, respectively.

For the Vietnam cohort, lifetime PTSD prevalence (95% CI) attributable to military or postmilitary trauma was 16.9% (15.3%-18.6%) compared with 8.5% (6.4%-10.7%) and 8.9% (7.5%-10.3%) for the near-Vietnam and US cohorts, respectively. The prevalence (95% CI) of lifetime PTSD attributed to premilitary trauma was 2.9% (2.2%-3.7%), 2.9% (1.7%-4.2%),

Table 2. Weighted Prevalence Estimates for PTSD by Wartime Location and Onset

	Cohort, Weighted % (95% CI)		
	Vietnam	Near-Vietnam	US
Any onset			
Lifetime			
PTSD	20.1 (18.3-21.8)	11.5 (9.1-13.9)	14.1 (12.4-15.8)
Subthreshold PTSD	9.0 (7.8-10.3)	7.4 (5.4-9.5)	11.3 (9.7-12.9)
Current			
PTSD	15.9 (14.3-17.5)	8.1 (6.0-10.2)	9.1 (7.7-10.5)
Subthreshold PTSD	9.5 (8.1-10.7)	7.9 (5.8-10.0)	11.9 (10.3-13.6)
By onset			
Lifetime PTSD			
Premilitary onset	2.9 (2.2-3.7)	2.9 (1.7-4.2)	5.0 (3.9-6.1)
Military or postmilitary onset	16.9 (15.3-18.6)	8.5 (6.4-10.7)	8.9 (7.5-10.3)
Current PTSD			
Premilitary onset	2.2 (1.6-2.9)	2.2 (1.2-3.4)	2.9 (2.1-3.8)
Military or postmilitary onset	13.5 (12.0-15.0)	5.8 (3.9-7.6)	6.1 (4.9-7.3)

Abbreviation: PTSD, posttraumatic stress disorder.

Table 3. Weighted Lifetime PTSD Prevalence Models

	Lifetime PTSD		
	OR (95% CI), Model 1[a]	AOR (95% CI)	
		Model 2[b]	Model 3[c]
Wartime location			
Vietnam (vs United States)	1.53 (1.28-1.83)[d]	1.78 (1.48-2.15)[d]	0.94 (0.71-1.24)
Near Vietnam (vs United States)	0.79 (0.60-1.05)	0.97 (0.72-1.29)	0.70 (0.51-0.98)[d]
Military characteristics			
Enlistment age	NA	0.94 (0.91-0.96)[d]	0.96 (0.93-1.00)[d]
Nurse (vs nonnurse)	NA	0.75 (0.62-0.91)[d]	0.79 (0.62-1.01)
White (vs nonwhite)	NA	1.07 (0.74-1.54)	1.17 (0.77-1.79)
Air Force (vs Army)	NA	0.74 (0.57-0.96)[d]	0.77 (0.58-1.04)
Marines (vs Army)	NA	1.25 (0.46-3.42)	1.22 (0.43-3.44)
Navy (vs Army)	NA	0.48 (0.31-0.75)[d]	0.56 (0.35-0.89)[d]
Wartime exposures			
Sexual discrimination or harassment	NA	NA	1.07 (1.05-1.08)[d]
Casualty- or environment-related stress	NA	NA	1.01 (1.00-1.03)
Performance pressure	NA	NA	1.03 (1.02-1.04)[d]
Triage or death	NA	NA	1.01 (1.00-1.03)[d]
Danger or threat	NA	NA	1.01 (1.00-1.02)
Overwork	NA	NA	1.00 (0.99-1.01)

Abbreviations: AOR, adjusted odds ratio; NA, not applicable; OR, odds ratio; PTSD, posttraumatic stress disorder.

[a] Indicates unadjusted model.

[b] Indicates adjusted for military service characteristics.

[c] Indicates adjusted for military service characteristics and wartime exposures.

[d] Statistically significant at $P \leq .05$.

and 5.0% (3.9%-6.1%) for the Vietnam, near-Vietnam, and US cohorts, respectively (Table 2).

Odds of PTSD by Wartime Location

For lifetime PTSD, model 1 (unadjusted) indicated that the odds of experiencing PTSD were 1.5 times greater for the Vietnam cohort (OR, 1.53 [95% CI, 1.28-1.83]) compared with the US cohort (**Table 3**). This effect remained significant after adjusting for military characteristics (model 2); however, when wartime exposures were included (model 3), the effect of Vietnam service was no longer statistically significant (adjusted OR, 0.94 [95% CI, 0.71-1.24]). In this model, wartime exposures increased the odds of PTSD; a 1-U increase in the standardized score (more exposure) for sexual discrimination or harassment increased the odds of PTSD by 7%; a 1-U increase in the standardized score for performance pressure increased the odds of PTSD by 3%; and a 1-U increase in the standardized score for triage or death increased the odds of PTSD by 1%. Being older at enlistment and being a nurse were protective against PTSD.

For current PTSD, as with lifetime PTSD, the unadjusted results (model 1) indicated that women in the Vietnam cohort were significantly more likely to experience current PTSD (OR, 1.89 [95% CI, 1.53-2.33]) compared with the US cohort (**Table 4**). After accounting for wartime exposures (model 3), the effects of Vietnam service were not statistically significant (adjusted OR, 1.05 [95% CI, 0.75-1.46]). For a 1-U increase in the standardized scores for sexual discrimination or harassment, casualty- or environment-related stress, performance pressure, and danger or threat, the odds of PTSD increased from 1% to

Table 4. Weighted Current PTSD Prevalence Models

	Current PTSD		
	OR (95% CI), Model 1[a]	AOR (95% CI)	
		Model 2[b]	Model 3[c]
Wartime location			
Vietnam (vs United States)	1.89 (1.53-2.33)[d]	2.33 (1.87-2.90)[d]	1.05 (0.75-1.46)
Near Vietnam (vs United States)	0.88 (0.63-1.23)	1.06 (0.75-1.50)	0.77 (0.52-1.14)
Military characteristics			
Enlistment age	NA	0.94 (0.90-0.97)[d]	0.98 (0.94-1.02)
Nurse (vs nonnurse)	NA	0.68 (0.51-0.90)[d]	0.64 (0.46-0.90)[d]
White (vs nonwhite)	NA	1.04 (0.68-1.59)	1.12 (0.68-1.85)
Air Force (vs Army)	NA	0.76 (0.56-1.03)	0.84 (0.59-1.20)
Marine Corp (vs Army)	NA	0.37 (0.09-1.56)	0.30 (0.07-1.23)
Navy (vs Army)	NA	0.38 (0.22-0.66)[d]	0.50 (0.28-0.90)[d]
Divorced or separated (vs never married)	NA	1.72 (1.26-2.33)[d]	1.49 (1.06-2.09)[d]
Married or living with partner (vs never married)	NA	1.20 (0.90-1.59)	1.50 (1.10-2.05)[d]
Widowed (vs never married)	NA	1.39 (0.94-2.05)	1.74 (1.12-2.70)[d]
3-y Degree or diploma (vs graduate or professional degree)	NA	1.12 (0.84-1.48)	1.44 (1.05-1.97)[d]
4-y College degree (vs graduate or professional degree)	NA	0.96 (0.74-1.26)	1.29 (0.96-1.74)
High school or less (vs graduate or professional degree)	NA	0.98 (0.55-1.75)	1.52 (0.81-2.87)
Some graduate school (vs graduate or professional degree)	NA	1.30 (0.92-1.83)	1.22 (0.82-1.82)
Vocational school, some college, or associate's degree (vs graduate or professional degree)	NA	0.99 (0.67-1.44)	1.10 (0.73-1.66)
Wartime exposures			
Sexual discrimination or harassment	NA	NA	1.07 (1.05-1.08)[d]
Casualty- or environment-related stress	NA	NA	1.02 (1.00-1.04)[d]
Performance pressure	NA	NA	1.04 (1.03-1.05)[d]
Triage or death	NA	NA	1.01 (1.00-1.03)
Danger or threat	NA	NA	1.01 (1.00-1.02)[d]
Overwork	NA	NA	1.00 (0.98-1.01)

Abbreviations: AOR, adjusted odds ratio; NA, not applicable; OR, odds ratio; PTSD, posttraumatic stress disorder.

[a] Indicates unadjusted model.

[b] Indicates adjusted for military service characteristics.

[c] Indicates adjusted for military service characteristics and wartime exposures.

[d] Statistically significant at $P \leq .05$.

7%. Navy service and nursing occupation were protective against PTSD. Being divorced or separated, married or living with a partner, or widowed significantly increased the odds of PTSD compared with never being married. In addition, having a 3-year degree or a college diploma significantly increased the odds of PTSD (adjusted OR, 1.44 [95% CI, 1.05-1.97]) compared with having a graduate or professional degree.

Sensitivity Analysis

Results were similar for lifetime and current PTSD when the models were constructed excluding the subset of women with premilitary onset of PTSD (eTables 4 and 5 in the Supplement) and when the models were constructed for lifetime PTSD excluding women with current PTSD (eTable 6 in the Supplement). Similar results were obtained when lifetime subthreshold PTSD was included with lifetime PTSD cases (eTable 7 in the Supplement) and when current subthreshold PTSD was included with current PTSD cases (eTable 8 in the Supplement).

Discussion

This unique national study examined Vietnam-era women veterans, a group whose military service, traumatic exposures, and mental health consequences have been understudied. In addition to considering women who served in Vietnam, we included additional cohorts of women veterans who served near Vietnam and in the United States, thus providing a continuum of types of war zone and service-related exposures. Our findings indicate that women in the Vietnam cohort (who were exposed directly to war zone experiences) have significantly higher levels of lifetime and current PTSD than their near-Vietnam (who may have been exposed to casualties but who were not stationed in a war zone) or US (who presumably had the lowest level of war-related exposures) cohort counterparts. The excess prevalence of current and lifetime PTSD in the Vietnam cohort is not attributable to premilitary trauma (although we cannot rule out premilitary trauma with military or postmilitary onset of symptoms) and persisted in models adjusting for demographic and

military characteristics. Only when we included wartime exposures—in particular, sexual discrimination or harassment and performance pressure, which were higher for women in the Vietnam cohort—was wartime location no longer significantly associated with PTSD. This finding indicates that the kinds of experiences captured in the WWES-R may have been traumas directly responsible for PTSD or else may have made these women more vulnerable to the impact of trauma exposure and the development of PTSD symptoms. Most telling is that sexual discrimination or harassment, which is not thought of as a unique war zone exposure, was higher among deployed women and significantly related to PTSD in every model. Some of the items in this subscale may have been actual trauma (eg, unwanted sexual experience involving threat or force), whereas other items may indicate an environment conducive to sexual stressors (eg, unfair treatment because of sex).

We found that lifetime PTSD prevalence was higher for the Vietnam cohort (20.1%) and the US cohort (14.1%) than for the estimated 10.4% to 12.3% for the general population of US women,[23-25] although our Vietnam veterans were older than the general population and PTSD prevalence tends to decline with age.[26,27] The instrument used, the CIDI, was nearly identical to the version used by Kessler et al,[23] thus enhancing comparability.

Our findings differ from those of the only other national study of PTSD among Vietnam-era women veterans, the NVVLS follow-up of the NVVRS.[2] In that long-term follow-up study, the prevalence of lifetime *DSM-5* PTSD among women who served in Vietnam was 15.2%. The *DSM-5* yields a lower prevalence of PTSD compared with the *DSM-IV* criteria used in the present study. An estimate comparable to our lifetime rate using *DSM-IV* criteria may be the estimate for *DSM-5* PTSD, including subthreshold cases,[28] which yielded a lifetime prevalence of 25.7%. Our lifetime prevalence of *DSM-IV* PTSD of 20.1% is comparable and within the confidence limits (17.7%-33.8%) of the previous estimate. The estimates of current *DSM-IV* PTSD, however, were higher than the 8.7% found for *DSM-5* diagnoses and subthreshold diagnoses in the NVVLS.[2] The CIDI uses the time frame of the past year for current prevalence, whereas the CAPS-5 used in the NVVLS obtains past-month prevalence; thus, the results are not directly comparable and a higher prevalence for past-year diagnosis would be expected. Furthermore, the CIDI uses a thorough assessment of traumatic events, which cover a wide range of military experiences, accidents, and interpersonal violence events, compared with the NVVLS methods that broadly assessed the cumulative impact of military experiences. In epidemiologic studies of PTSD, greater specificity in the assessment of traumatic events is associated with increased prevalence, and this effect is more robust among women compared with men.[28-30]

Our study has limitations. Nonrespondents (including those who have died) may have had a different PTSD prevalence than respondents. By using weights based on data obtained from military service records, we were able to compensate for nonresponse to some extent. Also, deployment to a war zone is not random and might be influenced by unmeasured individual characteristics that are risk factors for PTSD. Another limitation is the possible difficulty that some women have for accurately recalling events during approximately 6 decades that may have contributed to their current symptoms. In addition, we used the CIDI PTSD module, not the CAPS, a clinical instrument considered to be the criterion standard for PTSD assessment. Although conduct of clinical interviews using the CAPS is not feasible with a study sample so large, a substudy[17] found good correspondence of the CIDI PTSD module with the CAPS.

This study also has major strengths. The women identified for our study represent, to our knowledge, the most comprehensive cohort of women veterans who served during the Vietnam era, including the largest enumeration of women who served near Vietnam to date. Unlike most studies of women veterans, which draw on the limited subset who use VA health care services, this study was population based. The use of an epidemiologically accepted assessment for PTSD (the CIDI) will enable comparisons with other large epidemiologic cohorts. Furthermore, our use of *DSM-IV* PTSD circumvents problems surrounding the new *DSM-5* criteria.[28] We were able to examine combat and other war zone exposures as potential mediators of the effect of deployment on PTSD risk. Perhaps most important, we used military personnel records to assess service data, including wartime service location, thus reducing potential biases in recall and providing the basis of our research.

Conclusions

For women in the Vietnam cohort, the prevalence of lifetime PTSD was 20.1% and the prevalence of current PTSD was 15.9%. Vietnam service significantly increased the odds of PTSD relative to US service; this effect appears to be related to wartime exposures, especially sexual discrimination or harassment and job performance pressures. Because current PTSD is still present in many of these women decades after their military service, clinicians who treat them should continue to screen for PTSD symptoms and be sensitive to their noncombat wartime experiences.

Future research should examine the effect of military service on the presence of psychiatric disorders other than PTSD and the influence of these disorders on geriatric medical conditions. Although this report has focused on psychopathology, research should also investigate resilience and other positive aspects of military service for these women. This focus is important for the women who served their country during the Vietnam era and has implications for the large and rapidly growing numbers of women who have served in recent years and will serve in the future. Earlier and improved interventions may help to avert the late-life mental health consequences of military service for this next generation of military women.

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