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Differences in childhood adversity, suicidal ideation, and suicide attempt among veterans and nonveterans

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Abstract

Adverse childhood experiences (ACEs) are robustly associated with physical and mental health problems over the lifespan. Relatively limited research has examined the breadth of ACEs among military veteran populations, for whom ACEs may be premilitary traumas associated with suicidal ideation and attempt. Using data from the Comparative Health Assessment Interview

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Research Study, a large national survey sponsored by the US Department of Veterans Affairs, this investigation examined the prevalence of 22 self-reported potentially traumatic experiences before the age of 18 (i.e., ACEs) among veterans and nonveterans and estimated the association of ACEs with suicidal ideation and attempt at age 18 or older. All analyses were weighted to account for complex sampling design and stratified by gender. The study sample included 9,571 veteran men, 3,143 nonveteran men, 5,543 veteran women, and 1,364 nonveteran women. Veteran men reported greater average frequency of ACEs than nonveteran men (2.7 ACEs vs. 2.3 ACEs, respectively, $p<.001$); 11.1% of veteran men indicated >6 ACEs compared to 7.3% of nonveteran men ($p<.001$). Veteran women reported greater average frequency of ACEs than nonveteran women (3.1 ACEs vs. 2.4 ACEs, respectively, $p<.001$). Among women, more veterans than nonveterans reported >6 ACEs (14.9% vs. 8.6%, respectively, $p<.001$). The strongest correlate of suicide attempt at age 18 or older for veteran men was having >6 ACEs (aOR=4.20, 95%CI=2.72-6.49); for veteran women, the strongest correlate was suicidal ideation or attempt prior to age 18 (aOR=5.37, 95%CI=4.11-7.03). Suicide prevention research, policy, and practice should address ACEs among veterans as salient premilitary risk factors.

Keywords

Adult survivors of child abuse; Veterans; suicidal ideation; suicide attempt

INTRODUCTION

Deemed a “chronic public health disaster,” adverse childhood experiences (ACEs) are robustly tied to physical and mental health problems over the lifespan in the United States (US) (Anda & Brown, 2010) and globally (Hughes et al., 2017), including risk of suicidal ideation and suicide attempt (Choi et al., 2017; Dube et al., 2001). Thus, ACEs may be particularly relevant in veteran populations who tend to be at high risk of suicidal ideation and suicide attempt (US Department of Veterans Affairs, 2019). Recent studies from the US, Canada, and the United Kingdom suggest that military veterans may have greater exposure to ACEs than their nonveteran counterparts (Afifi et al., 2016; Blosnich et al., 2014; Woodhead et al., 2011). With the overall increase of suicide among military veterans in the US (US Department of Veterans Affairs, 2019), better epidemiology of the breadth of ACEs among veterans and studies comparing how veterans and nonveterans may differ on ACEs are necessary to fully understand cumulative trauma and inform targeted suicide prevention.

Suicide among veterans has become a national priority over the last 15 years after discovery that the suicide rate among veterans, typically historically lower than the general US population (Rothberg et al., 1990; Rothberg et al., 1987), was increasing and eventually exceeded the age- and sex-adjusted suicide rates of the general US population (Kang et al., 2015; Kaplan et al., 2007; McCarthy et al., 2009). In 2017, the age- and sex-adjusted suicide rate for veterans was 1.5 times that of nonveterans (US Department of Veterans Affairs, 2019). Suicide also has increased among active duty military personnel. The Department of Defense (DoD) reported annual increases in suicide among active duty service personnel and reservists from 2011-2018 (Tucker et al., 2019). Despite considerable

focus on traumas incurred during military service (Bryan et al., 2015) and medical and mental health conditions (McCarthy et al., 2015) as reasons for suicide disparities, limited attention has focused on premilitary trauma, such as ACEs.

The Adverse Childhood Experiences Study by Felitti and colleagues (1998) was the first large-scale survey to explore the effect of ACEs on health risk behaviors and health outcomes within a healthcare setting. The original inventory used 17 items that were distilled into seven categories of ACEs. The authors found that greater frequency of self-reported ACEs was positively associated with deleterious physical and mental health outcomes (Felitti et al., 1998), including increased risk of premature all-cause mortality (Brown et al., 2009). Later studies documented strong positive associations between adults with ACEs and suicide attempts (Dube et al., 2001). The Adverse Childhood Experiences Study would eventually give rise to an 11-item inventory to assess psychological abuse, physical abuse, sexual abuse, and household dysfunction (i.e., substance abuse, mental illness, or criminal behavior of household member; mother treated violently), adopted by the Centers for Disease Control and Prevention in public health surveillance (Bynum et al., 2010). Subsequent epidemiological research has replicated the high prevalence of suicidal ideation and suicide attempt in adults with ACEs (Fuller-Thomson et al., 2016; Joiner Jr et al., 2007). However, these studies have not typically expanded their assessment of ACEs beyond the 11-item inventory, purposefully included veterans or concurrently sampled from both veteran and civilian populations.

Prior research suggests there are robust gender differences in exposure to ACEs. Overall, women tend to report significantly more categories of ACEs (Edwards et al., 2003) than men, specifically childhood sexual abuse and witnessing maternal battering. Men are more likely than women to report physical abuse (Dube et al., 2005; Edwards et al., 2003). Importantly, the relationship between exposure to ACEs and health outcome may be moderated by gender. For example, in men, ACEs are linked with more high-risk health behaviors compared to women (Fang et al., 2016); emotional neglect has been linked with risk for suicide attempts in men (Choi et al., 2017). Moreover, men and women exhibit differential profiles of ACE exposure and associated mental health problems (e.g., substance use) (Cavanaugh et al., 2015). A large epidemiological analysis of civilians and those with military experience found that women with more total ACEs had poorer physical and mental health, while these relationships were less pronounced among men (Katon et al., 2015).

There are multiple theoretical pathways through which adults with ACEs may be at increased risk for suicide. For instance, maladaptive personality changes in youth may arise from a negative, violent, and chaotic environment that models and bolsters aggressive and impulsive behaviors (Perez et al., 2016), which may also stunt problem-solving abilities (Esposito & Clum, 2002). Additionally, ACEs map with the Interpersonal Theory of Suicide constructs of thwarted belongingness, perceived burdensomeness, and even acquired capability (Schönfelder et al., 2019; Van Orden et al., 2008). For example, acquired capability hinges upon painful and provocative experiences that erode the instinct to survive, and physical pain from physical and sexual violence victimization and mental pain or habituation to thoughts of death due to abuse may align with acquired capability (Kremer et al., 2017; Stewart et al., 2017). Furthermore, studies suggest that adults with ACEs may have

potential epigenetic sequelae that increase risk for suicide, including sustained engagement of the hypothalamic-pituitary-adrenal cortex (Braquehais et al., 2012; Roy et al., 2012), shortened telomere length (Kim et al., 2019), and weathering from chronic stress manifested through elevated allostatic load (Katz et al., 2012).

Research about ACEs experienced by veterans has been limited in the US due in part to the lack of data on military service and ACEs. Early research has supported the salience of ACEs for veterans, although this research has been limited to examining how the risk of posttraumatic stress disorder (PTSD) may be influenced by ACEs (Bremner et al., 1993; Zaidi & Foy, 1994). Studies, mostly with women, suggest that ACEs are more common among veterans than nonveterans (Kelly et al., 2011; Sadler et al., 2004; Schultz et al., 2006). Two Behavioral Risk Factor Surveillance System studies found large differences in prevalence of ACEs among both veteran men and women (Blosnich et al., 2014; Katon et al., 2015). However, these studies were not nationally representative. Studies also have explored ACEs among active duty personnel. Rosen & Martin (1996) documented that childhood sexual and physical abuse were highly correlated with psychological symptoms in a sample of over 1,300 soldiers from three Army posts. A review of soldiers who attempted or died by suicide from 2005-2010 revealed that about 4 in 10 soldiers who died by suicide had a history of childhood trauma and 6 in 10 soldiers who attempted suicide had a history of childhood trauma (Perales et al., 2012). In the 2015 DoD Health Related Behaviors Survey (HRBS) of active duty personnel, 13% of respondents reported lifetime physical abuse, but the survey did not identify childhood physical abuse (Meadows et al., 2018). However, these studies did not have a non-military comparison sample or, in the case of the HRBS, did not specifically ascertain abuse prior to 18 years of age.

Although widely used, the ACEs inventory may not adequately capture the breadth of early life adversity (Cronholm et al., 2015; Karatekin & Hill, 2019). Although the ACEs inventory identifies many potentially traumatic events (PTEs), veterans and nonveterans may have some experiences before the age of 18 (e.g., childhood bullying, living in unsafe communities as a child, and food or housing insecurity as a child) that are not typically assessed in the ACEs inventory but have been associated with poor physical and mental health in adulthood (Finkelhor et al., 2015; Sweeting et al., 2020). For example, Mersky, Janczewski, & Topitzes (2017) found that childhood PTEs not included in the ACEs inventory yet conceptually related (e.g., bullying, being a victim of violence, experiencing homelessness, food insecurity) were correlated with the ACEs inventory and positively associated with current stress. Furthermore, some researchers have argued that these childhood PTEs are critical to measure for a more complete categorization and understanding of ACEs and suggested expanding categories of ACEs to better gauge the extent of PTEs in childhood and their associations with adult wellbeing (Finkelhor et al. 2013; Karatekin & Hill, 2019). However, current knowledge regarding the relationship between ACEs and veterans' suicidal outcomes is limited by the lack of how an expanded breadth of ACEs may differ between veterans and nonveterans.

In sum, research suggests that military veterans are more likely to report ACEs than their peers who did not serve in the military, these experiences may increase military veterans' prevalence of suicidal ideation and suicide attempt, and existing research has

methodological limitations and key knowledge gaps. We sought to address these limitations through analysis of a large, national study of veterans and nonveterans, the Comparative Health Assessment Interview (CHAI) Research Study. Specifically, we aimed to: (1) compare the prevalence between veterans and nonveterans of potentially traumatic events (PTEs) prior to age 18 including commonly collected ACEs (e.g., childhood physical and emotional abuse), and (2) examine the associations of ACEs with the odds of suicidal ideation and suicide attempt after age 18. All analyses were stratified by gender due to known gender differences in ACEs between men and women both in veteran (Street et al., 2009) and nonveteran populations.

METHODS

The CHAI Research Study is a Department of Veterans Affairs (VA) cross-sectional survey study that aimed to explore differences in the health and well-being of post-9/11 veterans and nonveterans. CHAI obtained a stratified probability-based sample of veterans who served during Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (n=38,633) and an age- and sex-matched nonveteran sample (n=16,483). Veterans were drawn from the U.S. Veterans Eligibility Trends and Statistics (USVETS) dataset, which includes all deployed and non-deployed military personnel. The CHAI sample was limited to those who had been Active Duty or who had had a period of active service (as a member of the Reserve or National Guard) at some point between September 11, 2001 and May 2015. The nonveteran component was drawn from the GfK Groups' KnowledgePanel®, comprised of a probability-based, nationally representative web panel of non-institutionalized adults ≥18 years of age residing in the United States (GfK, (n.d.)). Veterans were excluded from this sample.

Data were collected from April 18, 2018 through August 10, 2018 by either a secured online survey or via a computer-assisted telephone interview. For the online survey, invitations were mailed to the veteran samples, introducing the study and its goals and providing a website and individualized log-in information to access the survey or they could complete the survey through computer-assisted telephone interview via a toll-free study line. After the mailed invitation, veterans who had not responded were followed up with a mailed reminder card and a mailed reminder letter. The sample of nonveterans received an invitation email and reminders that followed GfK recruitment protocol. Respondents completed the informed consent process via the website. All study participants received $50 as compensation for their time completing the survey. The response rate among veterans was 40.0%, similar to other response rates of recent surveys with veterans (Bastian et al., 2014; Eber et al., 2013; Street et al., 2013; Turvey et al., 2012). The response rate for nonveterans recruited through GfK was 56.5% for active panelists and 8.4% for inactive panelists (recruited to meet sampling targets for males ages 18-39). Because the veteran and nonveteran samples had different age ranges , the observations outside the region of common and well-represented support (ages 21-75) were censored. For example, because there were no veteran respondents aged 18 or 19 years, nonveterans respondents aged 18 or 19 years were excluded from analyses in order that model assumptions be satisfied. There was one veteran and 35 nonveterans aged 20 years old and these observations were all excluded because of the low representation of a single observation in the veteran group. Censoring the previously

mentioned observations and all observations with age 76 or over resulted in the exclusion of 124 individuals (118 nonveterans; 6 veterans). The VA Central Institutional Review Board approved this study.

Potentially traumatic events (PTEs) and ACEs.

The measurement of potentially traumatic events drew from two inventories about potentially traumatic events (PTEs): the Life Stressors Checklist – Revised (LSC-R) (Wolfe et al., 1997) and the Life Events Checklist for DSM-5 (LEC-5) – Extended (Weathers et al., 2013). Both the LSC-R and LEC-5 have demonstrated sound psychometric properties (Blevins et al., 2015; Gray et al., 2004). This approach was taken to create a measure that comprehensively covered overarching stressor categories assessed by these measures, while limiting time burden. Items were expanded to ask about life course timing of PTEs, as used in prior research (Garfin et al., 2020). If a respondent indicated an affirmative answer to any of the items, they were asked a follow-up question for each affirmative response to indicate if the event happened "before age 18," "age 18 or older," or both. We assessed 22 individual PTEs that occurred before the age of 18 (yes=1 or no=0). Table 2 includes the text of the 22 ACEs assessed. Because some PTEs in our analysis included experiences captured in the ACEs inventory (e.g., physical abuse) (Felitti et al., 1998) and some PTEs reflected experiences that have been identified as additional ACEs (e.g., food insecurity, homelessness) (Mersky et al., 2017), we use the acronym "ACEs" to include items both from the ACEs inventory and these additional PTEs. A variable for cumulative frequency of ACEs was generated based on the sum of affirmative answers to the 22 individual events. Based on the distribution of the cumulative frequency of ACEs and replicating a 5-level ordinal categorization from previous studies (Felitti et al., 1998; Cabrera et al., 2007), a 5-category ordinal variable of 0, 1-2, 3-4, 5-6, or >6 ACEs was used for comparative analyses.

Suicide Ideation and Attempts.

CHAI included items from the Columbia-Suicide Severity Rating Scale (C-SSRS) (Posner et al., 2011) to briefly assess active lifetime suicidal ideation (SI, "Have you ever actually had any thoughts of killing yourself?") and suicide attempt (SA, "Have you ever made a suicide attempt?"). An affirmative answer to either of these questions was followed with a timing variable asking the respondent if they experienced SI or SA "before age 18," "age 18 or older," or both. From these questions, we created four separate dichotomous variables: (1) suicidal ideation prior to age 18; (2) suicidal ideation at age 18 or older; (3) suicide attempt prior to age 18; and (4) suicide attempt at age 18 or older.

Covariates.

Three major sociodemographic factors were included as covariates in all analyses. Age group was defined using quartiles from the overall sample: 18-33, 34-38, 39-49, and ≥50. Race and ethnicity were categorized as: White non-Hispanic; Black/African American non-Hispanic; other racial identity non- Hispanic; and Hispanic. Highest level of educational attainment was recoded into four groups: high school diploma or less; some post-secondary education (including some college but no degree and associate degrees); baccalaureate degree; and post-baccalaureate education. A single variable for either suicidal ideation

or suicide attempt prior to age 18 was included as a covariate. Gender was defined as respondents who self-identified their gender identity as male or female. Respondents who indicated being transgender male (n=23), transgender female (n=11), gender nonconforming (n=29), or reported having a different gender identity (n=12) were excluded from analyses due to small samples. Because of disparities in ACEs among individuals who identify as lesbian, gay, or bisexual (Andersen & Blosnich, 2013), sexual orientation was included in analyses and coded as heterosexual or sexual minority (i.e., lesbian, gay, bisexual, or other sexual identity).

Analyses.

All analyses were weighted to account for the complex sampling design, noncoverage and nonresponse, and used Taylor series approximation (linearization) variance estimation. Separate weights were constructed for veteran and nonveteran samples. For veterans, weights included a base sampling weight, a nonresponse adjustment, and a calibration to gender, deployment factors (branch, component, geographic stratum), and pre/post 9/11activation (though all served on active duty or had periods of activation post-9/11, a subset also had been on active duty or activated prior to 9/11). For nonveterans, weight construction included the probability of selection into the KnowledgePanel and into the CHAI sample and matched back to US Census benchmarks from the most recent Current Population Survey.

Because ACEs differ between men and women, we stratified all analyses by gender. First, differences between veterans and nonveterans were assessed using bivariate comparisons adjusted for age/race-ethnic/education level distributions. For clarity of results, unweighted frequencies were suppressed in favor of reporting weighted percentages. Several bivariate comparisons were assessed. The literature contains commentary and arguments for and against using adjusted *p*-values to account for multiple testing and familywise error (O'Keefe, 2003; Rothman, 1990; Tutzauer, 2003). Rather than use a corrected *p*-value to determine statistical significance for the tests for bivariate comparisons, all uncorrected *p*-values for individual bivariate tests are reported for the reader. For all analyses, statistical significance was defined as $p<.05$. Unadjusted comparisons on ACEs between veterans and nonveterans were conducted in three ways: (1) difference in the prevalence of individual ACEs, (2) the mean number of ACEs reported between veterans and nonveterans, and (3) proportions across the categories of the ordinally-coded ACEs variable described above. To further assess whether veterans reported more ACEs compared to nonveterans, multiple logistic regression was used to assess the association of veteran status (0=nonveteran, 1=veteran) with the odds of reporting individual ACEs (yes=1, no=0) after controlling for educational attainment, age group, race/ethnicity, and sexual orientation.

Finally, to examine the associations of ACEs with SI and SA at age 18 or older, we stratified multiple logistic regression analyses by both sex and veteran status (e.g., how are ACEs associated with SI at age 18 or older among veteran men after controlling for other confounding factors?). ACEs were included in the models as the 5-level ordinal variable with zero ACEs as the reference category. Adjusted odds ratios with 95% confidence

intervals are reported for all multivariable models. All analyses were conducted using Stata SE version 15.

RESULTS

There was a total of 9,571 veteran men, 3,143 nonveteran men, 5,543 veteran women, and 1,364 nonveteran women in the study sample. Veterans and nonveterans differed on all sociodemographic characteristics. For instance, both veteran men and women tended to be younger and have higher educational attainment than their nonveteran men and women counterparts (Table 1). Veteran women tended to be more racially/ethnic diverse than nonveteran women, but veteran men tended to be less racially/ethnic diverse than nonveteran men. Additionally, veteran women tended to have a higher percentage of sexual minorities than nonveteran women (11.7% vs. 6.2%, respectively, $p<.001$), but veteran men had a lower percentage of sexual minorities than nonveteran men (2.7% vs. 8.3%, respectively, $p<.001$).

Among women, veterans and nonveterans did not significantly differ in unadjusted prevalence of either suicidal ideation or suicide attempt before the age of 18, but veteran women had significantly greater unadjusted prevalence of suicidal ideation and suicide attempt at age 18 or older compared to nonveteran women (Table 1). Among men, veterans had significantly lower prevalence of both suicidal ideation and suicide attempt before age 18 compared to nonveterans. However, this association reversed for suicidal ideation and suicide attempt at age 18 or older: veteran men had significantly higher prevalence than nonveteran men.

ACEs among veteran and nonveteran men

Veteran men were more likely than nonveteran men to report multiple ACEs (Table 2). For instance, after accounting for education, age group, race/ethnicity, and sexual orientation, veteran men had 69% increased odds of reporting family separation (aOR=1.69, 95%CI=1.37-2.08), 67% increased odds of witnessing extreme physical violence among family members (aOR=1.67, 95%CI=1.42-1.96), and 74% increased odds of being seriously physically assaulted by someone close to them (aOR=1.74, 95%CI=1.40-2.17) compared to nonveteran men. Based on the separate analyses of individual ACEs, veteran men had significantly greater odds than nonveteran men of experiencing 12 out of the 22 total ACEs. Veteran men had significantly lower odds of three ACEs than nonveteran men: 33% less likely to report having been bullied (aOR=0.67, 95%CI=0.61-0.74), 38% less likely to report exposure to unwanted or uncomfortable sexual experiences other than assault (aOR=0.62, 95%CI=0.50-0.77), and 73% less likely to report having experienced a life-threatening physical illness or injury (aOR=0.27, 95%CI=0.18-0.41).

On average, veteran men reported greater mean ACEs than nonveteran men (2.7 ACEs vs. 2.3 ACEs, respectively, $p<.001$). Approximately 11.1% of veteran men indicated more than six ACEs compared to 7.3% of nonveteran men ($p<.001$).

ACEs among veteran and nonveteran women

As with men, several differences were observed in ACEs among women based on veteran/nonveteran status after accounting for education, age group, race/ethnicity, and sexual

orientation (Table 3). For instance, veteran women had 67% increased odds of reporting emotional abuse or neglect by a parent, caregiver, or partner (aOR=1.67, 95%CI=1.37-2.03), 204% increased odds of witnessing sudden violent of accidental death or its aftermath (aOR=3.04, 95%CI=1.80-5.14), and 111% increased odds of being seriously physically assaulted by someone close to them (aOR=2.11, 95%CI=1.49-3.00) compared to the nonveteran women. From all of the separate analyses of individual ACEs, veteran women had significantly greater odds of experiencing 9 of 22 ACEs compared to nonveteran women. There were four instances in which veteran women had significantly lower odds of some ACEs than nonveteran women: 21% less likely to report experiencing the expected or non-sudden death of a close family member or friend (aOR=0.79, 95%CI=0.64-0.96), 44% less likely to have been bullied (aOR=0.56, 95%CI=0.47-0.66), 34% less likely to report exposure to unwanted or uncomfortable sexual experiences other than assault (aOR=0.66, 95%CI=0.54-0.80), and 31% less likely to witness severe human suffering (aOR=0.69, 95%CI=0.48-0.98).

On average, veteran women had greater mean ACEs than nonveteran women (3.1 ACEs vs. 2.4 ACEs, respectively, $p<.001$). Approximately 14.9% of veteran women indicated more than six ACEs compared to 8.6% of nonveteran women ($p<.001$).

Suicidal ideation, suicide attempt, and ACEs among veteran men

For veteran men, the strongest correlate of suicidal ideation at age 18 or older was having suicidal ideation or suicide attempt prior to age 18 (Table 4, Column A). Education and racial/ethnic identity were not significantly associated with odds of suicidal ideation at age 18 or older among veteran men. But veteran men in younger age groups and sexual minority veteran men had greater odds of suicidal ideation at age 18 or older than their respective peers. All ACEs categories were significantly associated with suicidal ideation at age 18 or older for veteran men.

A different group of covariates were significantly associated with suicide attempt at age 18 or older for veteran men (Table 4, Column C). Veteran men with lower educational attainment had significantly greater odds of suicide attempt at age 18 or older than veteran men with higher educational attainment. Unlike in the model estimating suicidal ideation at age 18 or older, having any suicidal ideation or suicide attempt prior to age 18 was not the strongest correlate of suicide attempt at age 18 or older for veteran men; having >6 ACEs was the strongest correlate (aOR=4.20, 95%CI=2.72-6.49). There was a noticeable linear association of ACEs with suicide attempt at age 18 or older among veteran men.

Suicidal ideation, suicide attempt, and ACEs among nonveteran men

Similar to veteran men, the strongest correlate of suicidal ideation at age 18 or older for nonveteran men was having suicidal ideation or suicide attempt prior to age 18 (Table 4, Column B), and all categories of ACEs were significantly associated with suicidal ideation at age 18 or older. However, unlike veteran men, age group was not significantly associated with suicidal ideation at age 18 or older among nonveteran men.

Age and race/ethnicity were not significantly associated with suicide attempt at age 18 or older for nonveteran men (Table 4, Column D). Unlike veteran men, having suicidal ideation

or suicide attempt prior to age 18 was the strongest correlate of suicide attempt at age 18 or older for nonveteran men. Moreover, ACEs categories were not significantly associated with suicide attempt at age 18 or older for nonveteran men, which was different from veteran men.

Suicidal ideation, suicide attempt, and ACEs among veteran women

Similar to veteran men, the strongest correlate of suicidal ideation at age 18 or older among veteran women was having suicidal ideation or suicide attempt prior to age 18 (Table 5, Column A). Veteran women between the ages of 34-49 appeared to have higher odds of suicidal ideation at age 18 or older compared to women age ≥50. Sexual minority veteran women had 59% increased odds of suicidal ideation at age 18 or older compared to heterosexual veteran women (aOR=1.59, 95%CI=1.24-2.04). As with veteran men, all ACEs categories were significantly associated with suicidal ideation at age 18 or older for veteran women.

Age was not significantly associated with suicide attempt at age 18 or older for veteran women (Table 4, Column C), however Black/African American veteran women and veteran women with a racial identity other than White had 57% and 51% increased odds, respectively, of suicide attempt at age 18 or older compared to white veteran women. Unlike veteran men, only the highest categories of ACEs (i.e., 5-6 and >6) were associated with suicide attempt at age 18 or older among veteran women. For veteran women, the strongest correlate of suicide attempt at age 18 or older was suicidal ideation or attempt prior to age 18 (aOR=5.37, 95%CI=4.11-7.03).

Suicidal ideation, suicide attempt, and ACEs among nonveteran women

For nonveteran women, the strongest correlate of suicidal ideation at age 18 or older was having suicidal ideation or suicide attempt prior to age 18 and all categories of ACEs (Table 5, Column B). There were fewer significant correlates of suicide attempt at age 18 or older for nonveteran women than there were for veteran women (Table 5, Column D). For example, sexual minority status and educational attainment were not significantly associated with suicide attempt at age 18 or older among nonveteran women. Only the highest ACEs category was associated with suicide attempt at age 18 or older; but this finding lacked precision (i.e., wide confidence interval).

DISCUSSION

The results corroborate earlier studies that suggest veterans are more likely to report ACEs than nonveterans (Blosnich et al., 2014; Katon et al., 2015). This study extends the literature in three important ways: by employing a nationally representative sample of veterans and nonveterans, verifying official military service history for the veteran sample, and incorporating a wider array of ACEs than are typically used, which were drawn from standard measures of PTEs. ACEs appeared to be more robust correlates of suicidal ideation and attempt for veteran men than for veteran women. Specifically, for veteran men, having >6 ACEs was a stronger correlate of suicide attempt at age 18 or older than suicidal ideation or suicide attempt prior to age 18.

The disparity in ACEs between veterans and nonveterans raises several implications for suicide prevention research. Principle among recommendations for research and practice is the utility and importance of assessing for cumulative trauma histories and treatment of complex trauma, which is pernicious and can require intensive treatment (Courtois, 2004). Research suggests important links between ACEs and suicide risk among veterans (Afifi et al., 2016; Blosnich & Bossarte, 2017; Carroll et al., 2017; Youssef et al., 2013), as well as other indicators of poor readjustment (e.g., poor mental health) (Cabrera et al., 2007), and the present results echo those findings. However, there are practical challenges to gathering data about cumulative trauma histories and such information is rarely available within health system records (Bejan et al., 2018). First, at an interpersonal level, trauma-informed care is far from widespread (Oral et al., 2016), despite evidence of impact of ACEs across the lifespan. Moreover, nearly 20 years after learning how tightly ACEs are associated with suicide attempt (Dube et al., 2001), structured data within health system about ACEs is nearly nonexistent. In fact, VA researchers resorted to natural language processing to identify ACEs in the electronic health records (Hammond, et al., 2015). Recent, but nascent, efforts have explored ways of gathering structured information about ACEs in the clinical setting (Glowa, et al., 2016; Koita et al., 2018).

Among the many different ACEs conceptualized in the present analyses, key differences corroborated earlier findings. For instance, veterans' greater odds for experiencing parental divorce and emotional and physical abuse than nonveterans (differences observed among both men and women), corroborates findings from other large probability-based survey findings of veterans and nonveterans (Blosnich et al., 2014; Katon et al., 2015). However, importantly, in the present study there were no differences observed between veteran and nonveteran men in terms of exposure to sexual assault before the age of 18, which is a departure from these earlier studies. In the present study, veteran men were significantly less likely than nonveteran men to report exposure to unwanted or uncomfortable sexual experiences other than assault. It is possible the different wording of these items precludes comparisons between studies. For example, in the present study, items used the words "sexual assault" and "rape" as opposed to how items in the ACEs inventory describe sexual abuse (e.g., forced to have sex by someone >5 years older than you). Further research is necessary to examine whether such wording for childhood sexual abuse experiences may introduce variation in reporting these experiences, especially among men.

Despite the impact of ACEs on suicidal ideation and suicide attempt, the majority of individuals who report ACEs do *not* attempt suicide, highlighting the importance of further research to explore potential resiliency to ACEs. For example, Dube et al. (2001) noted that people with 7 or more ACEs had 17 times the odds of suicide attempt compared to people without ACEs; arguably the highest risk group identified in the study sample. However, the prevalence data showed that 159 individuals reported 7 or more ACEs, of which 56 – or 35.2% - reported a suicide attempt at some point in their lifetime; the *majority* of the highest-risk group did not report suicide attempts. It is difficult to ascertain the reasons individuals with high exposure to ACEs did not report any suicide attempts, but some reasons may include stigma of reporting suicide attempt, mental health treatment for ACEs, other support to promote healing that was not measured in the survey, or innate grit or resilience. Another possibility is posttraumatic growth (Tedeschi & Calhoun, 2004), which

has mainly focused on combat-related traumas (Maguen et al., 2006; Tedeschi, 2011; Tsai et al., 2014). Additionally, research suggests that social support could be a major factor involved in resilience to ACEs (Herrenkohl et al., 2016; Roh et al., 2015).

The consistent association of ACEs with suicidal ideation and attempt at age 18 or older for veterans has important implications for other life events after age 18 that may be associated with suicide attempt. These may be especially relevant for the experiences of combat, which may include moral injury (Maguen et al., 2012) or sexual violence and other forms of trauma. It is possible that military-incurred traumas interact with ACEs in ways that were not captured in the scope of the present study but can be explored in future studies. However, these unique experiences pose analytic challenges for veteran-nonveteran comparisons because nonveterans will not have such military-specific exposures.

The potential interaction of military-specific exposures with ACEs raises issues around translating research into practice, namely earlier detection during active military service or during the early post-military period. For example, the US Army enacted the Comprehensive Soldier Fitness program as a strengths-based approach to develop resiliency among soldiers (Cornum et al., 2011). Assessing pre-military potentially traumatic experiences, such as ACEs, as part of this effort could provide valuable insight regarding the effectiveness of resilience programs for soldiers with different cumulative trauma histories. The post-military period is also a vulnerable time for suicide risk as Veterans readjust to civilian life. Although universal screening for ACEs remains debated in the field (Anda et al, 2020), targeted assessment for those experiencing readjustment and/or mental health issues can help hone referral and intervention efforts, such as trauma-focused evidence-based psychotherapies. Ensuring that assessment of ACEs is part of any comprehensive trauma evaluation for Veterans can verify that trauma across the life course is considered for appropriate triage and treatment planning. Given the high stakes of military service (e.g., combat exposure, moral injury, life disruption), targeted assessment and treatment of early life trauma to prevent exacerbation of risk for suicide during these vulnerable periods is especially urgent.

The etiology of disparities in ACEs among veterans remains underexplored. Individuals' reasons for joining the military, though varied and often borne of patriotism or desires to help others, may also include escaping adverse home environments in which ACEs are more common (Blosnich et al., 2014; Ginexi et al., 1994; Woodruff et al., 2006). Further, military service may be prompted by a family history of military service, which could be associated with potential ACEs (e.g., frequent family separations). Despite these possibilities, it is critical to note that childhood experiences identified as "adverse" or "potentially traumatic" are not always perceived as such by individuals. Additionally, successful pursuit of military service after escaping environments or experiences that are traumatic or adverse may reflect strength and allow for structure and growth.

There were several limitations to the research. To begin, although the data enabled parsing ACEs (by definition occurring before age 18) from suicidal ideation and suicide attempt at age 18 or older, this was a cross-sectional analysis and causality cannot be determined. Although many of the items overlapped with items in the oft-used 11-item ACEs inventory used by the Centers for Disease Control and Prevention (Bynum et al., 2010), the items were

worded slightly differently and gathered in a different survey context, which hampers direct comparison with previous studies. Although the survey was confidential, ACEs are sensitive topics remembered from earlier time periods, and it is unclear to what extent reactivity and recall biases may have affected response (Colman et al., 2016). Further, some individuals may be reluctant to report experience of suicidal ideation or attempt, although we do not have reason to believe that there would be a difference in reporting by veteran/nonveteran groups. Additionally, the non-specific wording of the item "Have you ever made a suicide attempt?" may result in underreporting of suicide attempt if individuals did not interpret their behavior as a suicide attempt (e.g., an attempt without harm or injury). The response rates to the surveys, though typical of other surveys with veterans (Bastian et al., 2014; Eber et al., 2013) was less than ideal. Although age was not central to the analysis, the categorization of age into quartiles may have suppressed age-related effects for the youngest group. Finally, this study reports on self-reported suicidal ideation or attempt; thus does not include those who have died by suicide or other means (i.e., survivor effect).

CONCLUSION

Using a nationally representative sample of adults who reported a wide array of ACEs, the present study adds to the extant literature by demonstrating that veterans experience greater prevalence of some ACEs than their nonveteran peers and documenting the relationship between ACES and suicidal ideation and suicide attempt among both groups. As the scientific evidence base grows, policymakers can apply these findings to mobilize research, prevention, and intervention efforts to address the needs of veterans with ACEs. Concomitant efforts are needed to discover how individuals can heal from and thrive after ACEs.

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PUBLIC HEALTH SIGNIFICANCE:

Study results showed that post 9/11 military veterans are more likely to report adverse childhood experiences (ACEs) than nonveterans. After accounting for demographic factors and suicidal thoughts and behaviors prior to age 18, ACEs were strongly associated with suicidal thoughts and behaviors after age 18 among veterans. Suicide prevention for veterans is a national priority and must attend to premilitary trauma as a significant risk factor.

Table 1.

Comparison of demographics and suicidality between veterans and nonveterans, stratified by gender

	Women			Men		
	Veteran (n=5,543)	Nonveteran (n=1,364)		Veteran (n=9,571)	Nonveteran (n=3,143)	
Age group	**%**	**%**	***p***	**%**	**%**	***p***
21-33	40.3	26.8	<.001	35.6	31.0	<.001
34-38	25.3	10.4		23.0	10.5	
39-49	21.4	23.3		22.4	21.4	
≥50	13.0	39.5		19.0	37.1	
Race/ethnicity						
White	55.2	62.1	<.001	68.7	63.3	<.001
Black/African American	21.2	12.4		10.9	11.6	
Other	9.6	8.7		9.5	9.7	
Hispanic	13.9	16.8		10.9	15.4	
Educational Attainment						
≤High school diploma	7.2	40.4	<.001	13.6	32.0	<.001
Some college	44.8	30.6		46.6	30.4	
4-year baccalaureate	27.1	16.4		23.8	21.7	
Post-baccalaureate	20.8	12.6		15.9	15.9	
Sexual Orientation						
Heterosexual	88.3	93.8	<.001	97.3	91.7	<.001
Sexual minority	11.7	6.2		2.7	8.3	
Suicidal ideation						
Before age 18	11.8	12.7	.453	5.8	10.5	<.001
Age 18 or older	26.1	15.6	<.001	22.5	16.7	<.001
Suicide attempt						
Before age 18	5.5	5.3	.737	1.1	1.9	.004
Age 18 or older	9.3	3.9	<.001	4.9	2.9	<.001

Table 2.

Prevalence of and adjusted odds of adverse childhood experiences (ACEs) between veteran and nonveteran men

	Men only				
	Veteran	Nonveteran		Veteran (Nonveteran as Reference)	
	(n=9,571)	(n=3,143)			
ACEs [1]	%	%	*p*	aOR[2]	95%CI
Lacked money for food/housing	5.9	5.7	.752	1.04	0.82-1.32
Lived in dangerous housing or neighborhood	11.1	9.6	.082	1.22*	1.01-1.47
Lived with someone with a severe physical, developmental, or mental disability or illness	6.6	7.4	.238	0.86	0.70-1.05
Ever separated from your family for an extended period of time (lived with relatives/friends, in foster care or adopted)	9.4	6.3	<.001	1.69*	1.37-2.08
Parent/caregivers separated or divorced while you were living with them	35.2	23.5	<.001	1.77*	1.58-1.99
Experienced expected or non-sudden death of close family member or friend	23.5	19.6	<.001	1.11	0.98-1.25
Ever bullied (made fun of, threatened with harm)	38.5	46.4	<.001	0.67*	0.61-0.74
Witnessed extreme physical violence between family members	17.5	12.8	<.001	1.67*	1.42-1.96
Emotionally abused or neglected by a parent, caregiver, or partner	17.8	13.0	<.001	1.52*	1.30-1.77
Physically abused by a parent, caregiver, or partner	13.3	10.0	<.001	1.60*	1.34-1.90
Experienced a sexual assault (rape, attempted rape, made to perform sexual act/s through force or threat of harm)	3.4	3.8	.479	1.23	0.92-1.64
Exposed to unwanted or uncomfortable sexual experiences other than assault	3.9	7.0	<.001	0.62*	0.50-0.77
Experienced robbery or mugging that did not include sexual assault	5.9	5.3	.337	1.11	0.88-1.41
Experienced serious physical assault by someone else close to you	8.9	5.7	<.001	1.74*	1.40-2.17
Experienced serious physical assault by someone else	14.7	10.5	<.001	1.39*	1.19-1.64
Experienced life-threatening physical illness or injury (e.g., cancer)	0.7	2.2	<.001	0.27*	0.18-0.41
Witnessed sudden violent or accidental death or its aftermath	5.5	2.9	<.001	1.94*	1.42-2.64
Caused serious injury, harm, or death to someone else, whether intentional or accidental	2.4	1.8	.117	1.29	0.88-1.89
Experienced serious disaster (e.g., flood, tornado, explosion)	13.4	8.4	<.001	1.56*	1.31-1.85
Experienced serious accident (e.g., car accident, on-the-job accident)	13.9	9.2	<.001	1.40*	1.18-1.65
Witnessed serious accident (e.g., car accident, on-the-job accident)	14.6	10.2	<.001	1.42*	1.20-1.67

	Men only				
	Veteran	Nonveteran		Veteran (Nonveteran as Reference)	
	(n=9,571)	(n=3,143)			
ACEs [1]	%	%	*p*	aOR[2]	95%CI
Witnessed severe human suffering	5.8	5.6	.724	1.01	0.80-1.26
Count of ACES (0-22)					
0	25.0	27.1	<.001	-	-
1-2	35.3	39.7			
3-4	18.6	17.4			
5-6	10.1	8.5			
>6	11.1	7.3			
	M (SE)	M (SE)		-	-
Average number of ACEs	2.7 (0.03)	2.3 (0.06)	<.001		

1= Respondent specifically asked if the experience happened before age 18.

2= Estimated with multiple logistic regression models adjusted for age group, educational attainment, race/ethnicity, and sexual orientation

**=* *p*<.05

Table 3.

Prevalence of and adjusted odds of adverse childhood experiences (ACEs) between veteran and nonveteran women

	Women only				
	Veteran (n=5,544)	Nonveteran (n=1,364)		Veteran(Nonveteran as Reference)	
ACEs [1]	%	%	*p*	aOR[2]	95%CI
Lacked money for food/housing	7.9	6.3	.106	1.04	0.72-1.50
Lived in dangerous housing or neighborhood	11.1	7.6	.001	1.04	0.79-1.39
Lived with someone with a severe physical, developmental, or mental disability or illness	9.6	6.6	.006	1.19	0.86-1.63
Ever separated from your family for an extended period of time (lived with relatives/friends, in foster care or adopted)	13.4	8.2	<.001	1.96*	1.45-2.65
Parents/caregivers separated or divorced while you were living with them	39.1	26.0	<.001	1.67*	1.39-2.01
Experienced expected or non-sudden death of close family member or friend	20.9	20.2	.642	0.79*	0.64-0.96
Ever bullied (made fun of, threatened with harm)	38.3	44.1	.004	0.56*	0.47-0.66
Witnessed extreme physical violence between family members	26.4	16.5	<.001	1.71*	1.37-2.13
Emotionally abused or neglected by a parent, caregiver, or partner	30.6	18.2	<.001	1.67*	1.37-2.03
Physically abused by a parent, caregiver, or partner	21.1	12.7	<.001	1.77*	1.39-2.26
Experienced a sexual assault (rape, attempted rape, made to perform sexual act/s through force or threat of harm)	17.4	12.8	.001	1.32*	1.04-1.68
Exposed to unwanted or uncomfortable sexual experiences other than assault	18.9	22.9	.010	0.66*	0.54-0.80
Experienced robbery or mugging that did not include sexual assault	3.1	2.7	.464	0.72	0.43-1.21
Experienced serious physical assault by someone else close to you	10.4	5.6	<.001	2.11*	1.49-3.00
Experienced serious physical assault by someone else	7.4	5.2	.018	1.82*	1.25-2.66
Experienced life-threatening physical illness or injury (e.g., cancer)	0.7	1.1	.117	0.77	0.37-1.62
Witnessed sudden violent or accidental death or its aftermath	3.9	1.3	<.001	3.04*	1.80-5.14
Caused serious injury, harm, or death to someone else, whether intentional or accidental	0.7	0.7	.879	1.95	0.70-5.48
Experienced serious disaster (e.g., flood, tornado, explosion)	9.6	5.7	<.001	1.20	0.90-1.60
Experienced serious accident (e.g., car accident, on-the-job accident)	8.8	7.4	.188	0.91	0.68-1.23
Witnessed serious accident (e.g., car accident, on-the-job accident)	8.2	5.1	.002	1.07	0.77-1.50
Witnessed severe human suffering	4.8	5.1	.802	0.69*	0.48-0.98

Count of ACES (0-22)

	Women only				
	Veteran (n=5,544)	Nonveteran (n=1,364)		Veteran(Nonveteran as Reference)	
ACEs [1]	%	%	*p*	aOR[2]	95%CI
0	22.7	27.3	<.001	-	-
1-2	31.1	35.3			
3-4	19.6	20.3			
5-6	11.7	8.6			
>6	14.9	8.6			
	M (SE)	M (SE)			
Average number of ACEs	3.1 (0.05)	2.4 (0.09)	<.001	-	-

1= Respondent specifically asked if the experience happened before age 18.

2= Estimated with multiple logistic regression models adjusted for age group, educational attainment, race/ethnicity, and sexual orientation

**=* *p*<.05

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Table 4.

Adjusted odds of suicidal ideation and suicide attempt at age 18 or older among men, stratified by veteran status

	Men							
	Suicidal ideation at age 18 or older				Suicide attempt at age 18 or older			
	(A) Veteran (n=9,533)		(B) Nonveteran (n=3,135)		(C) Veteran (n=9,533)		(D) Nonveteran (n=3,135)	
Age Group	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**
≥50	Ref		Ref		Ref		Ref	
39-49	1.34*	1.12-1.61	1.05	0.72-1.53	1.43	0.94-2.17	0.91	0.44-1.86
34-38	1.79*	1.50-2.15	0.90	0.60-1.34	2.22*	1.49-3.32	0.67	0.31-1.43
21-33	1.51*	1.27-1.80	0.86	0.58-1.25	1.85*	1.25-2.72	0.72	0.35-1.48
Race/Ethnicity								
White	Ref		Ref		Ref		Ref	
Black/African American	1.03	0.86-1.25	0.44*	0.28-0.70	1.22	0.85-1.76	0.83	0.37-1.86
Other	1.05	0.86-1.28	0.88	0.53-1.46	1.50*	1.07-2.10	1.37	0.44-4.29
Hispanic	0.91	0.75-1.11	0.64	0.41-1.00	1.28	0.91-1.80	0.69	0.36-1.30
Educational Attainment								
Post-baccalaureate	Ref		Ref		Ref		Ref	
≤High school diploma	1.22	0.97-1.53	1.20	0.78-1.83	3.65*	2.27-5.85	2.95*	1.16-7.49
Some post-secondary	1.19	1.00-1.42	1.08	0.75-1.55	2.49*	1.61-3.84	1.88	0.84-4.22
4-year baccalaureate	1.06	0.87-1.29	1.08	0.75-1.56	1.33	0.80-2.22	1.60	0.65-3.94
Sexual Orientation								
Heterosexual	Ref		Ref		Ref		Ref	
Sexual Minority	1.63*	1.16-2.30	1.85*	1.21-2.84	2.29*	1.46-3.58	2.45*	1.14-5.25
Any Suicidal Ideation or Attempt before Age 18	11.98*	9.38-15.30	14.06*	10.18-19.41	3.91*	2.93-5.24	6.74*	3.99-11.37
ACEs								
0	Ref		Ref		Ref		Ref	
1-2	1.47*	1.24-1.75	1.80*	1.17-2.77	1.78*	1.16-2.73	0.94	0.36-2.46
3-4	1.92*	1.59-2.33	3.37*	2.13-5.36	2.66*	1.72-4.11	2.27	0.92-5.56

Men

	Suicidal ideation at age 18 or older				Suicide attempt at age 18 or older			
	(A) Veteran (n=9,533)		(B) Nonveteran (n=3,135)		(C) Veteran (n=9,533)		(D) Nonveteran (n=3,135)	
Age Group	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**
5-6	2.97*	2.40-3.67	2.47*	1.43-4.28	3.83*	2.42-6.06	0.76	0.23-2.55
>6	2.80*	2.26-3.46	3.76*	2.13-6.66	4.20*	2.72-6.49	2.14	0.81-5.70

*= $p<.05$; aOR=adjusted odds ratio; ACEs = adverse childhood experiences

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Table 5.

Adjusted odds of suicidal ideation and suicide attempt at age 18 or older among women, stratified by veteran status

	Women							
	Suicidal ideation at age 18 or older				**Suicide attempt at age 18 or older**			
	(A) Veteran (n=5,516)		**(B) Nonveteran (n=1,362)**		**(C) Veteran (n=5,516)**		**(D) Nonveteran (n=1,362)**	
Age Group	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**
≥50	Ref		Ref		Ref		Ref	
39-49	1.47*	1.14-1.89*	1.28	0.68-2.40	1.31	0.87-1.96	0.69	0.25-1.88
34-38	1.46*	1.14-1.88	1.02	0.52-1.98	1.25	0.84-1.87	0.32*	0.11-0.92
21-33	0.98	0.76-1.26	0.82	0.42-1.58	0.95	0.64-1.41	0.31*	0.12-0.82
Race/Ethnicity								
White	Ref		Ref		Ref		Ref	
Black/African American	0.99	0.82-1.21	1.18	0.61-2.27	1.57*	1.18-2.09	3.03	0.89-10.33
Other	0.84	0.61-1.14	0.63	0.33-1.22	1.51*	1.04-2.19	2.27	0.98-5.28
Hispanic	0.98	0.77-1.25	0.98	0.48-2.00	1.19	0.84-1.69	1.73	0.61-4.91
Educational Attainment								
Post-baccalaureate	Ref		Ref		Ref		Ref	
≤High school diploma	1.22	0.83-1.80	1.04	0.58-1.87	3.08*	1.82-5.22	2.74	1.00-7.46
Some college	1.49*	1.20-1.85	1.85*	1.07-3.18	2.34*	1.62-3.37	1.99	0.69-5.74
4-year baccalaureate	1.15	0.91-1.45	1.74	0.97-3.12	1.42	0.95-2.11	1.08	0.30-3.86
Sexual Orientation								
Heterosexual	Ref		Ref		Ref		Ref	
Sexual minority	1.59*	1.24-2.04	2.14*	1.15-3.97	1.61*	1.17-2.21	0.48	0.15-1.56
Any Suicidal Ideation or Attempt before Age 18	12.33*	9.59-15.86	15.00*	9.33-24.13	5.37*	4.11-7.03	10.35*	4.49-23.86
ACEs								
0	Ref		Ref		Ref		Ref	
1-2	1.51*	1.19-1.91	2.41*	1.02-5.71	1.07	0.72-1.59	1.49	0.22-10.13
3-4	1.67*	1.29-2.16	6.27*	2.61-15.03	1.23	0.82-1.85	2.86	0.42-19.70

	Women							
	Suicidal ideation at age 18 or older				Suicide attempt at age 18 or older			
	(A) Veteran (n=5,516)		(B) Nonveteran (n=1,362)		(C) Veteran (n=5,516)		(D) Nonveteran (n=1,362)	
Age Group	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**	**aOR**	**95%CI**
5-6	2.30*	1.72-3.08	4.54*	1.83-11.27	1.71*	1.10-2.68	2.93	0.44-19.51
>6	2.10*	1.58-2.80	5.31*	1.97-14.30	2.27*	1.51-3.41	10.39*	1.64-65.98

*= $p<.05$; aOR=adjusted odds ratio; ACEs = adverse childhood experiences