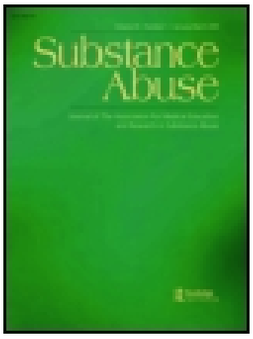

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Geographic differences in receipt of addictions treatment in a national sample of patients with alcohol use disorders from the U.S. Veterans Health Administration

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ABSTRACT

Background: In the United States, alcohol use disorder (AUD) is common and costly but substantially undertreated. Rurality is an important determinant of health that may influence receipt of evidence-based alcohol-related care. In a large, national sample of Veterans Health Administration (VA) patients with AUD with documented and non-Hispanic Black, Hispanic, or non-Hispanic White race/ethnicity, we examine whether meeting national Healthcare Effectiveness Data and Information Set (HEDIS) quality measures for specialty addictions care and receiving evidence-based medications for AUD differs across patients living in urban, large rural, and small rural areas. *Methods:* VA electronic health record data were used to identify all patients with AUD documented in Fiscal Year 2012. Rurality was measured using a three-category rural and urban commuting area (RUCA) classification linked to patient zip code. Logistic regression models with clustered standard errors—iteratively adjusted for hypothesized confounders—were used to estimate the likelihood and marginal probabilities of receiving care for patients living in small and large rural areas, relative to urban areas. Primary outcomes included HEDIS initiation (any visit within 14 days of initial AUD visit after a 60-day period of no treatment), HEDIS engagement (2 or more AUD visits within 30 days of HEDIS initiation visit) and having any filled prescription for AUD medications (naltrexone, disulfiram, acamprosate, or topiramate). *Results:* For all outcomes, patients living in large and small rural areas had a lower likelihood of receiving evidence-based AUD treatment than patients living in urban areas (all p-values < 0.05); differences in marginal probabilities across groups were relatively small. *Conclusions:* In this national sample of VA patients with AUD, those living in more rural areas were less likely to receive evidence-based treatment for AUD than those living in urban areas. Further research is needed to investigate strategies to increase receipt of specialty care and pharmacotherapy in more rural areas.

KEYWORDS
Rurality; HEDIS; alcohol use disorder; medications; veterans

Introduction

Alcohol use disorder (AUD) is a common and consequential substance use disorder in the United States and globally.[1] In the general U.S. population, its estimated 12-month prevalence is approximately 14%, and its estimated lifetime prevalence is 29%.[2] AUD carries both immediate and chronic repercussions that weigh heavily on both individual and population health. Persons with AUD are more prone to alcohol poisoning, alcohol-impaired driving, and unintentional injuries, as well as a higher burden of both long-term physical and mental health issues such as stroke, liver disease, various cancers, depression, and anxiety than those without AUD.[1,3] AUD has also been associated with a heightened risk of suicide,[4] various harms to others,[5] and negative social consequences including strained interpersonal relationships, employment challenges, and encounters with law enforcement.[6,7] Ultimately, rates of all-cause mortality are substantially higher among people with AUD than among individuals without.[8]

Evidence-based behavioral interventions offered in specialty addictions or mental health settings are effective and recommended for treating AUD.[9] Additionally, three medications are FDA-approved to treat AUD, and others have strong meta-analytic support for AUD treatment.[10] These medications may be offered out of specialty settings (including in primary care settings), making AUD treatment broadly accessible.[10] However, in the general population, fewer than 15% of persons with AUD reported seeking any type of alcohol-related care.[11] Even among populations with AUD receiving health care, such as patients served by the

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Veterans Health Administration (VA), AUD is substantially undertreated.[12,13] For instance, approximately 5% of VA patients with clinically recognized AUD receive effective medications.[13,14] One landmark study of health care quality in the U.S. that compared recommended care for twenty-five prevalent health conditions found that quality care for AUD was the least commonly received.[15]

Despite a few significant rural-urban differences in unhealthy alcohol use among VA patients,[16,17] persons with AUD living in rural areas may be less likely to receive recommended care due to multiple factors. For instance, common barriers to quality addictions care, such as accessibility of and stigma related to treatment, have been documented to be prominent among patients who live in rural areas in both quantitative[18–20] and qualitative studies.[21–23] Providers practicing in rural areas may perceive limited options for AUD treatment, and rural health care systems may not have sufficient resources to support AUD treatment. Indeed, in a recent qualitative study among primary care providers (PCPs) practicing in urban and rural Veterans Health Administration (VA) clinics, those practicing in rural areas described a limited knowledge of AUD medications[24] and reported rarely referring patients with AUD to specialty addictions care due to the perceived futility of doing so given a lack of available resources in their communities.[25]

Prior studies have explored rural-urban differences in access to care for mental health conditions[26–28] and alcohol and drug use disorders[18,29–34] within and outside of the VA in both national and small, non-representative samples. Early studies on rural-urban differences in care for alcohol and drug use disorders found few differences,[31] whereas other studies identified greater access barriers and lower utilization of addictions care in rural areas.[18,29] Several recent studies evaluating differences in receipt of AUD treatment across rurality in VA have generally identified lower likelihoods of treatment receipt among Veterans living in rural areas relative to those living in urban areas. Specifically, in a large, national study limited to men, the likelihood of receiving AUD medications was lower among rural than urban Veterans.[34] In a similar national study of female Veterans, similar patterns were observed, but no differences were identified.[35] In another large, national VA study assessing care for substance use disorders overall, living in a rural, relative to an urban area was associated with a higher marginal probability of receiving past-year treatment.[33] Finally, in a national study of VA patients living with HIV, those living in rural areas were less likely to receive AUD specialty addictions treatment than those living in urban areas.[36] The present study builds on these studies as the most extensive examination of differences in receipt of AUD care across rurality in a national sample of patients with AUD receiving care at the VA. It clarifies findings of earlier studies by using several quality measures of addictions treatment and receipt of any medications for AUD to assess multiple aspects of evidence-based care that are predictive of patient health outcomes.[37,38] We used common measures of rurality and receipt of AUD treatment to facilitate comparison of quality care for AUD within the VA, as well as across community health systems.

Methods

Study sample and data source

This study reflects secondary analyses of data collated from the VA's Corporate Data Warehouse (a large relational database including patient electronic health record data) for a study designed to understand racial/ethnic disparities in AUD treatment across three major racial/ethnic groups represented in VA.[12,13,39] For this study, clinical and administrative data (including inpatient and outpatient pharmacy benefits files) from the VA's National Patient Care Database and Decision Support System were extracted for all VA patients who had an outpatient visit or inpatient/residential stay during Fiscal Year (FY) 2012, were 18 years or older, had a documented AUD, and were of documented non-Hispanic Black, Hispanic, or non-Hispanic White race/ethnicity. Documented AUD was defined consistent with the denominator specification in Healthcare Effectiveness Data and Information Set (HEDIS) quality indicators for alcohol treatment. Specifically, documented AUD was measured through International Classification of Diseases 9th Edition (ICD-9) diagnoses for alcohol abuse and dependence, as well as alcohol-attributable conditions, such as alcoholic psychoses and withdrawal, alcoholic gastritis, and alcoholic cirrhosis (ICD-9 codes 291, 303.00 to 303.02, 303.90 to 303.92, 305.00 to 305.02, 535.3, 571.1), in any clinical encounter during the fiscal year. This definition is broadly inclusive to account for underdiagnosis of AUD.[40]

Measures

Independent variable

Rurality was measured using rural and urban commuting area (RUCA) codes.[41,42] Patients were assigned a RUCA category based on their recorded zip code of residence at the time of their clinical encounter that indicated AUD. RUCA codes based on the 2010 decennial census and 2006–2010 American Community Survey were used to categorize patients into three groups: (1) urban, (2) large rural, and (3) small/isolated rural (including small town/remote residences), as recommended by the WWAMI Rural Health Research Center.[43]

Dependent variables

Patients with an AUD diagnosis at any time during FY 2012 were followed to assess three primary measures of evidence-based AUD treatment, including initiation and engagement in care, and receipt of medications to treat AUD. Initiation and engagement measures were defined consistent with the HEDIS quality indicators for alcohol and drug dependence treatment and prior VA studies using HEDIS indicators.[12,44,45] Though HEDIS measures are not used for quality improvement efforts within the VA, they have been proven to be reliable in assessing specialty addictions care for AUD

in the VA compared with chart review.[45] Furthermore, HEDIS engagement predicts improvements in the health of VA patients with documented AUD.[38] HEDIS initiation is defined by a new episode of AUD treatment followed by (1) any inpatient admission with an AUD-related diagnosis or an (2) AUD-related outpatient visit identified by substance use disorder (SUD)-specific Current Procedure Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) code within 14 days of an AUD-related diagnosis.[45] The initial diagnostic visit must have been preceded by a 60-day SUD service-free "clean" period.[45] HEDIS engagement is assessed only among patients who met the HEDIS initiation measure and defined by having had two or more additional AUD visits (in any setting) within 30 days after the qualifying HEDIS initiation visit. Receipt of AUD medications was defined as having one or more filled prescriptions for acamprosate, disulfiram, topiramate, or oral or injectable naltrexone at any time in any treatment setting during FY 2012 and aligns with a validated operationalization of the American Society for Addiction Medicine's Standards of Care.[46] This definition was chosen to reflect medications with current FDA approval for AUD treatment[10] or strong meta-analytic support for AUD treatment, as well as to be consistent with previous studies in the VA.[13,47,48]

We also assessed three secondary outcomes, consistent with VA's Continuity of Care performance measures for substance use disorders, because they were relevant to this patient cohort.[37] These additional measures were ascertained from clinic stop and bed section codes, which have been previously demonstrated to reflect substance use disorder care.[44] These secondary measures offer a less restrictive (more liberal) assessment of treatment receipt than HEDIS measures in that they offer an increased timeframe for the initiation, enabling broader assessment of treatment receipt. Unlike for the HEDIS measures, for these measures, a SUD service-free "clean" period was not specified. The secondary initiation measure—6-month initiation—was defined as any documented visit for specialty addictions treatment on the day of or in 180 days following the first AUD diagnosis in FY 2012. Two secondary measures of engagement were defined, including (1) 30-day engagement: receipt of three or more AUD specialty care visits in the first month of treatment (i.e., within thirty days of first AUD specialty care visit) and (2) 3-month engagement: two or more AUD specialty care visits in each of the first three months of treatment (i.e., six total visits within three months).

Covariates

Covariate selection was guided by conceptual models that describe predisposing, enabling, and need-based factors associated with care receipt[49] and equitable alcohol-related care and outcomes.[50] Measured predisposing factors included gender (if the patient was ever female, they were coded as female), age in groups: 18–24; 25–34; 35–49; 50–64, and greater than or equal to 65 years (age as of October 1, 2011), and race/ethnicity. Race/ethnicity was categorized as non-Hispanic Black, Hispanic, and non-Hispanic White, consistent with reporting of race/ethnicity standardized by the U.S. Census Bureau).[51,52] Measured enabling factors included marital status and VA eligibility status. Marital status was categorized as married, single, divorced/separated, or widowed based on medical record documentation (used the last designation in FY 2012 of any of these categories). VA eligibility status reflects a combined measure of income and disability for VA patients and has been used as an indicator of socioeconomic status.[50] Four categories of VA eligibility status were derived: full VA coverage (indicating the most disadvantaged based on income or $\geq$50% service-connected disability), partial VA coverage (service-connected less than 50%), non-service-connected, and non-veteran or employee/volunteer, and we used the last designation in FY 2012 to assign these categories. (The sample included non-veteran and employee/volunteer patients to ensure findings would be representative of the full VA population). Measured need-based factors included diagnoses for mental health disorders (e.g., major depression, other mood disorders, and serious mental illness including PTSD, bipolar, and schizophrenic disorders); drug use disorders (any stimulant, opioid, cannabis, hallucinogens and/or sedative use disorders); tobacco use disorder, and the following alcohol-related medical conditions: outpatient fractures, inpatient traumas, upper GI bleed, and pancreatitis, all measured using documented ICD-9 Clinical Modification (CM) codes documented in the 180 days prior to AUD diagnosis. Medical comorbidity was also measured using the Deyo index,[53,54] a summary score indicative of mortality risk commonly used in studies using administrative and/or electronic health record data within and outside the VA.[55] It was calculated using ICD-9 CM codes specified in Table 1. The scores were grouped into three categories: 0, 1 to 2, and 3 or higher, to represent differing comorbidity severity levels. We also measured one system-level factor—the facility-level rate of AUD diagnoses—to reflect the facility's potential capacity for AUD care.[50] For this measure, patients were assigned to a facility based on where they received most of their health care in FY 2012.

Analyses

Participant characteristics across the three rurality categories were compared using chi-square tests of independence. The raw prevalence of each primary and secondary outcome was estimated for each rurality group. Subsequently, logistic regression models with clustered standard errors to account for clustering of patients within facilities were used to estimate the unadjusted odds ratio (OR) and adjusted odds ratio (AOR) and 95% confidence intervals (CIs) of each primary and secondary outcome for patients living in large and small rural areas relative to those living in urban areas. Stata's *margins* post-estimation command was used to estimate the marginal probability and 95% CI of each outcome from each regression model to illustrate the magnitude of differences across categories of rurality.[56] Marginal probabilities represent the average estimated probability of each

Table 1. Predisposing, enabling, and need characteristics of a national sample of VA patients with documented alcohol use disorders in fiscal year 2012: overall and compared across rurality.

	Urban $n = 237{,}914$	Large rural $n = 21{,}299$	Small rural $n = 40{,}242$	p-value	Total $n = 299{,}455$
Predisposing characteristics					
Race/ethnicity					
Non-Hispanic White	150,023 (63.1)	16,967 (79.7)	34,059 (84.6)	<.001	201,049 (67.1)
Non-Hispanic Black	71,052 (29.9)	3,581 (16.8)	4,871 (12.1)		79,505 (26.5)
Hispanic	16,838 (7.1)	751 (3.5)	1,312 (3.3)		18,901 (6.3)
Gender					
Female	10,360 (4.4)	757 (3.6)	1,271 (3.2)	<.001	12,388 (4.1)
Age					
18–24	5,059 (2.1)	454 (2.1)	804 (2.0)	<.001	6,317 (2.1)
25–34	23,953 (10.1)	1,796 (8.4)	3,489 (8.7)		29,238 (9.8)
35–49	42,332 (17.8)	3,450 (16.2)	6,176 (15.3)		51,958 (17.4)
50–64	128,844 (54.2)	11,535 (54.2)	21,752 (54.1)		162,131 (54.1)
≥65	37,726 (15.9)	4,064 (19.1)	8,021 (19.9)		49,811 (16.6)
Enabling characteristics					
Marital status					
Married	70,499 (29.7)	7,998 (37.7)	15,176 (37.8)	<.001	93,673 (31.4)
Never married	68,619 (28.9)	4,375 (20.6)	8,035 (20.0)		81,029 (27.2)
Divorced/separated	88,959 (37.5)	7,953 (37.5)	15,200 (37.9)		112,112 (37.6)
Widowed	8,999 (3.8)	889 (4.2)	1,725 (4.3)		11,613 (3.9)
VA eligibility status					
Full VA coverage	61,263 (25.8)	5,935 (27.9)	11,718 (29.1)	<.001	78,916 (26.4)
Service-connected	47,981 (20.2)	4,164 (19.6)	60,307 (20.1)		60,307 (20.1)
Non-service connected	127,176 (53.5)	11,090 (52.1)	20,197 (50.2)		158,463 (52.9)
Non-veteran or employee/volunteer	1,488 (0.6)	110 (0.5)	165 (0.4)		1,763 (0.4)
Need characteristics					
Drug use disorder[a]	67,043 (28.2)	4,282 (20.1)	7,175 (17.8)	<.001	78,500 (26.2)
Tobacco use disorder[b]	87,416 (36.7)	8,681 (40.8)	16,692 (41.5)	<.001	112,789 (37.7)
Alcohol-related medical conditions[c]					
Outpatient fractures	7,390 (3.1)	608 (2.9)	1,121 (2.8)	<.001	9,119 (3.0)
Inpatient traumas	21,845 (9.2)	1,729 (8.1)	3,121 (8.0)	<.001	26,805 (9.0)
Upper GI bleed	5,462 (2.3)	455 (2.1)	830 (2.1)	.007	5,462 (2.3)
Pancreatitis	3,759 (1.6)	286 (1.3)	527 (1.3)	<.001	4,572 (1.5)
Mental health conditions[d]					
Major depression	31,686 (13.3)	2,678 (12.6)	4,848 (12.0)	<.001	39,212 (13.1)
Other mood disorders	82,385 (34.6)	7,176 (33.7)	13,499 (33.5)	<.001	103,060 (34.4)
Serious mental illness	76,702 (32.2)	6,748 (31.7)	13,160 (32.7)	.032	96,610 (32.3)
General comorbidity[e]					
0	153,377 (64.5)	13,084 (61.4)	24,895 (61.9)		191,356 (63.9)
1–2	64,828 (27.2)	6,508 (30.6)	12,048 (29.9)	<.001	83,384 (27.8)
3+	19,709 (8.3)	1,707 (8.0)	3,299 (8.2)		24,715 (8.3)

Opioid abuse or dependence were determined using the following ICD-9 codes: ICD-9-CM 304.7–304.72 and 305.5–305.52, Other drug use or dependence: 304.3–304.32, 305.2–305.22, 304.1–304.12, 304.5–304.52, 305.3–305.32, and 305.4–305.42.

[b]Tobacco abuse or dependence: ICD-9-CM 305.1.

[c]Alcohol related medical conditions were determined using the following ICD-9 codes: Fractures (800–829, 733.8, 905.0–905.5) Trauma (830–904, 910–959, 994.1, 994.7,994.8) Liver disease (570, 571.0–571.5, 571.9) Upper GI bleed (456.0–456.2, 530.7, 530.82, 531.0, 531.2, 531.4, 531.6, 532.0, 532.2, 532.4, 532.6, 533.0, 533.2, 533.4, 533.6, 534.0, 534.2, 534.4, 534.6, 578.0, 578.1, 578.9) Pancreatitis (577).

[d]Mental health conditions were determined using the following ICD-9 codes: Major depression (296.2–3) Other mood disorders (311, 300.4, 309.0, 293.83, 296.9, 309.1, 301.12) Serious mental illness (295.0–9, 296.0–1, 296.4–6, 296.7, 309.81).

[e]General Comorbidity Deyo Index Conditions were calculated using the following ICD-9 codes: MI (410–410.9; 412), congestive heart failure (428–428.9), peripheral vascular disease (443.9441–441.9785.4 V43.4 procedure 38.48), cerebrovascular disease (430–438), senile and presenile dementias* (290–290.9), chronic pulmonary disease (490–496; 500–505; 506.4),rheumatologic disease (710.0; 710.1; 710.4; 714.0–714.2; 714.81; 725), peptic ulcer disease (531–534.9; 531.4–531.7; 532.4–532.7; 533.4–533.7; 534.4–534.7),mild liver disease including (571.2; 571.5; 571.6; 571.4–571.49), moderate or severe liver disease (572.2–572.8; 456.0–456.21), diabetes (250–250.3; 250.7), diabetes with chronic complications (250.4–250.6), hemiplegia or paraplegia (344.1; 342–342.9), renal disease (582–582.9; 583–583.7; 585; 586; 588–588.9), malignancies (140–172.9;174–195.8; 200–208.9), metastatic solid tumor(196–199.1), AIDS and HIV (042–044.9).

treatment outcome associated with each rurality category after standardizing covariates across each rurality category.[57] Iterative models were fit for each outcome: unadjusted, adjusted for the facility-level rate of AUD and clustered at the facility level, adding measured predisposing characteristics, adding measured enabling characteristics, and a final fully adjusted model adding measured need characteristics. Because it accounted for all measured factors that may account for differences in receipt of evidence-based AUD treatment across rurality, the final fully adjusted model was considered the primary model. However, given the complexity of isolating the role of geographic factors in health care outcomes and the possibility that certain clinical characteristics mediate rather than confound associations,[58] each model may also be of individual interest; thus, both raw prevalence and results from all models are presented. Models for HEDIS initiation were run on the full sample of patients with documented AUD ($n = 299{,}455$), models for HEDIS engagement were run only among those in the full sample who met initiation criteria (see criteria for HEDIS initiation and secondary initiation measure), and models for AUD medications were restricted to the subsample of patients with diagnosed alcohol abuse or dependence ($n = 294{,}630$) for whom medications are recommended.[9] The same

Table 2. Raw prevalence of primary and secondary alcohol use disorder (AUD) treatment outcomes among a national sample of VA patients with documented AUD in fiscal year 2012 for patients living in urban, large rural, and small rural areas.

	Urban *n* (%)	Large rural *n* (%)	Small rural *n* (%)	Total *n* (%)
Primary outcomes				
HEDIS initiation*	*n* = 237,914	*n* = 21,299	*n* = 40,242	*n* = 299,455
Any visit ≤14 days after index visit	43,342 (18.2)	3,115 (14.6)	5,708 (14.2)	52,165 (17.4)
HEDIS engagement*	*n* = 43,342	*n* = 3,115	*n* = 5,708	*n* = 52,165
≥2 additional AUD visits ≤ 30 days of HEDIS initiation	12,004 (27.7)	745 (23.9)	1,365 (23.9)	14,114 (27.1)
AUD Medications*	*n* = 234,082	*n* = 20,030	*n* = 36,603	*n* = 294,630
Filled ≥ 1 prescription for disulfiram, acamprosate, naltrexone, topiramate	12,418 (5.3)	915 (4.4)	1,729 (4.4)	15,062 (5.1)
Secondary outcomes				
6-month Initiation*	*n* = 237,914	*n* = 21,299	*n* = 40,242	*n* = 299,455
Specialty addictions visit ≤180 days of diagnosis	75,520 (31.7)	5,224 (24.5)	9,211 (22.9)	89,955 (30.0)
30-day Engagement*	*n* = 75,520	*n* = 5,224	*n* = 9,211	*n* = 89,955
≥3 additional specialty addictions visits ≤ 30 days of treatment	59,848 (79.2)	3,931 (75.2)	6,992 (75.9)	70,771 (78.7)
3-month Engagement*	*n* = 75,520	*n* = 5,224	*n* = 9,211	*n* = 89,955
≥2 Specialty addictions each month for first three months of treatment	41,760 (55.3)	2,577 (49.3)	4,549 (49.4)	46,886 (54.3)

*Alcohol-related care outcomes were measured among patients for whom care is recommended; initiation was measured among all patients with documented AUD or AUD-related conditions; all engagement indicators were measured among those who met initiation criteria.

procedure was repeated for the three secondary outcomes. Stata version 13 was used to conduct all analyses.[59]

Results

Among 299,455 VA patients with documented AUD included in this study, 79.4% ($n = 237{,}914$) resided in urban areas, 7.1% ($n = 21{,}299$) resided in large rural areas, and 13.4% ($n = 40{,}242$) resided in small rural areas. Characteristics are described in Table 1. Patients were largely non-Hispanic White, male, over age 50, unmarried, and without full VA coverage. Mental health, tobacco, and drug use disorders were common, as was having one or more general medical comorbidities, as measured by the Deyo index. Patients living in urban, large rural, and small rural areas differed significantly in all predisposing, enabling, and need-based characteristics examined (Table 1). Urban areas appeared to have the highest proportion of persons who were non-White, female, had drug use disorders, and were under the age of 50. Large and small rural areas had a greater proportion of married patients, and patients with full VA coverage, tobacco use disorder, and one or more general comorbidities.

HEDIS initiation and engagement—primary outcomes

Raw prevalence. Overall, 17.4% of patients with a documented AUD met the HEDIS AUD treatment initiation criteria (Table 2). Of those who met initiation criteria, 27.1% met engagement criteria. Among patients with an AUD diagnosis in FY 2012, 5.1% of patients filled one or more prescriptions for evidence-based AUD medications. A higher proportion of patients living in urban areas met the criteria for HEDIS initiation, HEDIS engagement, and receiving AUD medications than those living in large or small rural areas (Table 2).

Results of regression models. In all regression models, the likelihood of receiving all primary outcomes was significantly lower for patients living in large and small rural areas than those living in urban areas (Table 3). In fully adjusted models, those living in large and small rural areas each had 12% lower adjusted odds relative to patients living in urban areas of HEDIS initiation, respectively. Among those who met HEDIS initiation criteria, those living in large and small rural areas each had 14% lower adjusted odds, respectively, of meeting HEDIS engagement criteria, relative to those living in urban areas. Among those with diagnosed AUD, the adjusted odds of having filled one or more prescriptions for AUD medications was 16% (AOR= 0.84, 95% CI= 0.75–0.93) and 17% (AOR= 0.83, 95% CI= 0.73–0.94) lower among patients living in large and small rural areas as compared to those in urban areas. Unadjusted and fully adjusted marginal probabilities and 95% CIs of receiving each primary AUD treatment outcome for patients living in urban, large rural, and small rural areas are presented in Figure 1.

Secondary outcomes

Raw prevalence. Among those who met the criteria for 6-month initiation (30.0% of all eligible patients), 78.7% met the criteria for 30-day engagement, and 54.3% met the criteria cfor a 3-month engagement (Table 2). A higher proportion of patients living in urban areas met the criteria for 6-month initiation and the two engagement measures than those living in large or small rural areas (Table 2).

Results of regression models. In all regression models, the likelihood of receiving all secondary outcomes was significantly lower for patients living in small and large rural areas relative to those living in urban areas (Table 3). In fully adjusted models, patients living in large and small rural areas had a 18% (AOR = 0.82, 95% CI = 0.76–0.88) and 22% (AOR = 0.78, 95% CI = 0.70–0.86) lower odds, respectively, of meeting 6-month initiation criteria, compared to patients living in urban areas. Among those who met 6-month initiation criteria, patients living in large and small rural areas had a 15% (AOR = 0.85, 95% CI = 0.77–0.93) and 12% (AOR = 0.88, 95% CI = 0.79–0.99) lower odds, respectively, of meeting 30-day engagement criteria, relative to those living in urban areas. Finally, among those who met secondary initiation criteria, patients living in large and small rural areas each had 17% lower odds (AOR = 0.83, 95% CI = 0.77–0.90 and 0.83, 0.76–0.91,

Table 3. Unadjusted and adjusted odds of receiving evidence-based alcohol-related care for patients living in large and small rural areas, relative to urban, in a national sample of VA patients with documented AUD: primary and secondary outcomes.

		Large rural			Small rural		
	Urban	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Primary outcomes							
HEDIS initiation ($n = 52{,}165$)[a]							
Unadjusted		0.77	(0.72–0.82)	<.001	0.74	(0.69–0.80)	<.001
Adjusted for facility-level characteristics		0.78	(0.73–0.84)	<.001	0.76	(0.71 – 0.81)	<.001
Adjusted for facility and predisposing		0.82	(0.77–0.86)	<.001	0.81	(0.76–0.86)	<.001
Adjusted for facility, predisposing, and enabling		0.85	(0.79–0.90)	<.001	0.83	(0.78–0.88)	<.001
Adjusted for facility, predisposing, enabling, and need		0.88	(0.83–0.93)	<.001	0.88	(0.83–0.93)	<.001
HEDIS engagement ($n = 14{,}114$)[b]							
Unadjusted		0.82	(0.74–0.91)	<.001	0.82	(0.73–0.92)	<.001
Adjusted for facility-level characteristics		0.83	(0.75–0.92)	<.001	0.83	(0.74–0.93)	.001
Adjusted for facility and predisposing		0.84	(0.76–0.93)	.001	0.84	(0.75–0.94)	.003
Adjusted for facility, predisposing, and enabling		0.85	(0.77–0.94)	.001	0.85	(0.76–0.95)	.005
Adjusted for facility, predisposing, enabling, and need		0.86	(0.78–0.95)	.003	0.86	(0.77–0.97)	.013
AUD medications ($n = 15{,}062$)[c]							
Unadjusted		0.82	(0.73–0.91)	<.001	0.82	(0.71–0.94)	.005
Adjusted for facility-level characteristics		0.83	(0.74–0.93)	.001	0.83	(0.72–0.95)	.009
Adjusted for facility and predisposing		0.83	(0.74–0.92)	.001	0.82	(0.72–0.94)	.004
Adjusted for facility, predisposing, and enabling		0.82	(0.73–0.91)	<.001	0.81	(0.71–0.92)	.001
Adjusted for facility, predisposing, enabling, and need		0.84	(0.75–0.93)	.001	0.83	(0.73–0.94)	.005
Secondary outcomes							
6-month initiation ($n = 89{,}995$)[d]							
Unadjusted		0.70	(0.65–0.75)	<.001	0.64	(0.57–0.71)	<.001
Adjusted for facility-level characteristics		0.71	(0.66–0.76)	<.001	0.65	(0.58–0.72)	<.001
Adjusted for facility and predisposing		0.77	(0.71–0.83)	<.001	0.72	(0.66–0.79)	<.001
Adjusted for facility, predisposing, and enabling		0.79	(0.73–0.85)	<.001	0.74	(0.67–0.81)	<.001
Adjusted for facility, predisposing, enabling, and need		0.82	(0.76–0.88)	<.001	0.78	(0.70–0.86)	<.001
30-day engagement ($n = 70{,}771$)[e]							
Unadjusted		0.80	(0.72–0.88)	<.001	0.83	(0.74–0.93)	<.001
Adjusted for facility-level characteristics		0.82	(0.74–0.91)	<.001	0.85	(0.75–0.95)	.004
Adjusted for facility and predisposing		0.83	(0.76–0.92)	<.001	0.86	(0.77- 0.97)	<.001
Adjusted for facility, predisposing, and enabling		0.84	(0.76–0.93)	.001	0.87	(0.77–0.98)	.02
Adjusted for facility, predisposing, enabling, and need		0.85	(0.77–0.93)	<.001	0.88	(0.79–0.99)	.03
3-month engagement ($n = 46{,}886$)[f]							
Unadjusted		0.79	(0.72–0.86)	<.001	0.79	(0.72–0.87)	<.001
Adjusted for facility-level characteristics		0.81	(0.74–0.88)	<.001	0.81	(0.73–0.88)	<.001
Adjusted for facility and predisposing		0.83	(0.76–0.90)	<.001	0.83	(0.76–0.91)	<.001
Adjusted for facility, predisposing, and enabling		0.84	(0.77–0.91)	<.001	0.83	(0.76–0.91)	<.001
Adjusted for facility, predisposing, enabling, and need		0.83	(0.77–0.90)	<.001	0.83	(0.76–0.91)	<.001

*Alcohol-related care outcomes were measured among patients for whom care is recommended; initiation was measured among all patients with documented AUD or AUD-related conditions; all engagement indicators were measured among those who met initiation criteria.
[a]Any visit ≤14 days after index visit;
[b]≥2 additional AUD visits ≤30 days of HEDIS initiation;
[c]Filled ≥1 prescription for disulfiram, acamprosate, naltrexone, topiramate;
[d]Specialty addictions visit ≤180 days of diagnosis;
[e]≥3 additional specialty addictions visits ≤30 days of treatment;
[f]≥2 specialty addictions each month for first 3 months of treatment.

respectively), of meeting 3-month engagement criteria, relative to those living in urban areas. Unadjusted and fully adjusted marginal probabilities and 95% CIs of receiving each secondary AUD treatment outcome are presented in Figure 2.

Discussion

In this study of nearly 300,000 persons with AUD receiving VA health care across the U.S., modest yet consistent rural-urban differences in receipt of quality care for AUD were identified. Specifically, patients living in small rural and large rural areas, compared to those living in urban areas, had lower odds of initiating and engaging in evidence-based care for AUD, even after adjusting for factors likely to influence care receipt. Assessment of broader secondary outcomes reflecting receipt of specialty addictions treatment confirmed this pattern, albeit with higher overall rates of initiation and engagement. While secondary outcomes are not directly comparable to primary HEDIS measures due to differing measures specification and criteria (e.g., different denominators and follow-up periods), marginal probabilities were considerably higher for these outcomes and reflected wider rural-urban differences with regard to initiation and receipt of AUD medications.

Prior studies have quantitatively documented rural-urban differences in treatment for AUD[18,31,33,35,36] and have qualitatively examined rural provider perspectives regarding AUD care.[25] The present study builds on the literature by being the first to our knowledge to quantitatively examine rural-urban differences in receipt of evidence-based care for AUD among VA patients nationwide using nationally recognized quality measures. Use of HEDIS national quality measures facilitates comparisons across healthcare delivery systems, whereas the secondary outcomes facilitate comparisons to other studies conducted within the VA.[12,37] With

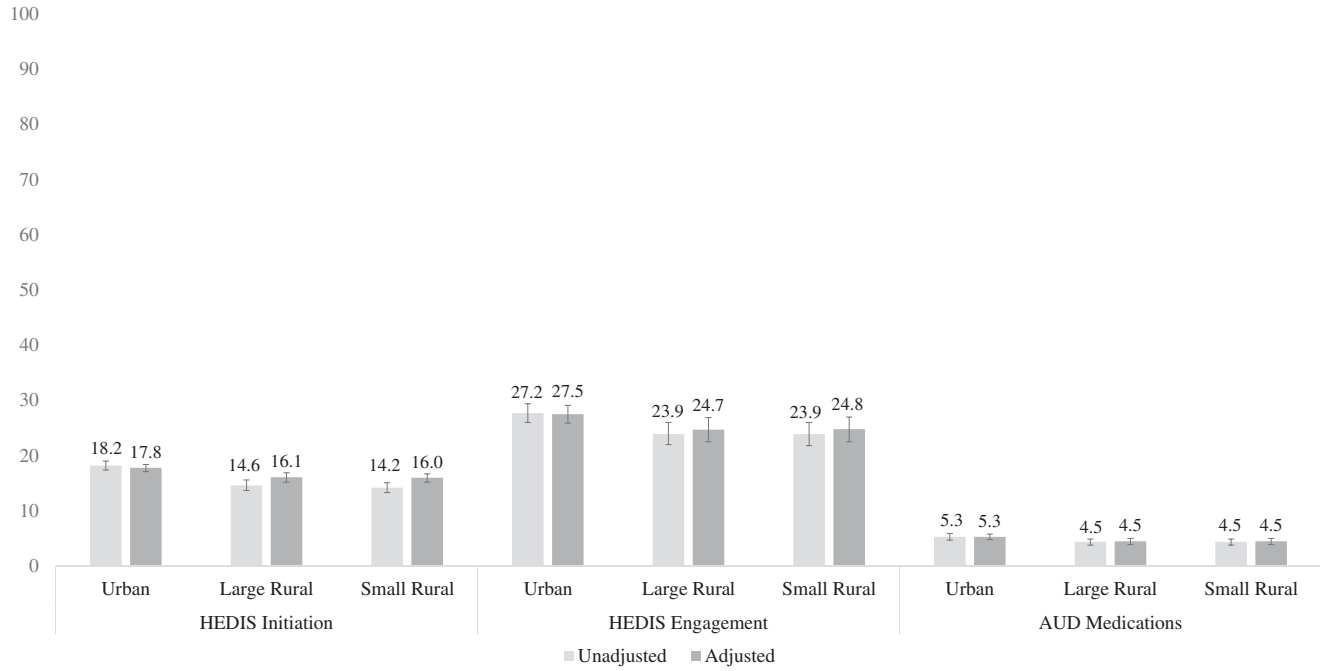

Figure 1. Unadjusted and adjusted marginal probabilities and 95% CI of receiving primary measures of alcohol-related care (HEDIS initiation and engagement and AUD medications) across rurality among VA patients with AUD.

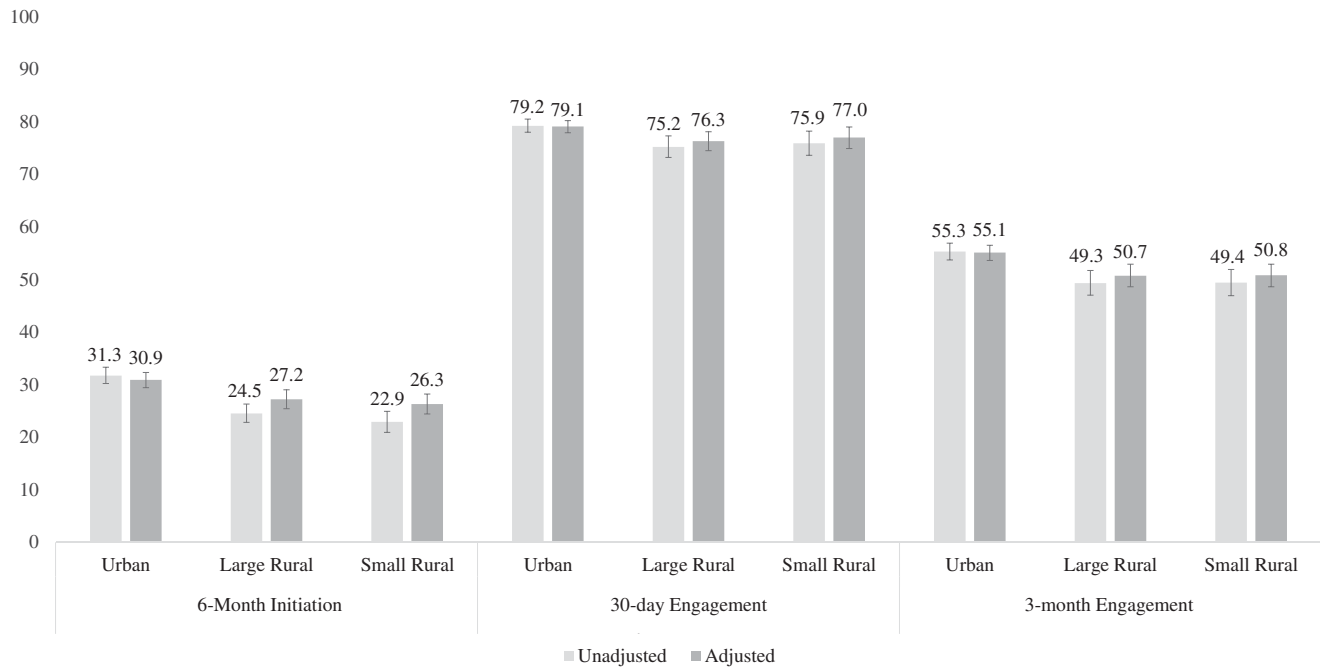

Figure 2. Unadjusted and adjusted marginal probabilities and 95% CI of receiving secondary measures of alcohol-related care across rurality among VA patients with AUD.

growing recognition of the integral role medications may play in AUD treatment,[10] a similar medication measure was recently proposed to be included in HEDIS.[60] This study confirms recent evidence that receipt of AUD medications in the VA is low, overall,[48] and is consistent with prior studies in the VA indicating patients in more rural areas are less likely to receive evidence-based medications for AUD than those living in urban areas.[34,35] This finding is concerning, as these medications may be particularly helpful for patients with AUD who reside in rural areas, where barriers to addiction specialty care are common.[24]

Various factors—including commonly-held values in rural communities,[61] privacy concerns,[19] and travel barriers[62]—may contribute to rural disadvantage in access to evidence-based care for AUD. Well-informed interventions that consider the social context of patients with AUD, and their unique needs and preferences, are also likely needed. In a recent study of provider perspectives on offering AUD-related care, rural PCPs

suggested improving training and support for prescribing AUD medications as well as expanding resources in rural areas and using electronic referral systems to enhance coordination with specialty addictions care.[25] Innovative modalities such as improving the provision of evidence-based AUD medications[24] and behavioral health interventions over the phone or via video conference may be of immediate benefit to rural patients with AUD who face barriers to in-person care.[29] Increasing use of phone and video conference within VA and other healthcare systems in response to the novel Coronavirus (COVID-19) may offer unique opportunities for evaluating remote interventions for AUD.

Finally, findings underscore low rates of care for AUD, overall, as has been documented in prior studies in the VA.[48,63] Compared to primary HEDIS measures, secondary measures identified a greater proportion of patients with AUD who initiated and engaged in care. The differences observed between the primary HEDIS measures and secondary measures in this study highlight potential delays in treatment initiation and engagement given that the secondary measures allowed for a wider timeframe and did not require a SUD service-free "clean" period, indicative of a new episode of care. Because HEDIS measures account for AUD-related care delivered in all settings and secondary measures are restricted to specialty care settings, these differences also raise concerns about the limited provision of care for AUD in primary care settings, and non-specialty settings, generally.

Limitations

This study has several limitations. First, these data were obtained from patients with AUD in FY 2012. Thus, findings may not reflect the influence of recent policy changes such as the Veterans Access, Choice, and Accountability Act of 2014 (CHOICE), the Comprehensive Addiction and Recovery Act of 2016 (CARA), the MISSION Act of 2019, or ongoing VA efforts to increase access to medications via academic detailing.[64] Though these initiatives may have changed patterns of care across rurality (e.g., CHOICE could have expanded care options to patients outside of the VA, while CARA could have improved resources available for substance use treatment), little evidence supports that major changes in access to AUD treatment have occurred since 2012 as studies evaluating the CHOICE Act document relatively low rates of purchasing care outside the VA,[65,66] and more recent estimates from the VA suggest similar overall rates of AUD treatment receipt.[48] The role of the MISSION Act in geographic differences in alcohol-related care should be explored in future studies.

Additionally, measurement error may exist in the study based on the use of VA administrative and clinical data, which do not capture AUD-related care sought outside the VA. The secondary measures used possibly captured continuous, rather than new, episodes of care. This may account for differences in findings observed between primary and secondary outcomes because secondary outcomes (unlike HEDIS measures), did not require a 60-day SUD service-free "clean" period. While two conceptual frameworks guided the choice of covariates adjusted for, there may be unmeasured confounding due to administrative data limitations. Additionally, findings may not be generalizable to all patients with AUD, as eligibility criteria for the parent study limited the sample to VA patients with a documented non-Hispanic Black, Hispanic, or non-Hispanic White race/ethnicity; thus, results may not generalize to patients of other racial/ethnic groups, such as those who identify as American Indian/Alaska Native.

Conclusions

Findings from this large, national study indicate that rural-urban differences in treatment are present across various domains of alcohol-related care, with rural patients having modestly lower rates of all measures. This study highlights a need for improved access to evidence-based care for AUD in more rural areas and supports conclusions of previous studies that suggest a need for improved access to care across rurality. Findings of the present study add to the existing literature on rural-urban differences in specialty addictions care and receipt of evidence-based medications for AUD[19,29,33,35,36] and build on this literature by assessing multiple measures of quality care for AUD in a large, national sample. Future research should examine trends in care for AUD over time and in more recent cohorts as well as examine the key mechanisms responsible for geographic differences. Identifying specific system-, provider-, and patient-level barriers to care could inform targeted health system interventions.

Disclosure statement

The authors have all approved the manuscript and have no conflicts of interest to declare. Views presented in the manuscript are those of the authors and do not reflect those of the University of Washington, the National Institute on Alcohol Abuse and Alcoholism, the National Institutes of Health, the Department of Veterans Affairs, or the United States Government.

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References

[1] Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*. 2009;373(9682):2223–2233.

[2] Grant BF, Goldstein RB, Saha TD, et al. Epidemiology of DSM-5 alcohol use disorder: results from the national epidemiologic survey on alcohol and related conditions III. *JAMA Psychiatry*. 2015;72(8):757–766.

[3] Room R, Babor T, Rehm J. Alcohol and public health. *Lancet*. 2005;365(9458):519–530.

[4] Wilcox HC, Conner KR, Caine ED. Association of alcohol and drug use disorders and completed suicide: an empirical review of cohort studies. *Drug Alcohol Depend*. 2004;76:S11–S19.

[5] Karriker-Jaffe KJ, Room R, Giesbrecht N, Greenfield TK. Alcohol's harm to others: opportunities and challenges in a public health framework. *J Stud Alcohol Drugs*. 2018;79(2):239–243.

[6] Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *Lancet*. 2009;373(9682):2234–2246.

[7] Mulia N, Ye Y, Greenfield TK, Zemore SE. Disparities in alcohol-related problems Among White, Black, and Hispanic Americans. *Alcohol Clin Exp Res*. 2009;33(4):654–662.

[8] Roerecke M, Rehm J. Alcohol use disorders and mortality: a systematic review and meta-analysis. *Addiction*. 2013;108(9):1562–1578.

[9] Department of Veterans Affairs. 2015. VA/DoD clinical practice guideline for the management of substance use disorders. Dept. of Veteran Affairs. http://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf. Accessed March 20, 2019.

[10] Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for adults with alcohol use disorders in outpatient settings. *JAMA*. 2014;311(18):1889.

[11] Cohen E, Feinn R, Arias A, Kranzler HR. Alcohol treatment utilization: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug Alcohol Depend*. 2007;86(2–3):214–221.

[12] Bensley KM, Harris AHS, Gupta S, et al. Racial/ethnic differences in initiation of and engagement with addictions treatment among patients with alcohol use disorders in the veterans health administration. *J Subst Abuse Treat*. 2017;73:27–34.

[13] Williams EC, Gupta S, Rubinsky AD, et al. Variation in receipt of pharmacotherapy for alcohol use disorders across racial/ethnic groups: a national study in the U.S. Veterans Health Administration. *Drug Alcohol Depend*. 2017;178:527–533.

[14] Harris AHS, Oliva E, Bowe T, Humphreys KN, Kivlahan DR, Trafton JA. Pharmacotherapy of alcohol use disorders by the veterans health administration: patterns of receipt and persistence. *Psychiatr Serv*. 2012;63(7):679–685.

[15] McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med*. 2003;348(26):2635–2645.

[16] Vander Weg MW, Cai X. Variability in veterans' alcohol use by place of residence. *Am J Addict*. 2012;21(1):31–37.

[17] Williams EC, McFarland LV, Nelson KM. Alcohol consumption among urban, suburban, and rural veterans affairs outpatients. *J Rural Health*. 2012;28(2):202–210.

[18] Booth BM, Kirchner J, Fortney J, Ross R, Rost K. Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. *J Stud Alcohol*. 2000;61(2):267–277.

[19] Fortney J, Mukherjee S, Curran G, Fortney S, Han X, Booth BM. Factors associated with perceived stigma for alcohol use and treatment among at-risk drinkers. *J Behav Health Serv Res*. 2004;31(4):418–429.

[20] Young LB, Grant KM, Tyler KA. Community-level barriers to recovery for substance-dependent rural residents. *J Soc Work Pract Addict*. 2015;15(3):307–326.

[21] Pullen E, Oser C. Barriers to substance abuse treatment in rural and urban communities: counselor perspectives. *Subst Use Misuse*. 2014;49(7):891–901.

[22] Broffman L, Spurlock M, Dulacki K, et al. Understanding treatment gaps for mental health, alcohol, and drug use in South Dakota: a qualitative study of rural perspectives. *J Rural Health*. 2017;33(1):71–81.

[23] Browne T, Priester MA, Clone S, Iachini A, DeHart D, Hock R. Barriers and facilitators to substance use treatment in the rural south: a qualitative study. *J Rural Health*. 2016;32(1):92–101.

[24] Williams EC, Achtmeyer CE, Young JP, et al. Barriers to and facilitators of alcohol use disorder pharmacotherapy in primary care: a qualitative study in five VA clinics. *J Gen Intern Med*. 2018;33(3):258–267.

[25] Young JP, Achtmeyer CE, Bensley KM, Hawkins EJ, Williams EC. Differences in perceptions of and practices regarding treatment of alcohol use disorders among VA primary care providers in urban and rural clinics. *J Rural Health*. 2018;34(4):359–368.

[26] Hauenstein EJ, Petterson S, Rovnyak V, Merwin E, Heise B, Wagner D. Rurality and mental health treatment. *Adm Policy Ment Health*. 2007;34(3):255–267.

[27] Hudson TJ, Fortney JC, Williams JS, Austen MA, Pope SK, Hayes CJ. Effect of rural residence on use of VHA mental health care among OEF/OIF veterans. *Psychatr Serv*. 2014;65(12):1420–1425.

[28] Teich J, Ali MM, Lynch S, Mutter R. Utilization of mental health services by veterans living in rural areas. *J Rural Health*. 2017;33(3):297–304.

[29] Borders TF, Booth BM. Research on rural residence and access to drug abuse services: where are we and where do we go? *J Rural Health*. 2007;23(s1):79–83.

[30] Davis MM, Spurlock M, Dulacki K, et al. Disparities in alcohol, drug use, and mental health condition prevalence and access to care in rural, isolated, and reservation areas: findings from the South Dakota Health Survey. *J Rural Health*. 2016;32(3):287–302.

[31] Fortney J, Booth BM. Access to substance abuse services in rural areas. *Recent Dev Alcohol*. 2001;15:177–197.

[32] Nietert PJ, French MT, Kirchner J, Han X, Booth BM. Health services utilization and cost for at-risk drinkers: rural and urban comparisons. *J Stud Alcohol*. 2004;65(3):353–362.

[33] Finlay AK, Harris AHS, Rosenthal J, et al. Justice involvement and treatment use among rural veterans. *Rural Ment Health*. 2018;42(1):46–59.

[34] Finlay AK, Binswanger I, Timko C, et al. Receipt of pharmacotherapy for alcohol use disorder by male justice-involved U.S. veterans health administration patients. *Crim Justice Policy Rev*. 2018;29(9):875–890.

[35] Taylor E, Timko C, Harris AHS, Yu M, Finlay AK. Receipt of pharmacotherapy for alcohol use disorder by justice-involved women in the Veterans Health Administration. *Addict Sci Clin Pract*. 2019;14(1):1.

[36] Bensley KM, Fortney J, Chan G, et al. Differences in receipt of alcohol-related care across rurality among VA patients living with HIV with unhealthy alcohol use. *J Rural Heal*. 2019;35(3):341–353.

[37] Harris AHS, Humphreys K, Bowe T, Kivlahan DR, Finney JW. Measuring the quality of substance use disorder treatment: evaluating the validity of the Department of Veterans Affairs continuity of care performance measure. *J Subst Abuse Treat*. 2009;36(3):294–305.

[38] Harris AHS, Humphreys K, Bowe T, Tiet Q, Finney JW. Does meeting the HEDIS substance abuse treatment engagement criterion predict patient outcomes? *J Behav Health Serv Res*. 2010;37(1):25–39.

[39] Williams EC, Gupta S, Rubinsky AD, et al. Racial/ethnic differences in the prevalence of clinically recognized alcohol use disorders among patients from the U.S. Veterans Health Administration. *Alcohol Clin Exp Res*. 2016;40(2):359–366.

[40] HEDIS. Technical Specifications. Vol. 2. Washington, DC: National Committee for Quality Assurance; 2011.
[41] Morrill R, Cromartie J, Hart G. Metropolitan, urban, and rural commuting areas: toward a better depiction of the United States settlement system. *Urban Geogr*. 1999;20(8):727–748.
[42] Economic Research Service. 2016. Documentation: 2010 Rural-Urban Commuting Area (RUCA) Codes. https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/documentation/. Accessed March 20, 2019.
[43] WWAMI Rural Health Research Center. 2018. Rural-urban commuting area codes (RUCAs). Retrieved from http://depts.washington.edu/uwruca/ruca-uses.php. Accessed March 20, 2019.
[44] Harris AHS, Reeder RN, Ellerbe L, Bowe T. Are VHA administrative location codes valid indicators of specialty substance use disorder treatment? *J Rehabil Res Dev*. 2010;47(8):699–708.
[45] Harris AHS, Reeder RN, Ellerbe LS, Bowe TR. Validation of the treatment identification strategy of the HEDIS addiction quality measures: concordance with medical record review. *BMC Health Serv Res*. 2011;11(1):73.
[46] Harris AHS, Weisner CM, Chalk M, Capoccia V, Chen C, Thomas CP. Specifying and pilot testing quality measures for the American Society of Addiction Medicine's Standards of Care. *J Addict Med*. 2016;10(3):148–155.
[47] Chen JA, Owens MD, Browne KC, Williams EC. Alcohol-related and mental health care for patients with unhealthy alcohol use and posttraumatic stress disorder in a National Veterans Affairs cohort. *J Subst Abuse Treat*. 2018;85:1–9.
[48] Williams EC, Lapham GT, Shortreed SM, et al. Among patients with unhealthy alcohol use, those with HIV are less likely than those without to receive evidence-based alcohol-related care: a national VA study. *Drug Alcohol Depend*. 2017;174:113–120.
[49] Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc*. 1973;51(1):95–124.
[50] Williams EC, Lapham GT, Hawkins EJ, et al. Variation in documented care for unhealthy alcohol consumption across race/ethnicity in the Department of Veterans Affairs Healthcare System. *Alcohol Clin Exp Res*. 2012;36(9):1614–1622.
[51] Mays VM, Ponce NA, Washington DL, Cochran SD. Classification of race and ethnicity: implications for public health. *Annu Rev Public Health*. 2003;24(1):83–110.
[52] Office of Management and Budget. Revisions to the standards for the classification of federal data on race and ethnicity. *Fed Regist*. 1997;62(210):58782–58790.
[53] Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol*. 1992;45(6):613–619.
[54] Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40(5):373–383.
[55] Sharabiani MTA, Aylin P, Bottle A. Systematic review of comorbidity indices for administrative data. *Med Care*. 2012;50(12):1109–1118.
[56] Williams R. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *The Stata Journal*. 2012;12(2):308–331.
[57] Muller CJ, MacLehose RF. Estimating predicted probabilities from logistic regression: different methods correspond to different target populations. *Int J Epidemiol*. 2014;43(3):962–970.
[58] Macintyre S, Ellaway A, Cummins S. Place effects on health: how can we conceptualise, operationalise and measure them? *Soc Sci Med*. 2002;55(1):125–139.
[59] Stata Statistical Software: Release 13. College Station, TX: StataCorp LP; 2013.
[60] Mattke S, Predmore Z, Sloss E, Wilks A, Watkins KE. Evidence for misspecification of a nationally used quality measure for substance use treatment. *J Healthc Qual*. 2018;40(4):228–235.
[61] Fischer EP, McSweeney JC, Wright P, et al. Overcoming barriers to sustained engagement in mental health care: perspectives of rural veterans and providers. *J Rural Health*. 2016;32(4):429–438.
[62] Fortney JC, Booth BM, Blow FC, Bunn JY, Loveland Cook CA. The effects of travel barriers and age on the utilization of alcoholism treatment aftercare. *Am J Drug Alcohol Abuse*. 1995;21(3):391–406.
[63] Hagedorn H, Sox-Harris A, Wisdom J, et al. Improving access to alcohol use disorder pharmacotherapy and treatment in primary care settings. *Implement Sci*. 2015;10(1):A75.
[64] Harris AHS, Bowe T, Hagedorn H, et al. Multifaceted academic detailing program to increase pharmacotherapy for alcohol use disorder: interrupted time series evaluation of effectiveness. *Addict Sci Clin Pract*. 2016;11(1):15.
[65] Rosen AK, Wagner TH, Pettey WBP, et al. Differences in risk scores of veterans receiving community care purchased by the veterans health administration. *Health Serv Res*. 2018;53:5438–5454.
[66] Vanneman ME, Harris AHS, Asch SM, Scott WJ, Murrell SS, Wagner TH. Iraq and Afghanistan Veterans' use of Veterans Health Administration and purchased care before and after veterans choice program implementation. *Med Care*. 2017;55:S37–S44.