

RESEARCH ARTICLE

Premorbid traumatic stress and veteran responses to the COVID-19 pandemic

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Abstract

The COVID-19 pandemic has had unprecedented effects on lifestyle stability and physical and mental health. We examined the impact of preexisting post-traumatic stress disorder (PTSD), alcohol use disorder (AUD), and depression on biopsychosocial responses to the pandemic, including psychiatric symptoms, COVID-19 exposure, and housing/financial stability, among 101 U.S. military veterans enrolled in a longitudinal study of PTSD, a population of particular interest given veterans' trauma histories and defense-readiness training. Participants (83.2% male, 79.2% White, $M_{\text{age}} = 59.28$ years) completed prepandemic, clinician-administered psychiatric diagnostic interviews and a phone-based assessment between May and September 2020 using a new measure, the Rapid Assessment of COVID-19-Related Experiences (RACE), which was used to assess pandemic responses and its effects on mental and physical health; COVID-19 diagnosis and testing were also extracted from electronic medical records. Multivariate regressions showed that, controlling for demographic characteristics, prepandemic PTSD, $\beta = .332$; $p = .003$, and AUD symptoms, $\beta = .228$; $p = .028$, were associated with increased pandemic-related PTSD symptoms. Prepandemic AUD was associated with increased substance use during the pandemic, $\beta = .391$; $p < .001$, and higher rates of self-reported or medical record-based COVID-19 diagnosis, $\beta = .264$; $p = .019$. Minority race was associated with pandemic-related housing/financial instability, $\beta = -.372$; $p < .001$, raising concerns of population inequities. The results suggest that preexisting PTSD and AUD are markers for adverse pandemic-related psychiatric outcomes and COVID-19 illness. These findings carry implications for the importance of targeting prevention and treatment efforts for the highest-risk individuals.

In late 2019, the first cases of the coronavirus disease 2019 (COVID-19) from the SARS-CoV-2 virus were reported in China. COVID-19 rapidly grew to the scale of a global pandemic, and by March 2020, there was widespread community transmission necessitating masking, social distancing, quarantines, school closures, and other major lifestyle changes to mitigate exposure and disease spread. As the only global pandemic since the Spanish Flu of 1918–1919, COVID-19 has had an unprecedented impact on society, the economy, and health care. The effects of COVID-19 on physical health and mortality have been devastating for the global population, especially for the elderly, racial/ethnic minorities, and individuals with preexisting chronic health conditions (Shadmi et al., 2020). The pandemic also poses risks to mental health and well-being (Pfefferbaum & North, 2020), including anxiety about threats to health and safety, depression and loneliness related to social isolation and loss, and the potential for pandemic-related increases in substance misuse and housing and financial instability. There is also stress associated with the need for increased vigilance (e.g., to avoid coronavirus exposure) and adaptability (e.g., to follow changing guidelines and community regulations).

Numerous studies have demonstrated the detrimental effects of the COVID-19 pandemic on mental health. In a self-report study of 2,485 college students, participants who lived in areas with higher rates of COVID-19 infection experienced more severe symptoms of PTSD and depression compared with students living in less affected areas (Tang et al., 2020). Similarly, in a sample of 7,143 undergraduates, participants who had family or friends who contracted the coronavirus reported higher levels of anxiety symptoms compared with those without proximal exposure to the virus (Cao et al., 2020). Increases in anxiety were also reported among students who experienced pandemic-related disruptions to daily life or economic standing (Cao et al., 2020). Thus, indirect effects of the pandemic, such as employment or financial instability, may also contribute to worsened mental health (Mimoun et al., 2020). In light of this, the identification of individuals with the highest risk of mental health concerns carries important public health implications such that it could inform prevention and intervention efforts aimed at mitigating the deleterious long-term effects of the pandemic.

Individuals with preexisting mental health conditions are likely among those at increased risk for detrimental outcomes in response to the pandemic. Preexisting PTSD may be a vulnerability given that exposure to new-onset stressors (e.g., the COVID-19 pandemic) has been shown to increase PTSD symptom severity associated with prior trauma exposure (Bramsen et al., 2006; Schock et al., 2016). In addition, the omnipresent threat and mandates to social distance stemming from the COVID-19 pandemic may

reinforce or even exacerbate symptoms of PTSD, such as emotional disconnect from others, hypervigilance about safety, behavioral avoidance of crowds and other social situations, and maladaptive cognitions about the basic safety of the world. In a web-based self-report study using a large, cross-sectional sample of veterans in the United Kingdom with preexisting mental health conditions (i.e., PTSD, anxiety, depression, anger difficulties, alcohol misuse), Murphy et al. (2020) found that the pandemic exacerbated preexisting psychiatric symptoms, especially symptoms of depression, anxiety, and PTSD. This effect was moderated by social support such that individuals with low levels of social support experienced steeper declines in preexisting mental health conditions (Murphy et al., 2020).

Health-related anxiety about the virus and isolation resulting from social distancing also has the potential to exacerbate other disorders that are often comorbid with PTSD, such as depression and alcohol use disorder (AUD). Given the association between loneliness and depression (Aylaz et al., 2012; Barg et al., 2006), pandemic-related social isolation may worsen depression. Similarly, drinking alcohol has been shown to be a coping mechanism for stress (Hasking et al., 2011; Woolman et al., 2015) and trauma (Hawn et al., 2020), and a recent study demonstrated an association between COVID-19-related stress and increased alcohol use in the general population (Rodriguez et al., 2020). Thus, for individuals who have preexisting depression and AUD, especially in conjunction with PTSD, pandemic-related stress may worsen these symptoms.

Preexisting mental health conditions may also increase the risk of poorer physical health outcomes related to the pandemic. In their recent review, Bailey et al. (2021) posited that preexisting AUD might increase the risk of contracting COVID-19 and increase disease severity. A study by Wang et al. (2021) supported this suggestion: The authors conducted a retrospective study of 73,099,850 patients using electronic health database records from hospitals and health care providers across the United States to ($n = 12,030$ with a COVID-19 diagnosis, $n = 7,510,380$ with a substance use disorder [SUD] diagnosis) and found that those with SUDs had an increased risk of contracting COVID-19. Additionally, in a retrospective study of 7,348 adult COVID-19 patients, schizophrenia spectrum disorders were associated with an increased risk of mortality (Nemani et al., 2021), further demonstrating the potential impact of psychiatric conditions on COVID-19 illness risk and severity.

Although numerous studies have examined the effects of both the COVID-19 pandemic broadly and the viral illness specifically on mental health, there has been relatively less research to date concerning how a range of preexisting psychiatric diagnoses and symptoms might predict

biopsychosocial responses to the pandemic, including psychiatric symptoms, exposure to the disease, and financial and housing stability during the pandemic. The studies that do exist have been limited by cross-sectional and retrospective designs and the use of web-based self-report data. Temporal separation of predictors and outcomes using a longitudinal design and clinician-based assessments may offer a more valid and nuanced approach to evaluating mental health predictors of psychiatric symptoms in response to the pandemic. This would allow for targeted prevention, monitoring, and intervention to be made available to the highest-risk individuals. Our research group had the opportunity to address these questions as we were in the midst of a longitudinal study of veterans with PTSD and comorbid psychiatric conditions when the pandemic began. The primary aim of this study was to examine how baseline (i.e., prepandemic) clinician-assessed traumatic stress (i.e., PTSD, AUD, and depression) predicted three biopsychosocial responses to the pandemic: (a) changes in mental health symptoms during the COVID-19 pandemic, (b) exposure to the SARS-COV-2 virus and associated illness, and (c) changes in housing and financial stability. We developed a new measure, the Rapid Assessment of COVID-19–Related Experiences (RACE), to evaluate these outcomes, and, thus, a secondary study aim was to conduct a preliminary evaluation of the measure’s psychometric characteristics (i.e., reliability and factor structure). To our knowledge, no other measure to date assesses changes in a range of pandemic-related experiences among individuals with preexisting trauma-related and psychiatric symptoms.

We examined these issues in a longitudinal sample of 101 trauma-exposed United States military veterans. Trauma-exposed veterans are a particularly unique population to study for these purposes because social distancing mandates and the threat of COVID-19 may reinforce or exacerbate preexisting PTSD symptoms, while, at the same time, veterans have unique military and disaster preparedness training that might also influence responses to the pandemic. We hypothesized that more severe psychiatric symptoms at baseline would predict poorer pandemic-related psychiatric and housing and financial outcomes. We also hypothesized that baseline psychiatric disorders, specifically AUD and PTSD, would increase the risk of COVID-19 illness given that preexisting SUDs have been shown to increase the risk of COVID-19 infection (Wang et al., 2021) and that PTSD is associated with adverse physical health outcomes (Wolf & Schnurr, 2016). Because demographic characteristics have been shown to be differentially associated with PTSD (e.g., minorities, women, and younger individuals tend to have more severe symptoms; Ditlevsen & Elklit, 2010; Frueh et al., 2007; Koe-

TABLE 1 Participant characteristics

Variable	<i>M</i>	<i>SD</i>
Age	59.28	12.92
	<i>n</i>	%
Male sex	84	83.2
Hispanic or Latinx	7	6.9
Race ^a		
White	82	81.2
Black or African American	16	15.8
American Indian or Alaska Native	6	5.9
Native Hawaiian or other Pacific Islander	1	1.0
High school education or more	78	77.2
Prepandemic PTSD diagnosis	44	43.6
Prepandemic MDD diagnosis	24	23.8
Prepandemic AUD diagnosis	19	18.8

Note: *N* = 101. PTSD = posttraumatic stress disorder; MDD = major depressive disorder; AUD = alcohol use disorder.

^aCategories were not mutually exclusive.

nen et al., 2003) and the pandemic is disproportionately affecting minority populations (e.g., job insecurity, risk of COVID-19–related death; Boserup et al., 2020; Couch et al., 2020), we simultaneously examined age, sex, educational attainment, and minority race and ethnicity in association with biopsychosocial responses to the pandemic.

METHOD

Participants

Participants (*N* = 101) were drawn from a cohort of veterans who were enrolled in an ongoing longitudinal study of PTSD and common comorbid psychiatric conditions, including depression and AUD, prior to the start of the COVID-19 pandemic. To be eligible for the longitudinal study, veterans 18 years of age or older had to endorse a history of trauma exposure. Veterans were excluded if they were at immediate risk of self- or other-harm or if they were under the acute influence of substances. To be eligible for the follow-up COVID-19–related phone assessment, participants were required to have completed the most recent follow-up assessment before the start of the pandemic; this assessment was used as the baseline data for the present analyses. Of the 175 initially eligible participants, 102 individuals were reached by telephone for this assessment; of these veterans, one declined to participate. Participant characteristics are provided in Table 1. The resulting

study sample was primarily male (83.2%), White (79.2%), and middle-aged ($M = 59.28$ years, $SD = 12.92$). The most common types of trauma exposure were combat or warfare (43.6%), unwanted sexual contact as an adult (11.9%), and an assault by an acquaintance or stranger (5.9%). Most participants had experienced multiple types of traumatic experiences ($M = 7.01$, $SD = 4.40$). Analyses revealed no significant differences with respect to age; sex; minority status; educational attainment; or PTSD, AUD, and depression diagnosis and severity among eligible participants who did versus did not participate in the COVID-19 phone assessment, $p_s = .159-.950$.

Procedure

Eligible veterans were contacted by phone and asked to participate in a brief phone-based assessment related to the COVID-19 pandemic. Elements of informed consent were discussed at the start of the phone call. Phone assessments took place between May and September 2020. On average, the assessments occurred 522.05 days ($SD = 234.17$, range: 138–1005) after the participant's most recent in-person study evaluation. Prepandemic assessments were completed in-person and consisted of self-report assessments, structured diagnostic interviews, a brief neuropsychological assessment, and a blood draw; each prepandemic assessment lasted approximately 4.5 hr. The diagnostic assessments were videotaped, with approximately 30% coded by a second rater to determine diagnostic reliability. Participants had scheduled breaks for food and were able to take additional breaks as needed. The protocol was approved by the VA Boston Healthcare System Institutional Review Board. Participants received \$135 (USD) for their participation in the prepandemic in-person assessment and \$20 for their participation in the COVID-19-related phone assessment. In addition to asking participants about whether they had been diagnosed with COVID-19 as part of the phone assessment, we also had permission to view the VA electronic medical record (EMR) to determine participants' history of COVID-19 testing and diagnoses. Medical record information was evaluated as of April 13, 2021.

Measures

Pandemic responses

The RACE (Wolf & Fein-Schaffer, 2020) was used to assess a range of biopsychosocial pandemic responses. This questionnaire was developed for this study and intended to efficiently measure a range of both adverse and adap-

tive biopsychosocial responses to the COVID-19 pandemic, including changes in psychiatric symptoms; to date, no other measures of which we are aware have been established for this purpose. The RACE was rationally derived after reviewing the literature concerning mental health questionnaires developed in response to prior SARS viruses. The instrument consists of 26 items across five subscales that are meant to capture recent self-reported pandemic-related changes in (a) housing and financial stability (two items), (b) mood and anxiety symptoms (three items), (c) substance use (i.e., alcohol use, nonalcohol substance use, and prescription drug use; three items), (d) PTSD symptoms (eight items), and (e) the respondent's COVID-19 exposure and exposure among their friends and family (five items). In addition, the RACE includes descriptive items that are used to assess social distancing habits (three items), concern over contracting COVID-19 (one item), and a rating of change in sense of personal resilience during the pandemic (one item). The personal resilience item was included to ensure that the RACE covered both adaptive and maladaptive psychiatric responses, as there is evidence that resilience and psychiatric symptoms are at opposite ends of the same underlying construct (Wolf et al., 2018).

Items related to psychiatric symptoms and personal resilience anchor response options to the past 2 weeks and followed a standard structure with Likert-like response options. For example, the item related to pandemic-related increases in PTSD-associated nightmares was phrased as follows: "In the past 2 weeks, to what extent has the COVID-19 pandemic affected your nightmares about past trauma?" Responses were rated on a 5-point scale ranging from 1 (*I am much less bothered by trauma nightmares than usual*) to 5 (*I am a lot more bothered by trauma nightmares than usual*), with no change in symptoms at the midpoint of the scale. The COVID-19 exposure items (e.g., "Have you been diagnosed with COVID-19 by a health-care professional?") and questions about social distancing (e.g., "Were you able to practice social distancing starting around mid-March?") used dichotomous (i.e., "yes" or "no") response options. Affirmative responses to the initial COVID-19 items related to personal infection and illness among friends and family were followed by additional questions used to assess the degree of illness (e.g., history of hospitalization, intubation). For the present paper, we refer to self-exposure to COVID-19 illness as "exposure," based on self-report and medical record data, whereas exposure of a participant's family or close friend to COVID-19 is referred to as "proximal exposure." The psychiatric symptom and resilience response options were keyed such that higher scores indicate more pathological outcomes, and the Housing/Financial subscale was keyed so higher scores indicated higher levels of stability.

The Mood/Anxiety and PTSD Symptom subscales demonstrated adequate, Cronbach's $\alpha = .64$, and good internal consistency, Cronbach's $\alpha = .83$, respectively. Reliability was not assessed for the other subscales, as they were either composed of a single item or of items that were not expected to covary because they were assessing distinct phenomena. Items were read to participants over the phone along with the possible response options. The RACE is included in the Supplementary Materials.

PTSD

The Clinician-Administered PTSD Scale for *DSM-5* (CAPS) for the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; i.e., CAPS-5; Weathers et al., 2013)* is the gold standard diagnostic tool for PTSD. The CAPS-5 was administered by interviewers, ranging from trained bachelor's-level psychology technicians to licensed clinical psychologists, during the prepandemic in-person assessment and was used to assess current (i.e., past-month) PTSD diagnosis and symptom severity. PTSD symptoms were anchored to the participant's self-identified prepandemic most distressing traumatic experience. The diagnostic reliability based on a subset of about 30% of the interviews from the initial data collection demonstrated good interrater reliability, PTSD diagnosis: $k = .78$, intraclass correlation coefficient (ICC) for PTSD severity: $r = .78$.

Other mental health disorders

Sections of the Structured Clinical Interview for *DSM-5* (SCID; First et al., 2015) were administered at the prepandemic in-person assessment following standard SCID administration rules. Administered modules included those on major depressive disorder (MDD), substance use disorders, generalized anxiety disorder, panic disorder, agoraphobia, and antisocial personality disorder from the SCID-PD (First et al., 2016). For the present study, we examined common diagnoses on the SCID (i.e., MDD and AUD; see Table 1) and symptom summary scores on these modules as predictors of COVID-19-related outcomes. The diagnostic reliability from the prepandemic data collection demonstrated good interrater reliability for SCID-based diagnoses, depression diagnosis: $k = .94$, AUD diagnosis: $k = .93$.

Data analysis

As the RACE was newly developed for the present study, we first conducted a confirmatory factor analysis (CFA) of items included in the Mood/Anxiety and PTSD subscales using the weighted least squares estimator (WLSMV) to

account for the categorical nature of the response options. The CFA was conducted using the *Mplus* (Version 8.5) statistical modeling software (Muthén & Muthén, 1998–2020) and evaluated using standard fit indices and guidelines (Hu & Bentler, 1999), including root mean square error of approximation (RMSEA; values less than .06 are indicative of good model fit), standardized root mean square residual (SRMR; (values less than .08 are consistent with good fit), and the comparative fit index (CFI) and Tucker–Lewis index (TLI; values of .95 or greater on both suggest good model fit). These fit statistics were evaluated together such that a single fit statistic that fell outside these guidelines in a model that otherwise demonstrated a good fit to the data would not negate the overall acceptability of the model. We also tested a competing model based on the initial CFA results and compared the fit using a nested chi-square test, adjusting for the use of the WLSMV estimator using the DIFFTEST function in *Mplus*.

Next, we conducted bivariate correlations in SPSS (Version 26) to assess the associations among baseline psychiatric symptoms, pandemic-related psychiatric symptoms, and COVID-19 exposure. We then ran five linear regression equations to examine how prepandemic psychiatric symptom severity predicted pandemic-related changes in psychiatric symptoms (i.e., PTSD, mood and anxiety symptoms, substance use) and experiences (i.e., COVID-19 exposure, housing and financial stability). In each regression, prepandemic PTSD, AUD, and depressive symptom severity were included as predictors together in the model, controlling for age, sex, race (minority vs. nonminority), and educational attainment. For the analyses predicting COVID-19 exposure, we used a variable that reflected participants who either self-reported a diagnosis of COVID-19 or who had a positive test result in their EMR. Prepandemic PTSD severity was calculated by summing the severity scores for each CAPS item per the standard scoring algorithm (Weathers et al., 2013). Prepandemic AUD and depressive symptom severity were calculated by summing the scores (i.e., reflecting threshold, subthreshold, or negative ratings for each *DSM-5* criterion) of the items from the SCID. If a SCID module was discontinued due to a lack of initial item endorsement per standard SCID administration guidelines, severity scores of 0 were assigned for unassessed items from that module. In follow-up analyses, we replaced these three severity scores with prepandemic PTSD, MDD, and AUD current diagnoses to see if significant results remained when diagnostic determinations were used as the predictors of COVID-19-related outcomes. Additional follow-up analyses were performed to determine if significant effects remained after controlling for proximal COVID-19 exposure and, separately, housing and financial stability, to evaluate if COVID-19-related stress resulting from illness

TABLE 2 Summary of responses to Rapid Assessment of COVID-19–Related Experiences (RACE) items indexing practical and medical health outcomes of the pandemic

Variable	<i>n</i>	%
Able to social distance	101	100.0
Frequency of leaving house		
Never	15	15.0
1–4 times a week	59	59.0
Nearly everyday	26	26.0
Financial stability		
Worsened financial situation	27	27.0
No effect	61	61.0
Improved financial situation	12	12.0
Faced housing instability	8	7.9
Exposure		
Diagnosed with COVID-19 per self-report	2	2.0
Had symptoms consistent with COVID-19	24	23.8
Family/friend diagnosed with COVID-19	31	31.3
Family/friend had symptoms consistent with COVID-19	25	25.0
Family/friend death from COVID-19	27	26.7
COVID-19 testing per medical record		
Positive	6	5.9
Negative	28	27.7
Not tested	67	66.3

Note: COVID-19 testing per medical record as of April 13, 2021.

among family and friends or housing instability better accounted for the effects attributed to psychopathology. There were no missing data in these analyses.

RESULTS

Sample characteristics with respect to COVID-19 exposure and impact

Sample characteristics with respect to COVID-19 exposure and impact are summarized in Table 2. All participants reported that they were able to socially distance beginning in March 2020. Over one quarter of the sample (27.0%) reported a worsened financial situation as a result of the pandemic, whereas 7.9% of participants reported increased housing instability due to the pandemic. A small proportion of individuals (2.0%) self-reported that they were diagnosed with COVID-19 by a health care professional,

whereas 23.8% believed they had symptoms of COVID-19 but were not tested. Nearly one third of the sample (31.3%) reported that a close family member or friend was diagnosed with COVID-19 by a health care professional, and 25.0% of participants had a close family member or friend who thought they had COVID-19 symptoms but did not get tested. Over one quarter of the sample (26.7%) reported that a close family member or friend died as a result of COVID-19. Per EMR review, as of April 13, 2021, six (5.9%) participants tested positive for COVID-19, 28 (27.7%) tested negative, and 67 (66.3%) were not tested.

CFA of RACE items and bivariate correlations

The results of the CFA supported the use of the RACE Mood/Anxiety and PTSD subscales. The two-factor model fit the data well, $\chi^2(43, n = 101) = 70.23, p = .005$, RMSEA = .079, SRMR = .061, CFI = .973, TLI = .966. All items loaded significantly onto their respective latent variables, $ps < .001$; the standardized factor loadings for the mood/anxiety items ranged from $\beta = .61$ to $\beta = .86$, and the standardized factor loadings for the PTSD items ranged from $\beta = .56$ to $\beta = .92$. The two factors were highly correlated with each other, $r = .90$. Based on this high factor correlation, we compared the two-factor model to a more parsimonious single-factor model. We found that the more restrictive single-factor model was associated with significantly degraded fit compared to the two-factor model, $\Delta\chi^2 = 4.46, \Delta df = 1, p = .035$. Thus, the two-factor model was preferred.

Correlations revealed expected relations among prepandemic psychiatric symptom severity and self-reported pandemic-related changes in psychiatric symptoms. Prepandemic PTSD severity was significantly associated with pandemic-related increases in symptoms of PTSD, $r = .38, p < .001$, and mood/anxiety, $r = .33, p = .001$. Prepandemic AUD severity was significantly associated with pandemic-related increases in PTSD symptoms, $r = .32, p = .001$; substance use, $r = .47, p < .001$; and mood/anxiety symptoms, $r = .20, p = .047$, as well as COVID-19 exposure, $r = .27, p = .006$. Prepandemic depressive symptom severity was significantly positively correlated with pandemic-related increases in PTSD symptoms, $r = .26, p = .009$ and mood/anxiety symptoms, $r = .33, p = .001$. In addition, a sense of reduced personal resilience during the pandemic, as indicated by high scores on the resilience item, was correlated with pandemic-related increases in mood/anxiety symptoms, $r = .33, p = .001$, and PTSD symptoms, $r = .26, p = .009$, although alterations in one's sense of personal resilience were not associated with any prepandemic variables.

TABLE 3 Descriptive characteristics and bivariate associations among pre-pandemic psychiatric conditions and pandemic-related psychiatric symptoms and experiences

Variable	1	2	3	4	5	6	7	8	9	10
1. Pre-pandemic PTSD severity	–	.247**	.575**	.018	.326**	.132	.378**	.077	.092	.016
2. Pre-pandemic AUD severity		–	.129	–.158	.199*	.473**	.315**	–.154	.272**	.093
3. Pre-pandemic MDD severity			–	–.044	.332**	.031	.261**	.173	.030	.059
4. Housing/financial				–	–.081	–.214*	–.039	.035	–.034	.011
5. Mood/anxiety symptoms					–	.201*	.686**	.332**	.234*	.092
6. Substance use						–	.273**	–.105	.227*	.062
7. PTSD symptoms							–	.258**	.311**	.289**
8. Resilience								–	–.120	–.089
9. COVID self-exposure									–	.310**
10. Proximal COVID exposure										–
<i>M</i>	22.38	2.43	4.55	5.59	11.35	8.29	28.39	2.95	0.27	0.83
<i>SD</i>	13.56	5.05	6.39	1.08	1.93	0.88	4.09	1.04	0.45	0.94
Range ^a	0–64	0–22	0–18	2–8	8–15	6–12	23–40	1–5	0–1	0–3

Note: Variables not identified as “pre-pandemic” were derived from the Rapid Assessment of COVID-19–Related Experiences (RACE), which was administered several months after the start of the pandemic. PTSD = posttraumatic stress disorder; AUD = alcohol use disorder; MDD = major depressive disorder.

^aObserved minimum and maximum.

p* < .05; *p* < .01.

Additional correlations among the RACE subscales are shown in Table 3.

Longitudinal multivariate regression models

The results of the regression models are summarized in Table 4. Significant predictors of pandemic-related changes in PTSD symptoms were pre-pandemic PTSD severity, $\beta = .332, p = .003$, and pre-pandemic AUD severity, $\beta = .228; p = .028$. Significant predictors of increased substance use during the pandemic included age, $\beta = -.317, p = .002$, and pre-pandemic AUD severity, $\beta = .391; p < .001$. Pre-pandemic AUD severity also significantly predicted self-reported or EMR-defined exposure to COVID-19, $\beta = .264; p = .019$. Minority race and ethnicity was the only significant predictor of housing and financial instability during the pandemic, $\beta = -.372; p < .001$. All effects remained significant (i.e., *p* < .05) after including both proximal COVID-19 exposure and housing and financial stability as covariates, in separate analyses, to account for the possible confounding effects of other COVID-19–related stressors. Models with significant effects for pre-pandemic psychiatric symptoms on pandemic out-

comes were rerun using the pre-pandemic diagnostic variables in place of symptom severity scores. The pattern of results was unchanged with respect to significant effects (details available from the corresponding author). Sex, educational attainment, and pre-pandemic depression did not significantly predict psychiatric outcomes, COVID-19 exposure, or lifestyle stability during the pandemic.

DISCUSSION

Identifying individuals at heightened risk for adverse outcomes during the pandemic is critical for leveraging resources for those with the highest level of need. In a sample of veterans who had experienced a range of trauma types, including combat and sexual and physical assault, we found that pre-pandemic mental health conditions, especially PTSD and AUD, were associated with psychological and health responses to the pandemic. In particular, our results demonstrated that baseline AUD predicted later exposure to the COVID-19 virus, which is consistent with recent literature (Wang et al., 2021). Given the association between SUDs and both increased risk-taking propensity (LaSpada et al., 2020) and reduced harm avoidance (Miller et al., 2003), individuals with SUDs may be less

TABLE 4 Results of regressions examining prepandemic psychiatric symptoms as predictors of subsequent pandemic-related symptoms and experiences^a

Variable	PTSD		Mood/anxiety disorders		Substance use		COVID-19 self-exposure		Housing/financial stability	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Age	-.146	.158	-.095	.365	-.317	.002	-.145	.165	.055	.582
Sex	.140	.175	.068	.520	.032	.747	-.148	.156	.014	.886
Education	.040	.693	-.122	.240	.067	.492	.015	.880	-.048	.620
Minority race/ethnicity	.189	.066	.064	.535	.157	.112	.052	.613	-.372	.000
Prepandemic PTSD severity	.332	.003	.198	.091	.101	.353	.077	.525	.021	.856
Prepandemic AUD severity	.228	.028	.144	.184	.391	.000	.238	.034	-.029	.793
Prepandemic MDD severity	.043	.699	.202	.089	-.128	.245	-.045	.710	-.003	.978

Note: Demographic characteristics were included in Step 1 and psychiatric variables in Step 2 of each model. Bolded values are statistically significant. PTSD = post-traumatic stress disorder; AUD = alcohol use disorder; MDD = major depressive disorder.

^aOverall model fit statistics for model predicting pandemic-related PTSD: Step 1: $R^2 = .034$, $F(4, 95) = 1.873$, $p = .121$; Step 2: $\Delta R^2 = .172$, $\Delta F(3, 92) = 6.993$, $\Delta p < .001$; Overall fit statistics for model predicting pandemic-related mood/anxiety: Step 1: $R^2 = .035$, $F(4, 95) = .866$, $p = .487$; Step 2: $\Delta R^2 = .133$, $\Delta F(3, 92) = 4.889$, $\Delta p = .003$; Overall fit statistics for model predicting pandemic-related substance use: Step 1: $R^2 = .139$, $F(4, 95) = 3.844$, $p = .006$; Step 2: $\Delta R^2 = .138$, $\Delta F(3, 92) = 5.870$, $\Delta p = .001$; Overall fit statistics for model predicting COVID-19 self-exposure: Step 1: $R^2 = .046$, $F(4, 95) = 1.140$, $p = .342$; Step 2: $\Delta R^2 = .067$, $\Delta F(3, 92) = 2.308$, $\Delta p = .082$; Overall fit statistics for model predicting pandemic-related housing/financial stability: Step 1: $R^2 = .146$, $F(4, 95) = 4.052$, $p = .004$; Step 2: $\Delta R^2 = .001$, $\Delta F(3, 92) = .033$, $\Delta p = .992$.

able to accurately judge risks related to physical health and safety, especially while they are under the influence. Furthermore, individuals with SUDs may be using substances in social settings, which could increase their risk of COVID-19 exposure. SUDs also impact immunological responses (Loftis & Huckans, 2013), which may play a role in the increased risk of COVID-19 diagnosis and related symptoms.

Prepandemic AUD was also associated with pandemic-related increases in PTSD symptoms, which carries implications for understanding PTSD comorbidity and its associations with broad, underlying dimensions representing internalizing (e.g., unipolar mood disorders, anxiety, somatization disorders) and externalizing (e.g., SUDs, antisocial personality disorder) psychopathology (Slade & Watson, 2006). PTSD is often thought of as an internalizing disorder (Slade & Watson, 2006). However, there is evidence that PTSD may arise through genetic liability to either internalizing or externalizing psychopathology (Wolf et al., 2010), and research has demonstrated phenotypic associations between PTSD and both psychopathology spectra (Miller et al., 2014; Wolf et al., 2010). The results of our longitudinal research further suggest that externalizing conditions, such as SUDs, may be associated with worsening PTSD symptom severity after controlling for baseline PTSD severity. Thus, although PTSD is more strongly associated with internalizing disorders and, in the present study, shared

more variance in common with internalizing versus externalizing symptoms, the externalizing presentation may be a marker for a particularly unique and problematic PTSD symptom course. The importance of this is further highlighted by the present finding that AUD was associated with an increased risk of COVID-19 exposure over time.

In addition, our results demonstrate an increase in preexisting psychiatric symptoms during the pandemic. Prepandemic PTSD predicted pandemic-related increases in PTSD symptoms, which is consistent with prior literature concerning PTSD and psychiatric responses to the pandemic (Liu et al., 2021; Murphy et al., 2020). This finding suggests that the COVID-19 pandemic, an acute-onset stressor, exacerbates PTSD symptoms related to prior traumatic experiences. One possibility is that behaviors that are important for reducing viral exposure during the pandemic, such as quarantining, social distancing, and remaining vigilant about masking, may reinforce existing PTSD symptoms, such as avoidance, estrangement from others, and hypervigilance. In addition, participants with prepandemic AUD were more likely to report increased substance use during the pandemic. Thus, individuals with PTSD and AUD are at a higher risk for poorer pandemic-related psychiatric outcomes, suggesting targeted treatment efforts among these individuals may be particularly useful in mitigating the long-term consequences of the COVID-19 pandemic.

We found that 5.9% of the sample had tested positive for COVID-19, which was lower than the cumulative prevalence of the disease in the northeast region of the United States, where the study was conducted, at the time of study completion. Haderlein et al. (2020) found that veterans with PTSD were less likely to test positive for COVID-19 than veterans without PTSD. The authors suggested that veterans with PTSD were already more socially isolated before the pandemic, potentially resulting in lower infection rates in this population (Haderlein et al., 2020). Veterans may also have military training that lends itself to increased hypervigilance and preparedness (e.g., isolating and stocking resources for long periods). Thus, the low rates of infection within this clinical veteran sample could suggest that the characteristics of PTSD (e.g., avoidance, heightened perceived sense of threat) associated with an increased risk of worsening mental health symptoms are protective with respect to avoiding exposure to the virus. This requires careful clinical consideration in how to prevent COVID-19 exposure among this population without reinforcing PTSD symptoms.

An alarming proportion of participants (26.7%) reported that a close family member or friend died from COVID-19. Murphy et al. (2020) also reported that a high proportion (15.1%) of individuals in their veteran sample knew someone who had died from COVID-19. Given that the current assessment was administered during the summer of 2020, relatively early in the pandemic, it is particularly troubling that such a high proportion of the present sample had experienced a COVID-19–related loss. These losses may meet the definition of a *DSM-5*–defined traumatic experience, potentially contributing to psychiatric symptoms in response to new trauma exposure. Another concerning trend in the data was that racial and ethnic minorities, a variable included in all analyses along with age, educational attainment, and sex, were more likely to lose their housing as a result of the pandemic. This is consistent with known race-related health disparities (Lopez et al., 2021; Tai et al., 2021) and the disproportionate rise in unemployment (Couch et al., 2020) among minority individuals during the pandemic. Notably, the factors that were associated with changes in psychiatric symptoms during the pandemic were distinct from those associated with housing changes. This finding highlights the growing need for programs designed to prevent housing loss among veterans, such as the U.S. Department of Housing and Urban Development–VA Supportive Housing (HUD-VASH) Program.

These results should be interpreted in consideration of the study's strengths and limitations. The main strengths of the study include its longitudinal design, the use of clinician-administered diagnostic interviews, and the breadth of assessment of both prepandemic and

pandemic-related mental health. Limitations include the small sample size and the predominantly male, all-veteran sample, which limits the generalizability of the results. An additional limitation is that our pandemic assessment was based on a newly derived measurement self-report tool, the RACE, although this initial examination of its psychometric properties, including internal consistency and the results of the CFA, supports its use. The RACE was administered relatively early in the pandemic, before the spike of COVID-19 cases in the United States in late 2020 and early 2021, and, thus, an additional limitation is that we may not have fully captured veterans' responses to the worst of the pandemic to date. Additionally, the current version of the RACE does not assess mask usage, and this would be a useful addition to future revisions to the measure. Another limitation of the measure is that there are strong demand characteristics when inquiring about social distancing practices; thus, respondents may have been reluctant to report that they did not follow these guidelines. Furthermore, due to the small number of participants who either self-reported a COVID-19 diagnosis or had a positive test result in the EMR (5.9%), we considered both participants who were diagnosed with COVID-19 and those who believed they had COVID-19 symptoms but were not tested as having been exposed to COVID-19. It is important to note that the phone assessment was conducted in the initial 6 months of the pandemic, when testing was not easily accessible. In addition, we did not administer the CAPS-5 or SCID over the phone, so our assessment of pandemic-related symptom change was limited by the self-report nature of this evaluation. We also did not assess mental health treatment at the time of the follow-up, so we were not able to control for intervention effects. We did not assess if participants' exposure to COVID-19–related loss or illness met the *DSM-5* definition of a traumatic experience or if individuals had PTSD symptoms specific to this potentially traumatic event. In addition, we were underpowered to evaluate potential demographic or other moderators of the associations of interest, so it is unclear if associations between prepandemic psychiatric symptoms and pandemic-related outcomes might differ by participant characteristics. Finally, although the study benefited from a longitudinal design, we cannot determine causal associations among the data given the potential for unmeasured, confounding variables.

Overall, the present results demonstrate that individuals with preexisting conditions, particularly PTSD and AUD, are uniquely affected by the pandemic and are at heightened risk for both adverse psychiatric outcomes and exposure to the virus. These findings carry implications for targeting prevention and treatment efforts for these high-risk individuals. For instance, brief PTSD and AUD assessments administered during routine primary care visits,

followed by the provision of brief psychoeducation related to drinking guidelines and risks factors for COVID exposure or treatment referrals may have clinically significant downstream effects. Just as resources are leveraged for individuals with an increased risk of poor outcomes from the virus itself (i.e., the elderly, individuals with preexisting cardiac conditions), targeted prevention and intervention efforts should be made for those with the highest risk of adverse psychiatric outcomes.

OPEN PRACTICES STATEMENT

The study reported in this article was not formally pre-registered. Neither the data nor the materials have been made available on a permanent third-party archive; qualified investigators may apply for access to deidentified data via a data repository that we maintain by sending an email to the corresponding author at Erika.Wolf@va.gov.

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