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Clinical presentations, social functioning, and treatment receipt among individuals with comorbid life-time PTSD and alcohol use disorders versus drug use disorders: findings from NESARC-III

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Abstract

Aims—To compare individuals with comorbid life-time post-traumatic stress disorder (PTSD) and alcohol use disorders [AUD; i.e. no drug use disorders (DUD)] with those with comorbid PTSD and DUD on past-year prevalence of these disorders, social functioning, life-time psychiatric comorbidities, and treatment receipt. The comorbid groups were also compared with their single diagnosis counterparts.

Design and Setting—Cross-sectional cohort study using data from the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC-III).

Participants—The total sample size was 36 309. Six groups were established: PTSD/AUD, PTSD/DUD, AUD, DUD, PTSD, and neither PTSD nor AUD/DUD. Life-time prevalence of AUD among those with PTSD/DUD was 80.2% and among those with DUD was 73.8%.

Measurements—The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-5 version assessed lifetime and past-year psychiatric disorders and treatment receipt. Demographics and social stability indicators were queried. Group characteristics were summarized using weighted means. Prevalences and estimates for adjusted differences in means and adjusted

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Declaration of interests
None.

Supporting Information
Additional supporting information may be found online in the Supporting Information section at the end of the article.

odds ratios (aORs) were derived from multiple linear regression and logistic regression models, respectively. Analyses were conducted in R and accounted for the NESARC-III's complex survey design, clustering, and non-response.

Findings—Compared with those with life-time PTSD/AUD, those with life-time PTSD/DUD were significantly less likely to have neither disorder in the past year (PTSD/AUD = 16.1%; PTSD/DUD = 8.5%; aOR = 0.54), and were more likely to report worse social and psychiatric functioning, and to have received both addiction and mental health treatment (PTSD/AUD = 18.4%; PTSD/DUD = 43.2%; aOR = 3.88). Compared with their single disorder counterparts, those with PTSD/DUD reported greater impairment than both groups, whereas the comorbid PTSD/AUD group differed more from the AUD than the PTSD group.

Conclusions—People with comorbid PTSD and drug use disorder have greater social and psychiatric impairment and may require different types and intensity of intervention than people with comorbid post-traumatic stress disorder and alcohol use disorder.

Keywords

Alcohol use disorders; comorbidity; cross-sectional Cohort Study; drug use disorders; epidemiology; post-traumatic stress disorder

INTRODUCTION

There is substantial research demonstrating that people with post-traumatic stress disorder (PTSD) frequently have co-occurring substance use disorders (SUD) [1–10] and that they typically evidence greater impairment than individuals with either one or the other disorder [2–5,7,8,11–14]. However, these investigations have taken different approaches when populating the groups, making comparisons across studies challenging. For example, one commonly cited study used a treatment-seeking sample to compare people with PTSD, alcohol use disorder (AUD), and PTSD/AUD, excluding anyone with a drug use disorder (DUD) [3], while another study used epidemiological data to compare these same three groups, but included those with DUDs in all groups [2].

Individuals with DUDs are routinely found to be less socially stable and more apt to have co-occurring psychiatric disorders, particularly disorders involving externalizing behaviors [15–18], than those with AUDs only [19–22]. Thus, treating SUD as a unitary construct may obscure important between-group differences, while excluding those with DUDs risks losing clinically relevant information both because many individuals have concurrent AUDs and DUDs [19,21,23–25] and because DUDs frequently co-occur with PTSD [6,10]. To our knowledge, no study has compared those with PTSD/AUD to those with PTSD/DUD, nor compared these groups to their single disorder counterparts.

To address this gap in the literature, the current study took a novel approach to classifying groups of comorbid individuals by separating those with PTSD/AUD (i.e. excluding individuals with DUD) and those with PTSD/DUD (including those who may also have an AUD) to address three questions: (1) what are the life-time and past-year diagnostic rates of PTSD/AUD, PTSD/DUD, AUD, DUD, and PTSD?; (2) how do those with life-time PTSD/DUD differ from those with PTSD/AUD on demographics, social stability indicators,

symptom severity, additional psychiatric comorbidities, and treatment receipt?; and (3) what are the patterns of similarities and differences when the comorbid groups are compared with their single diagnosis counterparts? We anticipated more individuals with life-time PTSD/DUD would meet past-year diagnostic criteria for one or more of the disorders comprising the comorbidity and would also evidence greater social and clinical impairment than those with life-time PTSD/AUD [19–22]. We also anticipated that the comorbid groups would evidence greater social and psychiatric impairment than their single disorder comparators [2–5,7,8,11–14].

METHODS

Study sample

The National Epidemiologic Survey of Alcohol and Related Conditions-III (NESARC-III) was conducted in 2012–13 and used multi-stage probability sampling to guide selection of a representative sample of non-institutionalized US residents aged 18 years and older not serving on active military duty [26,27]. The data were adjusted for non-response and weighted to represent the US population [28]. The total sample size was 36 309 and the response rate was 60.1%, which is comparable to other US national surveys [26].

The sample was grouped according to life-time diagnostic status with regard to PTSD, AUD, and DUD. Those with DUD were excluded from the AUD groupings. Individuals with DUD may also have an AUD. The following six groups were established: PTSD/AUD, PTSD/DUD, AUD, DUD, PTSD, and neither PTSD nor AUD/DUD. Life-time prevalence of AUD among those with PTSD/DUD was 80.2% (1.8%) and among those with DUD was 73.8% (1.0%). See Supporting information, Table S1 for information on prevalence of specific DUDs.

Human subjects approval was granted by the VA Puget Sound Healthcare IRB, Seattle, WA. Data were obtained from the National Institute on Alcoholism and Alcohol Abuse on 23 November 2016 and were analyzed between 11 December 2017 and 31 December 2018.

Measures

All data were collected via the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-5 version (AUDADIS-5), an in-person structured diagnostic interview designed for use by non-clinicians [29].

Demographic characteristics and past-year social stability indicators were sex, age, race/ethnic identity, sexual orientation, veteran status, marital status, employment status, college status, past-year annual family income below the poverty line, homelessness, public assistance, food stamps, and health insurance status. Incarceration status was also included.

The NESARC-III definition of life-time PTSD was used for participant grouping and past-year status was used for descriptive purposes. Although more conservative than the DSM-5 criteria for PTSD, as it required one additional symptom for criteria D and E, both our own and previous [30] sensitivity checks found that the NESARC-III PTSD indicator identified the same individuals as a constructed DSM-5-consistent indicator. Test–retest reliability of

PTSD diagnoses was fair and reliability of the dimensional PTSD criteria scale was good [10]. A life-time PTSD symptom count variable represents symptom severity.

Life-time AUD and DUD diagnostic status were used for participant grouping and past-year statuses were used for descriptive purposes. Diagnostic status for each of the following drugs was assessed: sedative/tranquilizer, cannabis, stimulants, cocaine, non-heroin opioid, heroin, hallucinogen, club drugs, and solvent/inhalant. Test–retest reliability of AUD diagnoses was good to excellent and construct validity was excellent [31]. Test–retest of DUD diagnoses was fair and construct validity was fair to excellent throughout drug classes [28]. Symptom counts were calculated for AUD and each DUD, with the highest symptom count diagnosis used to describe severity. The number of DUDs (including AUD) was tallied for those in the DUD groups.

Life-time diagnostic status on the following disorders were assessed: major depression, bipolar-I, dysthymia, panic, agoraphobia, social anxiety disorder, generalized anxiety disorder, antisocial, borderline, and schizotypal personality disorders, as well as presence/absence of lifetime thoughts of suicide and suicide attempts. The psycho-metric properties of these interview modules are reported elsewhere [32].

Participants' receipt of SUD treatment and/or mental health treatment was coded as affirmative if they endorsed at least one type of treatment from these domains.

Statistical analysis

All analyses were conducted using R and incorporated the NESARC-provided weights to account for the complex survey design's clustering, oversampling, and non-response [33–36]. Group characteristics were summarized using weighted means and prevalences and their corresponding standard errors (SE), so that analyses are representative of the US civilian population [27].

Estimates incorporating the survey weights for adjusted differences in means and adjusted odds ratios (aORs) were derived from multiple linear regression and multiple logistic regression models, respectively, to investigate between groups differences on past-year diagnostic status, demographics, social instability, symptom counts, prevalence of additional psychiatric disorders, and treatment receipt. The following pairwise comparisons were conducted using the life-time groupings: PTSD/AUD versus PTSD/DUD; PTSD/AUD versus AUD; PTSD/AUD versus PTSD; PTSD/DUD versus DUD; PTSD/DUD versus PTSD, and AUD versus DUD.

Models were minimally adjusted with select demographic covariates whenever a given covariate was not being treated as the response variable (sex, age, race/ethnicity, and education) to avoid partialing out variance relevant to clinical presentation and functioning.

The Benjamini–Hochberg [37] procedure was used to limit risk of Type I error (false positives) with the study's overall false discovery rate set at 5%. Results within the 5% false discovery rate are considered significant.

NESARC imputed values from the screener or interview to replace missing values for variables used in the computation of survey weights where possible; hot deck imputation was used as needed [27]. Missingness was minimal (i.e. 1% or less) for outcome variables included in the present study and pairwise deletion was used to handle missing data.

RESULTS

Life-time and past-year prevalence

Prevalence (SE) of life-time and past-year PTSD/AUD was 1.7% (0.1) and 0.8% (0.1) and of PTSD/DUD 1.8% (0.1) and 0.7% (0.1). Life-time and past-year prevalence of AUD was 20.0% (0.3) and 11.0% (0.2) and of DUD 8.1% (0.2) and 3.2% (0.1). Life-time and past-year prevalence of PTSD was 2.6% (0.1) and 3.2% (0.1); past-year prevalence was higher than life-time prevalence because some participants in the life-time comorbid groups lost their SUD diagnoses.

Compared with the life-time PTSD/AUD group, those with life-time PTSD/DUD were significantly more likely to have a past-year SUD (i.e. either AUD or DUD), but the two groups did not differ significantly on past-year PTSD status (see Table 1). The life-time PTSD/DUD group was significantly more likely to remain symptomatic overall than the PTSD/AUD group; 8% of the former group did not have any of the target diagnoses in the past-year versus 16% of the latter group. Those with life-time PTSD/AUD were significantly less likely to have past-year AUD than those with life-time AUD, but did not differ significantly from those with life-time PTSD on past-year PTSD status. Those with life-time PTSD/DUD did not differ significantly from the life-time DUD group on past-year DUD status, but were more likely than the life-time PTSD group to meet criteria for past-year PTSD.

Between-group comparisons: demographics and social functioning indicators

Participant demographics and social functioning indicators means (SE) and prevalences (SE) are shown in Table 2 and corresponding between-group differences in means and aORs are shown in Table 3.

The PTSD/DUD group was younger than the PTSD/AUD group, as well as more likely to be male, sexual minorities, to not have attended college, be currently unemployed, and to have been incarcerated before age 18 and as adults (significant aORs range from 1.41 to 2.54).

Those in the DUD group were younger than the AUD group, more likely to be sexual minorities, and less likely to be racial/ethnic minorities (note: without covariates in the model, those with DUD are slightly more likely to be members of a racial/ethnic minority). Additionally, those in the DUD group were more likely to have no college education, be unmarried, currently unemployed, be below the poverty line, homeless, on public assistance, food stamps, to have only government health insurance or no insurance, and to have experienced incarceration (aORs range from 1.17 to 2.60).

Both the PTSD/AUD versus AUD and the PTSD/DUD versus DUD comparisons show that the comorbid groups were more likely to be female, sexual minorities, veterans, unmarried,

currently unemployed, below the poverty level, homeless, on public assistance, food stamps, have only government insurance, and to have experienced incarceration. Those with PTSD/AUD were more likely to not have attended college than those with AUD. Significant PTSD/AUD versus AUD aORs range from 1.30 to 2.45 and PTSD/DUD versus DUD aORs range from 1.29 to 1.79.

Comparisons between the comorbid groups and those with PTSD show that the comorbid groups were younger and more likely to be male and sexual minorities. In addition, those with comorbid PTSD/AUD were more likely to have attended some college and those with comorbid PTSD/DUD were more likely to be unmarried, unemployed, below the poverty line, and to be on food stamps than those with PTSD. Both the comorbid groups were more likely to have been homeless and to have experienced incarceration. Significant PTSD/AUD versus PTSD aORs range from 0.75 to 2.56 and PTSD/DUD versus PTSD aORs range from 1.46 to 5.94.

Between-group comparisons: psychiatric comorbidities, suicide behaviors and treatment receipt

Means (SE) pertaining to PTSD, AUD, and DUD symptom counts and prevalences (SE) regarding psychiatric conditions, suicide behaviors and receipt of treatment by group are shown in Table 4 and corresponding between-group differences in means or aORs are shown in Table 5. See Supporting information, Tables S2 and S3 for prevalences of specific forms of treatment received and between-group comparisons.

The PTSD/DUD group endorsed more DUD symptoms for their worst DUD than the PTSD/AUD group endorsed for AUD. The PTSD/DUD group was more likely than the PTSD/AUD group to meet life-time diagnostic criteria for social anxiety disorder, all three personality disorders, and were more likely to have thought about and attempted suicide (aORs range from 1.45 to 2.23). The PTSD/DUD group was more likely to have received SUD treatment, mental health treatment or both than the PTSD/AUD group.

Those in the DUD group endorsed more DUD symptoms for their worst DUD relative to the number of AUD symptoms endorsed by the AUD group. The DUD group was more likely to have all the comorbid psychiatric disorders except specific phobia than the AUD group and were more likely to have thought about and attempted suicide (aORs range from 1.71 to 2.71). The DUD group was also more likely to have received SUD treatment, mental health treatment or both.

Those in the comorbid groups endorsed more DUD/AUD symptoms for their worst DUD or AUD relative to their non-comorbid counterparts. The PTSD/DUD group met diagnostic criteria for more DUDs than did the DUD group. Comparisons between the comorbid and non-comorbid SUD groups show differences on all the psychiatric comorbidities as well as having thought about and attempted suicide (PTSD/AUD versus AUD aORs range from 2.79 to 8.61; PTSD/DUD versus DUD range from 1.76 to 6.04). The comorbid groups were also more likely to report receipt of SUD treatment, mental health treatment or both than their SUD comparators.

Those in the comorbid groups endorsed more PTSD symptoms than those in the PTSD group. Compared with those in the PTSD group, individuals in the PTSD/AUD group were more likely to have thought about and attempted suicide and to have all the psychiatric comorbidities except for major depression, dysthymia and social anxiety (aORs range from 1.40 to 2.93). Compared with the PTSD group, those in the PTSD/DUD group were more likely to have thought about suicide, attempted suicide and to have all the psychiatric comorbidities except for major depression and dysthymia (aORs range from 1.66 to 4.83). Both the comorbid groups were more likely to have reported receiving SUD treatment, mental health treatment or both than the PTSD group.

DISCUSSION

The current study took a novel approach to classifying groups of comorbid individuals by separating those with PTSD/AUD (and no DUD) from those with PTSD/DUD (with and without an AUD) in a nationally representative sample. Doing so allowed us to address gaps in the extant literature, including examining differences in prevalence of both life-time and past-year diagnostic status and providing greater clarity regarding each group's social functioning, clinical profiles, and treatment receipt.

While the life-time incidence of PTSD/DUD and PTSD/AUD was quite similar, and both groups were apt to remain symptomatic with regard to the presence of either one or the other, or both, of the target disorders in the past year, those with PTSD/DUD were significantly more likely to remain symptomatic in the past year when compared to the PTSD/AUD group. The PTSD/DUD group was also more likely to have past-year PTSD than those with PTSD, but did not differ significantly from the DUD group with respect to the presence of a past-year SUD. Those with PTSD/AUD were less likely than those with AUD to meet criteria for past-year AUD and they did not differ on past-year PTSD status when compared with the PTSD group. These patterns suggest that those with PTSD/DUD may have a particularly chronic course with respect to these disorders compared to the other groups examined.

We found some support for the hypothesis that those with PTSD/DUD would show greater impairment than those with PTSD/AUD. With the overall false discovery rate set at 5%, approximately one-third of the comparisons indicated worse social and psychiatric functioning for the PTSD/DUD group compared with the PTSD/AUD group, and in no case was the PTSD/AUD group found to have worse social functioning or greater prevalence of psychiatric comorbidity. Specifically, relative to those with PTSD/AUD, those with PTSD/DUD were more likely to have been incarcerated as youth and as adults, to not have attended college, to be unemployed, to meet diagnostic criteria for social anxiety and all three personality disorders, and to have considered and attempted suicide. Large proportions of individuals in both groups reported having received some form of mental health treatment, while those with PTSD/DUD were more than twice as likely as those with PTSD/AUD to report having received some form of SUD treatment.

Consistent with prior literature, the parallel analyses comparing the DUD and AUD groups found the same general pattern as was found in the comorbid comparisons, although the

DUD group was found to be more consistently impaired than the AUD group with regard to social functioning, psychiatric severity, and treatment receipt [19–22]. These findings suggest that compared to those with an AUD, those with a DUD are likely to present with markedly more social and psychiatric instability whether or not they also have PTSD. Because many of the differences between the DUD groups and the AUD groups involve externalizing behaviors [15–18,38], individuals contending with drug use disorders may need treatment specifically tailored to address these issues [39,40].

Although the PTSD/AUD group exhibited greater social and psychiatric impairment than either of its single disorder counterparts, the number and magnitude of the differences was more pronounced in comparisons with their AUD peers than in comparisons with their PTSD peers [6,41]. These findings suggest that the co-occurrence of PTSD with AUD leads to clinical presentations that appear more like PTSD than AUD, and that it is PTSD, rather than AUD, largely driving the increased burden of social instability and psychiatric impairment seen in individuals with both disorders. In contrast, the degree of elevated impairment evidenced by those in the PTSD/DUD group relative to both the DUD group and the PTSD group was relatively high, suggesting that for those with comorbid PTSD/DUD there may be an additive or synergistic effect, such that the combination leads to excess impairment relative to either disorder alone.

Important to note are the high rates of suicidal ideation and suicide attempts seen in both comorbid groups, such that just under half those in the PTSD/AUD group and just over half those in the PTSD/DUD group had considered suicide, and a substantial minority of both groups had made one or more suicide attempts. Consistent with prior research in this area [2,3,7], the prevalence of suicidal ideation among the comorbid groups was significantly higher than among the AUD and DUD groups, signaling a high degree of distress and a critical need to assess and address their clinical acuity early in treatment. It is likely, however, that suicidal ideation was under-ascertained, because only NESARC respondents who endorsed sufficient markers of low and high mood were queried on suicidal ideation and attempts. Additionally, the NESARC-III did not query self-harm behavior not intended to cause death and it is possible that some of the reported suicide attempts were not intended to be lethal, particularly given the large proportion of those with comorbid PTSD/SUD who endorsed signs and symptoms consistent with borderline personality disorder (PTSD/AUD = 58.9%; PTSD/DUD = 70.9%), a disorder associated with both non-lethal self-harm behavior and elevated suicide risk [42].

The findings also reveal that those in the two comorbid groups are very likely to have engaged in mental health treatment, SUD treatment or both, with only 19.6% of the PTSD/AUD group and 12.6% of the PTSD/DUD reporting no treatment. In contrast, 68% of those in the AUD group, 43.2% of those in the DUD group and 29.6% of those in the PTSD group reported never having received treatment. Further, more than 40% of those with PTSD/DUD reported having received both SUD and mental health treatment, yet only 8.5% of them no longer met diagnostic criteria for either past-year PTSD or a SUD. Fewer than a fifth of those with PTSD/AUD reported having received both types of treatment, and approximately 16% no longer met past-year diagnostic criteria for either PTSD or AUD. Overall, these findings suggest that both comorbid groups probably did not receive treatment

that adequately addressed their comorbid conditions. Thus, more research is needed to develop disseminable and effective interventions for both PTSD/AUD and PTSD/DUD.

Taken together, the study's findings indicate that there are important differences in course and clinical outcomes between those with comorbid PTSD/AUD and those with PTSD/DUD, suggesting that it is critical to be cognizant of this in future epidemiological studies and clinical trials when operationalizing who is to be included in participant or patient groups of interest. It is important to note, however, that 80% of those with comorbid PTSD and DUD also met criteria for life-time AUD, which leaves open the question of whether the excess social instability and disease burden in this group relative to those with PTSD/AUD is driven by polysubstance use or specifically by correlates of drug misuse. Within the context of comorbidity with PTSD we were underpowered to address this question, but future research could use the NESARC-III to address it more generally. Either way, these results strongly suggest that it is critically important in treatment and research contexts to ascertain whether individuals with an AUD also meet criteria for one or more DUDs.

The present study has several limitations. First, cell sizes were small for some comparisons involving the comorbid and PTSD groups. Secondly, we could not ascertain whether diagnostic criteria for AUD, DUD, and PTSD were met during the same time-periods. Thirdly, the data are cross-sectional and do not allow us to draw causal conclusions. Finally, although there are probably important differences among individuals with different types of DUDs [6], there was not sufficient power to evaluate them separately.

CONCLUSIONS

Those with PTSD/DUD reported generally worse social and psychiatric functioning than those with PTSD/AUD and were more likely to have received both SUD and mental health treatment. Compared with their single disorder counterparts, those with PTSD/DUD reported greater impairment than both groups, whereas those with PTSD/AUD differed more from the AUD group than the PTSD group. Similarly, while most individuals in both comorbid groups were found to have either or both disorders comprising the comorbidity when past-year diagnostic statuses were examined, this was most pronounced for the PTSD/DUD group. Findings suggest it is important to distinguish between individuals with comorbid PTSD/AUD and PTSD/DUD and specific treatment strategies that address the numerous challenges facing those with PTSD/DUD are needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Prevalence of past-year primary disorders, stratified by life-time disorders, % (SE)[a].

Past-year disorders	Life-time PTSD/AUD (n = 656)		Life-time PTSD/DUD (n = 693)		Life-time AUD (n = 6726)		Life-time DUD (n = 2855)		life-time PTSD (n = 990)		Life-time no SUD/no PTSD (n = 24 389)	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Past-year PTSD/AUD	32.2	2.2	12.4	1.5	NA		NA		NA		NA	
Past-year AUD	7.9	1.3	3.8	0.8	46.9	0.7	17.8	0.9	NA		NA	
Past-year PTSD/DUD	NA		37.7	2.3	NA		NA		NA		NA	
Past-year DUD	NA		6.6	1.1	NA		38.0	1.1	NA		NA	
Past-year PTSD	43.9	2.5	31.0	2.2	NA		NA		72.7	1.7	NA	
Past-year no PTSD/no SUD	16.1[b]	1.8	8.5[b]	1.4	53.1	0.7	27.3	1.7	27.3	1.7	100.0	0.0
Any past-year AUD	40.1[c]	2.4	16.2	1.7	46.9[c]	0.7	17.8	0.9	NA		NA	
Any past-year DUD	NA		44.3[d]	2.3	NA		38.0[d]	1.1	NA		NA	
Any past-year SUD	(40.1)[e]	(2.4)	6O.5[e,f]	2.3	(46.9)	(0.7)	55.9[f]	1.1	NA		NA	
Any past-year PTSD	76.1[g,h]	2.1	81. 1[g,i]	1.9	NA		NA		72.7[i]	1.7	NA	

[a]Based on weighted data. A Benjamini–Hochberg adjustment with false discovery rate set to 5% was used for the entire set of comparisons and the adjusted *P*-values are reflected in the footnotes below.

[b]Life-time post-traumatic stress disorder/drug use disorders (PTSD/DUD) had significantly lower odds of having neither past-year PTSD or substance use disorder (SUD) than life-time PTSD/AUD [adjusted odds ratio (aOR) = 0.54; confidence interval (CI) = 0.34, 0.84, $P = 0.0107$].

[c]Life-time PTSD/AUD had significantly lower odds of having a past-year alcohol use disorder (AUD) than life-time AUD only (aOR = 0.75; CI = 0.61, 0.93, $P = 0.011$).

[d]Life-time PTSD/DUD did not differ significantly from the life-time DUD group on odds of past-year DUD (aOR = 1.24; CI = 0.99,1.55, $P = 0.0749$, not significant (NS).

[e]Life-time PTSD/DUD had significantly higher odds of having a past-year SUD than life-time PTSD/AUD (aOR = 2.00; CI = 1.51, 2.67, $P < 0.0001$).

[f]Life-time PTSD/DUD did not differ significantly from the life-time DUD group on odds of past-year SUD (aOR = 1.17; CI = 0.94,1.46, $P = 0.1967$, NS).

[g]Life-time PTSD/DUD group did not differ significantly from life-time PTSD/AUD only group on odds of past-year PTSD (aOR = 1.32; CI = 0.95, 1.85, $P = 0.1217$, NS).

[h]Life-time PTSD/AUD-only group did not differ significantly from life-time PTSD only group on odds of past-year PTSD (aOR = 0.94; CI = 0.72, 1.23; $P = 0.6832$, NS).

[i]Life-time PTSD/DUD had significantly higher odds of having PTSD in the past year than life-time PTSD-only (aOR = 1.34; CI = 1.01, 1.78, $P = 0.0568$, NS). SE = standard error.

Table 2

Prevalence of demographics and social functioning indicators among life-time comorbidity groups and non-comorbid groups, % (SE).[a,b]

	PTSD/AUD		PTSD/DUD		AUD		DUD		PTSD		Neither PTSD or SUD	
Demographics	**% /mean**	**SE/SD**	**% /mean**	**SE/SD**	**% /mean**	**SE/SD**	**% /mean**	**SE/SD**	**% /mean**	**SE/SD**	**% /mean**	**SE/SD**
Age[b]	42.0	0.7	38.6	0.6	42.7	0.2	39.5	0.3	47.4	0.6	48.5	0.1
Female	67.7	2.3	57.8	2.4	39.0	0.7	36.2	1.1	75.5	1.7	56.2	0.4
Sexual minority	7.4	1.2	11.1	1.4	3.6	0.3	5.9	0.6	2.9	0.7	1.8	0.1
Racial/ethnic minority	29.6	2.1	32.1	2.1	25.7	0.6	26.6	0.9	32.5	1.6	37.4	0.3
Veteran	12.6	1.7	9.9	1.5	12.2	0.5	9.3	0.6	10.5	1.2	8.8	0.2
Social functioning												
Not married or living with partner	50.3	2.5	59.1	2.3	42.4	0.7	52.0	1.2	47.2	1.9	40.0	0.4
No college	36.7	2.3	45.7	2.3	32.4	0.7	43.2	1.1	44.4	1.9	39.8	0.4
Currently unemployed	18.8	1.9	30.4	2.1	11.5	0.5	19.1	0.9	20.9	1.6	9.8	0.2
Family income below poverty level	36.8	2.3	48.6	2.3	24.8	0.6	35.3	1.1	37.6	1.8	29.5	0.3
Homeless in past year	5.6	1.3	9.5	1.3	1.8	0.2	5.5	0.6	2.2	0.5	0.6	0.0
Public assistance in past year	16.8	1.8	20.8	1.7	8.3	0.4	12.9	0.7	19.0	1.4	9.0	0.2
Food stamps in past year	27.2	2.1	36.8	2.2	12.6	0.5	23.7	0.9	23.4	1.5	11.9	0.2
Government insurance in past year	33.9	2.3	39.9	2.3	18.6	0.6	24.9	1.0	37.4	1.8	25.9	0.3
No insurance in past year	18.9	1.8	24.0	2.1	18.9	0.5	25.3	1.0	16.4	1.3	19.1	0.3
Incarcerated before age 18	9.2	1.5	16.5	1.6	5.0	0.3	13.5	0.8	4.2	0.8	2.0	0.1
Incarcerated age 18+	19.9	1.9	39.5	2.3	15.8	0.5	34.9	1.1	9.1	1.1	5.0	0.2

[a]Based on weighted data.

[b]To protect the privacy of National Epidemiologic Survey of Alcohol and Related Conditions-III (NESARC-III) respondents aged 90 or older (n = 187), exact ages for these individuals were not reported. Accordingly, our computations of mean [standard error (SE)] age are relevant to a population younger than 90 years. AUD = alcohol use disorder; PTSD/DUD = post-traumatic stress disorder/drug use disorders; SD = standard deviation; SUD = substance use disorder.

Table 3

aORs (95% CI) and adjusted mean differences (95% CI) between groups on demographics and social functioning indicators.[a,b]

Demographics	PTSD/AUD versus PTSD/DUD	AUD versus DUD	AUD versus PTSD/AUD	DUD versus PTSD/DUD	PTSD versus PTSD/AUD	PTSD versus PTSD/DUD
Age (years)	−3.00	−2.85	0.05	−0.57	−5.69	−8.86
	−4.81,−1.18	−3.64, −2.05	−1.42, 1.52	−1.98, 0.83	−7.51, −3.87	−10.63, −7.09
Female	0.64	0.89	3.30	2.39	0.60	0.38
	0.48, 0.85	0.80, 1.00	2.66, 4.10	1.93, 2.95	0.45, 0.80	0.29, 0.50
Sexual minority	1.61	1.68	1.87	1.73	2.25	3.34
	1.03, 2.51	1.29, 2.19	1.29, 2.70	1.22, 2.47	1.25, 4.06	1.86, 5.99
Racial/ethnic minority	0.97	0.87	1.10	1.26	0.85	0.81
	0.73, 1.28	0.77, 0.98	0.88, 1.38	1.01, 1.57	0.66, 1.11	0.62, 1.05
Veteran	0.68	0.88	2.05	1.82	1.15	0.79
	0.38, 1.20	0.72, 1.07	1.42, 2.95	1.19, 2.78	0.71, 1.86	0.44, 1.40
Social functioning						
Not married/partnered	1.29	1.24	1.30	1.29	1.14	1.46
	0.98, 1.69	1.11, 1.39	1.06, 1.60	1.04, 1.61	0.89, 1.46	1.13, 1.89
No college	1.41	1.59	1.32	1.15	0.75	1.06
	1.07, 1.86	1.42, 1.79	1.06, 1.65	0.93, 1.43	0.58, 0.97	0.82, 1.36
Currently unemployed	1.72	1.59	1.60	1.79	0.94	1.69
	1.22, 2.44	1.36, 1.85	1.21, 2.12	1.40, 2.27	0.68, 1.29	1.27, 2.27
Family income below poverty level	1.35	1.33	1.47	1.57	1.11	1.47
	1.02, 1.79	1.18, 1.49	1.19, 1.83	1.26, 1.96	0.85, 1.44	1.13, 1.91
Homeless in past year	1.49	2.47	2.45	1.62	2.35	4.03
	0.83, 2.69	1.82, 3.36	1.40, 4.28	1.08, 2.44	1.22, 4.51	2.24, 7.24
Public assistance past year	1.11	1.36	1.68	1.41	0.94	1.06
	0.79, 1.56	1.15, 1.62	1.26, 2.24	1.09, 1.82	0.67, 1.30	0.78, 1.43
Food stamps past year	1.35	1.74	1.99	1.57	1.35	1.77
	1.00, 1.81	1.51, 2.00	1.54, 2.56	1.25, 1.98	1.01, 1.82	1.35, 2.34
Government insurance in past year	1.20	1.45	2.09	1.72	1.02	1.33
	0.89, 1.62	1.26, 1.65	1.66, 2.64	1.38, 2.16	0.78, 1.34	1.01, 1.74
No insurance in past year	1.10	1.18	0.92	0.97	1.04	1.21

Demographics	PTSD/AUD versus PTSD/DUD	AUD versus DUD	AUD versus PTSD/AUD	DUD versus PTSD/DUD	PTSD versus PTSD/AUD	PTSD versus PTSD/DUD
	0.79, 1.52	1.03, 1.35	0.72, 1.19	0.75, 1.24	0.76, 1.42	0.87, 1.67
Incarcerated before 18	1.60	2.40	1.93	1.37	2.12	3.41
	1.03, 2.48	1.98, 2.90	1.29, 2.89	1.02, 1.82	1.17, 3.84	2.08, 5.57
Incarcerated age 18+	2.55	2.60	1.55	1.40	2.56	5.94
	1.85, 3.51	2.28, 2.97	1.19, 2.02	1.11, 1.78	1.76, 3.70	4.14, 8.53

[a] All models used in the computation of adjusted odds ratio (aOR) estimates and adjusted differences in means utilized weighted data and the following adjustment covariates (whenever a given covariate is not being treated as the response variable): age, gender, race/ethnicity and education. Values in bold type connote statistically significant differences following a Benjamini–Hochberg adjustment with false discovery rate set to 5% for the entire set of comparisons.

[b] The first group was always used as the referent. PTSD/DUD = post-traumatic stress disorder/drug use disorders; CI = confidence interval.

Table 4

Mean symptom counts, prevalence of life-time psychiatric comorbidities and suicide behaviors among life-time comorbidity groups and non-comorbid groups, % (SE).[a,b]

	PTSD/AUD		PTSD/DUD		AUD		DUD		PTSD		Neither PTSD or SUD	
	% /mean	SE/SD	% /mean	SE/SD	% /mean	SE/SD	% /mean	SE/SD	% /mean	SE/SD	% mean	SE/SD
PTSD symptom count	15.6	0.1	15.8	0.1	NA		NA		15.2	0.1	NA	
Most severe DUD symptom count	6.3	0.1	7.6	0.1	5.3	0.0	6.5	0.1	NA		NA	
Number DUDs	NA		2.6	0.1	NA		2.2	0.0	NA		NA	
Major depression	51.9	2.5	50.1	2.4	23.7	0.6	33.6	1.1	54.8	1.9	15.1	0.3
Bipolar I	14.1	1.7	20.7	1.9	2.3	0.2	5.7	0.5	5.7	1.0	0.6	0.1
Dysthymia	21.6	2.0	23.6	1.9	6.1	0.3	11.3	0.7	19.0	1.5	3.2	0.1
Panic	28.2	2.3	32.6	2.2	5.4	0.3	10.1	0.8	17.5	1.5	2.7	0.1
Agoraphobia	14.4	1.9	13.2	1.6	1.7	0.2	4.1	0.4	6.9	0.9	0.9	0.1
Social anxiety DO	15.9	1.8	24.3	2.1	3.7	0.3	7.2	0.6	11.6	1.2	2.1	0.1
Specific phobia	22.3	2.1	25.3	2.0	7.3	0.4	8.7	0.6	15.5	1.4	4.6	0.2
Generalized anxiety DO	34.8	2.4	38.3	2.3	8.1	0.4	14.0	0.8	28.1	1.7	4.4	0.2
Antisocial PDO	14.6	1.7	30.6	2.1	5.5	0.3	15.4	0.8	6.5	1.0	1.5	0.1
Borderline PDO	58.9	2.4	70.9	2.2	13.4	0.5	29.6	1.1	33.6	1.8	4.8	0.2
Schizotypal PDO	32.9	2.3	50.8	2.3	5.7	0.3	14.6	0.8	20.8	1.5	3.0	0.1
Thought about suicide	46.3	2.5	54.9	2.3	12.7	0.5	25.3	1.0	36.2	1.9	6.1	0.2
Life-time suicide attempt	29.0	2.3	36.6	2.3	5.9	0.3	12.6	0.7	17.3	1.5	2.9	0.1
SUD treatment	22.7	1.9	48.9	2.4	15.3	0.5	36.9	1.1	2.8	0.5	1.7	0.1
MH treatment	76.2	2.0	81.6	1.8	21.7	0.6	39.1	1.1	69.7	1.8	11.6	0.3
Both SUD and MH treatment	18.4	1.7	43.2	2.3	4.9	0.3	19.2	1.0	2.1	0.5	0.4	0.0
Never received treatment	19.6	1.9	12.6	1.6	68.0	0.7	43.2	1.1	29.6	1.8	87.1	0.3

[a]Based on weighted data. AUD = alcohol use disorder; DO = Disorder; MH = mental health; PDO = Personality Disorder; PTSD/DUD = post-traumatic stress disorder/drug use disorders; SE = standard error; SD = standard deviation; SUD = substance use disorder.

Table 5

aORs (95% CI) and adjusted mean differences (95% CI) between groups on symptom severity, life-time psychiatric comorbidities and suicide behaviors.[a,b]

	PTSD/AUD versus PTSD/DUD	AUD versus DUD	AUD versus PTSD/AUD	DUD versus PTSD/DUD	PTSD versus PTSD/AUD	PTSD versus PTSD/DUD
PTSD symptom count	0.01	NA	NA	NA	**0.44**	**0.64**
	−0.35, 0.38				0.10, 0.78	0.29, 1.00
Most severe DUD symptom count	**1.16**	**1.11**	**1.03**	**1.20**	NA	NA
	0.79, 1.53	0.95, 1.27	0.76, 1.31	0.90, 1.50		
Number DUDs	NA	NA	NA	**.43**	NA	NA
				0.26, 0.59		
Major depression	1.02	**1.71**	**2.79**	**1.76**	0.86	0.88
	0.77, 1.34	1.52, 1.94	2.27, 3.43	1.41,2.20	0.66, 1.11	0.68, 1.14
Bipolar	1.44	**2.48**	**7.91**	**4.25**	**2.64**	**3.55**
	0.99, 2.09	1.87, 3.28	5.40, 11.58	3.11, 5.79	1.65, 4.20	2.27, 5.55
Dysthymia	1.24	**2.01**	**3.48**	**2.32**	1.25	1.33
	0.90, 1.69	1.66, 2.44	2.66,4.55	1.78, 3.04	0.91, 1.70	0.98, 1.80
Panic	1.32	**1.99**	**5.22**	**3.99**	**1.85**	**2.49**
	0.97, 1.80	1.61,2.46	4.01, 6.79	3.03, 5.24	1.37,2.51	1.83, 3.38
Agoraphobia	0.93	**2.49**	**8.00**	**2.88**	**2.20**	**2.07**
	0.62, 1.41	1.80, 3.43	5.51. 11.63	2.02, 4.11	1.44, 3.36	1.33, 3.21
Social anxiety DO	**1.73**	**2.06**	**4.46**	**3.95**	1.44	**2.49**
	1.20, 2.49	1.62, 2.62	3.24, 6.14	2.91, 5.36	1.01, 2.04	1.72,3.58
Specific phobia	1.21	1.22	**2.84**	**3.18**	**1.61**	**1.88**
	0.87, 1.68	1.00, 1.48	2.17, 3.72	2.45,4.13	1.16,2.24	1.35, 2.63
Generalized anxiety DO	1.35	**2.06**	**5.52**	**3.68**	**1.40**	**1.66**
	1.01, 1.80	1.73,2.45	4.33, 7.04	2.87,4.73	1.07, 1.85	1.26, 2.20
Antisocial PDO	**2.23**	**2.71**	**3.48**	**2.75**	**2.10**	**4.83**
	1.55, 3.20	2.26, 3.26	2.51,4.83	2.13, 3.55	1.31, 3.37	3.17, 7.34
Borderline PDO	**1.45**	**2.51**	**8.61**	**5.51**	**2.93**	**4.37**
	1.08, 1.94	2.20, 2.88	6.95, 10.67	4.36, 6.97	2.26, 3.79	3.29, 5.80
Schizotypal PDO	**1.81**	**2.57**	**7.54**	**6.04**	**1.87**	**3.44**

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	PTSD/AUD versus PTSD/DUD	AUD versus DUD	AUD versus PTSD/AUD	DUD versus PTSD/DUD	PTSD versus PTSD/AUD	PTSD versus PTSD/DUD
	1.36, 2.40	2.13, 3.09	5.87,9.67	4.78, 7.63	1.40, 2.49	2.60, 4.55
Thought about suicide	**1.50**	**2.33**	**4.88**	**3.39**	**1.34**	**2.02**
	1.14, 1.98	2.02, 2.69	3.92, 6.07	2.71,4.24	1.03, 1.73	1.55,2.63
Life-time Suicide Attempt	**1.44**	**2.10**	**4.90**	**3.53**	**1.89**	**2.64**
	1.06, 1.95	1.74, 2.53	3.80, 6.32	2.74, 4.54	1.39, 2.57	1.93, 3.62
SUD treatment	**3.62**	**3.22**	**1.70**	**1.79**	**12.36**	**42.68**
	2.68, 4.88	2.83,3.66	1.34,2.16	1.43.2.23	7.74, 19.73	25.86. 70.44
MH treatment	**1.61**	**2.48**	**10.58**	**6.67**	1.25	**1.98**
	1.16,2.25	2.19,2.81	8.38, 13.36	5.12, 8.69	0.94, 1.66	1.45, 2.69
Both SUD and MH treatment	**3.88**	**4.65**	**4.23**	**3.24**	**12.12**	**46.02**
	2.84, 5.29	3.87, 5.57	3.20, 5.57	2.55,4.10	7.16,20.52	26.46, 80.04
Never received treatment	**0.53**	**0.35**	**0.12**	**0.19**	**0.64**	**0.35**
	0.36, 0.77	0.31,0.39	0.10. 0.16	0.14, 0.25	0.48, 0.87	0.25, 0.50

[a]All models used in the computation of adjusted odds ratio estimates (aOR) and adjusted differences in means utilized weighted data and the following adjustment covariates: age, gender, race/ethnicity and education. Values in bold type connote statistically significant differences after a Benjamini–Hochberg adjustment with false discovery rate set to 5% for the entire set of comparisons.

[b]The first group was always used as the referent. AUD = alcohol use disorder; DO = Disorder; MH = mental health; PDO = Personality Disorder; PTSD/DUD = post-traumatic stress disorder/drug use disorders; SE = standard error; SD = standard deviation; SUD = substance use disorder.