

Adverse Childhood Experiences and Adult Health Outcomes Among Veteran and Non-Veteran Women

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Abstract

Background: Women veterans represent a vulnerable population with unique health needs and disparities in access to care. One constellation of exposures related to subsequent poor health includes adverse childhood experiences (ACEs; e.g., physical and sexual child abuse), though research on impacts of ACEs among women veterans is limited.

Methods: Data were drawn from the 2010 Behavioral Risk Factor Surveillance System for the 11 states that included the ACE module ($n=36,485$). Weighted chi-squared tests and multivariable logistic regression were used to assess the prevalence of ACEs among women veterans compared with women non-veterans and differences in the following outcomes, controlling for ACEs: social support, inadequate sleep, life satisfaction, mental distress, smoking, heavy alcohol use, obesity, diabetes, cardiovascular disease symptoms, asthma, and disability.

Results: Women veterans (1.6% of the total sample) reported a higher prevalence of 7 out of 11 childhood adversities and higher mean ACE score than women non-veterans. Women veterans were more likely to be current smokers and report a disability, associations which were attenuated when controlling for ACE.

Conclusions: Despite women veterans' higher prevalence of ACE, their health outcomes did not differ substantially from non-veterans. Further research is needed to understand the intersections of traumatic experiences and sources of resilience over the lifecourse among women veterans.

Introduction

ADVERSE CHILDHOOD EXPERIENCES (ACEs), such as parental mental illness or substance abuse, witnessing domestic violence, and physical, sexual, and emotional child abuse, are constellations of exposures related to poor adulthood health.¹ Recent evidence suggests that women with military service history report greater burdens of ACEs than women who have never served in the military;² however, little research has examined if ACEs may contribute to poorer health among women veterans compared with non-veterans. The scant research about childhood abuse and women veterans has relied on clinical samples, namely women veterans using Veterans Health Administration (VHA) care,^{3–5} though a significant proportion of veterans do not use VHA services. Consequently, health outcomes and factors related to health (i.e., ACEs) among non-VHA samples of women veterans are needed in order to more comprehensively understand the broader population of women veterans in the United States.

ACEs have been linked to a greater likelihood of adulthood substance use and abuse, depression, suicide ideation and attempts, obesity, chronic physical health conditions (ischemic heart disease and liver disease), and premature mortality among the general population.^{6–13} Researchers have suggested several potential mechanisms underlying the association of ACEs and adult health, suggesting the accumulation of adversity—and the body's stress response—can be detrimental to later health or that there are latent effects of exposure to adversity during critical periods of development.^{14–16} ACEs are also associated with risk behaviors (sexual risk behavior, substance use), which may be maladaptive behavioral responses to early childhood trauma resulting in later poor adult health.^{17,18}

Because multiple traumatic experiences can have particularly deleterious impacts on health,^{19–21} early-life traumas like ACEs are important to consider among populations with high risks of adulthood trauma. Previous research documents high rates of unique forms of adulthood trauma among

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women veterans, including combat exposure, military sexual trauma, and intimate partner violence.^{22–24} Women who have served in the military also report particularly high prevalence of ACEs, though data comparing women veterans with non-veterans are scarce. One study of 2010 Behavioral Risk Factor Surveillance System (BRFSS) data from 10 states and the District of Columbia found that women with a history of military service, which included those on active duty and those in the Reserves or National Guard regardless of activation, reported higher rates of household physical abuse, emotional abuse, and exposure to domestic violence compared with women who had not served in the military (rates of other ACE factors did not differ significantly by military status).² This study, though, did not assess whether a higher burden of ACEs was associated with health outcomes. A study of 2010 BRFSS data from Washington state found that military service increased the association between ACEs and mental health (but not physical health) outcomes.²⁵ However, that study did not stratify analysis by sex, thus not presenting specific effects for women, who tend to experience more ACEs than do men.²⁶ Other limitations of current literature on ACEs among veteran women include the primary focus on sexual abuse, the use of convenience samples, and a lack of a non-veteran comparison group, limitations which the current study addresses.^{27,28}

Unlike other studies examining the association between ACEs and military service,^{2,25} the focus of this study was specifically on women veterans: those who had served in, and separated from, military service. The purposes of the present study were to document the prevalence of ACEs among women veterans compared with women non-veterans, assess a range of physical and mental health outcomes among women veterans and non-veterans, and determine the role of ACEs in health differences among veteran and non-veteran women. Specifically, we hypothesized that (1) women veterans would experience greater prevalence of ACEs than women non-veterans, (2) women veterans would report poorer health indicators than women non-veterans, and (3) ACEs would account for differences in health outcomes between women veterans and non-veterans.

Materials and Methods

Data

Data are from the 2010 Behavioral Risk Factor Surveillance System (BRFSS), a probability-based, nationally representative, telephone survey of noninstitutionalized adults over age 18 years in the United States.²⁹ Surveys were conducted by trained interviewers using computer-assisted telephone interview (CATI) software. Respondents completed the core BRFSS items and optional modules which varied by state. We restricted analyses to the 11 states that included the Adverse Childhood Experiences (ACE) module in their BRFSS (Hawaii, Nevada, Vermont, Wisconsin, the District of Columbia, Maine, Nebraska, Ohio, Pennsylvania, Utah, and Washington). Response rates by state ranged from 49.95% (Pennsylvania) to 68.78% (Nebraska), with a mean of 55.05% for the 11 states included in the current analyses.³⁰ Our sample included 36,485 women who self-identified as veteran or non-veteran, with the latter category including Reserves and National Guard who did not serve on active duty ($n=112$). Due to the focus on

veteran status, we excluded women who indicated current active duty ($n=42$).

Measures

Demographic characteristics included age (mean age), education (high school diploma or less vs. some college or higher), income ($\leq \$25,000$, $\$25,000$ – $\$50,000$, or $> \$50,000$) and partnership status (partnered vs. nonpartnered). Due to the small number of women veterans across racial categories, race/ethnicity was dichotomized into non-Hispanic white versus racial/ethnic minority. Our primary predictor was veteran status measured with the survey item, “Have you ever served on active duty in the United States Armed Forces, either in the regular military or in a National Guard or military reserve unit? Active duty does not include training for the Reserves or National Guard, but DOES include activation, for example, for the Persian Gulf War.” Participants who indicated they had served on active duty in the past were classified as veterans. Women who had never served in the military or who trained for the Reserves or National Guard but were never activated were classified as non-veteran. Due to the focus on veteran status, we excluded women who indicated current active duty ($n=42$). The ACE module includes six items related to household dysfunction (parental mental illness, incarceration, domestic violence, divorce, alcohol abuse, and illicit substance use) and five items related to childhood abuse (emotional abuse, physical abuse, touched sexually, forced to touch someone else sexually, or forced to have sex).¹² At the beginning of the ACE module, all respondents received the following prompt: “All questions refer to the time period before you were 18 years of age. Now, looking back before you were 18 years of age...” followed by each ACE item (e.g., “Did you live with anyone who was depressed, mentally ill, or suicidal?”). Differences in ACEs between women veterans and non-veterans were examined in three ways: (1) as individual items; (2) as a four-category variable representing no ACEs, household dysfunction only, abuse only, and both household dysfunction and abuse; and (3) count of the number of ACEs participants experienced. Internal consistency reliability for the 11 items in the present subanalysis was 0.77, which is comparable to the overall sample of participants who completed the ACE module ($\alpha=0.78$).³¹

Health outcomes were coded dichotomously and included the following three domains. Mental health risk indicators included frequent mental distress, inadequate sleep, low satisfaction with life, and poor social or emotional support. Frequent mental distress was assessed with the item, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Participants indicated the number of days, and those with ≥ 6 days of poor mental health³² were classified as having frequent mental distress. Inadequate sleep was assessed with the item, “During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?” with ≥ 14 days as the threshold for not getting enough rest or sleep.^{33,34} Life satisfaction was measured with the item, “In general, how satisfied are you with your life?” with responses on a 4-point Likert scale from “very dissatisfied” to “very satisfied.” Responses were dichotomized as very dissatisfied or dissatisfied versus satisfied or very satisfied. Finally, poor

TABLE 1. DEMOGRAPHICS AND ADVERSE CHILDHOOD EXPERIENCE PREVALENCE AMONG WOMEN, BY VETERAN STATUS

	<i>Veteran</i> n (%) (N = 631)	<i>Non-veteran</i> n (%) (N = 35,854)	p
Age (mean, SE)	50.5 (1.14)	49.4 (0.18)	0.297
Race/ethnicity			
White, non-Hispanic	507 (84.9)	28,381 (83.6)	0.611
Racial/ethnic minority	117 (15.1)	7,026 (16.4)	
Education			
Some college or higher	486 (75.4)*	22,759 (63.1)	<0.001
≤ High school diploma	145 (24.6)	13,009 (36.9)	
Household income/year (USD)			
≤ 25,000	145 (22.0)	9,089 (25.4)	0.241
25,000–50,000	153 (24.0)	8,890 (26.9)	
> 50,000	254 (54.0)	12,775 (47.7)	
Partnership status			
Partnered	294 (60.9)	19,134 (65.5)	0.171
Not partnered	331 (39.1)	16,558 (34.5)	
Individual ACE items			
Household mental illness	118 (24.1)	6,088 (19.8)	0.168
Parental separation or divorce	136 (20.9)	7,156 (23.7)	0.391
Household drug use	49 (12.7)	2,486 (9.7)	0.289
Household alcohol abuse	184 (31.5)*	8,481 (24.9)	0.040
Incarcerated household member	26 (4.8)	1,400 (5.6)	0.604
Exposure to domestic violence	130 (23.4)*	5,125 (15.9)	0.006
Physical abuse	149 (27.7)*	5,288 (16.4)	<0.001
Emotional abuse	214 (40.0)*	9,044 (27.6)	<0.001
Touched sexually	120 (24.4)*	4,848 (14.1)	<0.001
Made to touch another sexually	82 (14.8)*	3,199 (9.8)	0.025
Forced to have sex	49 (10.0)*	1,799 (5.7)	0.024
Household dysfunction only	100 (19.7)	6,503 (21.0)	0.711
Abuse only	57 (11.4)	3,118 (8.7)	0.220
Both household dysfunction and abuse	188 (34.3)*	8,178 (26.8)	0.034
Number of ACEs (mean, SD)	2.32 (0.20)*	1.72 (0.03)	0.003

Frequencies are unweighted; percentages are weighted.

* $p < 0.05$.

social or emotional support was measured with the item, “How often do you get the social and emotional support you need?” Responses were on a 5-point Likert-type scale and were recoded to always, usually, and sometimes versus rarely or never. Health risk indicators included current smoking (smoking at least 100 cigarettes during lifetime and currently smoking some days or every day).³⁵ Heavy alcohol use was operationalized as either having more than one alcoholic drink per day in the last 30 days or binge drinking in the past 30 days, using Centers for Disease Control and Prevention (CDC)-derived variables.³⁶ Respondents self-report their height and weight, which CDC uses to create a calculated variable for BMI. Overweight or obese was classified as having a BMI ≥ 25 . Finally, physical health indicators included lifetime diagnosis by a health care professional of asthma, diabetes, or symptoms of cardiovascular disease (i.e., stroke, heart attack, coronary heart disease). Disability was classified as having “any health problem that requires you to use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone.”

Analysis

Weighted chi-squared tests (for categorical variables) and Wald tests of means (for continuous variables) were used to examine crude differences between veterans and non-veter-

ans in demographic characteristics, ACEs, and health outcomes. We used two sets of multivariable logistic regression analyses to assess the association of veteran status with each health outcome. The first set of regression models examined whether veteran status was associated with each health outcome after controlling for age, race/ethnicity, education, income, and partnership status. In the second set of models, we included the same sociodemographic variables and added ACEs to the model (modeled as a count ranging from 0 to 11) to determine if veteran status remained significantly associated with health outcomes after also adjusting for ACEs. We report weighted adjusted odds ratios with 95% confidence intervals (95% CIs) for veteran status. All analyses were conducted using Stata/SE 12 and weighted to create representative estimates for the subsample (i.e., across the 11 states included in the analyses) by accounting for nonresponse, noncoverage, and the complex sampling design of the BRFSS. This study was approved by the Institutional Review Board at the VA Pittsburgh Healthcare System.

Results

Almost two percent of women in the analytic sample identified as veterans (1.6%; 95% CI 1.4–1.9; $n = 631$).

TABLE 2. CRUDE PREVALENCE OF HEALTH INDICATORS AMONG WOMEN, BY VETERAN STATUS

	Veteran n (%) (N = 631)	Non-veteran n (%) (N = 35,854)	p
<i>Mental health</i>			
Low social support	105 (19.1)	6,222 (17.2)	0.566
Inadequate sleep	167 (30.1)	8,457 (29.2)	0.792
Low satisfaction with life	36 (6.2)	1,793 (5.5)	0.672
Mental distress	116 (23.6)	5,646 (18.0)	0.086
<i>Health risk behaviors</i>			
Current smoker	120 (24.9)*	5,110 (17.4)	0.020
Heavy alcohol use	62 (15.9)	3,700 (12.2)	0.236
Overweight or obese	356 (60.4)	19,160 (56.3)	0.272
<i>Physical health</i>			
Diabetes	71 (9.7)	4,307 (9.9)	0.893
CVD symptoms	76 (9.4)	3,173 (6.7)	0.101
Asthma	103 (16.4)	5,783 (15.6)	0.768
Disability	99 (14.0)*	4,144 (8.2)	0.003

Frequencies are unweighted; percentages are weighted.
* $p < 0.05$.

Women veterans and non-veterans were similar in age, race/ethnicity, household income, and partnership status (Table 1). However, a larger proportion of women veterans reported having at least some college education or higher, compared with women non-veterans (75.4% vs. 63.1%, $p < 0.001$).

Consistent with hypothesis 1, we found that women veterans reported a higher prevalence of several types of ACEs

than women non-veterans, including household alcohol abuse (31.5% vs. 24.9%, $p = 0.040$), exposure to domestic violence (23.4% vs. 15.9%, $p = 0.006$), physical abuse (27.7% vs. 16.4%, $p < 0.001$), emotional abuse (40.0% vs. 27.6%, $p < 0.001$), and sexual abuse (touched sexually: 24.4% vs. 14.1%, $p < 0.001$; made to touch another sexually: 14.8% vs. 9.8%, $p = 0.025$; forced to have sex: 10.0% vs. 5.7%, $p = 0.024$). Additionally, a significantly greater proportion of women veterans reported both family dysfunction and abuse (34.3% vs. 26.8%, $p = 0.034$) and had a higher mean ACE score ($p = 0.003$) than women non-veterans (Table 1).

Mental health risk indicators, health risk behaviors, and physical health outcomes were generally similar among women veterans and non-veterans, although a greater proportion of women veterans were current smokers (24.9% vs. 17.4%, $p = 0.02$) and reported a disability (14.0% vs. 8.2%, $p = 0.003$) (Table 2). The associations of veteran status with current smoking and with disability persisted after controlling for age, race/ethnicity, education, income, and partner status in multivariable models (Table 3, Model 1), providing partial support for hypothesis 2.

Controlling for demographics and veteran status, the number of ACEs was associated with elevated odds of all health outcomes (Table 3, Model 2). Adjusted odds ranged from 1.06 (obesity) to 1.27 (low satisfaction with life). The association between veteran status and current smoking status was attenuated when accounting for ACEs (without ACE: adjusted odds ratio [AOR] 1.84, 95% CI 1.18–2.88; with ACE: AOR 1.57, 95% CI 0.96–2.58). Similarly, in the multivariable model examining disability, the association between veteran status and disability was attenuated after adjusting for ACEs (without

TABLE 3. ASSOCIATION OF VETERAN STATUS WITH HEALTH INDICATORS AMONG WOMEN BEFORE AND AFTER ADJUSTING FOR ACEs

	Model 1 ^a		Model 2 ^b	
	Veteran AOR (95%CI)		Veteran AOR (95%CI)	ACE AOR (95%CI)
<i>Mental health</i>				
Low social support	1.16 (0.65–2.06)		0.99 (0.53–1.84)	1.19 (1.16–1.22)*
Inadequate sleep	1.02 (0.69–1.52)		0.96 (0.63–1.46)	1.14 (1.11–1.17)*
Low satisfaction with life	1.18 (0.58–2.39)		0.89 (0.41–1.95)	1.27 (1.22–1.32)*
Mental distress	1.56 (0.99–2.45)		1.32 (0.79–2.21)	1.22 (1.19–1.26)*
<i>Health risk behaviors</i>				
Current smoker	1.84 (1.18–2.88)*		1.57 (0.96–2.58)	1.20 (1.17–1.23)*
Heavy alcohol use	1.35 (0.77–2.36)		1.31 (0.73–2.35)	1.08 (1.05–1.12)*
Overweight or obese	1.25 (0.88–1.77)		1.20 (0.83–1.73)	1.06 (1.04–1.09)*
<i>Physical health conditions</i>				
Diabetes	1.06 (0.66–1.72)		0.92 (0.56–1.52)	1.06 (1.03–1.10)*
CVD symptoms	1.42 (0.69–2.92)		1.28 (0.57–2.86)	1.15 (1.10–1.21)*
Asthma	0.96 (0.64–1.44)		0.82 (0.54–1.25)	1.13 (1.10–1.16)*
Disability	1.83 (1.08–3.10)*		1.57 (0.90–2.75)	1.23 (1.19–1.27)*

Analyses are weighted.

* $p < 0.05$.

^aAssociations of veteran status, and health outcomes adjusted for age, race/ethnicity, education, income, and partnership status.

^bAssociations of veteran status, ACEs, and health outcomes adjusted for age, race/ethnicity, education, income, and partnership status. ACEs were modeled as a count (range 0–11).

ACE, adverse childhood experience; AOR, adjusted odds ratio; CI, confidence interval; CVD, cardiovascular disease; SD, standard deviation.

ACE: AOR 1.83, 95% CI 1.08–3.10; with ACE: AOR 1.57, 95% CI 0.90–2.75). Both of the findings for smoking and for disability supported hypothesis 3.

Discussion

Our findings suggest that women veterans are significantly more likely than women non-veterans to have experienced both childhood household dysfunction and abuse. Women veterans had higher odds of two health outcomes (smoking and disability) compared with non-veteran women; however, these associations attenuated to nonsignificance when we controlled for women veterans' differential exposure to childhood adversity (i.e., ACEs). Literature has long supported an association between ACEs and smoking,³⁷ and our results suggest that ACEs may help to explain the higher smoking rate among women veterans than non-veterans in our sample. That veteran status was significantly associated with disability even after adjusting for sociodemographic characteristics may be due to women veterans' military service. However, it is notable that after adjusting for ACEs, veteran status was no longer significant. ACEs have been robustly associated with disability,^{38,39} and present results suggest that burden of ACEs may help to explain differences in disability (and in smoking) among women above and beyond that of military service.

Smoking and disability notwithstanding, women veterans generally did not report increased mental health risk indicators or poorer physical health compared to non-veteran women, despite having higher prevalence of 7 out of 11 unique ACEs and higher prevalence of multiple ACEs. We offer two potential explanations for these findings. First, it is possible that, despite or perhaps because of childhood adversity, there is a resiliency among women veterans that buffers them from experiencing poor health as adults despite their excess prevalence of early childhood adversity. Studies suggest that some women join the military as a way to escape stressful or abusive home lives,³ and the intentional act of enlisting may indicate general self-efficacy that bodes for improved health over the lifecourse. Resiliency also may be built through increased resources developed while in the military.⁴⁰ Resiliency and coping strategies among women veterans warrant further study—particularly through qualitative methods—to better understand the unique situations that may inform a phenomenon such as resiliency in the context of traumatic histories.

An additional explanation for the lack of differences in health outcomes between women veterans and non-veterans in the face of women veterans' high prevalence ACE involves a selection effect known as the "healthy soldier effect."⁴¹ It is possible that women veterans are healthier than the general population due to mental and physical health requirements for military service. Consequently, this selection effect—setting military experienced populations apart from the general population as healthier—may have compensated for the poor health one would expect to see in a group with high ACE exposure based on literature from the general population.¹ Health characteristics of women veterans, however, may be more similar to women non-veteran civilians than to women actively serving in the military, since the healthy soldier effect may wane with age.⁴² Unfortunately, BRFSS data do not indicate time since serving in

active duty, and the number of active duty women in the sample was too small to analyze. Additional research that can incorporate more nuanced information about veteran status, such as date of severance from service, could help in understanding how and if ACEs impact women veterans health based on their time since service.

Although these findings are in a large population-based sample, several limitations must be considered. First, we were only able to use data from states that included the ACE module, limiting the generalizability of our findings to veteran and non-veteran women in Hawaii, Nevada, Vermont, Wisconsin, the District of Columbia, Maine, Nebraska, Ohio, Pennsylvania, Utah, and Washington. Second, recall bias of ACE may be a potential concern, but research has shown that the bias is typically in the direction of underestimates (i.e., false negatives).⁴³ Third, some of the items in the BRFSS are crude, such as mental distress, and although the mental distress item has been shown to be valid,³² a more nuanced scale of mental health may have facilitated better detection of differences between veteran and non-veteran populations. An additional limitation of the BRFSS dataset includes nonresponse bias, which would result in the underestimation of harder-to-reach populations.⁴⁴ The CDC does not provide information on the differences between responders and nonresponders to assess the extent to which this potential bias impacts the current analyses, though the states included here achieved response rates greater than the threshold that has been assessed previously in the literature (<40%).⁴⁴ Nevertheless, this potential bias should be kept in mind when interpreting the present findings. Fourth, the veteran status was self-reported and could not be verified against records of service, which may result in potential misclassification bias. Fifth, further information about length of service, number of deployments, time since service, and service-related disability would provide better context within which to interpret these findings. Moreover, other measures of trauma experienced while on active duty were not measured in this nationally representative dataset precluding us from commenting on the role of military sexual assault and other violence victimization in predicting subsequent health outcomes among veteran women. Finally, the majority of sample was in middle adulthood, and it is possible that the chronic health effects of ACE, which could have delayed presentation, had not yet surfaced at detectable levels.¹⁶

These limitations notwithstanding, the higher prevalence of ACE among women veterans is concerning. Further research is needed to discern the etiology of this disparity and to explore, with more nuanced measures and larger samples, how ACE and other forms of trauma may impact health outcomes among women veterans. Our finding that veteran women and non-veteran women have similar health outcomes despite the higher prevalence of ACE indicates that there may be unmeasured protective factors unique to the experience of veteran women. Important next steps include assessing for these protective factors to inform potential interventions and build resilience among other populations vulnerable to poor health after trauma exposure.

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