

# The impact of COVID-19 on trends in alcohol use disorder treatment in Veterans Health Administration

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## Funding information

There are no funders to report.

## Abstract

**Background and Aims:** The COVID-19 pandemic disrupted health-care provision in the United States and prompted increases in telehealth-delivery of care. This study measured alcohol use disorder (AUD) treatment trends across visit modalities before and during COVID-19.

**Design, Setting, Participants and Measurements:** We conducted a national, retrospective cohort study with interrupted time-series models to estimate the impact of COVID-19 on AUD treatment in the Veterans Health Administration (VHA) in the United States during pre-COVID-19 (March 2019 to February 2020) and COVID-19 (March 2020 to February 2021) periods. We analyzed monthly trends in telephone, video and in-person visits for AUD treatment and compared patient and treatment characteristics of patients receiving AUD treatment between the pre-COVID-19 and COVID-19 periods. AUD was defined using International Classification of Diseases, 10th revision (ICD-10) codes for alcohol abuse (F10.1) and alcohol dependence (F10.2), which have previously been used to study AUD in VHA.

**Findings:** The predicted percentage of VHA patients with an AUD diagnosis receiving any AUD treatment at the beginning of the pre-COVID period was 13.8% ( $n = 49\,494$ ). The predicted percentage decreased by 4.3% ( $P = 0.001$ ) immediately at the start of the COVID-19 period due to a decline in AUD psychotherapy. Despite an increase of 0.3% per month ( $P = 0.026$ ) following the start of COVID-19, the predicted percentage of VHA patients with an AUD diagnosis receiving any AUD treatment at the end of the study period remained below the pre-COVID-19 period. In February 2021, AUD psychotherapy visits were primarily delivered by video (50%, 58 748), followed by in-person (36.6%, 43 251) and telephone (13.8%, 16 299), while AUD pharmacotherapy visits were delivered by telephone (38.9%, 3623) followed by in-person (34.3%, 3193) and video (26.8%, 2498) modalities. Characteristics of VHA patients receiving AUD treatment were largely similar between pre-COVID-19 and COVID-19 periods.

**Conclusions:** Despite increased telehealth use, the percentage of United States Veterans Health Administration patients with an alcohol use disorder (AUD) diagnosis receiving AUD treatment declined during COVID-19 (March 2020 to February 2021) mainly due to a decrease in psychotherapy.

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## KEYWORDS

Alcohol use disorder, COVID-19, substance use disorders, telehealth, telemedicine, veterans

## INTRODUCTION

Alcohol-related deaths were rising prior to 2020 [1, 2], and accelerated during the novel SARS-CoV-2 (COVID-19) pandemic [3, 4]. The increase in alcohol-related mortality during COVID-19 suggests a decrease in alcohol use disorder (AUD) treatment utilization and/or an increase in treatment need that has not been met in this vulnerable population. Several studies have found an increase in alcohol use, including hazardous alcohol use, during COVID-19 [5–8], and adverse alcohol-related health outcomes [9]. However, there has been limited understanding of AUD treatment utilization during COVID-19.

COVID-19 has had widespread impacts on health-care delivery and use [10, 11]. To reduce COVID-19 exposure in health-care environments, United States federal policy changes were implemented in March 2020 that expanded telehealth [12], including both video and telephone-only visits to patients at home. Prior work has found that expanded use of telehealth supported sustainment of medication treatment for opioid use disorder after the start of the pandemic [13, 14]. However, further studies are needed to understand the impact of COVID-19 on treatment utilization in patients with AUD and other substance use disorders, particularly those where effective treatments include both medication and psychotherapies. Telehealth in AUD care has been examined to a limited extent in single-center studies to assess patient satisfaction, change in alcohol use and treatment attendance [15–20]. However, to our knowledge there are no studies examining changes in receipt of telehealth and other modalities of AUD care during the COVID-19 pandemic in large health-care systems. Research examining trends in AUD care among telehealth modalities, including telephone and video, and changes in the characteristics of patients who are receiving treatment during the COVID-19 pandemic could help to identify care and treatment gaps.

The Veterans Health Administration (VHA) is the largest integrated health system in the United States and is the largest addiction treatment provider in the country. Substance use disorder care is a VHA priority [21]. The objective of this study was to estimate the impact of COVID-19 on AUD treatment among a national sample of Veterans receiving care in VHA with an AUD diagnosis. Herein we compare shifts in delivery modalities and patient characteristics of those seeking AUD treatment before and during COVID-19.

## METHODS

In this retrospective cohort study, we examined United States national VHA data to compare trends in AUD treatment (psychotherapy and pharmacotherapy) throughout the 12 months before and after the start of COVID-19 in the United States. The ‘pre-COVID-19’ period was defined as the 12 months from March 2019 to February 2020 and the ‘COVID-19’ period was defined as the

12 months from March 2020 to February 2021. The COVID-19 pandemic was declared as a national emergency by the President of the United States on 13 March 2020. Data were obtained from VHA’s Corporate Data Warehouse, a relational database that contains the VHA’s electronic health records, including demographics, outpatient and inpatient visits and pharmacy data, including all medication coverage (fill data) that have been used for VHA patients [22–24]. This study was deemed exempt from review by the VA Ann Arbor Health-care System Institutional Review Board and followed the Strengthening of Reporting of Observational Studies in Epidemiology Statement (STROBE, see Supporting Information, Table S1) checklist [25].

## Cohort definition

There were two approaches to defining cohorts in this study. The first was comprised of monthly rolling cohorts of VHA patients with AUD diagnoses to examine changes in overall treatment use and treatment use by modalities across months during the two periods (pre-COVID-19 and COVID-19). Patients in each monthly cohort included VHA patients ages  $\geq 18$  years with at least one VHA outpatient encounter with an AUD diagnosis (either primary or secondary) in the 12 months prior to and including the month of interest. AUD was defined using International Classification of Diseases, 10th revision (ICD-10) codes for alcohol abuse (F10.1) and alcohol dependence (F10.2), which have previously been used to study AUD in VHA [26–28]. The second cohort was comprised of patients who received any AUD treatment in the pre-COVID-19 and COVID-19 periods to assess for changes in patient characteristics and number of AUD treatment visits between the pre-COVID-19 and COVID-19 periods.

## Outcomes

An AUD treatment visit was defined as: (1) AUD psychotherapy visit, classified as group or individual psychotherapy visit for AUD using Current Procedural Terminology (CPT) codes and VHA stop codes (see Supporting information, Table S1), and/or (2) AUD pharmacotherapy visit when the provider for the AUD visit was the same as the prescriber for a Food and Drug Administration (FDA)-approved medication for AUD (i.e. naltrexone oral or extended-release, disulfiram or acamprosate). The number of patients receiving any AUD pharmacotherapy for each monthly rolling cohort was based on the total number of patients with medication coverage (fill days) that month. Using a similar approach to prior work in substance use disorders [29], AUD treatment visit modality was defined using VHA clinic stop codes and CPT codes corresponding to video, telephone or in-person modalities associated with a provider who delivered psychotherapy and/or wrote the prescription for AUD pharmacotherapy (see

Supporting information, Table S1). As AUD treatment use may vary based on whether or not patients had more recently started AUD treatment, similar to studies of substance use [13], we divided patients with AUD treatment into two groups: (1) those initiating AUD care, defined as patients with no AUD treatment (including AUD psychotherapy or pharmacotherapy fills covering any days) in the prior 90 days and (2) those continuing AUD care, defined as patients who received any AUD treatment in the prior 90 days.

We compared patient characteristics among patient cohorts of those who had received any AUD treatment during the 12-month pre-COVID and COVID periods, which includes overlap of patients who may have received AUD treatment during both periods (see Analysis below). We collected available data on socio-demographics, including age, sex, race, ethnicity, VHA eligibility status (across categories of service connectedness) [30, 31], rurality of patient residence based on Rural–Urban Commuting Area codes [32, 33], homelessness and/or housing instability based on ICD-10-CM/visit codes (see Supporting information, Table S1). We also examined clinical characteristics, including comorbid mental health disorders [serious mental illness, non-AUD substance use disorders, depression and post-traumatic stress disorder (PTSD)] together with the number of AUD treatment visits (see Supporting information, Table S1). Rurality and service connectedness, defined by the first documented status during the study period, were included as both may have impacted AUD treatment utilization and modalities used during COVID-19. Mental health diagnoses and homelessness were classified as service used or diagnosis during any visit within the 1 year prior to the first AUD diagnosis during each study period.

## Analysis

The analytical goals were to: (1) estimate the impact of COVID-19 on the percentage of patients with AUD receiving AUD treatment, (2) compare monthly trends in treatment modalities (video, telephone and in-person) separately for psychotherapy visits and for pharmacotherapy visits between the pre-COVID-19 and COVID-19 periods and (3) compare characteristics of patients receiving AUD treatment, number of treatment visits and the number of patients initiating and continuing treatment between the pre-COVID-19 and COVID-19 periods. In each month, we calculated among those with diagnosed AUD the percentage (and number) of patients receiving any AUD treatment, and separately for psychotherapy and for pharmacotherapy treatment. We chose the month of the declaration of the COVID-19 pandemic as a national emergency in the United States (March 2020) as the interruption time-point. This declaration was associated with federal telehealth policy changes in the United States that ensued during the same month of March 2020 to help to address disruptions in health-care related to the pandemic [34]. When the data for overall AUD treatment were visualized over time, the pattern was clearly linear with an interruption, and thus we used a segmented regression model for our interrupted time-series (ITS) data analyses [35] for each overall, psychotherapy and pharmacotherapy. We used

the ITS package in Stata version 17 [36] (2021; StataCorp LLC, College Station, TX, USA) which uses robust standard errors. A segmented regression model adjusts for the prior trends in outcome and thus more robustly examines change in AUD treatment trends between the pre- and COVID-19 periods [35, 37]. For each time-series outcome data, we included in the model time as month from the start of COVID-19 (incrementing each month by 1 from -12 for March 2019 and 11 for February 2021), an indicator for post-COVID-19 period, and an interaction between time and post-COVID-19 period indicator, allowing estimation of the monthly rate of use in AUD treatment during pre-COVID-19 period (slope), immediate level change and difference in slopes between the two periods, respectively. We also estimated the monthly number of AUD psychotherapy and pharmacotherapy visits by modalities (video, telephone and in-person) to compare trends in treatment modalities between the two study periods. Finally, patients who received treatment for AUD in the pre-COVID-19 and COVID-19 periods were compared on patient characteristics and number of AUD treatment visits for both psychotherapy and pharmacotherapy, using generalized linear models with an indicator for the pandemic period and generalized estimating equation (GEE) to account for correlation of patients included in both periods. We used effect sizes to express and understand the standardized magnitude of differences in patient characteristics between cohorts [38, 39]. The data for AUD treatment visits were skewed, and therefore the median with interquartile range are reported.

In this study, fewer than 2% of patients had missing data for the following variables: race/ethnicity, rurality and service connectedness. Missing data were grouped into 'other/unknown'. There were no missing data for other variables. Bias in this study was minimized because the comparisons were based on natural interruption of the COVID-19 pandemic, and because we examined monthly time-series data adjusting for trends prior to COVID-19 pandemic throughout the study outcomes. The analysis plan for this study was not pre-registered, and therefore findings are exploratory in nature.

## RESULTS

The total number of patients with an AUD diagnosis decreased by 5% from 364 355 in March 2019 to 346 121 in February 2021. ITS analysis in the 12-month pre-COVID period found the predicted percentage of patients with an AUD diagnosis who were receiving any AUD treatment at the beginning of the study period was 13.8% ( $n = 49\ 494$ ), and decreased 0.09% per month ( $P = 0.005$ , Table 1 and Figure 1). The predicted percentage decreased by 4.3% ( $P = 0.001$ ) immediately at the start of the COVID-19 period, followed by an increase of 0.30% per month ( $P = 0.026$ ). The predicted percentage of patients receiving any AUD treatment at the end of the study period remained below the pre-COVID-19 period (Figure 1a).

From the ITS analysis examining the impact of COVID-19 on AUD treatment, the predicted percentage of patients receiving AUD psychotherapy at the start of the 12-month pre-COVID-19 period

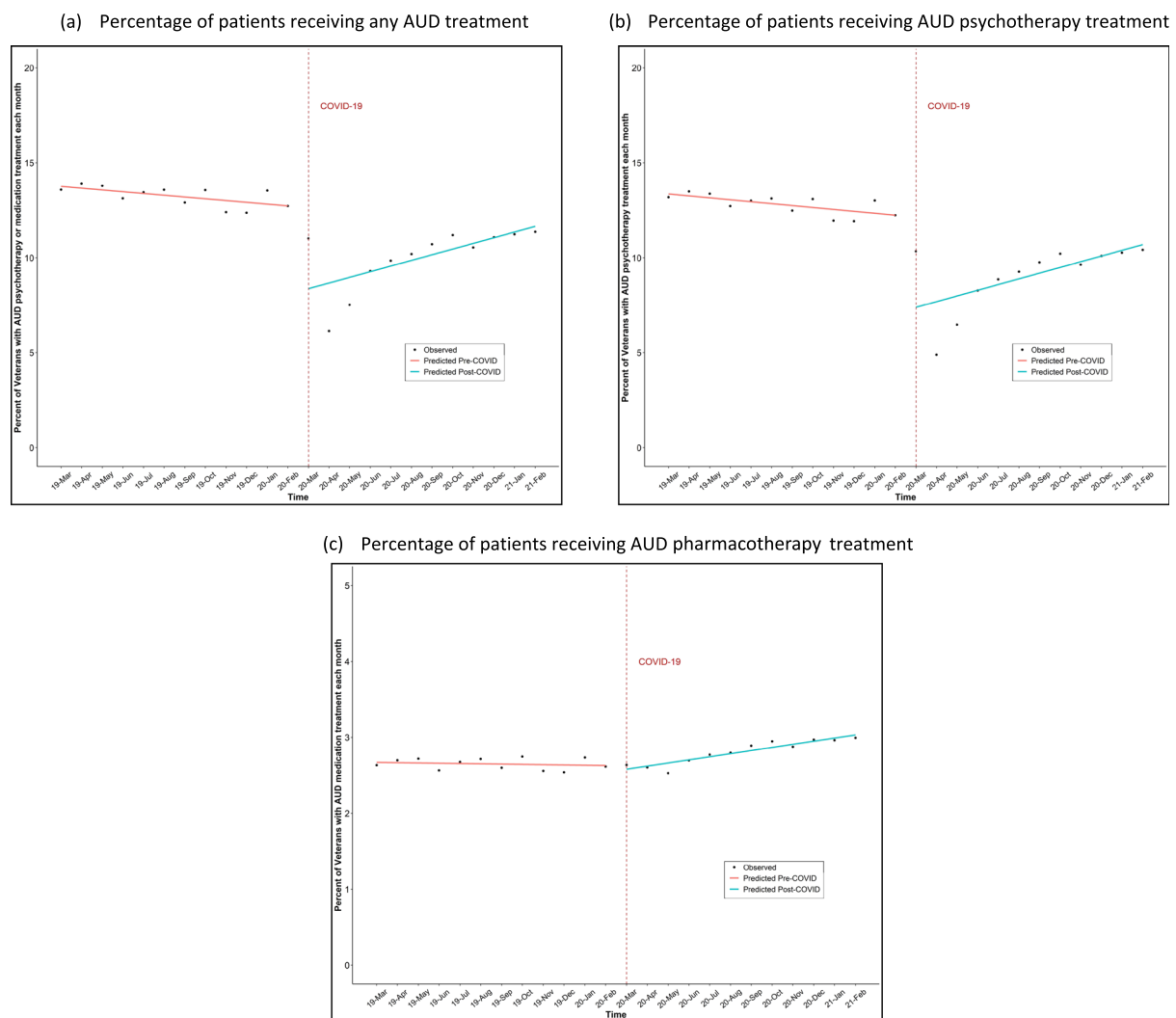
**TABLE 1** Interrupted time-series analyses examining percentage of patients receiving AUD treatment before (March 2019–February 2020) and during (March 2020–February 2021). COVID-19.

	Pre-COVID-19		Change from February 2020 to March 2020		Post-COVID-19		Post- compared to pre-COVID-19	
	Rate (%) <sup>a</sup>	CI	Change	CI	Rate (%) <sup>a</sup>	CI	Rate Difference	CI
% of patients with any AUD treatment	-0.093**	(-0.15, -0.03)	-4.270**	(-6.43, -2.11)	0.298*	(0.04, 0.56)	0.391**	(0.12, 0.66)
% of patients with AUD psychotherapy	-0.101**	(-0.16, -0.04)	-4.756**	(-7.11, -2.40)	0.300*	(0.02, 0.59)	0.401**	(0.11, 0.69)
% of patients with AUD pharmacotherapy	-0.004	(-0.01, 0.01)	-0.046	(-0.16, 0.07)	0.041**	(0.03, 0.05)	0.045**	(0.03, 0.06)

AUD = alcohol use disorder; CI = confidence interval.

\*P < 0.05; \*\*P < 0.01.

<sup>a</sup>Change per month in the percentage of patients receiving AUD treatment.

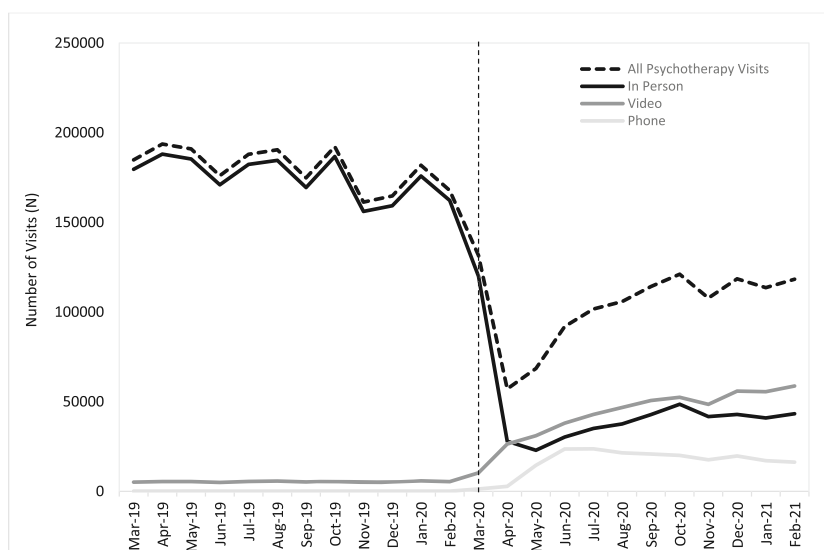


**FIGURE 1** Trends in the percentage of patients receiving alcohol use disorder (AUD) treatment from March 2019 to February 2021 in Veterans Health Administration. Trend lines are from interrupted time-series models: (a) AUD psychotherapy and/or pharmacotherapy use, (b) AUD psychotherapy use and (c) AUD pharmacotherapy use.

was 13.4%, with a decrease of 0.1% per month ( $P = 0.002$ ) during pre-COVID-19. The predicted percentage of patients receiving AUD psychotherapy treatment decreased by 4.8% ( $P < 0.001$ ) immediately at the start of the COVID-19 period, followed by a monthly increase of 0.3% ( $P = 0.040$ ). The predicted percentage of patients receiving AUD psychotherapy in the COVID-19 period remained below that in the pre-COVID-19 (Figure 1b). The predicted percentage of patients receiving AUD pharmacotherapy at the start of the 12-month pre-COVID-19 period was 2.7%, without a significant monthly change ( $P = 0.424$ ) during the 12 months prior to the start of COVID-19, and no significant immediate change was seen at the start of the COVID-19 period ( $P = 0.428$ ). However, the predicted percentage of patients receiving AUD pharmacotherapy treatment increased by 0.04% per month ( $P < 0.001$ ) during the COVID-19 period. The predicted percentage of patients receiving AUD pharmacotherapy at the end of the

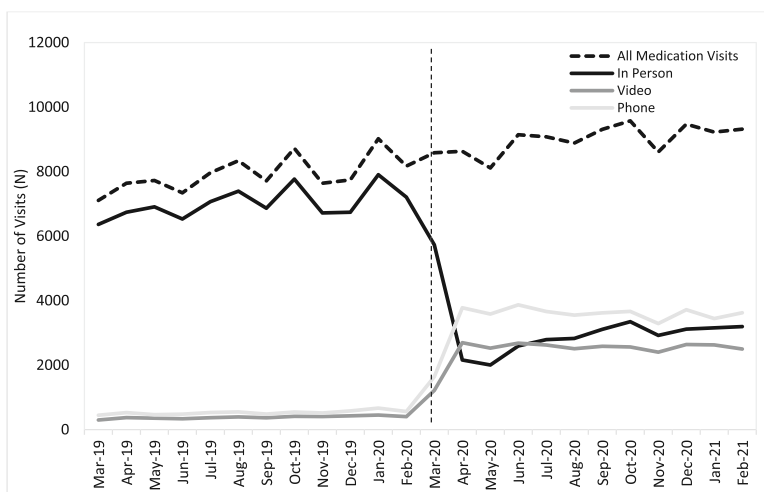
COVID-19 period was significantly higher compared to that at the start of the pre-COVID-19 period (Figure 1c).

Modalities used for AUD treatment changed substantially during the study period (Figure 2). In March 2019, 179 583 visits (97.2% of March 2019 AUD psychotherapy visits) were conducted in-person, and this decreased to 43 251 (36.6%) by February 2021 (Figure 2a). Similarly, the number of AUD pharmacotherapy visits that were in-person decreased from 6363 visits (89.5% of AUD pharmacotherapy visits) in March 2019 to 3193 visits (34.3% of AUD pharmacotherapy visits) in February 2021 (Figure 2b). By February 2021, AUD psychotherapy visits were primarily delivered by video (50%, 58 748), followed by in-person (36.6%, 43 251) and telephone (13.8%, 16 299), while AUD pharmacotherapy visits were delivered by telephone (38.9%, 3623) closely followed by in-person (34.3%, 3193) and video (26.8%, 2498) modalities.



(a) Number of AUD psychotherapy visits in the Veterans Health Administration across modalities on a given month between 3/2019 and 2/2021.

Note: the dashed line denotes the point between pre- and post-COVID timepoints (3/1/2020).



(b) Number of AUD visits with a receipt of pharmacotherapy in the Veterans Health Administration across modalities on a given month between 3/2019 and 2/2021.

Note: the dashed line denotes the point between pre- and post-COVID timepoints (3/1/2020).

**FIGURE 2** Trends in the monthly number of (a) AUD psychotherapy and (b) pharmacotherapy visits among modalities from March 2019 to February 2021 in Veterans Health Administration. AUD = alcohol use disorder.

Descriptive comparisons of patient characteristics with an AUD diagnosis and AUD treatment utilization among Veterans engaged in psychotherapy or medication for AUD in the 1-year pre-COVID-19 and COVID-19 periods are presented in Table 2. Patient characteristics were largely unchanged among the time-periods given the small

effect sizes, although patients with AUD treatment in the COVID-19 period were more likely to be younger, female, white and Hispanic and less likely to be homeless or non-service-connected compared to patients in pre-COVID-19 period. Patients with AUD treatment in the COVID-19 period had a lower prevalence of mental health disorders,

**TABLE 2** Comparing patient characteristics and treatment utilization among Veterans engaged in psychotherapy or medication for alcohol use disorder during 12 months before (March 2019–February 2020) and after (March 2020–February 2021) COVID-19 telehealth policy changes.

	Pre-COVID-19 n = 182 604	COVID-19 n = 139 433	P-value <sup>a</sup>	ES  <sup>b</sup>
Age in years	52.3 ± 14.1	51.2 ± 14.1	< 0.001	0.065
Age groups [n (%)]			< 0.001	0.039
18–29	8559 (4.7)	6416 (4.6)		
30–44	50 962 (27.9)	43 569 (31.3)		
45–64	82 374 (45.1)	61 375 (44.0)		
65+	40 708 (22.3)	28 072 (20.1)		
Female [n (%)]	14 880 (8.2)	13 187 (9.5)	< 0.001	0.046
Race/ethnicity [n (%)]			< 0.001	0.020
White, non-Hispanic	105 960 (59.0)	80 940 (59.2)		
Black, non-Hispanic	47 335 (26.4)	34 143 (24.9)		
Hispanic	15 973 (8.9)	13 090 (9.6)		
Other/unknown, non-Hispanic	10 377 (5.8)	8505 (6.2)		
Rurality [n (%)]			0.431	0.002
Urban	158 247 (86.7)	120 929 (86.7)		
Rural	18 724 (10.3)	14 266 (10.2)		
Other/unknown	5633 (3.1)	4238 (3.0)		
Homelessness	46 046 (25.2)	33 696 (24.2)	< 0.001	0.023
Service connectedness [n (%)]			< 0.001	0.028
Non-service connected	60 321 (33.0)	45 645 (32.7)		
Service connection < 50%	35 690 (19.6)	27 474 (19.7)		
Service connection 50–100%	85 397 (46.8)	64 648 (46.4)		
Other/unknown	1196 (0.7)	1666 (1.2)		
Mental health disorders [n (%)]				
Serious mental illness <sup>c</sup>	30 869 (16.9)	22 267 (15.9)	< 0.001	0.027
Other substance use disorder (excluding AUD)	35 349 (19.4)	24 711 (17.7)	< 0.001	0.044
Depressive disorder	115 378 (63.2)	87 793 (63.0)	0.068	0.004
Post-traumatic stress disorder	89 088 (48.8)	68 888 (49.4)	< 0.001	0.012
Number of AUD psychotherapy visits, median (IQR)	3 (1, 10)	3 (1, 8)	< 0.001	0.117
Number of AUD pharmacotherapy visits, median (IQR)	2 (1, 4)	2 (1, 5)	0.083	0.039

Cell values are mean ± standard deviation unless otherwise specified.

AUD = alcohol use disorder; ES = standardized effect size; IQR = interquartile range; SD = standard deviation.

<sup>a</sup>P-values come from generalized estimating equation (GEE) with an indicator for the COVID period to account for correlation of patients included in both periods.

<sup>b</sup>Effect size calculation:

1. For continuous variable:

$$D = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2 + s_2^2}{2}}}$$

$\bar{x}_1$  and  $\bar{x}_2$  denote the sample mean of variable in each group,  $s_1^2$  and  $s_2^2$  denote the sample variances, respectively.

2. For binary variable:

$$D = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1) + \hat{p}_2(1-\hat{p}_2)}{2}}}$$

$\hat{p}_1$  and  $\hat{p}_2$  denote the proportion of variable, respectively.

3. For categorical variable with more than two groups, the effect size comes from Cramér's V for  $\chi^2$  test.

<sup>c</sup>Includes bipolar disorder, psychosis and/or schizophrenia.



except for PTSD. The median number of AUD psychotherapy visits per patient decreased significantly during the COVID-19 period ( $P < 0.001$ ), while the median number of AUD pharmacotherapy visits per patient was unchanged ( $P = 0.083$ ) when compared to the pre-COVID-19 period. The number of unique patients who initiated AUD treatment decreased by 30% from 117 653 (117 534 psychotherapy and 24 495 pharmacotherapy) in the pre-COVID-19 period to 82 298 (78 618 psychotherapy and 21 609 pharmacotherapy) in the COVID-19 period. The total number of patients who continued AUD treatment decreased by 12% from 64 951 (60 444 psychotherapy and 12 338 pharmacotherapy) in the pre-COVID-19 period to 57 135 (51 404 psychotherapy and 13 342 pharmacotherapy) in the COVID-19 period.

## DISCUSSION

In this study, estimating the impact of COVID-19 on AUD treatment in VHA, a nation-wide health-care system in the United States, we found that the percentage of patients with an AUD diagnosis receiving any AUD treatment decreased substantially after the start of COVID-19. Overall decreases in AUD treatment were driven by a sharp decline in psychotherapy treatment visits which were not supplanted by smaller increases in AUD pharmacotherapy visits. At the same time, delivery of AUD care shifted substantially away from in-person visits towards both video and telephone visits for both psychotherapy and pharmacotherapy. Furthermore, while patient characteristics during the pre-COVID-19 and COVID-19 periods were largely unchanged, the number of patients initiating and continuing AUD treatment also fell. Despite increases in telehealth utilization for AUD treatment, the number of patients receiving AUD treatment declined during COVID-19, suggesting a widening gap in AUD care.

Additionally, the overall number of patients with an AUD diagnosis decreased by 5% over the study period. Given the rise of alcohol-associated mortality during COVID-19 [3, 4], these findings are concerning and could suggest that fewer Veterans are being diagnosed with AUD during the COVID-19 pandemic, despite broader increases in harmful drinking [5, 6, 8]. Findings from this study highlight the need to focus upon bringing more Veterans with AUD into care, a long-standing problem [40, 41] now exacerbated by COVID-19, and to further consider how AUD care can be optimally delivered using telehealth or in-person modalities to reach more patients.

COVID-19 telehealth policies aimed to support and maintain access to care during the pandemic. These AUD treatment findings differ from prior studies examining opioid use disorder treatment, which found that the expansion of telehealth-delivered buprenorphine helped to sustain and even increase opioid use disorder care after the start of the COVID-19 pandemic [13, 14]. The sharp rise of alcohol-related mortality during COVID-19 coupled with the rapid implementation and expansion of telehealth services in response to the pandemic has created urgency to understand what needs to be provided overall to both telehealth and in-person care to address AUD treatment needs. In this study, we examined AUD treatment trends among

in-person and telehealth (video and telephone) visit modalities in the 1 year before and 1 year after onset of COVID-19. Due to social distancing and other COVID-19 mitigation measures, we expectedly saw a sharp decline of in-person AUD treatment visits. Despite an increase in the number of AUD psychotherapy and pharmacotherapy visits delivered by telehealth, the percentage of patients with an AUD diagnosis receiving any AUD treatment, together with the median number of psychotherapy visits per patient, all decreased in the COVID-19 period when compared to the pre-COVID-19 period.

There are both effective psychosocial and pharmacological treatments for AUD [42–44]. However, globally, pre-COVID-19 estimates indicate that only one in six people with AUD received treatment [45, 46]. Psychotherapy visits can be conducted as individual or group visits and are aimed at developing skills to manage AUD symptoms. In our study, group and individual psychotherapy accounted for most of the AUD treatment during the pre-COVID-19 period, but also decreased the most during the COVID-19 period. One reason for the change in AUD psychotherapy use compared to pharmacotherapy could be the nature of the treatment itself. Many studies suggest that telehealth psychotherapy is associated with similar acceptability and feasibility compared to in-person psychotherapy treatment [20, 47, 48]. However, there are some indicators that there may be additional logistical challenges for group psychotherapy [49, 50] that may impact patient engagement compared to telehealth for individual psychotherapy and pharmacotherapy, at least with rapid implementation that occurred during the pandemic. The lack of supplanted AUD pharmacotherapy in the COVID-19 period may be related to low utilization pre-COVID-19 [23, 40, 51], but may also represent an opportunity to enhance AUD treatment use given the ongoing pandemic and its impact on health-care. Numerous barriers to AUD treatment exist, including stigma, lack of patient-perceived treatment need, limited knowledge regarding AUD treatment by patients and clinicians and limited perceived effectiveness of AUD treatment, among others [52, 53], and the decrease in treatment rates indicate that many barriers were further exacerbated by the pandemic.

Examining telehealth delivery of treatment for vulnerable patients, including those with AUD, is particularly important in the current context of the ongoing COVID-19 pandemic. Much chronic care management, including behavioral health, has shifted from in-person to telehealth care during COVID-19 [12], and our study findings parallel broader changes reported during COVID-19 [54]. However, the observed decline in the percentage of patients receiving AUD treatment, particularly psychotherapy treatment, in this study suggests that AUD treatment needs are not being met despite increases in telehealth utilization. Possible contributors to the declining percentage of patients receiving AUD treatment include: (1) patients dropping out of AUD care and (2) a decrease in patients initiating treatment. Both issues are individually problematic, particularly when the overall treatment rates for AUD are low. Prior studies of patient perceptions of telehealth for substance use disorder care have been limited to single-practice settings and singular treatments, but have demonstrated high levels of patient satisfaction with telehealth treatment, comparable with in-person treatment [19, 20, 55].

However, these studies do not distinguish whether patients might have different perceptions of their experiences in telehealth based on the type of substance use disorder treatment received. A small, single-clinic study examined patient satisfaction in telehealth among substance use disorder treatments (including individual and group psychotherapy) during COVID-19 [49]. In this study, most patients were continuing (not initiating) substance use disorder treatment, identified alcohol as the substance use that had caused most difficulty recently and were engaged in group or individual psychotherapy. Despite strong ratings of satisfaction with telehealth, only 36% of participants reported a preference for individual therapy via telehealth and 43% preferred group therapy visits via telehealth. For patients seeking treatment for a range of substance use disorders, there may be varying experiences/preferences for visit modality across evidence-based treatments due to variability in the level of interpersonal interaction and engagement among these visit modalities, and further tailoring may be needed to patient preferences that may not have been possible during the pandemic.

There are several strengths and limitations to this study. This study was a retrospective observational cohort study using administrative data, and therefore findings should be treated as observations. Furthermore, given the lack of pre-registration of the analysis plan, the findings in this study are exploratory. Patients receiving care in VHA are represented in this cohort and are an important population at higher risk for AUD [56], but generalizability to other populations may be limited. The VHA has a comprehensive electronic medical record that includes inpatient and outpatient clinical care and prescription data tracked across all VHA facilities, although our data do not capture treatment received outside the VHA. During the COVID-19 pandemic, the VHA rapidly implemented infrastructure to support and scale telehealth care delivery broadly, so the use of telehealth for AUD may exceed that in other health systems [57–61]. Additionally, many patients have been previously exposed to AUD treatment but do not remain treated. This study was not able to assess AUD treatment exposure rate but, rather, evaluated AUD treatment received at a given point in time. At baseline, before COVID-19, overall receipt of pharmacotherapy for AUD is low across all medications [62]. Given the low rates of AUD treatment pre-COVID-19, treatment rates are sensitive to fewer patients coming into care and staying in care.

This study found that in the national VHA health-care system, the percentage of patients with an AUD diagnosis receiving treatment declined during the COVID-19 pandemic. There have been important priorities set supporting and expanding care for substance use disorders, such as opioid use disorder before and during COVID-19. Studies assessing the impact of these policy changes during COVID-19 demonstrate sustainment of opioid use disorder care [14]. In contrast, there has been limited investigation of the impact of COVID-19 on AUD treatment utilization. Given the already very low rates of AUD treatment pre-COVID-19 pandemic [45, 46], these decreases are concerning and suggest that additional interventions are needed to engage untreated patients with AUD care. This study suggests that increased stressors on the health-care system from COVID-19 [11, 63, 64], similar to other medical conditions [65–69], resulted in decreased health-care utilization, and that transition to telehealth as it

was conducted during the pandemic did not address declines in AUD treatment. It is too soon to tell if the decreases in AUD treatment observed in this study will endure beyond the COVID-19 pandemic, and re-engaging patients into AUD care may prove more challenging. Further studies examining barriers to telehealth (both telephone and video) are needed, especially focusing upon psychotherapy for AUD. This study highlights important gaps in AUD treatment in patients in VHA and may be helpful for future program planning and research aimed at increasing engagement in AUD care and treatment.

#### AUTHOR CONTRIBUTIONS

**Ponni Perumalswami:** Conceptualization; formal analysis; investigation; methodology; project administration; resources; supervision; writing—original draft; writing—review and editing. **Sidonie Kilpatrick:** Data curation; formal analysis; investigation; methodology; validation; writing—review and editing. **Madeline C. Frost:** Methodology; writing—review and editing. **Megan Adams:** Writing—review and editing. **Hyungjin Myra Kim:** Formal analysis; methodology; writing—original draft; writing—review and editing. **Lan Zhang:** Data curation; formal analysis; investigation; methodology; validation; writing—original draft; writing—review and editing. **Lewei Lin:** Conceptualization; formal analysis; funding acquisition; investigation; methodology; project administration; resources; supervision; writing—original draft; writing—review and editing.

#### ACKNOWLEDGEMENTS

The opinions expressed in this work are the authors' and do not necessarily reflect those of the institutions, funders, the Department of Veterans Affairs, or the United States Government. This work was supported by funding from the VA Office of Connected Care (OCC 21-11). L.A.L. is also supported by a US Department of Veterans Affairs Health Services Research and Development Career Development Award (CDA 18-008) and CDC R49 CE003085.

#### DECLARATION OF INTERESTS

L.A.L. consults on telehealth for substance use disorder treatment for National Committee for Quality Assurance with funding from Alkermes and for Providers Clinical Support System with funding from SAMHSA.

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## SUPPORTING INFORMATION

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

**How to cite this article:** Perumalswami PV, Kilpatrick S, Frost MC, Adams MA, Kim HM, Zhang L, et al. The impact of COVID-19 on trends in alcohol use disorder treatment in Veterans Health Administration. *Addiction*. 2023;118(6):1062–71. <https://doi.org/10.1111/add.16156>