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Comorbidity of posttraumatic stress disorder with alcohol dependence among US adults: Results from National Epidemiological Survey on Alcohol and Related Conditions

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Abstract

Background—Despite the high rates of comorbidity of post-traumatic stress disorder (PTSD) and alcohol dependence (AD) in clinical and epidemiological samples, little is known about the prevalence, clinical presentation, course, risk factors and patterns of treatment-seeking of co-occurring PTSD-AD among the general population.

Methods—The sample included respondents of the Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Weighted means, frequencies and odds ratios (ORs) of sociodemographic correlates, prevalence of psychiatric disorders and rates of treatment-seeking were computed. Results: In the general population, the lifetime prevalence of PTSD only, AD only and PTSD-AD was 4.83%, 13.66% and 1.59%, respectively. Individuals with comorbid PTSD-AD were more likely than those with PTSD or AD only to have suffered childhood adversities and had higher rates of Axis I and II disorders and suicide attempts. They also met more PTSD diagnostic criteria, had earlier onset of PTSD and were more likely to use drugs and alcohol to relieve their PTSD symptoms than those with PTSD only; they also met more AD diagnostic criteria than those with AD only and had greater disability. Individuals with PTSD-AD had higher rates of treatment seeking for AD than those with AD only, but similar rates than those with PTSD only.

Conclusion—PTSD-AD is associated with high levels of severity across a broad range of domains even compared with individuals with PTSD or AD only, yet treatment-seeking rates are very low. There is a need to improve treatment access and outcomes for individuals with PTSD-AD.

Keywords

Post-traumatic stress disorder (PTSD); Alcohol dependence; Substance use disorders; Comorbidity; NESARC

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Contributors Carlos Blanco developed the concept for the study and wrote the initial draft of the manuscript. Yang Xu, Gabriela Pérez-Fuentes and Mayumi Okuda conducted the literature reviews and contributed to revisions of the manuscript. Shuai Wang conducted the data analyses. Kathleen Brady made important contributions to manuscript revision and editing. All authors contributed to and have approved the final manuscript.

Conflict of interest No conflict declared.

1. Introduction

Posttraumatic stress disorder (PTSD) is characterized by symptoms of re-experiencing, avoidance and increased arousal following exposure to a traumatic event (American Psychiatric Association, 1994). Epidemiological studies indicate that PTSD has a 12-month prevalence of 1.33–3.5% (Creamer et al., 2001; Kessler et al., 2005) and a lifetime prevalence of 6.6–7.8% (Breslau et al., 1991, 1998; Kessler et al., 1995; Pietrzak et al., 2011; Resnick et al., 1993). It is often comorbid with other psychiatric disorders (Creamer et al., 2001; Pietrzak et al., 2011), and associated with substantial personal, economic and other societal costs (Kessler, 2000; Kessler et al., 2005).

Prior clinical (Behar, 1987; Kofoed et al., 1993; Saladin et al., 1995; Riggs et al., 2003; Evren et al., 2011) and epidemiological studies (Chilcoat and Menard, 2003; Grant et al., 2008; Kessler et al., 1997a,b) have consistently documented a strong association between PTSD and alcohol use disorders. Clinical studies have found that among individuals with PTSD, heavy alcohol drinking is associated with greater number (Behar, 1987) and more severe PTSD symptoms (Saladin et al., 1995), and prolonged course of illness (Herman, 1992; Yehuda et al., 1995). In addition, individuals with comorbid PTSD and alcohol dependence (AD) have higher prevalence of childhood trauma (Evren et al., 2011), earlier onset of AD symptoms (Driessen et al., 2008), poorer socioeconomic status (Riggs et al., 2003), and poorer physical and mental health (Evren et al., 2011), compared with those with AD only and their increased alcohol use is positively correlated with PTSD symptom severity (Bremner et al., 1996). Recent studies in clinical samples have suggested a reciprocal relationship between alcohol use and PTSD symptom improvement (Back et al., 2006), and trauma-focused exposure therapy significantly improved the symptoms of AD (Coffey et al., 2006).

While previous studies have provided substantial valuable information concerning the comorbidity of PTSD and AD, conclusions from clinical studies cannot be generalized to community populations. Knowledge of the clinical presentation, course, and risk factors of comorbidity of PTSD-AD among general population is important for understanding etiologic connections and to develop more effective prevention and treatment interventions. To fill this gap, we sought to build on previous work by employing a bidirectional approach to examine the comorbidity of AD and PTSD, utilizing the 2004–2005 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). This approach provides a unique opportunity to investigate the incremental effect of having both disorders relative to either alone in regard to strength of associations with particular sociodemographic features and with other DSM-IV disorders. Specifically, we sought to: (1) provide prevalence estimates of comorbid lifetime PTSD and AD (PTSD-AD) among sociodemographic subgroups; (2) examine potential childhood and family environmental risk factors for PTSD-AD; (3) characterize the clinical presentation, course, psychosocial functioning, and comorbidity pattern of PTSD-AD; (4) Investigate the treatment seeking patterns among individuals with PTSD-AD.

2. Method

2.1. Sample

The 2004–2005 Wave 2 sample of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) was used in the present study. The NESARC is based on a nationally representative sample of the US non-institutionalized population 18 years of age or older who reside in households and group quarters (e.g., college dormitories, group homes, boarding homes) throughout the 50 states and the District of Columbia. A detailed description of the NESARC Wave 1 and 2 methodologies is reported elsewhere (Grant et al.,

2003; Grant and Kaplan, 2007; Read et al., 2004). African Americans, Hispanics, and adults aged 18–24 were over-sampled, with data adjusted for over-sampling and household- and person-level non-response. All procedures, including informed consent, received full ethical review and approval from the US Census Bureau and US Office of Management and Budget.

The Wave 1 NESARC surveyed 43,093 respondents, yielding a response rate of 81% (Grant et al., 2003). Participants in Wave 1 were contacted to be re-interviewed in Wave 2. Excluding ineligible respondents, (e.g., deceased), the response rate for Wave 2 was 86.7%, resulting in 34,653 respondents (Grant et al., 2008). Sample weights are described elsewhere (Grant and Kaplan, 2007) and were developed to adjust for Wave 2 non-response, socio-demographic factors, and the presence of any psychiatric diagnoses in Wave 1. Weighted data were adjusted to be representative of the US civilian population based on estimates from the 2000 census.

In our study, participants who meet a diagnosis of lifetime PTSD (without AD; $n = 2463$), lifetime AD (without PTSD; $n = 4914$) or both were included. Those who meet both lifetime PTSD and lifetime AD compose the PTSD-AD comorbidity group ($n = 597$).

2.2. Measures

2.2.1. Socio-demographic measures—Sociodemographic measures included sex, age, race-ethnicity, nativity, educational level, marital status, place of residence, region of the country, individual income and type of health insurance.

2.2.2. Childhood adversities—Previous studies have suggested childhood adversities and negative family environment as risk factors for AD and PTSD (Bromet et al., 1998; Brewin et al., 2000; Ozer et al., 2003). To investigate their role in the course of comorbidity of PTSD-AD, this study also incorporated these measures. Childhood adversities include verbal abuse, physical abuse, sexual abuse, and neglect. Respondents completed a series of questions regarding exposure to childhood abuses occurring before age 18. Response categories for most scale items were 1 = never, 2 = almost never, 3 = sometimes, 4 = fairly often, and 5 = very often. Response category values were summed across items to produce scales. Verbal and physical abuse was assessed using questions from the Conflict Tactics Scale (Straus, 1979). Verbal abuse items assessed how often caregivers insulted, swore at, said hurtful things, threatened respondents with violence or acted in any other way that made respondents afraid that they would be physically hurt or injured. Physical abuse items ascertained the frequency of caregiver violent behavior toward the respondent such as pushing, grabbing, shoving, slapping or hitting so hard that resulted in marks or injuries. Emotional and physical neglect were assessed using questions from the Childhood Trauma Questionnaire (Bernstein et al., 1994). To assess physical neglect, respondents were queried how often they were made to do chores too difficult or dangerous for someone their age, were left unsupervised when they were too young to be alone, were not provided with regular meals or adequate clothing, or did not receive necessary medical treatment. Emotional neglect was assessed with three items querying whether there was someone in the respondent's family who wanted him or her to be success, help him or her to feel important or was a source of strength and support. The CTQ also includes an endangerment item that assesses whether respondents were made to do chores that were dangerous for someone their age. Previously validated questions (Wyatt, 1985) regarding sexual experiences that were unwanted, involved an adult, or occurred when the respondent was too young to know what was happening were used to assess sexual abuse. These questions queried about touching and fondling, touching in a sexual way and attempting or actually having sexual intercourse.

Negative family environment measures include vulnerable family environment operationalized, as in prior studies, as parental absence or separation from a biological parent before age 18 (Alegria et al., 2010; Vesga-López et al., 2008), parental divorce, parental history of alcohol and drug use problems, parental behavioral problem, and partner with alcohol problem.

2.2.3. DSM-IV diagnostic interview—All psychiatric diagnoses, except for psychotic disorder, were made according to DSM-IV criteria (American Psychiatric Association, 1994) through the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV), a reliable and valid diagnostic interview designed to be used by nonprofessional interviewers (Grant et al., 2001). Axis I diagnoses investigated in the survey comprised three main groups: (1) substance use disorders (including alcohol abuse and dependence, drug abuse and dependence, and nicotine dependence); (2) mood disorders (including major depressive disorder, dysthymia, and bipolar disorder); and (3) anxiety disorders (including panic disorder, social anxiety disorder, specific phobia, and generalized anxiety disorder). History of ADHD and conduct disorder and personality disorders were assessed on a lifetime basis. The test–retest reliability of AUDADIS-IV has been reported elsewhere and range from good to excellent (Grant et al., 2003; Stinson et al., 2008).

2.2.4. Lifetime alcohol dependence disorder—Consistent with DSM-IV, lifetime diagnoses of alcohol dependence diagnoses required 3 or more of the 7 DSM-IV dependence criteria in the last 12 months or during any previous 12-month period (Hasin et al., 2007). The reliability of the AUDADIS-IV alcohol diagnoses is documented in clinical and general population samples (Chatterji et al., 1997; Grant et al., 2003, 1995; Hasin et al., 1997a,b), with test–retest reliability ranging from good to excellent ($=0.70$ – 0.84). Convergent, discriminate, and construct validity of AUDADIS-IV alcohol use disorder criteria and diagnoses were good to excellent (Hasin et al., 1990; Hasin and Paykin, 1999; Hasin et al., 2003, 1997a,b).

2.2.5. Lifetime post-traumatic stress disorder and history of traumatic experiences—Past year and prior-to-past year diagnoses of PTSD were assessed in the Wave 2 NESARC. PTSD symptoms were assessed among individuals exposed to traumatic events in which both of the following had been present: (1) the person experienced, witnessed or was confronted with an event(s) that involved actual or threatened death or serious injury to the physical integrity of self or others; and (2) the person’s response involved intense fear. DSM-IV criteria for PTSD were assessed for the individual’s, self-reported, worst traumatic event. PTSD was diagnosed when all of the following criteria were present, for at least a month, following exposure to the worst traumatic event: (1) persistent re-experience of the event; (2) persistent avoidance of stimuli associated with trauma and numbing of general responsiveness (as indicated by three or more DSM-IV symptoms); and (3) persistent symptoms of increased arousal (as indicated by two or more DSM-IV PTSD symptoms). PTSD diagnoses required three or more of the seven DSM-IV dependence criteria in lifetime period. The NESARC asked 23 questions, one or two for each type of traumatic experience. Twenty-two questions were about events that qualify as traumatic events in DSM-IV, and the last question inquired about “any other extremely stressful or traumatic experience.” Questions about having experienced/witnessed a terrorist attack included one question for “any terrorist attack” and an additional question addressing the 9/11 terrorist attacks. Finally, the NESARC allowed for examination of other types of traumatic events experienced during a war, revolutionary or armed conflict, as a military combat, relief worker, unarmed civilian or refugee. Test–retest reliability coefficients for

lifetime and 12-month PTSD diagnoses were fair to good ($\kappa = 0.64$ and 0.77 , respectively; Ruan et al., 2008).

2.2.6. Course and disability—Variables including age of onset, number of diagnostic criteria met, and duration of the longest episode were examined to compare the course of AD, PTSD and PTSD-AD. Moreover, individuals with PTSD were asked if they ever used any substance, including alcohol or drugs to relieve their PTSD symptoms. Previous clinical studies had also suggested that trauma may predispose victims to developing additional disorders through increased impulsivity (Roy, 2005; Zlotnick et al., 1997) and emotion dysregulation (van der Kolk and Fisler, 1994). To test this hypothesis in a community sample, we measured the impulsivity by asking respondents if they “have done things impulsively” most of the time throughout their lives, regardless of the situation or whom they were with.

Disability was assessed with the physical component summary, mental component summary, social functioning scale, role emotional scale, and mental health scales of the Short-Form-12v2 (SF-12), a reliable and valid measure in population surveys (Ware et al., 2002). The SF-12 is used across a wide range of clinical and research settings to provide self-reports of behavioral functioning and perceived psychological well-being independent of age, disease, or specific treatment. Each SF-12 norm-based disability score is a continuous variable with a mean of 50 in the general population, standard deviation of 10, and range of 0–100. Lower scores indicate greater disability and have been associated with psychopathology in prior studies (Compton et al., 2007).

2.2.7. Suicide attempts—Suicide attempts were assessed only in individuals, who reported having been sad, blue depressed or having a period that they did not care about things that they usually enjoyed for at least two weeks. In those cases, suicide attempt was assessed and computed for those who reported having attempted suicide during that period.

2.2.8. Mental health treatment seeking—Respondents were classified as seeking lifetime mental health treatment for PTSD or AD, if they: (1) visited a counselor, therapist, doctor, or psychologist; (2) were a patient in a hospital for at least one night; (3) visited an emergency room; or (4) were prescribed medications. Treatment utilization questions were disorder-specific. Moreover, the past 12 months treatment-seeking rates were also compared among individuals with PTSD only, AD only and PTSD-AD.

2.3. Statistical analyses

Weighted means, frequencies and odds ratios (ORs) of sociodemographic correlates, prevalence of psychiatric disorders and rates of treatment-seeking were computed. Analyses of variance followed by post hoc tests were used to compare the means of continuous variables. Adjusted odds ratios (AORs) derived from multiple logistic regressions indicate associations between a specific outcome (e.g., psychiatric disorders) and sociodemographic correlates of respondents with and without PTSD and with and without alcohol dependence. We consider two percentage estimates significantly different from each other if their 95% confidence intervals (95% CI) do not overlap. Standard errors and 95% confidence intervals were estimated using SUDAAN, to adjust for complex design of the NESARC.

3. Results

3.1. Sociodemographic characteristics and childhood adversities

The estimate of lifetime prevalence of DSM-IV PTSD-AD was 1.59% (1.49% in men and 1.68% in women). Compared with individuals with lifetime PTSD only, those with lifetime

PTSD-AD were more likely to be Asian, unmarried, and having no insurance, but less likely to be female, foreign born, older than 45 years old and to have less than high school education. By contrast, compared with individuals with lifetime AD only, individuals with lifetime PTSD-AD were more likely to be female, 45–64 years old, Black or Asian, widowed, separated or divorced, and having public health insurance, but less likely to have individual income over \$20,000. Compared with either those with PTSD only or those with AD only, individuals with comorbid PTSD-AD were more likely to have all types of childhood adversities (Table 1).

3.2. Course and disability

Compared with individuals with lifetime PTSD only, individuals with comorbid PTSD-AD met more PTSD diagnosis criteria, had earlier onset of PTSD, and were more likely to use alcohol and drugs to relieve their PTSD symptoms than those with PTSD only, whereas the duration of their longest episode of PTSD did not differ from those with PTSD only. Individuals with PTSD-AD had higher scores on the SF-12 physical component scale than those with PTSD only, but the two groups did have significant differences in the other scales. By contrast, compared with individuals with lifetime AD only, individuals with comorbid PTSD-AD met more AD diagnosis criteria, had lower scores in all SF-12, whereas their age of onset of AD was similar to those with AD only. In addition, rate of having difficulty in emotion expression and impulsivity was highest among individuals with comorbid PTSD-AD (Table 2).

3.3. Lifetime psychiatric comorbidities

Among respondents with PTSD-AD, the lifetime prevalence of any psychiatric disorder, any Axis I disorder, and any Axis II disorder were 96.39%, 94.69% and 72.41%, respectively. Individuals with lifetime PTSD-AD had increased odds of having almost all types of Axis I and Axis II disorders, with a few exceptions: (a) compared with individuals with PTSD only, individuals with comorbid PTSD-AD had similar rates of lifetime major depressive disorder, bipolar II, conduct disorder and dependent personality disorder; and, (b) compared with individuals with AD only, individuals with comorbid PTSD and AD had similar rates of lifetime conduct disorder and pathological gambling.

Moreover, individuals with comorbid PTSD and AD were more likely than those with PTSD only to have used at least one other substance in their lifetime. The lifetime prevalence of suicide attempt was also higher in the PTSD-AD group than among those with PTSD only or AD only (Table 3).

3.4. Mental health treatment seeking

Compared with those PTSD only, individuals with comorbid PTSD-AD had higher rates of lifetime treatment seeking for AD but not for PTSD. Furthermore, individuals with comorbid PTSD-AD had higher rates of lifetime use of outpatient mental health services than the other two groups, and higher rates of lifetime use of psychotropic medication than those with AD only. Rates of lifetime use of inpatient mental health treatment among individuals with PTSD-AD, PTSD only, and AD were similar. The rate of past 12-months treatment-seeking for any Axis I disorders among individuals with comorbid PTSD and AD was higher than those with AD only, but similar to those with PTSD only (Table 4).

4. Discussion

In a large, nationally representative sample, the lifetime prevalence of PTSD only, AD only, and PTSD-AD were 6.42%, 15.25% and 1.59%, respectively. Compared with individuals with PTSD only, individuals with PTSD-AD were more likely to be never married, have no

insurance, have a history of childhood adversities, and endorse familial risk factors. They also had more severe forms of PTSD, as indicated by greater number of diagnostic criteria met, higher likelihood of using substances to relieve PTSD symptoms, and higher rates of other lifetime psychiatric comorbidity. Moreover, although individuals with PTSD-AD had greater number of AD diagnostic criteria and poorer physical and psychosocial functioning than those with AD only, they were not more likely to seeking treatment for AD. Furthermore, rates of 12-month treatment for PTSD and AD among individuals with PTSD-AD were very low.

Consistent with previous data from National Comorbidity Survey (Kessler et al., 1997a), we found that around one third of the individuals with lifetime PTSD had lifetime AD. Several factors are likely to contribute to this increased comorbidity. First, recent data have suggested the existence of a general liability factor for a broad range of psychiatric disorders (Lahey et al., 2012), which may be partly genetically determined (Lahey et al., 2011). Second, in some cases there could direct, quasi-direct causation or reciprocal causation. Individuals with PTSD may use alcohol in a failed attempt to alleviate their symptoms, which may lead in some cases to AD, while excessive alcohol consumption may impair judgment and lead individuals to engage in risky situations. Epidemiological data indicate that half of the individuals with PTSD-AD had their AD onset in the same year or later than onset of PTSD (Kessler et al., 1997a), and the odds of having alcohol use disorders increase with the number of PTSD criteria (Pietrzak et al., 2011). Furthermore, there is considerable overlap in the neural circuitry involved in addictions and the stress response and positive feedback loops provide mechanistic connections between stress and addictions (Cleck and Blendy, 2008; Kalivas and Volkow, 2005; Potenza et al., 2012; Sinha et al., 2005). Stress can modulate the initial rewarding effects of addictive drugs, reinstate drug seeking and cause relapse to substance use in individuals in recovery while substance use also alters the individual's biologic response to stress (Brady and Sinha, 2005; Cleck and Blendy, 2008). Third, risk factors for the development of PTSD and AD overlap, including lower socioeconomic status and lower support from the spouse or partner, as found in our study as well as in clinical samples (Riggs et al., 2003). This overlap of risk factors may contribute to increased comorbidity directly or by potentiating the neural connections between stress and addictions. For example, lack of social support and resources could place individuals with single pathology (PTSD or AD) at greater risk for deterioration of the initial pathology and subsequent development of other comorbidities (Riggs et al., 2003).

Our study also found that the majority of individuals with PTSD-AD had a history of childhood verbal abuse, physical abuse or neglect, and that half of the individuals with PTSD-AD had a history of vulnerable family environment, parental history of alcohol use disorder and antisocial personality disorder or a partner with alcohol problem. These rates were significantly higher than those among individuals with PTSD only or AD only. Childhood maltreatment experiences may contribute to future emotion dysregulation, heightened physiological responsivity, interfere with the development of coping mechanisms psychopathology (Heim and Nemeroff, 2001), predispose to current life stressors and poor social support in adulthood (Solomon et al., 1988), and increase the risk of multiple psychiatric disorders (van der Kolk and Fisler, 1994). Moreover, a history of parental alcohol use disorders can also increase children's later risk of developing alcohol misuse (Chassin et al., 1999; Jennison and Johnson, 2001), and PTSD (Emery et al., 1991) through childhood stress and hereditary vulnerability as well (Milne et al., 2009). Our findings are consistent with the existing literature on the close relationship between childhood experiences and adulthood psychopathology (Kessler et al., 1997b, 2010; Pérez-Fuentes et al., 2012; Sugaya et al., 2012), stressing the importance of promoting childhood mental health to prevent the development of psychiatric disorders in adulthood.

There is emerging evidence to suggest that variation in some stress-related genes may moderate the risk for psychopathology or resilience in individuals exposed to early life trauma. In particular, it appears that there are important variations in the genes encoding for the stress response (CRH receptor) that can influence the development of alcohol dependence following an early life trauma through a gene by environment interaction. One study of children at risk found an interaction between CRH variation and sexual trauma in adolescents that predicted an earlier age of onset of drinking and heavy alcohol consumption (Blomeyer et al., 2008). These findings suggest that the interaction of genetic susceptibility and environmental exposure can lead to a pathological stress system response which increases the risk for the development of alcohol dependence in victims of trauma.

Compared with individuals with PTSD only, multiple indicators, including age of onset of PTSD and number of diagnostic criteria met, suggested that individuals with PTSD-AD had more severe PTSD than individuals with PTSD only. Compared with individuals with AD only, persons with PTSD-AD had greater number of AD criteria, were more likely to have impulsive behaviors, have difficulty expressing emotions, and used alcohol and drugs to relieve PTSD symptoms. Clinical studies have suggested that increased impulsivity (Roy, 2005; Zlotnick et al., 1997) and emotional dysregulation (van der Kolk and Fisler, 1994) may act as mediators of the trauma-related stress contributing to the development of substance use disorders. Community data also suggest a dynamic relationship between stress and impulsivity with regard to hazardous drinking (Fox et al., 2010). Targeting impulsivity and emotional regulation may help to achieve better outcomes for both PTSD and substance use disorders, as suggested by the Seeking Safety trials (Najavits, 1993; Norman et al., 2010; Ruglass et al., 2012).

Lifetime comorbidity with additional psychiatric disorders and suicide attempts among individuals with PTSD-AD was remarkably high. To the extent that comorbidity may be the result of a latent variable underlying multiple diagnoses (Blanco et al., 2013; Krueger et al., 1998), higher rates of additional psychopathology may be another index of the severity of the disorder (Bolton et al., 2010; Bolton and Robinson, 2010; Nepon et al., 2010). Moreover, the existence of additional comorbidities may also contribute to a greater psychological impairment, which is linked to poorer coping mechanisms and may lead to higher risk for suicidal attempts (Nepon et al., 2010). Despite the high severity and high rate of suicide attempts among individuals with PTSD-AD, they were neither more likely to seek treatment for PTSD than those with PTSD only nor more likely to seek treatment for AD than those with AD only. Lower socioeconomic status among individuals with PTSD-AD may limit their access to mental health services. Alternatively, the use of alcohol to relieve their symptoms may lead to decreased motivation to seeking professional help. Conducting screening and promoting mental service outreach to high-risk populations, and providing personalized treatment may help decrease barriers to treatment for individuals with PTSD-AD. For example, a common strategy in the management of PTSD and AD is to treat sequentially, often usually requiring abstinence from substance use before initiating PTSD treatment (Back, 2010). Because achieving sobriety or alcohol and drug use might be particularly difficult for individuals with PTSD, this requirement may constitute an important barrier to treatment for individuals with PTSD-AD. However, a recent clinical trial found that symptom improvements in PTSD after treatment had a greater impact on improvement in alcohol dependence symptoms than the reciprocal relationship (Back et al., 2006). In another study among civilian women, trauma-focused treatment was significantly more effective than health education in achieving substance use improvement, and treatment completion (Hien et al., 2010). Integrated, exposure-based cognitive behavior therapy has shown promise in the treatment of co-occurring PTSD and AD (Back et al., 2012). A recent randomized trial of integrated exposure-based treatment for PTSD with treatment as usual for substance use disorders compared to treatment for substance use disorders alone found

that integrated treatment resulted in improvement in PTSD symptom severity without an increase in severity of substance dependence (Mills et al., 2012). These findings suggest that integrated rather than separate treatment of PTSD and AD may lead to superior clinical outcomes (Najavits et al., 2005; Triffleman et al., 1999).

Our study has limitations common to most large epidemiological studies. First, the NESARC sample only included civilian households and group living populations aged 18 and older. Therefore, information was unavailable in the military at the time of the survey, which may have different rates of PTSD or AD. Second, because of questions about the validity of the diagnosis of alcohol abuse (Hasin et al., 1999; Keyes and Hasin, 2008), we limited our analyses to alcohol dependence. Thus, our results may not generalize to individuals with PTSD and alcohol abuse. Third, impulsivity was assessed only with one item, which may have led to limited reliability, increased error variance, and decreased statistical power. Even with this broad assessment, our results suggest differences in impulsivity across the three groups, consistent with previous analyses of the NESARC (Chamorro et al., 2012). Fourth, we assessed suicide only among individuals who had been sad or depressed for at least two weeks, which may have excluded impulsive suicide attempts. However, the results of previous studies suggest that the number of individuals with history of suicide attempts who do not report sadness or depressed mood is very low (Baca-Garcia et al., 2010, 2011), suggesting that this restriction is unlikely to have changed our pattern of results. Fifth, specific reasons for low treatment-seeking rates among individuals with PTSD-AD were not assessed in NESARC survey. Future research should collect information that may facilitate access to treatment of inform treatment development.

Despite these limitations, our study contributes new information concerning the comorbidity of PTSD-AD in terms of risk factors, clinical correlates, comorbid patterns, and rates of treatment. The substantial disability and low rate of mental health service usage among individuals with comorbidity of PTSD-AD warrant urgent public health efforts promoting prevention and developing efficient clinical treatment models which address both PTSD and AD.

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Table 1
Sociodemographic characteristics among individuals with lifetime PTSD, lifetime AD and comorbidity of lifetime PTSD and lifetime AD

Sociodemographic characteristics	PTSD only		PTSD-AD		AD only		PTSD-AD vs. PTSD only		PTSD-AD vs. AD only	
	n = 1866 (4.83%) %	S.E.	n = 597 (1.59%) %	S.E.	n = 4317 (13.66%) %	S.E.	%	S.E.	OR	95% CI
Sex										
Men*	2.61	0.15	0.15	0.12	1.49	0.12	19.53	0.52	1.00	1.00
Women	6.87	0.22	0.22	0.12	1.68	0.12	8.26	0.32	0.43	0.55
Race/ethnicity										
White*	4.76	0.18	0.18	0.09	1.55	0.09	14.57	0.38	1.00	1.00
Black	5.98	0.38	0.38	0.24	1.93	0.24	10.60	0.56	1.00	1.31
Asian	5.48	1.06	1.06	0.91	3.83	0.91	17.96	1.92	2.15	1.13
Native American	2.67	0.58	0.58	0.28	0.62	0.28	7.27	1.09	0.72	0.27
Hispanic	4.87	0.44	0.44	0.22	1.45	0.22	12.53	0.77	0.92	0.63
Nativity										
U.S. born*	5.00	0.16	0.16	0.09	1.74	0.09	14.75	0.34	1.00	1.00
Foreign born	3.81	0.29	0.29	0.13	0.65	0.13	6.91	0.58	0.49	0.31
Age										
18-29*	3.73	0.30	0.30	0.25	2.07	0.25	22.55	0.87	1.00	1.00
30-44	4.90	0.24	0.24	0.17	1.95	0.17	17.48	0.58	0.72	0.51
45-64	5.88	0.27	0.27	0.14	1.78	0.14	11.58	0.41	0.55	0.38
65+	3.77	0.28	0.28	0.06	0.29	0.06	3.98	0.31	0.14	0.08
Education										
Less than high school	5.94	0.38	0.38	0.20	1.51	0.20	11.70	0.64	0.71	0.53
High school graduate	4.03	0.25	0.25	0.15	1.20	0.15	12.10	0.58	0.83	0.60
Some college or higher*	4.89	0.18	0.18	0.11	1.76	0.11	14.70	0.42	1.00	1.00
Individual income (\$)										
0-19,999*	6.15	0.26	0.26	0.15	1.95	0.15	11.80	0.41	1.00	1.00
20,000-34,999K	4.26	0.26	0.26	0.15	1.54	0.15	15.02	0.58	1.14	0.86
35,000-69,999K	3.80	0.23	0.23	0.14	1.33	0.14	15.65	0.60	1.11	0.82

Sociodemographic characteristics	PTSD only <i>n</i> = 1866 (4.83%) %	PTSD-AD <i>n</i> = 597 (1.59%) S.E.	AD only <i>n</i> = 4317 (13.66%) %	PTSD-AD vs. PTSD only		PTSD-AD vs. AD only						
				S.E.	%	S.E.	%	OR	95% CI	OR	95% CI	
70,000 or more	3.15	0.40	0.84	0.22	13.52	0.80	0.85	0.46	1.57	0.38	0.21	0.67
Marital status												
Married or cohabiting*	4.45	0.18	1.29	0.09	11.96	0.36	1.00	1.00	1.00	1.00	1.00	1.00
Widowed/separated/divorced	7.32	0.35	2.18	0.20	12.14	0.56	1.03	0.81	1.29	1.66	1.30	2.12
Never married	3.51	0.25	2.02	0.22	21.56	0.84	1.98	1.46	2.69	0.87	0.66	1.13
Urbanicity												
Rural	4.83	0.16	1.62	0.10	13.71	0.38	1.00	1.00	1.00	1.00	1.00	1.00
Urbana*	4.86	0.36	1.45	0.17	13.41	0.63	0.89	0.66	1.21	0.91	0.68	1.22
Region												
Northwest	4.78	0.31	1.89	0.22	12.78	0.63	1.08	0.78	1.49	1.16	0.85	1.57
Midwest	5.24	0.40	1.50	0.17	13.42	0.59	0.78	0.54	1.13	0.88	0.63	1.22
South	4.75	0.22	1.40	0.13	14.30	0.54	0.80	0.60	1.07	0.77	0.58	1.01
West*	4.69	0.27	1.72	0.16	13.49	0.51	1.00	1.00	1.00	1.00	1.00	1.00
Insurance												
Private*	4.43	0.15	1.34	0.08	13.14	0.37	1.00	1.00	1.00	1.00	1.00	1.00
Public	7.87	0.52	2.76	0.31	11.08	0.62	1.16	0.86	1.55	2.44	1.85	3.21
None	4.65	0.44	2.12	0.28	19.48	0.84	1.50	1.05	2.15	1.06	0.78	1.45
Childhood risk factors												
Childhood Verbal Abuse	6.93	0.26	3.18	0.20	18.77	0.53	2.55	2.01	3.24	2.77	2.20	3.50
Childhood Physical Abuse	6.57	0.25	2.94	0.19	18.02	0.50	2.23	1.77	2.81	2.36	1.91	2.91
Childhood Sexual Abuse	11.53	0.62	5.83	0.49	16.77	0.78	1.91	1.50	2.44	4.29	3.41	5.40
Childhood Neglect	6.88	0.28	2.97	0.21	16.20	0.51	1.89	1.48	2.40	2.63	2.12	3.28
Familial risk factors												
Vulnerable family environment	5.83	0.28	2.64	0.19	17.11	0.54	1.72	1.36	2.17	1.62	1.31	2.00
Parental divorce	5.74	0.36	2.90	0.27	19.34	0.69	1.86	1.42	2.43	1.55	1.22	1.97
Parent with behavioral problem	8.92	0.61	5.37	0.57	26.56	1.00	2.15	1.60	2.89	2.02	1.57	2.61
Parent with alcohol/drug problem	6.94	0.34	3.69	0.27	21.81	0.61	2.31	1.82	2.94	1.97	1.59	2.44
Partner with alcohol problem	6.93	0.35	3.68	0.27	21.96	0.62	2.23	1.79	2.79	1.88	1.53	2.31

Note: significant ORs are in bold.

* Reference group.

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Table 2

Course and disability among individuals with lifetime PTSD, lifetime AD and comorbidity of lifetime PTSD and lifetime AD

	PTSD only		PTSD-AD		AD only		ANOVA		Pairwise <i>T</i> -tests				
	<i>n</i> = 1866 (4.83%)		<i>n</i> = 597 (1.59%)		<i>n</i> = 4317 (13.66%)				Mean	S.E.	<i>F</i> -score	<i>p</i> -value	
	Mean	S.E.	Mean	S.E.	Mean	S.E.			Mean	S.E.	<i>F</i> -score	<i>p</i> -value	
Course													
Number of PTSD criteria	13.95	0.08			14.66	0.15			4.68	0.08	3955.32	<0.0001	a, b, c
Number of AD criteria	1.02	0.04			5.36	0.06			4.93	0.03	3616.28	<0.0001	a, b, c
Age of onset PTSD	30.12	0.49			24.33	0.69			N/A	N/A	32.41	<0.0001	a
Age of onset AD	N/A	N/A			26.34	0.54			26.09	0.22	0.19	0.6617	
Duration of longest episode PTSD (months) mean	133.63	4.63			138.29	7.77			109.51	6.45	6.19	0.0035	b, c
		%	S.E.	%	S.E.	%	S.E.	OR	95% CI	OR	95% CI		
Difficulty of expressing emotions/feelings		18.41	1.15	25.86	2.29	22.75	0.77	1.55	1.17	2.05	1.18	0.92	1.52
Impulsiveness		26.59	1.28	46.48	2.61	29.19	0.86	2.40	1.86	3.10	2.11	1.68	2.64
Ever used any substance Use to help relieve symptoms PTSD		11.49	0.86	45.17	2.57	4.49	0.36	6.35	4.84	8.33	17.53	13.52	22.73
Ever used alcohol to help relieve symptoms of PTSD		10.36	0.80	42.02	2.57	4.29	0.36	6.27	4.75	8.28	16.18	12.38	21.15
Ever used drug to help relieve symptoms of PTSD		3.13	0.53	16.18	1.81	1.27	0.21	5.97	3.84	9.29	15.05	9.83	23.04
SF-12 scores (past 12 months)	Mean	S.E.	Mean	S.E.	Mean	S.E.	<i>F</i> -score	<i>p</i> -value	Pairwise <i>T</i> -tests				
Physical component summary	45.75	0.42	47.76	0.62	51.44	0.20	95.67	<0.0001	a, b, c				
Mental component summary	45.08	0.35	43.91	0.59	49.59	0.20	96.42	<0.0001	b, c				
Social functioning scale	45.29	0.41	44.74	0.58	50.91	0.19	124.69	<0.0001	b, c				
Role emotional scale	43.38	0.37	42.99	0.64	48.83	0.20	108.21	<0.0001	b, c				
Mental health scale	45.13	0.34	44.67	0.58	50.05	0.20	109.19	<0.0001	b, c				

Note: significant differences are in bold.

a: Differences between PTSD-AD and PTSD-only groups are significant.

b: Differences between PTSD-AD and AD-only groups are significant.

c: Differences between PTSD-only and AD-only and groups are significant.

Table 3

Psychiatric comorbidity among individuals with lifetime PTSD, lifetime AD and comorbidity of lifetime PTSD and lifetime AD

	PTSD only		PTSD-AD		AD only		PTSD-AD vs. PTSD only		PTSD-AD vs. AD only					
	n = 1866 (4.83%) %	S.E.	n = 597(1.59%) %	S.E.	n = 4317(13.66%) %	S.E.	%	S.E.	AOR ^a	95% CI	AOR ^a	95% CI		
Any psychiatric diagnosis	83.04	1.22			96.39	0.85	84.07	0.65	4.59	2.73	7.71	3.99	2.44	6.54
Any axis I disorder	77.92	1.36			94.69	0.96	79.96	0.72	4.58	2.97	7.05	3.59	2.44	5.27
Any substance disorders	35.81	1.28			74.22	2.30	65.07	0.96	4.04	3.09	5.28	1.46	1.13	1.88
Any drug use disorder	12.28	1.00			52.68	2.53	39.20	0.87	6.15	4.71	8.02	1.84	1.49	2.29
Drug abuse	9.56	0.87			36.22	2.28	32.82	0.84	3.98	2.93	5.41	1.25	1.01	1.55
Drug dependence	3.85	0.56			30.69	2.44	13.62	0.65	8.32	5.68	12.19	2.87	2.23	3.67
Nicotine dependence	29.84	1.27			62.51	2.64	50.78	1.04	3.24	2.47	4.24	1.50	1.16	1.93
Any mood disorder	54.39	1.50			76.55	2.14	39.03	0.93	2.87	2.23	3.68	4.26	3.32	5.48
Major depressive disorder	34.89	1.45			36.19	2.28	22.77	0.76	1.20	0.95	1.53	1.58	1.27	1.96
Bipolar disorder I	14.50	1.00			32.94	2.34	11.60	0.63	2.48	1.89	3.25	3.31	2.57	4.28
Bipolar disorder II	3.75	0.57			6.22	0.98	3.67	0.35	1.43	0.84	2.43	1.58	1.05	2.36
Dysthymia	9.42	0.86			11.72	1.45	5.24	0.37	1.56	1.08	2.26	1.84	1.34	2.52
Any anxiety disorder	54.96	1.57			71.23	2.05	37.33	0.88	2.15	1.67	2.77	3.50	2.77	4.42
Panic disorder	22.60	1.38			28.96	2.28	12.48	0.60	1.34	1.01	1.77	2.27	1.68	3.07
Social phobia	15.82	1.05			30.27	2.29	12.52	0.64	2.31	1.77	3.02	2.59	1.99	3.36
Specific phobia	32.98	1.34			50.52	2.53	20.19	0.76	2.19	1.71	2.81	3.39	2.64	4.35
Generalized anxiety disorder	25.54	1.29			34.99	2.10	11.57	0.56	1.61	1.26	2.04	3.34	2.67	4.18
ADHD	6.68	0.70			14.39	1.76	5.47	0.44	1.84	1.27	2.67	2.97	2.08	4.25
Conduct disorder	1.35	0.37			1.40	0.48	1.64	0.23	1.03	0.41	2.60	0.94	0.44	2.01
Pathological gambling	0.62	0.17			2.72	0.72	1.42	0.25	4.12	1.82	9.33	1.83	0.93	3.58
Any psychotic disorder	7.34	0.86			12.72	1.76	3.67	0.37	1.62	1.08	2.43	3.28	2.17	4.95
Any axis II disorder	42.60	1.56			72.41	2.20	39.96	1.00	3.02	2.33	3.91	3.83	3.04	4.82
Avoidant	5.64	0.68			11.00	1.62	4.81	0.42	1.86	1.22	2.83	2.06	1.40	3.03
Dependant	1.62	0.33			3.20	0.89	0.78	0.17	1.54	0.77	3.06	3.53	1.51	8.24
Obsessive-compulsive	14.68	1.12			30.52	2.33	12.86	0.60	2.74	2.08	3.61	2.81	2.20	3.60
Paranoid	10.37	1.00			21.43	2.42	9.21	0.55	2.20	1.53	3.16	2.25	1.62	3.12

	PTSD only		PTSD-AD		AD only		PTSD-AD vs. PTSD only		PTSD-AD vs. AD only					
	<i>n</i> = 1866 (4.83%) %	S.E.	<i>n</i> = 597 (1.59%) %	S.E.	<i>n</i> = 4317 (13.66%) %	S.E.	%	S.E.	AOR ^a	95% CI				
Schizoid	7.52	0.78	15.00	1.74	15.00	1.74	5.51	0.43	1.94	1.34	2.82	2.88	2.05	4.04
Schizotypal	11.62	0.89	26.02	1.85	26.02	1.85	6.93	0.48	2.17	1.63	2.88	4.20	3.32	5.32
Narcissitic	14.61	1.06	26.51	2.02	26.51	2.02	10.77	0.57	1.70	1.29	2.23	3.27	2.56	4.18
Borderline	18.77	1.12	40.50	2.69	40.50	2.69	13.22	0.63	2.42	1.88	3.12	3.95	3.09	5.05
Histrionic	2.85	0.49	10.85	1.68	10.85	1.68	5.00	0.37	3.04	1.77	5.21	2.16	1.45	3.22
Antisocial	3.92	0.59	18.41	2.00	18.41	2.00	12.52	0.62	4.13	2.65	6.45	1.78	1.29	2.47
Suicide attempt	35.41	2.15	52.79	3.36	52.79	3.36	39.82	1.83	1.82	1.28	2.58	1.62	1.19	2.22
Any substance use	60.76	1.31	88.73	1.67	88.73	1.67	86.31	0.64	4.37	3.00	6.37	1.22	0.85	1.74
Any tobacco use	51.66	1.38	76.53	2.29	76.53	2.29	71.75	0.97	2.80	2.06	3.80	1.28	0.97	1.71
Any drug use	27.74	1.40	70.44	2.23	70.44	2.23	62.46	0.92	5.04	3.95	6.45	1.44	1.16	1.80

Note: significant ORs are in bold.

^aAORs are adjusted for sex, race, nativity, age, income, marital status, education, urbanicity, and region.

Table 4

Treatment seeking among individuals with lifetime PTSD, lifetime AD and comorbidity of lifetime PTSD and lifetime AD

	PTSD only <i>n</i> = 1866 (4.83%) %	PTSD-AD <i>n</i> = 597(1.59%) S.E.	AD only <i>n</i> = 4317(13.66%) %	PTSD-AD vs. PTSD only S.E.	PTSD-AD vs. AD only %	S.E.	OR	95% CI	OR	95% CI
Life time treatment seeking										
Treatment sought for PTSD (%)	47.86	1.43	55.19	2.54	35.61	2.22	1.34	1.07	1.69	2.23
Treatment sought for AUD (%)	58.25	9.37	86.08	3.22	79.31	1.66	4.43	1.72	11.41	1.61
Inpatient	8.00	0.74	9.78	1.36	5.94	1.17	1.25	0.88	1.77	1.72
Outpatient	42.02	1.48	51.08	2.49	33.23	2.18	1.44	1.15	1.80	2.10
Medications	27.79	1.24	31.91	2.29	19.05	1.87	1.22	0.95	1.56	1.99
Treatment seeking for any axis I disorder in past 12 months	15.03	0.98	17.88	1.85	10.09	1.51	1.23	0.93	1.63	1.94

Note: significant differences are in bold.