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Treatment for alcohol use disorder among persons with and without HIV in a clinical care setting in the United States

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Abstract

Background: Alcohol use disorders (AUD) can lead to poor health outcomes. Little is known about AUD treatment among persons with HIV (PWH). In an integrated health system in Northern California, 2014–2017, we compared AUD treatment rates between PWH with AUD and persons without HIV (PWoH) with AUD.

Methods: Using Poisson regression with GEE, we estimated prevalence ratios (PRs) comparing the annual probability of receiving AUD treatment (behavioral intervention or dispensed medication), adjusted for sociodemographics, psychiatric comorbidities, insurance type, and calendar year. Among PWH, we examined independent AUD treatment predictors using PRs adjusted for calendar year only.

Results: PWH with AUD (N=633; 93% men, median age 49) were likelier than PWoH with AUD (N=7006; 95% men, median age 52) to have depression (38% vs. 21%) and a non-alcohol substance use disorder (SUD, 48% vs. 25%) (both $P<0.01$). Annual probabilities of receiving AUD treatment were 45.4% for PWH and 34.4% for PWoH. After adjusting, there was no difference by HIV status (PR 1.02 [95% CI 0.94–1.11]; $P=0.61$). Of treated PWH, 59% received only a behavioral intervention, 5% only a medication, and 36% both, vs. 67%, 4%, 30% for treated PWoH, respectively. Irrespective of HIV status, the most common medication was gabapentin.

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CONTRIBUTORS

All authors have contributed to the work and approved the final version.

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Among PWH, receiving AUD treatment was associated with having depression (PR 1.78 [1.51–2.10]; $P<0.01$) and another SUD (PR 2.68 [2.20–3.27]; $P<0.01$).

Conclusions: PWH with AUD had higher AUD treatment rates than PWoH with AUD in unadjusted but not adjusted analyses, which may be explained by higher psychiatric comorbidity burden among PWH.

Keywords

HIV; alcohol use disorder; unhealthy alcohol use; depression; psychotherapy; pharmacotherapy; gabapentin; naltrexone

1. INTRODUCTION

Unhealthy alcohol use, including excessive drinking and alcohol use disorder (AUD), affects 10–25% of US persons with HIV (PWH), compared with 5–15% of the general population (American Psychiatric Association, 2013; Crane et al., 2017; Curry et al., 2018; Grant et al., 2015; Hartzler et al., 2017; Park et al., 2016; Silverberg et al., 2020). Among PWH, unhealthy alcohol use can lead to lower care engagement and virologic suppression and to increased sexual risk behaviors (Hutton et al., 2019; Lesko et al., 2019; Monroe et al., 2016; Satre et al., 2020). PWH with unhealthy alcohol use also have higher rates of liver and cardiovascular disease, pneumonia, and mortality (DeLorenze et al., 2011; Freiberg et al., 2010; Jolley et al., 2016; Klein et al., 2016). Unhealthy alcohol use therefore puts PWH at risk of multiple adverse health outcomes and forward HIV transmission, and treating unhealthy alcohol use in this population has important implications for patient and community health.

Several therapies are efficacious to reduce or cease unhealthy alcohol use, including behavioral interventions (e.g., cognitive behavioral therapy, motivational interviewing) and three medications approved by the US Food and Drug Administration (FDA): acamprosate, disulfiram, and naltrexone (Curry et al., 2018; Karno et al., 2021; Kranzler and Soyka, 2018; Maisel et al., 2013; Reus et al., 2018). Nalmefene is approved for alcohol use reduction by the European Medications Agency but not the FDA (Palpacuer et al., 2015). Several medications FDA-approved for other indications (e.g., gabapentin, topiramate) can reduce symptoms associated with alcohol withdrawal and subsequent relapse (Kranzler et al., 2014; Kranzler and Soyka, 2018; Mason et al., 2014). Clinical trials have demonstrated the safety and efficacy among PWH of naltrexone, motivational interviewing, and integrated behavioral and pharmacotherapy to reduce alcohol use and in some instances improve HIV outcomes (Edelman et al., 2019a; Edelman et al., 2019b; Gonzales et al., 2020; Korthuis et al., 2017; Satre et al., 2019b). Observational studies among military veterans with HIV have also reported alcohol use reductions with gabapentin, and improvements in antiretroviral adherence, CD4 count, and virologic suppression with intensive behavioral treatment (McGinnis et al., 2020; Rentsch et al., 2019).

Receipt of AUD treatment is low in high-income countries, ranging 7–18% in the US general population (Donoghue, 2021; Grant et al., 2015; Mekonen et al., 2020). Studies among veterans have also reported low AUD treatment rates, with lower rates for PWH than

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persons without HIV (PWoH), and low medication use among patients receiving behavioral treatment (McGinnis et al., 2020; Oldfield et al., 2020; Williams et al., 2017). There is little evidence on AUD treatment rates among PWH in other settings, and existing studies have examined treatment for substance use disorders (SUDs) but not AUD specifically, or screening, brief interventions, and referral to treatment rather than treatment for AUD (Hechter et al., 2019; Satre et al., 2013; Silverberg et al., 2020).

Given the burden and adverse effects of AUD among PWH, examining AUD treatment rates in this population is essential to identify unmet needs, inform clinical management, and develop targeted interventions. Furthermore, characterizing current clinical practices with PWH receiving AUD treatment can inform future studies evaluating real-world effectiveness in PWH, whose experiences with antiretrovirals, comorbidities, and stigma could impact treatment outcomes. Using data from a large integrated health system, among patients with AUD, we compared receipt of behavioral and pharmacologic AUD treatment by HIV status, and examined treatment predictors among PWH.

2. METHODS

2.1 Study population

This study was nested in a cohort of adult (≥18 years) PWH enrolled in Kaiser Permanente Northern California (KPNC) between 1 July 2013 and 31 December 2017, matched 1:20 to PWoH by age, sex, race/ethnicity, and observation start year (Silverberg et al., 2020). KPNC is an integrated health system providing primary and specialty care to >4.5 million members who are demographically similar to other insured adults in this region (Gordon and Lin, 2016; Gordon, 2020). Psychiatry and addiction medicine treatment in KPNC includes assessment, individual and group therapy, and medication management. Addiction medicine services further include day hospital, education, and relapse prevention groups. KPNC members can access psychiatry and addiction medicine services without referral, except members with Medicaid coverage (12% of members), who must access addiction medicine services through county providers (Gordon, 2020). Sociodemographics, diagnoses, clinic visits, procedures, dispensed medications, and laboratory measurements were captured from electronic health records (EHR).

In this study, we included cohort patients with an AUD diagnosis recorded by a provider in the EHR between 1 January 2014 and 31 December 2017. AUD diagnoses were captured using International Classification of Diseases (ICD), Ninth and Tenth revisions codes, excluding remission codes (Supplemental Table 1). Analyses were conducted by calendar year, and patients contributed to each year during which they had an AUD diagnosis recorded.

The KPNC and University of California, San Francisco Institutional Review Boards approved this study with waivers of informed consent.

2.2 Study measures

We examined two AUD treatment types, behavioral intervention and medication. Receipt of a behavioral intervention was defined as having ≥1 encounter in a given calendar year

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for individual or group psychotherapy with a provider in psychiatry or addiction medicine, captured using CPT codes 90792, 90832–90840, 90845, and 90853. We did not include codes for evaluation without medical services (CPT 90791), or for family psychotherapy (CPT 90846, 90847). Medication use was defined as having ≥1 dispensed prescription in a given calendar year for a medication FDA-approved (acamprosate, disulfiram, naltrexone) or used off-label (baclofen, gabapentin, nalmefene, topiramate) to treat AUD (Kranzler and Soyka, 2018). Off-label medications were only included if they were prescribed by a provider in psychiatry or addiction medicine, to avoid capturing prescriptions for other indications. For each calendar year, medications dispensed the previous year were counted if supply was sufficient to last until the current year (e.g., a 90-day supply dispensed on 1 November of the previous year).

Covariates in this analysis were sex, race/ethnicity, age, depression, non-alcohol SUD, insurance type, neighborhood deprivation index (NDI), and smoking status. Age was updated every calendar year and categorized as 18–29, 30–39, 40–49, 50–59, and ≥60 years. Depression and SUD were updated every calendar year and defined as any diagnosis recorded by a provider in the EHR during the current or previous year (Supplemental Table 1). Insurance type and NDI were time-fixed and measured at the earliest AUD diagnosis recorded in the study period. NDI was calculated according to published methodology and categorized into quartiles based on the sample distribution (Messer et al., 2006). Smoking status was updated every calendar year and defined using the last known measurement in the current or previous year.

Among PWH, covariates also included HIV acquisition risk factor (men who have sex with men [MSM], injection drug use [IDU], heterosexual, other), CD4 count (categorized as <350, 350–500, >500 cells/μL), and viral suppression, defined as an HIV viral load (VL) <200 copies/mL. For CD4 count and VL, we used the earliest available measurement in each calendar year.

2.3 Statistical analysis

For each calendar year 2014–2017, for each AUD treatment type and for any AUD treatment (either a behavioral intervention or medication), we estimated the annual probability of receiving treatment, calculated as the number of patients receiving treatment divided by the number of patients with an AUD diagnosis recorded in that year. Poisson regression models with generalized estimating equations (GEE) estimated prevalence ratios (PRs) comparing PWH and PWoH, accounting for patients contributing to more than one calendar year of analysis, and adjusting for all listed covariates. We selected *a priori* covariates that could influence provider referral or patient uptake of AUD treatment. To describe which covariates were the strongest confounders of any association between HIV status and AUD treatment, we conducted analyses adjusting for one covariate at a time, measuring the change-in-estimate, calculated as $|(adjusted\ PR - unadjusted\ PR) / unadjusted\ PR|$ and expressed as a percentage, with a larger percentage signifying stronger confounding (Rothman et al., 2008). To evaluate the possible impact on our results of treatment not specific to addiction or AUD, we conducted sensitivity analyses restricted to behavioral interventions in addiction medicine and FDA-approved AUD medications.

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To identify treatment predictors that might inform specifically the care of PWH, we conducted a subgroup analysis among PWH and examined factors independently associated with receiving any AUD treatment, using separate Poisson regression models with GEE to estimate PRs for each characteristic. Because there was no primary risk factor of interest in this subgroup analysis, we did not fit multivariable models. We adjusted only for calendar year, to account for possible changes in the patient population of PWH over the study period.

Analyses were conducted in SAS v9.4 (SAS Institute, Cary, NC). *P*-values were two-sided with a pre-specified alpha of 0.05.

3. RESULTS

3.1 Study sample

From the cohort of 11,235 PWH and 227,320 matched PWoH (Supplemental Fig. 1), we included 633 PWH and 7006 PWoH with an AUD diagnosis recorded during the study period who contributed 910 and 9546 person-years, respectively. Demographic characteristics were similar by HIV status due to matching in the original cohort, but there were several differences after selecting only patients with AUD. PWH were less likely than PWoH to be men (93% vs. 95%), White (56% vs. 61%), and ≥60 years old (18% vs. 26%) (Table 1, all $P<0.05$). PWH were likelier than PWoH to have depression (38% vs. 21%) and a non-alcohol SUD (48% vs. 25%), particularly stimulant use disorder (31% vs. 9%) (all $P<0.01$).

Among PWH, the most common HIV risk factors were MSM (65%) and IDU (15%). At the earliest AUD diagnosis recorded in the study period, 83% of PWH were virally suppressed with a median CD4 count of 598 cells/μL (interquartile range 410–840).

3.2 AUD treatment by HIV status

Overall, 53% of PWH and 39% of PWoH received any AUD treatment, either a behavioral intervention or medication, at any time during the study period. Of these, among PWH, 59% received only a behavioral intervention, 5% only a medication, and 36% received both, compared with 67%, 4%, and 30% among PWoH, respectively.

Among patients with a recorded AUD diagnosis in a given year, the annual probability of receiving any AUD treatment was 45.4% (95% confidence interval [CI] 41.6%−49.5%) for PWH and 34.4% (33.3%−35.5%) for PWoH (Fig. 1). Comparing PWH to PWoH, the unadjusted PR for receiving any treatment was 1.32 (1.20–1.45; $P<0.01$). In adjusted analyses, there was no difference by HIV status (PR 1.02 [0.94–1.11]; $P=0.61$). When examining individual covariates (Supplemental Table 2), the strongest confounders were age (5.2% change-in-estimate from unadjusted to adjusted), depression (14.5%), and non-alcohol SUD (15.0%).

The annual probability of receiving a behavioral intervention was 42.3% for PWH (38.6% −46.4%) and 32.3% (31.3%−33.4%) for PWoH, with an unadjusted PR of 1.31 (1.19–1.44; $P<0.01$) (Fig. 1). There was no difference between PWH and PWoH after adjustment (PR

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1.01 [0.92–1.10; P=0.88]). Among patients who received a behavioral intervention at any time during the study period, 27.3% of PWH only received an intervention from a provider in psychiatry, 41.3% only in addiction medicine, and 31.4% both, compared with 26.5%, 50.8%, and 22.8%, respectively, among PWoH.

For medication use, either FDA-approved or off-label, the annual probability of treatment was 18.0% (15.3%−21.3%) and 11.3% (10.6%−12.1%) among PWH and PWoH, respectively, with an unadjusted PR of 1.59 (1.33–1.90; P<0.01) (Fig. 1). In adjusted analyses, PWH had a PR of 1.15 (0.97–1.36; P=0.10) compared with PWoH. Among patients who used a medication at any time in the study period, there were no differences in medication distribution by HIV status (Table 2, all P>0.05). The most frequently prescribed medications were gabapentin (77% of PWH, 70% of PWoH) and naltrexone (26% of PWH, 33% of PWoH), and one-quarter of both PWH and PWoH used more than one medication during the study period. The proportion of treated patients with a medication refill during the study period was 73% for PWH and 62% for PWoH, ranging 43–80% by specific medication (Supplemental Table 3).

In sensitivity analyses restricted to behavioral interventions in addiction medicine and FDA-approved AUD medications (Supplemental Fig. 2), annual probabilities of treatment were lower than the main findings, particularly for medication use with 6.3% (4.7%−8.4%) for PWH and 5.4% (4.9%−6.0%) for PWoH. In these analyses, there was no difference by HIV status in medication use, while PR estimates for behavioral interventions and any AUD treatment were similar to the main findings.

3.3 Factors associated with AUD treatment among PWH

Among PWH, the annual probability of receiving any AUD treatment increased slightly over the study period (PR per year 1.07 [1.01–1.14]; P<0.05) (Table 3). Adjusted only for calendar year, the annual probability of receiving treatment was lower for patients who were 50–59 (PR 0.78 [0.64–0.95]; P<0.05) or ≥60 (PR 0.53 [0.39–0.73]; P<0.01) vs. 40–49 years old. Sex and race/ethnicity were not associated with receiving treatment. Compared with MSM, the probability of receiving treatment was higher for those with IDU risk factor (PR 1.25 [1.01–1.55]; P<0.05) and lower for those with heterosexual risk (PR 0.62 [0.42–0.90]; P<0.05). Patients with depression or a non-alcohol SUD were likelier to receive treatment, with PRs of 1.78 (1.51–2.10; P<0.01) and 2.68 (2.20–3.27; P<0.01), respectively. Insurance type was also associated with treatment, with a PR of 0.70 (0.54–0.89; P<0.01) for commercial/Medicare compared with commercial insurance only. Having a lower CD4 count was associated with a lower probability of receiving AUD treatment, for example patients with CD4 counts 350–500 vs >500 cells/μL had a PR of 0.71 (0.57–0.89; P<0.01). Patients who were not virally suppressed had a PR of 0.79 (0.62–0.99; P<0.05).

4. DISCUSSION

In this integrated health system, the annual probability of receiving AUD treatment among PWH with AUD was 42% for behavioral interventions, 18% for medications, and 45% for any treatment, compared with 32%, 11%, and 34% among PWoH with AUD, respectively. In adjusted analyses, there was no difference by HIV status for any treatment or behavioral

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interventions, and only a small difference for medications that was not statistically significant. Among PWH with AUD, those with depression and other SUD were likelier to receive AUD treatment, while patients older than 50 years were less likely.

Our findings on AUD treatment rates are consistent with previous work among PWH and PWoH showing generally low treatment rates for unhealthy alcohol use including AUD, particularly with pharmacotherapy. A recent study based in the same KPNC cohort reported that among PWH exceeding recommended alcohol consumption limits, 36% received a brief intervention, and 5% were linked to an addiction specialist within a year (Silverberg et al., 2020). Several studies have examined AUD treatment among US military veterans with HIV, with 20–40% receiving addiction specialty care and 1–4% a medication (Frost et al., 2019; Oldfield et al., 2020; Williams et al., 2017). Among military veterans, 20% of PWH receiving behavioral AUD treatment also received a medication, compared almost 40% in our study (McGinnis et al., 2020). In the general population, primary care-based studies have reported that 4–10% of patients with AUD had a medication prescription and 18–25% had a visit with a behavioral health specialist, and a national survey found that 8% of respondents with recent AUD had sought treatment (Bernstein et al., 2021; Evoy et al., 2020; Grant et al., 2015; Hallgren et al., 2020). In a national study of commercially insured adults with AUD, 13% filled a prescription for AUD treatment (Huskamp et al., 2020).

Treatment rates in our study were slightly higher than previous reports, though comparison across studies is hampered by differences in calendar periods, populations (military veterans vs. private clinics; patients with excessive alcohol use vs. diagnosed AUD), and study design, particularly in treatment time frames (ranging 14 days to 2 years) and inclusion of non-FDA approved medications. These design differences align with particular objectives, e.g., estimating care quality metrics vs. identifying individual- and facility-level treatment predictors (Oldfield et al., 2020; Weisner et al., 2019). In our study aiming to broadly characterize AUD treatment rates and types by HIV status, our approach including all patients with AUD in a given year allowed us to capture both prevalent and incident AUD, and treatment initiated at any time. Despite study differences, our findings along with previous studies highlight the persistent challenges of increasing AUD treatment rates among PWH and PWoH.

Studies of AUD treatment rates by HIV status have found conflicting results. Previous work in this cohort showed that, in patients exceeding recommended alcohol use limits, PWH were less likely than PWoH to receive a brief intervention, but likelier to be linked to addiction specialty care (Silverberg et al., 2020). In contrast, studies among military veterans have generally reported lower treatment initiation for unhealthy alcohol use among PWH compared with PWoH (Oldfield et al., 2020; Williams et al., 2017). In unadjusted analyses, we observed higher annual treatment rates for PWH, with a PR of 1.3 and an absolute difference of 11%. This is a relatively small difference. However, given the challenges of increasing AUD treatment uptake, a treatment rate that is 11% higher may nonetheless represent substantial clinical efforts. After adjustment, differences by HIV status were even smaller and not statistically significant. When we examined individual covariates, age, depression, and SUD were the strongest confounders explaining the association between

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HIV status and receiving AUD treatment. Differences in these characteristics across study populations might partly explain discrepancies between studies.

For example, in our study, there was a large difference in stimulant use disorder prevalence between PWH and PWoH (31% vs. 9%), while in a recent AUD treatment study in military veterans, there was a lower prevalence of stimulant use disorder overall and a lesser difference by HIV status (Oldfield et al., 2020). While we adjusted for non-alcohol SUD in comparing treatment rates, we could not adjust for upstream effects such as differential AUD diagnosis rates. Further, there could be differences across study populations in variables we did not measure here. Other studies examining treatment for any SUD including AUD have also found conflicting results, with one study reporting higher uptake for PWH vs. PWoH, and another reporting no difference by HIV status (Hechter et al., 2019; Kraemer et al., 2019).

Among PWH with AUD, having depression or another SUD was strongly associated with receiving AUD treatment, consistent with some earlier work in military veterans (Frost et al., 2019). Patients older than 50 years were less likely to receive AUD treatment. Previous studies have reported inverse associations between age and AUD or SUD treatment uptake (Hechter et al., 2019; Oldfield et al., 2020; Satre et al., 2013). Age-related effects on AUD treatment uptake warrant additional research to understand underlying reasons, as evidence shows that substance use including alcohol remains an important health concern as PWH get older (Parsons et al., 2014). We did not observe any treatment differences by race/ethnicity, unlike reports of lower rates for Black vs. White patients, among both PWH and PWoH and in various clinical settings (Chen et al., 2020; Hechter et al., 2019; Oldfield et al., 2020; Silverberg et al., 2020; Weisner et al., 2019). Markers of less well-controlled HIV were also associated with lower treatment in our study. Altogether, in the setting of an integrated health system with equal care access, these findings might identify patients with competing health needs receiving greater provider attention, or structural barriers to care engagement such as food insecurity (Whittle et al., 2019).

Our finding that gabapentin was the most frequently used medication is consistent with a recent study among military veterans (McGinnis et al., 2020). While some trial and observational evidence has shown a benefit of gabapentin to treat AUD, other studies have found no benefit (Kranzler and Soyka, 2018; Rentsch et al., 2019). US guidelines generally recommend acamprosate or naltrexone as first-line AUD pharmacotherapy (Reus et al., 2018; VA/DOD, 2015). Oral and extended-release naltrexone have been shown to be safe and efficacious specifically in PWH as well (Edelman et al., 2019b; Gonzales et al., 2020; Korthuis et al., 2017). Efforts should be made to ensure patients with AUD receive the most effective available treatments. However, we did not examine AUD treatment history in our study. Gabapentin use could reflect unsuccessful prior treatment with other medications, or patient or provider preferences for gabapentin. Additional work is needed to understand prescribing patterns and longitudinal treatment course in patients initiating AUD medications.

This study's strengths include a large sample of patients with AUD with diverse racial/ethnic distribution. Additionally, the integrated health system setting enabled us to compare AUD

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treatment using a matched cohort of PWH and PWoH. We were also able to leverage EHR data to examine both behavioral and pharmacologic AUD treatment, including gabapentin and other off-label AUD medications, which few studies have done.

This study has several potential limitations. Patients in our study were from a single region, mostly privately insured, and almost entirely men. Our findings may not be generalizable to women or patients in other settings. A majority of PWH were MSM, but we did not have sexual orientation data for PWoH and could not adjust for this factor. We relied on provider specialty to identify off-label medication use, which could have missed prescriptions to treat AUD by other providers, or captured uses for other indications. Similarly, we could not ascertain whether behavioral interventions targeted AUD specifically. In sensitivity analyses restricted to behavioral interventions in addiction medicine and FDA-approved AUD medications, there was no difference in medication use by HIV status, but other results led to similar conclusions as the main findings. Additionally, we did not examine specific types of behavioral interventions, other types of health counseling, or inpatient treatment. Finally, an important consideration is that our study focused on patients with diagnosed AUD based on EHR, which may be associated with patient and physician factors. For example, factors like depression and non-alcohol SUD that might have led to higher AUD treatment rates among PWH could also have led to a higher AUD diagnosis rate. In contrast, a KPNC study reported that PWH were less likely than PWoH to be screened for unhealthy alcohol use in routine primary care, which could result in a lower AUD diagnosis rate among PWH (Silverberg et al., 2020). In a study of all patients with AUD, differences in treatment rates between PWH and PWoH could therefore be attenuated or more pronounced compared with our findings, depending on underlying associations of HIV status with AUD diagnosis. Thus, our results should be interpreted with caution and replicated in future research.

Our findings have several implications for clinical care and future research. Less than half of patients with AUD received treatment annually, and medications were particularly underutilized. Efforts should continue to be made to increase treatment uptake in patients with AUD. Although unadjusted AUD treatment rates were higher among PWH, several considerations highlight the need for particular efforts to improve diagnosis and treatment of AUD in PWH. PWH in high-income countries experience a higher AUD prevalence than PWoH, and greater negative health effects of alcohol use (Justice et al., 2016; Park et al., 2016). In our study, PWH with AUD had a substantially higher prevalence of depression and non-alcohol SUDs than PWoH with AUD, which could further lead to worse health outcomes and greater challenges for effective AUD treatment. Increasing AUD treatment uptake in PWH may require targeted interventions to address fears of stigma, lack of provider comfort, and other structural barriers (Chichetto et al., 2019; Chokron Garneau et al., 2018; Harris et al., 2012; Keyes et al., 2010). Approaches integrating SUD treatment in HIV care may be preferred by PWH, have shown promise to improve HIV and SUD outcomes, and are being further evaluated (Altice et al., 2011; Edelman et al., 2019a; Edelman et al., 2019b; Egan et al., 2011; Korthuis et al., 2017; Oldfield et al., 2019; Satre et al., 2019a). Nonetheless, attention should be paid to potential treatment barriers among PWH with only AUD, half of our sample, who remain at risk of adverse health outcomes. Finally, future studies should examine AUD treatment outcomes among PWH, including retention and effectiveness, to further identify unmet needs and areas for improvement.

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5. CONCLUSIONS

AUD treatment rates in this integrated health system were higher than in some previous studies but remained low, especially for pharmacotherapy. PWH with AUD, who had a high burden of depression and other SUDs, were likelier to receive AUD treatment than PWoH with AUD, but after adjusting for sociodemographics and psychiatric comorbidities no statistically significant differences were observed. Efforts should continue to focus on increasing AUD treatment uptake among PWH with AUD and evaluating AUD treatment outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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HIGHLIGHTS

- AUD treatment rates were higher for PWH with AUD than PWoH with AUD.
- Adjusted for psychiatric conditions, AUD treatment rates were similar by HIV status.
- Gabapentin was the most common AUD pharmacotherapy, regardless of HIV status.
- Depression and non-alcohol SUD were associated with AUD treatment in PWH with AUD.

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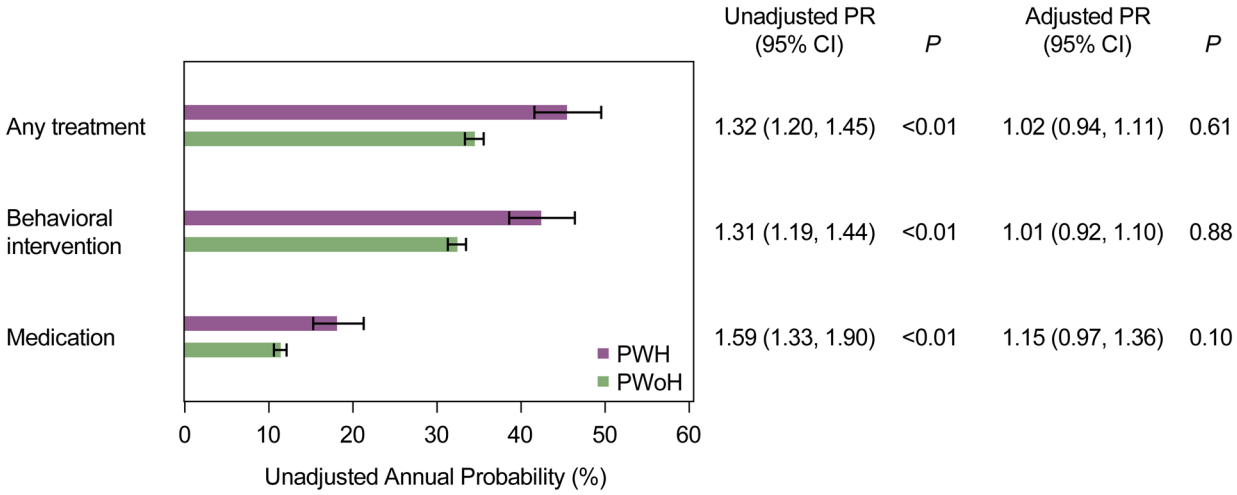

Figure 1.

Probability of receiving treatment for alcohol use disorder (AUD) in a given calendar year and prevalence ratios comparing person-years with HIV (N=910) and without HIV (N=9546), among patients with AUD in Kaiser Permanente Northern California, 2014–2017. Error bars are 95% confidence intervals. Estimates and 95% confidence intervals were obtained from Poisson regression models with generalized estimating equations to account for patients contributing to more than one calendar year of analysis. Models for adjusted estimates included as covariates sex, race/ethnicity, age, depression, other non-alcohol substance use disorder, insurance type, neighborhood deprivation index, and calendar year. Abbreviations: CI, confidence interval; PR, prevalence ratio; PWH, persons with HIV; PWoH, persons without HIV.

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Table 1.

Characteristics of patients with alcohol use disorder in Kaiser Permanente Northern California, 2014–2017, stratified by HIV status.

Characteristic[a]	Persons with HIV N = 633	Persons without HIV N = 7006	*P*[b]
	n (%) or median (IQR)	n (%) or median (IQR)	
Men	586 (93%)	6641 (95%)	<0.05
Race/ethnicity			<0.01
Black	106 (17%)	1214 (17%)	
Hispanic	110 (17%)	1208 (17%)	
White	354 (56%)	4263 (61%)	
Other/unknown	63 (10%)	321 (5%)	
Age, years			<0.01
18–29	62 (10%)	455 (6%)	
30–39	100 (16%)	789 (11%)	
40–49	156 (25%)	1656 (24%)	
50–59	200 (32%)	2312 (33%)	
≥60	115 (18%)	1794 (26%)	
Year of earliest known alcohol use disorder diagnosis	2014 (2007, 2016)	2014 (2007, 2016)	0.88
Depression[c]	238 (38%)	1499 (21%)	<0.01
Any substance use disorder other than alcohol[c]	302 (48%)	1752 (25%)	<0.01
Cannabis use disorder[c]	127 (20%)	907 (13%)	<0.01
Opioid use disorder[c]	55 (9%)	397 (6%)	<0.01
Stimulant use disorder[c]	198 (31%)	623 (9%)	<0.01
Smoking status[d]			<0.01
Current	208 (33%)	2057 (29%)	
Former	278 (44%)	2797 (40%)	
Never/unknown[e]	147 (23%)	2152 (31%)	
Insurance			<0.01
Commercial only	437 (69%)	5181 (74%)	
Commercial and Medicare	130 (21%)	1354 (19%)	
Medicaid[f]	56 (9%)	390 (6%)	
Other	10 (2%)	81 (1%)	
NDI quartile[g]			<0.05
1 (least deprived)	175 (28%)	1755 (25%)	
2	137 (22%)	1749 (25%)	
3	134 (21%)	1738 (25%)	
4 (most deprived)	184 (29%)	1745 (25%)	

Abbreviations: NDI, neighborhood deprivation index.

[a] Measured at the earliest alcohol use disorder diagnosis recorded in the study period.

[b] *P* values were obtained from Chi-square tests for categorical variables and Wilcoxon rank-sum tests for continuous variables, comparing persons with and without HIV.

[c] Defined as any diagnosis recorded in the current or prior calendar year.

[d] Most recent measurement in the current or prior calendar year.

[e] Includes 8 persons with HIV (PWH) and 220 persons without HIV (PWoH) with unknown smoking status.

[f] With or without any other insurance type.

[g] Missing for 3 PWH and 19 PWoH.

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Table 2.

Medications used to treat alcohol use disorder (AUD) by HIV status among persons with AUD in Kaiser Permanente Northern California, 2014–2017.

AUD medication used during the study period	Persons with HIV N = 137	Persons without HIV N = 916	*P* [a]
	n (%)	n (%)	
FDA-approved			
Acamprosate	8 (6%)	61 (7%)	0.85
Disulfiram	18 (13%)	140 (15%)	0.61
Naltrexone	35 (26%)	298 (33%)	0.11
Off-label			
Baclofen	3 (2%)	15 (2%)	0.72
Gabapentin	105 (77%)	640 (70%)	0.11
Nalmefene	0	0	*b*
Topiramate	10 (7%)	55 (6%)	0.57
Number of medications			0.45
1	105 (77%)	688 (75%)	
2	22 (16%)	173 (19%)	
3	10 (7%)	46 (5%)	
≥4	0	9 (1%)	

Abbreviations: AUD, alcohol use disorder; FDA, Food and Drug Administration.

[a] *P* values were obtained from Fisher's exact tests comparing persons with and without HIV.

[b] A statistical test was not conducted for this medication.

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Table 3.

Factors associated with receiving a behavioral intervention or medication to treat alcohol use disorder (AUD) in a given year for 910 person-years among persons with HIV and AUD, 2014–2017.

Characteristic	Year-adjusted PR (95% CI)[a]	*P*
Calendar year, per 1-year increase	1.07 (1.01, 1.14)	0.03
Women vs men	0.72 (0.48, 1.09)	0.12
Race/ethnicity		
Black	0.89 (0.68, 1.16)	0.38
Hispanic	1.10 (0.88, 1.37)	0.39
White	1 (ref.)	
Other/unknown	0.83 (0.59, 1.17)	0.30
Age, years[b]		
18–29	0.81 (0.60, 1.10)	0.17
30–39	0.95 (0.75, 1.20)	0.66
40–49	1 (ref.)	
50–59	0.78 (0.64, 0.95)	0.01
≥60	0.53 (0.39, 0.73)	<0.01
HIV risk group		
MSM	1 (ref.)	
IDU	1.25 (1.01, 1.55)	0.04
Heterosexual	0.62 (0.42, 0.90)	0.01
Other/unknown	1.09 (0.81, 1.47)	0.55
Depression[c]	1.78 (1.51, 2.10)	<0.01
Any SUD other than alcohol[c]	2.68 (2.20, 3.27)	<0.01
Smoking status[d]		
Current	0.87 (0.69, 1.08)	0.21
Former	0.94 (0.76, 1.15)	0.53
Never/unknown	1 (ref.)	
Insurance[e]		
Commercial only	1 (ref.)	
Commercial and Medicare	0.70 (0.54, 0.89)	<0.01
Medicaid	0.44 (0.28, 0.71)	<0.01
Other	1.32 (0.84, 2.07)	0.22
NDI quartile[e]		
1 (least deprived)	1 (ref.)	
2	0.82 (0.65, 1.05)	0.11
3	0.76 (0.58, 0.97)	0.03
4 (most deprived)	0.83 (0.66, 1.03)	0.08
CD4 count, cells/μL[f,g]		
<350	0.52 (0.38, 0.69)	<0.01

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Characteristic	Year-adjusted PR (95% CI)[a]	*P*
350–500	0.71 (0.57, 0.89)	<0.01
>500	1 (ref.)	
Not virally suppressed[f, h]	0.79 (0.62, 0.99)	0.04

Abbreviations: CI, confidence interval; IDU, injection drug use; MSM, men who have sex with men; NDI, neighborhood deprivation index; PR, prevalence ratio; SUD, substance use disorder.

[a]Estimates and confidence intervals from separate Poisson regression models with generalized estimating equations. Each model includes only one characteristic and calendar year.

[b]Updated annually.

[c]Updated annually and defined as any diagnosis recorded in the current or prior calendar year.

[d]Updated annually and defined as the most recent measurement in the current or prior calendar year.

[e]Time-fixed and measured at the earliest alcohol use disorder diagnosis during the study period.

[f]Updated annually using the earliest available measurement in the current calendar year.

[g]Missing for 88 person-years.

[h]Viral suppression was defined as an HIV RNA viral load <200 copies/mL. Missing for 69 person-years.