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# The Impact of Adverse Childhood Experiences (ACEs) and Combat Exposure on Mental Health Conditions Among New Post-9/11 Veterans

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**Objective:** Adverse childhood experiences (ACEs) are early life experiences of abuse and neglect, and observed violence, among others. For military veterans, both ACEs and combat exposure are associated with mental health problems. **Method:** This study examines the relationship between ACEs and combat exposure on the current mental health in a large sample of recent post-9/11 U.S. veterans. **Results:** Fifty-nine percent of female and 39% of male veterans reported exposure to 1 ACE, whereas 44% of female and 25% of male veterans were exposed to multiple ACEs. Female veterans were more likely to experience 4 or more ACEs. ACEs were more consistently associated with mental health problems for male veterans than their female peers. For female veterans, exposure to 1 or 2 ACEs did not increase the odds of having any mental health condition, whereas for males, this level of exposure was associated with probable PTSD and anxiety. Combat patrol events were associated with an increase in the likelihood of having a probable mental health problem, with 2 exceptions—combat patrol events were not associated with depression in male veterans and not associated with alcohol misuse in female veterans. Combat was not associated with alcohol misuse. Experiencing a corollary of combat (e.g., accidents, moral injury) was inconsistently associated with the odds of having a probable mental health problem. **Conclusions:** This study confirms prior studies demonstrating a relationship between ACEs and combat on subsequent mental health problems. Importantly, 2 different types of combat exposure had differential effects on mental health problems.

### Clinical Impact Statement

Exposure to combat and to adverse childhood experiences (ACEs), such as abuse and neglect, are both associated with poorer mental health among veterans. Thus, it is critical that clinicians working with veterans take care in gathering background information on these experiences and formulate treatment plans that account for both types of traumatic exposures. There are a number of evidence-based treatments to address both childhood and combat trauma, and these should be used to treat veterans whenever possible.

**Keywords:** adverse childhood experiences (ACEs), veterans, combat exposure, PTSD, anxiety

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Adverse childhood experiences (ACEs) are early life adversities that include exposure to abuse (e.g., psychological, physical, sexual, emotional), neglect, observing violence, and living in toxic family and contextual environments (Felitti et al., 1998). A number of problematic health, behavioral, and life course outcomes have been associated with exposure to ACEs. ACEs are correlated with the development of psychological and psychiatric problems (McLaughlin et al., 2012), including depression, anxiety, aggression, suicide attempts and completions, and personality disorders (Turner, Finkelhor, & Ormrod, 2006). ACEs are also associated with greater likelihood of risky behaviors such as alcohol and drug abuse, smoking, criminal activity, overeating/obesity, and unsafe sexual practices (Wright, Carter, & Cullen, 2005), and ultimately with premature mortality (Brown et al., 2009).

Exposure to different types of ACEs often co-occur within the same individual. In the landmark ACEs study (Felitti et al., 1998), 65% to 93% of individuals exposed to any adverse childhood experience were also exposed to at least one additional category of adverse experience, and the probability of experiencing two or more such experiences ranged from 40% to 74%. In a nationally representative sample of children 2 to 17 years old, 22% of those surveyed reported exposure to four or more ACEs (Finkelhor, Ormrod, & Turner, 2007). Not only is the co-occurrence of different types of ACEs within the same person common, exposure to these events results in a graded relationship between ACEs and problematic health and behavioral outcomes, such that higher levels of ACEs exposures are associated with poorer outcomes (Felitti et al., 1998).

### Exposure to ACEs Among Veterans

Understanding veterans' exposure to ACEs is important for several reasons. A significant number of veterans, particularly female veterans, report enlisting to escape toxic family situations (Sadler, Booth, Mengeling, & Doebbeling, 2004). A number of studies have also found that veterans have a higher prevalence of ACEs compared with nonveterans (Blosnich, Dichter, Cerulli, Batten, & Bossarte, 2014). For example, male veterans compared with their civilian counterparts had significantly higher prevalence of ACEs across all 11 categories, twice the prevalence of sexual abuse, and twice the prevalence of experiencing four or more ACEs (Blosnich et al., 2014). Female veterans compared with their civilian counterparts had a higher prevalence of physical abuse, exposure to domestic violence, emotional abuse, and being touched sexually (Blosnich et al., 2014). In addition, prior to enlistment, between one third and one half of female veterans had been exposed to physical or sexual abuse (Mercado, Wiltsey-Stirman, & Iverson, 2015). Female veterans also reported greater exposure to ACEs when compared with their male veteran peers (Bannister, Lopez, Menefee, Norton, & Wanner, 2018). In a sample of veterans in inpatient mental health care at the VA, the prevalence of childhood physical abuse was 13.4% and sexual abuse was 11.3%, whereas 5.3% reported a history of both physical and sexual abuse (Koola et al., 2013).

Recent attention has focused on ACEs exposure among veterans due to concerns that ACEs may have a negative effect on the relationship between difficult military experiences (e.g., deployments, up-tempo military operations, combat exposure) and current veteran health (Cabrera, Hoge, Bliese, Castro, & Messer,

2007). ACEs exposure among veterans is associated with a greater likelihood of having a mental health problem later in life (Montgomery, Cutuli, Evans-Chase, Treglia, & Culhane, 2013). Studies with veterans have found direct, main effects of ACEs on PTSD symptoms (Koola et al., 2013; Van Voorhees et al., 2012). Other studies have found interaction effects such that veterans exposed to ACEs are more vulnerable to the effect of combat-related traumatic stress (Iversen et al., 2007). Exposure to ACEs is also associated with depression, and suicidal ideation and suicide attempts (Youssef et al., 2013). The relationship between ACEs and alcohol misuse among veterans is less clear with some studies showing no such relationship (McCauley, Blosnich, & Dichter, 2015) and others showing a positive relationship (Katon et al., 2015).

Not all individuals exposed to ACEs evidence increased risk of later psychological problems. A majority of victims of ACEs who have served in the military show resilience in the face of their prior adversity (Isaacs et al., 2017; Pietrzak & Cook, 2013). Resilience has been defined as the ability to adapt well and maintain a high level of psychosocial functioning following exposure to a trauma or severe stress (Bonanno, Westphal, & Mancini, 2011). Resilience is associated with better mental health among those exposed to trauma (Pietrzak & Cook, 2013). In veterans, resilience has shown to be a mediating factor in the association between both PTSD alone and PTSD in combination with alcohol use disorder and lifetime suicide attempts (Straus et al., 2019). Building resilience among service members prior to combat, such as Comprehensive Soldier Fitness (Seligman & Fowler, 2011), has been attempted, although empirical support for these approaches remains in question. Facilitation of posttraumatic growth (PTG) among service members and veterans has also received attention in the clinical literature (Tedeschi, 2011).

### The Current Study

This study attempted to address several limitations of research examining exposure to ACEs and combat on psychological functioning. First, most prior studies examined samples that include veterans from different combat eras. This is a problem because there is evidence that the relationships among ACEs, combat, and mental health are different as a function of when individuals served (Blosnich et al., 2014). Relatedly, prior studies do not consider how long veterans have been separated from the military. Collapsing data from veterans who have served in different eras (e.g., WWII, Vietnam, Desert Storm, post-9/11) and have been separated from military service over the span of decades likely masks potential differences in the relationships among ACEs, combat, and mental health. Thus, this study examined only post-9/11 veterans who recently separated from the military. Third, in many studies, the number of female veterans is small. Fourth, this one of the first studies to examine two different types of combat exposure (i.e., combat patrol, corollaries of combat) for potential differential effects on mental health outcomes. Finally, only a few studies have examined the degree to which resilience may mediate the impact of ACEs and combat exposure on mental health. Given prior research, we hypothesized that (1) majority of female veterans would report having experienced at least one ACE, whereas fewer male veterans would also report such exposure; (2) female veterans would endorse experiencing a higher percentage of each

type of ACEs compared with male veterans; (3) veterans' exposure to combat would increase the likelihood of mental health problems; (4) veterans who experienced more types of ACEs would have increased odds of having probable mental health problems; and (5) resilience would decrease the odds of having a mental health problem.

## Method

**Participants.** Using the Veterans Affairs/Department of Defense Identity Repository (VADIR), a total population of 48,965 veterans who separated from military service in the prior 90 days between August–November 2016 were identified and invited to participate in the research study. Of the total invited population, complete data were provided by 9,566 veterans in the first wave. Detailed demographics for the original sample have been

previously published (Vogt et al., 2018). Descriptive statistics by gender for covariates and outcomes are presented in Table 1.

**Measures.** Adverse childhood experiences were measured using a seven-item questionnaire from prior research on the impact of ACEs exposure on the risk of developing postdeployment PTSD in a large sample of Marines (LeardMann, Smith, & Ryan, 2010). The measure used in the Marine study was itself derived from the Adverse Childhood Experiences Study (Dube et al., 2003; Felitti et al., 1998). Participants were asked to retrospectively indicate whether they had experienced any of seven ACEs (i.e., physical neglect, emotional neglect, physical abuse, emotional abuse, sexual abuse, domestic violence, family history of mental illness or alcohol abuse) prior to the age of 17 years. Items were dichotomized and summed to create the total number of experiences (i.e., none, 1 to 2, 3, and 4 or more) used in the analytic model. The

Table 1  
*Demographics (Weighted)*

Demographic variables	Female ( <i>n</i> = 7,741)		Male ( <i>n</i> = 40,787)	
	Estimated	( <i>SE</i> ) design effect	Estimated	( <i>SE</i> ) design effect
Army (referent)	29.8%	(1.5%) 1.14	32.5%	(0.7%) 1.18
Navy	23.4%	(1.4%) 1.18	17.9%	(0.6%) 1.22
Air Force	17.6%	(1.1%) 0.84	12.8%	(0.4%) 0.85
Marine Corps	7.2%	(0.8%) 1.01	19.2%	(0.6%) 1.20
National Guard/Reserve (NGR)	22.0%	(1.6%) 1.64	17.6%	(0.7%) 1.45
Left active duty, remaining in NGR	14.6%	(1.1%) 1.00	14.3%	(0.5%) 1.12
Junior enlisted E1–E4 (referent)	42.0%	(1.7%) 1.22	41.3%	(0.8%) 1.29
Enlisted E5–E6	27.6%	(1.4%) 1.12	30.0%	(0.7%) 1.12
Enlisted E7–E9	12.3%	(1.2%) 1.49	13.6%	(0.5%) 0.96
Warrant officer W1–W5	0.6%	(0.2%) 0.79	1.2%	(0.2%) 0.94
Junior officer O1–O3	8.8%	(0.9%) 1.01	6.0%	(0.3%) 0.80
Senior officer O4–O10	8.7%	(0.9%) 1.00	8.0%	(0.4%) 0.89
Honorable discharge (referent)	78.3%	(1.5%) 1.39	82.3%	(0.7%) 1.41
Other than honorable discharge	2.9%	(0.6%) 1.47	4.0%	(0.4%) 1.68
Medical discharge	7.9%	(0.8%) 1.03	5.9%	(0.4%) 1.24
NGR who deactivated	10.8%	(1.3%) 1.71	7.9%	(0.5%) 1.48
Service support occupation (referent)	56.1%	(1.7%) 1.20	33.0%	(0.7%) 1.19
Combat arms occupation	5.0%	(0.8%) 1.26	26.6%	(0.7%) 1.19
Combat support occupation	38.8%	(1.6%) 1.20	40.4%	(0.8%) 1.20
Combat patrol event exposure	14.7%	(1.2%) 1.16	36.6%	(0.7%) 1.14
Corollaries of combat exposure	27.5%	(1.5%) 1.12	49.1%	(0.8%) 1.19
White, non-Hispanic (referent)	51.0%	(1.7%) 1.20	65.0%	(0.8%) 1.26
Black, non-Hispanic	19.5%	(1.4%) 1.33	9.1%	(0.5%) 1.40
Hispanic	15.5%	(1.2%) 1.22	15.6%	(0.6%) 1.25
Asian	5.4%	(0.8%) 1.21	4.2%	(0.3%) 1.43
Multiracial, non-Hispanic	6.3%	(0.8%) 1.16	4.6%	(0.3%) 1.23
Other non-Hispanic	2.1%	(0.6%) 1.68	1.0%	(0.2%) 1.66
Single (referent)	27.5%	(1.6%) 1.30	25.8%	(0.7%) 1.38
Married, first and only marriage	37.2%	(1.6%) 1.15	51.5%	(0.8%) 1.20
Married two or more times	15.2%	(1.2%) 1.14	13.5%	(0.5%) 1.04
Separated, widowed, divorced	20.1%	(1.4%) 1.24	9.2%	(0.5%) 1.22
Military partner is a veteran	21.4%	(1.4%) 1.16	6.7%	(0.4%) 1.05
Military partner currently serving	22.0%	(1.3%) 1.08	3.2%	(0.3%) 1.24
High resilience	20.1%	(1.4%) 1.22	27.8%	(0.7%) 1.16
No ACEs exposure (referent)	41.1%	(1.7%) 1.22	60.7%	(0.7%) 1.19
One to two ACEs	25.5%	(1.4%) 1.14	21.6%	(0.7%) 1.20
Three ACEs	8.7%	(1.0%) 1.23	5.4%	(0.3%) 1.13
Four or more ACEs	24.5%	(1.5%) 1.22	12.3%	(0.5%) 1.17
Wave 1 probable PTSD	30.5%	(1.5%) 1.20	24.9%	(0.7%) 1.16
Wave 1 probable anxiety	32.8%	(1.6%) 1.20	25.9%	(0.7%) 1.22
Wave 1 probable depression	22.8%	(1.4%) 1.23	17.8%	(0.6%) 1.25
Wave 1 probable alcohol misuse	33.2%	(1.6%) 1.20	35.6%	(0.8%) 1.20

*Note.* ACEs = adverse childhood experiences; PTSD = posttraumatic stress disorder.

ACEs measure demonstrated good internal consistency reliability ( $\alpha = .84$ ).

Resilience was measured using the Brief Resilience Scale (BRS; Smith et al., 2008). The BRS is a six-point Likert scale that assesses the degree to which the respondent is able to bounce back from difficulties, cope with stress, and tolerate challenges. Respondents indicated the extent to which they agreed or disagreed on a five-point scale (0 = *cannot bounce back*, 5 = *can easily bounce back*). In the analyses, resilience was used as a protective factor. The items were summed and a cut-point of 4.31 and higher was designated as high resilience whereas values of 1 to 4.30 were designated as low to average resilience (related to cut points see Smith, Epstein, Ortiz, Christopher, & Tooley, 2013). The BRS demonstrated good internal consistency reliability ( $\alpha = .88$ ).

Traumatic combat exposure was measured using a modified nine-item scale that asks how often the veteran encountered a variety of combat-related events (King, King, Vogt, Knight, & Samper, 2006). Combat patrol events items included encountering land or water mines, booby traps, and roadside bombs and firing a weapon at enemy combatants. Corollaries of combat events included being shot at, seeing civilians after they had been severely wounded or disfigured, or personally witnessing a fellow unit member or an ally being severely wounded or disfigured. Response options included 0 (*never*), 1 (*once or twice*), 2 (*several times*), and 3 (*many times*). Due to nonnormal distribution, response options were recoded into a dichotomized variable 1 (*at least once*) and 0 (*never*). Items loaded differently for female and male veterans. The analyses confirmed a two-factor model for female veterans of combat patrols (Items 1, 3, 5, 6) and corollaries of combat (Items 2, 4, 7, 8, 9). Although there was a single factor for males, distinguishing between these two types of stressors is theoretically important. Not all veterans experience the types of stressors related to combat patrol, as some experience only the collateral damage of war contained in the “corollaries of combat” factor. As female veterans’ occupations are broadened to include combat occupations, differentiating between these experiences are crucial. Therefore, the two types of combat factors remained in the analysis for both male and females. This measure demonstrated good internal consistency reliability for both combat patrol events ( $\alpha = .87$ ) and corollaries of combat ( $\alpha = .89$ ). Only the main effects of each type of exposure are included in this analysis.

Probable posttraumatic stress disorder (PTSD) was assessed using the five-item version of the Primary Care PTSD Screen-5 (Prins et al., 2004). The screen asked respondents to indicate if they were exposed to any traumatic event (e.g., a serious accident or fire, physical or sexual assault or abuse, exposure to a warzone) across their life. If the respondent had experienced any traumatic events, they were then asked if they experienced any of the following symptoms in the last month: (1) having nightmares, (2) trying hard not to think about it or avoid situations that were reminders of the experience, (3) being vigilant or easily startled, and (4) feeling numb or detached. In the current study, the screen demonstrated good internal consistency reliability ( $\alpha = .82$ ). Endorsement of three or more symptoms is considered positive for probable PTSD.

Probable anxiety and depression were measured using the Patient Health Questionnaire-4 (PHQ-4; Kroenke, Spitzer, Williams, & Löwe, 2009). Veterans were asked if they experienced two

anxiety-related items within the last 2 weeks: feeling nervous, anxious, or on edge, and not being able to stop or control worrying. The two depression-related items asked the veteran if he or she had experienced the following: little interest or pleasure in doing things or feeling down, depressed, or hopeless within the last 2 weeks. In the present study, the PHQ-4 demonstrated good internal consistency reliability for both anxiety ( $\alpha = .82$ ) and depression ( $\alpha = .77$ ). Response options ranged from 0 (*not at all*) to 3 (*nearly every day*). A sum of the anxiety and depression scores was computed, then a dichotomous variable was computed if the veteran agreed to three or more of the symptoms to meet the criteria for probable anxiety or depression.

Probable alcohol use problems were assessed using the three-item Alcohol Use Disorders Identification Test Consumption (AUDIT-C; Bradley et al., 2007). Questions assessed how often one drinks, how many drinks on a typical day, and how often six or more drinks are consumed at one time. The AUDIT-C demonstrated good internal consistency reliability ( $\alpha = .82$ ). A sum total of the four items were computed. A categorical item was created if the veteran agreed to three or more symptoms for females or four or more symptoms for males to meet the criteria for probable alcohol misuse.

Additional measures were demographic and military service variables, including branch (Army, Air Force, Navy, Marines, National Guard/Reserves [NGR]), paygrade, discharge status, military occupation, race/ethnicity, and marital status.

**Procedures.** Details on the procedures used in this study have been previously published (Vogt et al., 2018). In brief, each veteran identified from VADIR was sent invitations to participate in the study, including a pre-alert postcard, a notification letter containing a \$5 incentive, and two postcard reminders. In addition to the \$5 cash incentive, veterans who completed the survey received a \$20 gift card. The first survey was sent within 3 months of the veteran separating from the active duty component or deactivating from the National Guard/Reserve component. The mental health screeners were measured at the first wave of data collection whereas the ACEs measure was collected approximately 24 to 27 months after separation. ACEs were assessed at this time because the first waves of data collection focused on a narrower range of immediate transition needs. The survey was web-based and took approximately 40 min to complete.

**Data analytic approach.** In survey studies that do not use random sampling, there is always a question regarding the degree to which the responses may be biased because participants in the study may not fully represent the population from which the population was drawn (Cochran, 1997). Because this was not a random sample, the data were weighted to adjust for nonresponse based on three demographic characteristics known in the population of new post-9/11 veterans: branch, paygrade, and gender and nonresponse at Wave 5 (when adverse childhood experiences questions were asked). Weighting statistically adjusts the sample to better reflect the characteristics of the population, although weighting does not guarantee absence of bias. Frequencies were used to describe veterans’ exposure to ACEs. Descriptive statistics were used to estimate mean scores of veterans’ mental health and well-being. Bivariate correlations were calculated for ACEs and each of the outcomes. Finally, logistic regression was used to estimate the relationship between ACEs exposure and probable mental health conditions after controlling for factors that are associated with mental and social functioning among veterans

Table 2  
*Exposure to ACEs Among New Post-9/11 Veterans (Weighted)*

Exposures to ACEs: Number and type	Female (n = 7,787)		Male (n = 41,169)	
	M [95% CI] Estimated (SE)	Design effect	M [95% CI] Estimated (SE)	Design effect
M ACE exposures (range = 0–7)	1.92 [1.77–2.06]	1.08	1.08 [1.02–1.13]	1.21
Number of ACEs				
No exposure to ACEs	41.3% (1.7%)	1.21	60.8% (0.8%)	1.19
Exposure to any ACEs	58.7% (1.7%)	1.21	39.2% (0.8%)	1.19
One ACE	15.6% (1.1%)	1.12	14.1% (0.6%)	1.20
Two ACEs	10.8% (1.0%)	1.11	7.4% (0.4%)	1.18
Three ACEs	8.6% (0.9%)	1.23	5.4% (0.3%)	1.13
Four to seven ACEs	24.7% (1.5%)	1.22	12.3% (0.5%)	1.16
Types of ACEs				
Emotional abuse	39.6% (1.6%)	1.20	25.1% (0.7%)	1.17
Family history of mental illness or alcohol abuse	36.6% (1.6%)	1.17	22.0% (0.7%)	1.18
Emotional neglect	32.4% (1.6%)	1.20	18.1% (0.6%)	1.18
Physical abuse	27.4% (1.5%)	1.21	16.8% (0.6%)	1.16
Sexual abuse	23.4% (1.4%)	1.24	5.6% (0.4%)	1.12
Domestic violence	17.0% (1.3%)	1.24	10.2% (0.5%)	1.13

Note. ACEs = adverse childhood experiences.

(e.g., combat exposure, service-connected disability rating for both physical and mental health problems, and racial/ethnic minority status). Logistic regression models were analyzed separately by gender due to the expected different profiles of the number of adverse childhood experiences; results are reported as odds ratios with their 95% confidence intervals and design effects.

**Results**

**Post-9/11 veteran exposure to ACEs.** As shown in Table 2, the first hypothesis that more female veterans would report at least 1 ACE than males was supported, as a majority of female (59%) and a substantially smaller proportion of male (39%) veterans reported exposure to at least one ACE. In addition, a significantly higher proportion of female veterans (22%) reported exposure to sexual abuse than their male peers (6%). Moreover, as predicted,

a larger proportion of female (43%) and a smaller proportion of male (26%) veterans reported being exposed to multiple ACEs. The second hypothesis was also supported as all types of ACEs were more prevalent for female veterans than male veterans. Emotional abuse, family history of mental illness or alcohol abuse, emotional neglect, and physical abuse were the most commonly experienced adverse childhood experiences.

**Relationship among ACEs, combat exposure, and probable PTSD.** As shown in Tables 3 and 4, female and male veterans who experienced combat patrol events were more than twice as likely to have PTSD. Those females who experienced combat corollaries (e.g., witnessing wounded and injured comrades) were 86% more likely to have probable PTSD than those with no combat corollaries. Male veterans with combat corollary exposure were more than twice as likely to have probable PTSD compared with those with no combat

Table 3  
*Odds Ratios for the Relationship Between Veteran Characteristics and ACEs and Probable Mental Health Outcomes for Females (Weighted)*

Veteran characteristics	Female (n = 7,731)		Female (n = 7,720)		Female (n = 7,741)		Female (n = 7,741)	
	PTSD odds ratio [95% CI]	Design effect	Depression odds ratio [95% CI]	Design effect	Anxiety odds ratio [95% CI]	Design effect	Alcohol misuse odds ratio [95% CI]	Design effect
No combat exposure (ref)								
Combat patrols	2.13 [1.26, 3.59]***	1.16	2.08 [1.20, 3.60]*	1.17	1.67 [1.03, 2.68]*	1.05	1.57 [1.00, 2.47]	1.09
Corollaries of combat	1.86 [1.24, 2.78]***	1.05	1.48 [0.91, 2.38]	1.13	1.33 [0.89, 1.99]	1.04	1.22 [0.83, 1.79]	1.06
Low/average resilience (referent)								
High resilience	0.16 [0.08, 0.31]***	1.45	0.15 [0.07, 0.31]***	1.13	0.22 [0.13, 0.39]***	1.19	0.77 [0.52, 1.12]	1.14
No ACEs (referent)								
One to two ACEs	0.94 [0.62, 1.42]	1.13	1.40 [0.88, 2.23]	1.16	1.17 [0.79, 1.72]	1.11	1.28 [0.89, 1.86]	1.13
Three ACEs	1.93 [1.04, 3.56]*	1.19	2.47 [1.31, 4.68]*	1.22	2.21 [1.28, 3.81]***	1.12	1.42 [0.84, 2.41]	1.13
Four through seven ACEs	2.72 [1.80, 4.13]***	1.22	2.01 [1.27, 3.19]***	1.18	1.89 [1.23, 2.89]***	1.19	1.54 [1.05, 2.25]*	1.16

Note. ACEs = adverse childhood experiences. Nonsubstantive covariates (branch, paygrade, discharge status, combat occupation, marital status, race/ethnicity) were excluded from the table for easier viewing but are described briefly in the results section. ACEs = adverse childhood experiences \* p < .05. \*\*\* p < .001.

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Table 4

*Odds Ratios for the Relationship Between Veteran Characteristics and ACEs and Probable Mental Health Outcomes for Males (Weighted)*

Veteran characteristics	Male (n = 40,775)				Male (n = 40,787)			
	PTSD odds ratio [95% CI]	Design effect	Depression odds ratio [95% CI]	Design effect	Anxiety odds ratio [95% CI]	Design effect	Alcohol misuse odds ratio [95% CI]	Design effect
No combat (referent)								
Combat patrols	2.31 [1.84, 2.91]***	1.14	1.27 [0.99, 1.62]	1.13	1.37 [1.10, 1.71]*	1.12	1.37 [1.13, 1.66]***	1.10
Corollaries of combat	2.20 [1.71, 2.82]***	1.23	1.59 [1.22, 2.06]***	1.23	1.45 [1.15, 1.83]***	1.20	1.03 [0.85, 1.25]	1.14
Low/average resilience								
High resilience	0.18 [0.14, 0.23]***	1.16	0.17 [0.12, 0.24]***	1.37	0.17 [0.13, 0.22]***	1.27	0.65 [0.56, 0.76]***	1.15
No ACEs (referent)								
One to two ACEs	1.31 [1.06, 1.61]*	1.20	1.20 [0.95, 1.51]	1.26	1.36 [1.11, 1.66]***	1.24	1.13 [0.95, 1.34]	1.20
Three ACEs	1.91 [1.36, 2.68]***	1.15	2.08 [1.47, 2.94]***	1.19	2.20 [1.61, 3.01]***	1.17	1.30 [0.97, 1.74]	1.14
Four to seven ACEs	2.63 [2.06, 3.36]***	1.17	2.21 [1.72, 2.84]***	1.19	2.60 [2.06, 3.28]***	1.17	1.12 [0.91, 1.38]	1.15

*Note.* ACEs = adverse childhood experiences. Nonsubstantive covariates (branch, paygrade, discharge status, combat occupation, marital status, race/ethnicity) were excluded from the table for easier viewing but are described briefly in the results section.

\*  $p < .05$ . \*\*\*  $p < .001$ .

exposure. Female and male veterans who scored high in resilience were significantly less likely to have probable PTSD than those low to average in resilience.

For female veterans exposed to one or two ACEs, there were no differences in probable PTSD compared with those with no ACEs. Female veterans who were exposed to three ACEs were 1.9 times more likely to have probable PTSD compared with those with no ACEs, whereas those with four or more ACEs were 2.7 times more likely to have probable PTSD. Male veterans exposed to one or two ACEs were 31% more likely to have probable PTSD compared with peers reporting no exposures. Male veterans with three ACEs were nearly twice as likely to have probable PTSD, and those exposed to four or more ACEs were nearly three times as likely.

Several covariates were also related to probable PTSD. Female veterans from the Navy and Marines were more likely to have probable PTSD relative to those from the Army. Compared with female veterans from the most junior enlisted paygrades, female veterans from the senior officer paygrades were significantly less likely to have probable PTSD; however, no other differences in paygrade were found. Male veterans from E5–E6 paygrades and officer paygrades were less likely to have probable PTSD compared with the most junior enlisted paygrades (E1–E4). Compared with White non-Hispanic (NH) veterans, Black NH and multiracial NH veterans were 70% and more than twice as likely to have probable PTSD, respectively. Male veterans who were Black NH, Hispanic, and multiracial NH were all more likely to have probable PTSD than White NH males. Male veterans with a medical discharge were 73% more likely to have probable PTSD relative to those with an honorable discharge.

**Relationship among ACEs, combat exposure, and probable depression.** Female veterans who experienced combat patrol events were more than two times as likely to have probable depression compared with noncombat patrol peers (see Table 3). In addition, there was no significant relationship for male veterans with combat patrol events, however, males who were exposed to corollaries of combat were 60% more likely to have depression than those with no such exposure (see Table 4). Both male and

female veterans with high resilience were significantly less likely to have probable depression. Moreover, female and male veterans exposed to one or two ACEs did not have increased odds of probable depression compared with those with no exposures. Both female and male veterans exposed to three or more ACEs were more than twice as likely to have depression compared with those with no exposures.

Several other covariates related to probable depression. Female veterans from the Navy were 87% more likely to have probable depression compared with those from the Army, the reference group. Female veterans from the NGR were significantly less likely to have depression compared with Army peers. Compared with female veterans from the most junior enlisted paygrades, those from the senior officer paygrades were significantly less likely to have probable depression. Male veterans from the E7–E9 paygrades and officers were less likely to have depression compared with those from the most junior enlisted paygrades. Female veterans who had a medical discharge were 86% more likely to have probable depression than peers with an honorable discharge, whereas male veterans with a medical discharge were nearly three times more likely to have probable depression than those with an honorable discharge. Compared with their White NH female veteran peers, veterans who belong to other non-Hispanic racial groups (i.e., Middle Eastern, Native American Indian) were four times more likely to have probable depression. Compared with White NH veterans, Black NH and Hispanic male veterans were 63% and 66% more likely to have probable depression, respectively.

**Relationship among ACEs and probable anxiety.** As shown in Table 3, female veterans who experienced combat patrol events were 67% more likely to have anxiety. Moreover, male veterans who experienced combat patrol events and corollaries of combat were 37% and 45% more likely to have anxiety than those with no combat exposure (see Table 4). Female and male veterans high in resilience were less likely to have anxiety.

The odds of having anxiety did not differ between female veterans exposed to one to two ACEs and no ACEs. In contrast, male veterans exposed to one or two ACEs were 36% more likely

to have anxiety compared with veterans with no ACEs. Female veterans exposed to three ACEs and those exposed to four or more ACEs were 2.2 and 1.9 times more likely, respectively, to have anxiety compared with those with no ACEs. Male veterans exposed to three ACEs or four or more ACEs were more than twice as likely to have anxiety compared with those not exposed.

Several other covariates related to probable anxiety. Male veterans from the Air Force, NGR, and those who had left active duty but were currently serving in NGR were all significantly less likely to have probable anxiety compared with their Army peers, whereas those from the Marines were 33% more likely. Compared with female veterans from the most junior enlisted paygrades, warrant officers were almost five times more likely to have probable anxiety. For male veterans, warrant and commissioned officer paygrades were less likely to have anxiety compared with junior enlisted paygrades (E1 to E4). Female veterans who had a general, other than honorable, or medical discharge were both more than twice as likely to have anxiety compared with those who were honorably discharged. For male veterans, those who had a medical discharge were two times more likely to have anxiety compared with an honorable discharge. There were no differences in anxiety prevalence among racial groups among female veterans. However, compared with their White NH male veteran peers, Black NH and Hispanic veterans were 40% and 33% more likely to have anxiety, respectively.

**Relationship among ACEs, combat, and probable alcohol misuse.** As shown in Table 3, neither combat patrol events nor corollaries of combat were associated with probable alcohol misuse for female veterans. However, male veterans with combat exposure were 37% more likely to have alcohol misuse compared with veterans without combat exposure (see Table 4). Resilience was not associated with alcohol misuse among female veterans, but highly resilient male veterans were significantly less likely to have alcohol misuse problems.

Exposure to fewer than four ACEs did not increase the odds of having a probable alcohol misuse problem. Female veterans with four or more ACEs exposures were 54% more likely to have a probable alcohol misuse than those exposed to no ACEs. For males, ACEs were not associated with probable alcohol misuse problems.

Other covariates were also related to probable alcohol misuse. Male veterans from the Navy were 61% and those from the Marines were 52% more likely to have a probable alcohol misuse problem compared with their Army peers, whereas those who left activated status and were still serving in NGR were significantly less likely. Compared with female veterans from the most junior enlisted paygrades, those from the senior officer paygrades were nearly twice as likely to have alcohol misuse. Female veterans with a general or other than honorable discharge were nearly three times more likely to have alcohol misuse compared with those honorably discharged. Black NH and multiracial female veterans were significantly less likely to have an alcohol misuse problem compared with White NH veterans. Black NH, Hispanic, and Asian NH male veterans were significantly less likely to have alcohol misuse compared with White NH veterans. Compared with male veterans with a service support occupation, those with a combat arms occupation were 37% more likely to have alcohol misuse.

## Discussion

This was the first study to examine the impact of veteran characteristics (e.g., gender, paygrade, race), military experiences, and exposure to ACEs on the current mental health functioning of a large sample of male and female post-9/11 veterans who recently left active duty service. Consistent with hypotheses, a majority of female and a substantial proportion of male veterans reported exposure to one ACE. Moreover, approximately half of female and one-quarter of male veterans experienced exposure to multiple ACEs, with the four most common types of ACEs experienced being the same for both sexes. Thus, the findings of this study converge on prior research examining the frequency of veteran exposure to ACEs (Blosnich et al., 2014; Katon et al., 2015), among post-9/11 veterans (Van Voorhees et al., 2012).

As with other studies (Blosnich et al., 2014), female veterans were particularly vulnerable to ACEs. Females were more likely to experience four or more ACEs exposures compared with males. Sexual and physical abuse were experienced by approximately one-quarter of female veterans. This level of ACEs is concerning because these exposures have stronger associations to poor health outcomes for female veterans than male peers (Katon et al., 2015). There are a number of effective evidence-based trauma-related treatments that could be used with both male and female veterans (Ehring et al., 2014), but these treatments have high levels of attrition (Kehle-Forbes, Meis, Spont, & Polusny, 2016). Future research should explore how best to increase treatment completion for trauma-related problems to ensure program effectiveness for this population at risk. Effective delivery of these treatments in fewer sessions is one promising approach (Foa, 2011).

The impact of ACEs on the likelihood of mental health conditions was complex and varied to an extent by gender. In general, ACEs were associated with increased odds of having a probable mental health problem, replicating prior studies (Van Voorhees et al., 2012). ACEs were more consistently associated with mental health problems for male veterans (i.e., eight significant associations) than their female peers (i.e., six significant associations). For female veterans, exposure to one to two ACEs did not increase the odds of having any mental health condition, whereas for males this level of exposure was associated with PTSD and anxiety. This finding may provide support for the notion that, for some individuals, exposure to ACEs may build, rather than diminish, one's capacity to cope with difficult circumstances later in life (Seery, 2011), and this may be particularly true for female veterans. Future studies should examine why some veterans are not adversely affected by low frequency ACEs exposure. Such insights could yield important information on how to build resilience among service members and veterans. Indeed, building resilience among veterans has been a focus of intervention. For example, *moving forward* is a brief problem-solving group intervention that has shown promising effects for veterans impacted by traumatic experiences (Tenhula et al., 2014). Other psychosocial factors that should be targeted in building resilience in the face of trauma include optimism, active coping skills, social support, cognitive flexibility, and maintaining physical well-being (Iacoviello & Charney, 2014).

Generally, combat patrol events were associated with approximately a one- to twofold increase in the likelihood of having a probable mental health problem, although there were two excep-



tions. For male veterans, combat patrol exposure was not associated with depression, whereas for females, combat was not associated with alcohol misuse. The association between combat exposure and mental health challenges, particularly PTSD, has been well documented among veterans (Institute of Medicine, 2010), and there is evidence that post-9/11 veterans exposed to combat have poorer mental health than veterans from prior conflicts (Waszak & Holmes, 2017).

An important extension of the literature made in this study was the distinction made between direct combat exposure and being exposed to the corollaries of combat (e.g., witnessing carnage). This is an important distinction because there are many service members who observe the combat corollaries (e.g., nurses, physicians, transportation specialists). Although combat exposure was consistently associated with poorer mental health, experiencing a combat corollary was inconsistently associated with the odds of having a probable mental health problem. Future studies should examine the interaction of combat, corollaries of combat, and ACEs. Providers should assess the degree to which veterans were exposed to both types of traumatic combat experiences.

A limitation of this study is that we were not able to classify the intensity of the ACEs experienced, only the frequency of exposure to seven different types of ACEs. The intensity of experiences and the particular mix of exposure types may be important in determining the strongest impact on mental health and well-being outcomes later in life. We also did not measure the intensity of combat exposure and corollaries, which may have differed considerably between male and female veterans. Combat military occupations have only been open to females since December 2015, and it is unclear how their combat experiences differ from their male peers' (Swick & Moore, 2019). Future studies should investigate the interaction between ACEs and combat experiences and their impact on mental health outcomes as a function of gender. As more females take on combat roles, there will be more opportunities to examine this phenomenon.

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