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The Prevalence of HEDIS Initiation and Engagement in Treatment among Patients with Cannabis Use Disorders in Seven U.S. Health Systems

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Abstract

Background: Cannabis use disorders (CUD) have increased with more individuals using cannabis, yet few receive treatment. Health systems have adopted the Healthcare Effectiveness Data and Information Set (HEDIS) quality measures of initiation and engagement in alcohol and other drugs (AOD) dependence treatment, but little is known about the performance of these among patients with CUD.

Methods: This cohort study utilized electronic health records and claims data from seven health care systems to identify patients with documentation of a new index CUD diagnosis (no AOD

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diagnosis 60 days prior) from International Classification of Diseases-9th edition codes (10/1/2014–8/31/2015). The adjusted prevalence of each outcome (initiation, engagement and a composite of both) was estimated from generalized linear regression models, across index identification setting (inpatient, emergency department, primary care, addiction treatment and mental health/psychiatry), AOD comorbidity (patients with CUD only and CUD plus other AOD diagnoses) and patient characteristics.

Results: Among 15,202 patients with an index CUD diagnosis, 30.0% (95% CI 29.2% – 30.7%) initiated, 6.9% (95% CI 6.2% – 7.7%) engaged among initiated, and 2.1% (95% CI 1.9%–2.3%) overall both initiated and engaged in treatment. The adjusted prevalence of outcomes varied across index identification setting and was highest among patients diagnosed in addiction treatment, with 25.0% (95% CI 22.5%–27.6%) who initiated, 40.9% (95% CI 34.8%–47.0%) engaged and 12.5% (95% CI 10.0%–15.1%) initiated and engaged. The adjusted prevalence of each outcome was generally highest among patients with CUD plus other AOD at index diagnosis compared to those with CUD only, overall and across index identification setting, and was lowest among uninsured and older patients.

Conclusion: Among patients with a new CUD diagnosis, the proportion meeting HEDIS criteria for initiation and/or engagement in AOD treatment was low and demonstrated variation across index diagnosis setting, AOD comorbidity, and patient characteristics, pointing to opportunities for improvement.

Keywords

cannabis; substance use disorder; quality indicators; comorbidity; health services research; treatment

INTRODUCTION

Cannabis is the third most widely used substance in the United States after alcohol and tobacco, with 8.9% of the population aged 12 and older reporting current use in 2016.¹ The prevalence of cannabis use disorders (CUD) has increased in the U.S. since 2002, with 3.5% of men and 1.5% of women having a current CUD, and is expected to increase as legal access expands.^{2–5} Although nearly 3 in 10 adults who use cannabis have a CUD, only 7.6% of individuals with a current diagnosis receive treatment.^{1–3,6}

The National Committee for Quality Assurance's (NCQA's) Healthcare Effectiveness Data and Information Set (HEDIS) is the most widely used set of health care quality measures in the United States.⁷ HEDIS includes measures to assess Initiation and Engagement of Alcohol and Other Drug Dependence Treatment (IET).^{7,8} These health care system-level performance measures are intended to assess and promote system-wide efforts to assure patient referral and engagement in alcohol and other drug (AOD) treatment through electronic health record (EHR) documentation of early involvement in AOD treatment following a new diagnosis.⁹ Historically, most health care systems have underperformed on these measures^{9,10} and little is known about patient- and system-level factors associated with higher performance, aside from health care setting and specialty. Namely, patients who initiate AOD treatment as outpatients, compared to inpatients, are more likely to engage,

while patients in contact with specialty addictions treatment are more likely to initiate and engage compared to patients in other settings.¹¹

To our knowledge, no study has evaluated the performance of HEDIS initiation and engagement in AOD treatment measures among patients with CUD. As a result, little is known about the association between characteristics of patients with CUD and these performance metrics. Using EHR and claims data from seven health care systems within the Health Systems Node of the NIDA Clinical Trials Network, we sought to evaluate initiation and engagement in AOD treatment among patients with a new CUD diagnosis, and assess variation across health care setting and patient characteristics. As other comorbid AOD disorders strongly predict treatment utilization among patients with CUD,^{12,13} we also evaluated outcomes stratified by patients based on AOD comorbidity: those with a CUD only, and those with a CUD plus other AOD disorder diagnoses.

METHODS

Setting and study sample

This observational cohort study utilized EHR and claims data from seven geographically diverse health care systems within the Health Systems Node of the National Institute on Drug Abuse Clinical Trials Network. These health systems serve patients in nine states, three of which had legalized nonmedical and medical cannabis use, four had legalized medical use, and two had no legalized cannabis use at the time of this study. Each health system utilizes a system-wide EHR and provides both health care and insurance coverage. Each health system also employs a common data model with harmonized EHR and medical insurance claims data, including diagnoses, procedures and utilization, contained in a standardized data repository, the Virtual Data Warehouse (VDW), designed to support multisite research. The VDW was accessed locally by programmers at each site and data were aggregated by the lead site into a single dataset for analysis. Data included patient demographics, procedures, health care utilization, and mental health and AOD diagnoses, and medical comorbidity diagnoses.

The study sample included adult patients (>18 years) from each site who met criteria for enrollment and for the HEDIS AOD IET denominator between October 1, 2014 and August 31, 2015. Specifically, patients were eligible if: 1) they had a health care encounter, including inpatient, outpatient, detoxification or emergency department visit, with documentation of an *index AOD diagnosis*, defined as a primary or secondary AOD diagnosis without documentation of any AOD diagnosis in the prior 60 days; and 2) were continuously enrolled for the two months prior through 44 days post index identification date. Patients with an index AOD diagnosis that included a CUD diagnosis were included in the present analyses. Because patients could have had more than one AOD diagnosis documented at the index identification date (an indicator of substance use severity), two mutually exclusive subsamples of *CUD index diagnosis groups* were categorized: 1) patients with CUD only and 2) patients with CUD plus other AOD diagnoses. This study received approval and waivers of consent and HIPAA authorization from the Institutional Review Boards at each site.

Measures

Measures at index CUD diagnosis—International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) abuse and dependence diagnoses codes for an index AOD diagnosis were specified by HEDIS, including ICD-9-CM codes for cannabis use disorders (i.e., *index CUD diagnosis*; 305.2.–22; 304.3–304.32). Indicators for other AOD disorder diagnoses at index included alcohol, opioid, stimulants (i.e., cocaine and amphetamine) and other/unspecified (i.e., hallucinogen, sedative, antidepressant, unspecified) drug abuse and dependence. These indicators were used to derive a count of *other AOD diagnoses at index CUD diagnosis* (0, 1, 2). Because the HEDIS AOD IET measures consider *index identification setting*,^{8,14} this measure was categorized into five health care settings: 1) inpatient; 2) emergency department; 3) primary care, including internal medicine, family practice, urgent care and obstetrics/gynecology; 4) addictions treatment; and 5) mental health and psychiatry, with the latter three defined by outpatient visits.

Measures prior to index CUD diagnosis—ICD-9-CM codes were used to identify AOD and mental health disorders diagnosed in the year prior to the index encounter. Specifically, a composite indicator for *any AOD diagnosis in year prior to index* included indicators for cannabis, alcohol, opioids, stimulants, and other drug use, as well as ICD-9-CM codes for nicotine dependence. A composite indicator for *any mental health disorder in the year prior to index* included indicators for anxiety, depression, and serious mental illness. Medical comorbidity in the past year was characterized by the Charlson comorbidity index (score 0–2 vs. 3).^{15,16} *Utilization* included counts (> 1 visits) of emergency department, primary care, mental health/psychiatry and other specialty care visits in the 60 days prior to index.

Other patient characteristics—Other patient characteristics measured at the time of index identification date include gender (male/female), age (18–29, 30–49, 50–64, 65 years), race/ethnicity (Black/African American, Hispanic/Latino, white, other/unknown), and health insurance (commercial/private pay, Medicare, state subsidized, including Medicaid, and unknown).

Outcome measures—The HEDIS IET AOD treatment indicators (i.e., 0/1) included: 1) *initiation*, defined as an encounter with a documented AOD diagnosis within 14 days of index AOD diagnosis; and 2) *engagement*, among those who initiated treatment, defined as two or more similar encounters within 30 days after initiation. Consistent with HEDIS, patients diagnosed with an index AOD diagnosis while inpatient were assumed to have initiated. To evaluate the extent of initiation and engagement among patients with an index CUD diagnosis and account for bias as a result of engagement based on only those who initiate,¹⁷ a composite indicator of *initiation & engagement* was also evaluated.

Analyses

Patient-level analyses described sample characteristics overall and across CUD index diagnosis group, with chi-square tests of independence used to test for significant differences between the two groups. The unadjusted probability and 95% confidence intervals for each

of the three outcomes (initiation, engagement, and initiation & engagement) was calculated for comparison to NCQA published performance estimates.¹⁰ For these analyses, patients diagnosed during an inpatient stay were included in initiation estimates.

To estimate the adjusted probability of each outcome, overall and stratified by index CUD diagnosis group, generalized linear models with a logit link were used. Adjusted estimates for initiation excluded inpatients, as index identification during inpatient was equated with initiation consistent with HEDIS, while engagement included all patients who initiated, including inpatients. Robust standard errors were calculated using the sandwich estimator to account for correlation between patients from the same health system. Models were adjusted for covariates available in the dataset, with known associations between CUD and treatment^{12,18,19} and significant bivariate associations between outcomes (Appendix A). These included gender, age, race/ethnicity, health insurance, Charlson comorbidity, other AOD diagnoses at index, any AOD diagnosis and/or any mental health diagnosis in the year prior to index, utilization in the 60 days prior to index, and index identification setting. Results were presented as the average adjusted predicted probability of each outcome based on recycled predictions.^{20,21} Along with stratification by CUD index diagnosis group, results were presented across index identification setting and patient characteristics. Analyses were completed using Stata version 15.0 MP edition.²²

RESULTS

Sample characteristics

Among the 86,565 patients with an index AOD diagnosis during the study period, 15,202 (17.6%) had an index diagnosis of CUD and were included. The sample was mostly male (63.1%), younger (47.8% 18–29 years old) and white (52.2%; Table 1). The index CUD diagnosis most frequently occurred in primary care (33.5%), followed by emergency departments (29.4%), inpatient stays (23.6%), mental health and psychiatry visits (10.2%) and addiction treatment settings (3.7%), with significant variation between patients with and without other AOD at index diagnosis. Among all patients with an index CUD, 74.6% had no other AOD diagnosis at index, while the remaining 25.4% had other AOD diagnoses at index diagnosis: 19.1% with one and 6.4% with two or more additional AOD diagnoses at index, with 58.3% of patients with other AOD at index having an alcohol use disorder. Patients with and without other AOD diagnoses at index differed across all patient characteristics (Table 1). For example, in the year prior to index diagnosis, patients with other AOD diagnoses experienced a greater burden of AOD (50.1% vs. 37.1%; $p < 0.001$) and mental health disorders (56.6% vs. 47.2%; $p < 0.001$) compared to patients with CUD only.

Unadjusted prevalence of initiation and engagement

For all patients with CUD, the unadjusted prevalence of initiation was 30.0% (95% CI 29.2% – 30.7%), the majority (78.0%) of which was accounted for by inpatient encounters, which, by definition, met HEDIS guidelines for initiation. Among patients who initiated treatment, 6.9% (95% CI 6.2% – 7.7%) engaged in treatment and 2.1% (95% CI 1.9% – 2.3%) of all patients initiated and engaged in treatment.

Adjusted prevalence of initiation and engagement

The adjusted prevalence of initiation, which excluded patients with inpatient index diagnoses, varied across index identification setting and was highest for patients diagnosed in addiction treatment settings (25.0% [95% CI 22.5–27.6%]; Table 2). Initiation was also highest for patients with other AOD diagnoses at index, which ranged between 10.4% (95% CI 4.5%–16.5%) and 42.9% (95% CI 37.4%–48.4%), depending on index identification setting, compared to patients with CUD only at index, which ranged between 3.8% (95% CI 1.9%–5.9%) and 21.6% (95% CI 19.7%–23.6%).

The adjusted prevalence of engagement, among all who initiated, also varied across index identification setting, ranging from 2.9% (95% CI 2.0%–3.9%) for inpatient to 40.9% (95% CI 34.8%–47.0%) for addiction treatment settings, and was generally highest among patients with other AOD diagnoses at index (8.4% [95% CI 6.1%–10.7%]) compared to patients with CUD only at index (5.6% [95% CI 6.1%–10.7%]).

Finally, the adjusted prevalence of initiation and engagement, among all patients, varied across index identification setting, which ranged from 0.9% (95% CI 0.7%–1.1%) for primary care to 12.5% (95% CI [10.0%–15.1%]) for addiction treatment settings and was also highest among patients with other AOD diagnoses at index (3.1% [95% CI 2.5%–3.7%]), compared to patients with CUD only at index (1.4% [95% CI 1.1%–1.6%]). For all three outcomes, prevalence estimates were generally lowest among uninsured and older patients (< 65 years) and highest among patients with other AOD diagnoses at index diagnosis (Table 3; Appendix B).

DISCUSSION

This study evaluated rates of initiation and engagement in AOD treatment among patients with a new CUD diagnosis in seven health care systems across the U.S., as measured by HEDIS performance measures. About one third of patients initiated treatment and among those who initiated, less than 7% engaged in treatment. Overall, 2% of patients with a CUD initiated and engaged in treatment for alcohol and other drug use disorders, based on HEDIS criteria. However, rates varied considerably depending on patient and clinical characteristics. For each outcome, rates were highest among patients diagnosed in addiction treatment settings compared to other settings and among those with other AOD diagnoses at the time of diagnosis compared to those with CUD only, with the lowest rates among uninsured and older patients.

This is the first study to assess HEDIS initiation and engagement performance measures among patients with a new episode of CUD, and how these results compare to patients with CUD in other health systems is not known. Among all patients newly diagnosed with AOD disorders, the HEDIS-defined initiation rate has ranged between 17% and 40.8% depending on health care system, region and insurance type.^{10,23–25} The 2016 HEDIS IET performance rates reported by NCQA for health maintenance organizations ranged between 32.7% and 40.8%, among patients with Medicare, commercial and Medicaid coverage.¹⁰ Similarly, the engagement rate among those who initiated ranged between 3.6% and 12.5%, with initiation and engagement among all patients ranging between 1.2% and 5.1%.¹⁰ The comparable

rates of these measures found among patients with a new episode of CUD in this study suggests that HEDIS measures may have similar results for specific substance use disorders, like CUD, as for AOD disorders overall.

Consistent with previous findings, this study found that the health care setting of a newly diagnosed episode of CUD was associated with significant variation in initiation and engagement in treatment, with patients diagnosed during an addictions treatment visit demonstrating the highest rates compared to other settings.^{11,24,26} Yet, notably, less than 4% (n=556) of patients with CUD were identified in addiction treatment settings and the majority (80%) had multiple AOD disorders when diagnosed. Patients with CUD presenting to addiction treatment may have higher motivation to self-refer or act upon referral to treatment and to engage in treatment. Although 65% of patients who initiated and engagement in AOD treatment were identified outside of addiction treatment, nearly half those remaining were diagnosed while inpatient, which, per HEDIS, is equated with AOD treatment initiation, limiting comparisons to other settings. Factors that may influence differences in initiation and engagement in other settings include the underlying prevalence of CUD among patients, which can impact provider awareness and incentive to facilitate treatment, and the influence of CUD and other AOD symptom severity on patient selection of visit setting.^{27,28} Despite these potential differences, rates of initiation and engagement, although variable across setting, were low - overall and across settings - indicating that efforts to improve these treatment rates for patients with CUD are needed.

This study also found that a new encounter of CUD was often co-occurring with other AOD diagnoses at the time of diagnosis. Individuals with CUD frequently have comorbid alcohol, illicit drug and prescription medication use disorders²⁹⁻³¹ and a quarter of patients with a new episode of CUD in this study had at least one other AOD diagnosis. Consistent with previous findings,¹² the results from this study highlight that AOD severity among patients with CUD is associated with a higher likelihood of initiating and engaging in AOD treatment compared to patients with CUD only. However, this study assessed initiation and engagement documented for *any* AOD diagnosis, not just CUD (e.g., initiation could be for an alcohol use disorder, not CUD), consistent with HEDIS, and other factors may explain these differences. For example, patients with other AOD may have had more initiation opportunities resulting from multiple AODs. Other AOD comorbidity could have also contributed to patient willingness to seek treatment and triggered enhanced treatment linkage and retention, whereas patients with CUD only may have been less likely to be encouraged to initiate treatment.

Recognition and assessment of patients for CUD and other AOD diagnoses is a key prerequisite of HEDIS AOD treatment measures and several factors could have contributed to a whether a patients was diagnosis with CUD in this study.⁹ Patients in states with medical and nonmedical cannabis use laws may have been more willing to acknowledge cannabis use, with providers more willing to ask about use, and AOD comorbidity at presentation and in the prior year likely influenced recognition and diagnosis. Conversely, providers in busy medical settings, including primary care and emergency departments, may not feel they have the time or tools necessary to diagnosis patients, and some patients may have only received an AOD diagnosis at the time they were willing to enter treatment.

Moreover, routine cannabis and drug screening is not currently recommended and under-recognition of AOD in medical settings remains a concern.^{32–34} For example, the prevalence of CUD among primary care patients in one health system included here was found to be considerably lower than population estimates.^{1,2,35} Yet recent efforts to integrate screening and assessment in the same system improved recognition and diagnosis of AOD.³⁶

Whether adherence to HEDIS treatment measures impacts cannabis use or CUD symptoms is not known. Assessed at the health system level, AOD treatment initiation and engagement have been associated with meaningful but clinically modest substance use symptom improvement,^{23,37,38} and may be most meaningful for specific subgroups, such as those mandated to and/or attending specialty AOD treatment.^{39–41} However, potential influence of HEDIS measures on outcomes among patients with CUD is unknown and research is needed address this gap.

This study has several limitations. HEDIS measures of initiation and engagement are based on EHR-documentation of a visit-based qualifying AOD diagnosis. The quality and type of AOD treatment based on these measures is not known and likely varies by health setting and site.²⁶ Moreover, this study specifically examined HEDIS measures and did not consider broader definitions (e.g., longer initiation period to account for potential delays in treatment access; brief treatment interventions) that may have captured other AOD treatment initiation and engagement.²⁴ The treatment options available to patients with CUD in this study were not captured and it is unclear what evidence-based treatments for CUD would have been available across systems and settings or what treatment may have been missed outside the system (e.g., self-help groups, out-of-pocket treatment). No medications have been approved or demonstrated to be broadly effective for the treatment of CUD,^{42,43} and psychosocial therapies, including cognitive behavioral and motivational enhancement therapies, remain the first line of treatment.^{42,44} The potential influence of legalized cannabis use on patient initiation and engagement in AOD treatment is unknown. Providers may be uncertain how to diagnose and advise patients who use cannabis for medical reasons who may also have a CUD and patients may not view their medical or recreational cannabis use as problematic, leading under-diagnosis and lower treatment acceptance. The study sample was comprised of mostly insured patients enrolled in large health systems and the generalizability to other systems, such as federally-qualified health centers, is unclear. For the minority with unknown insurance, the prevalence of initiation and engagement could be low if patients were uninsured, restricting available data to encounters within the health system. HEDIS measures are meant as health system-level quality measures and results found here were aggregated across health systems to explore associations among patients with CUD.

This study also has important strengths. The seven integrated health systems included had access to common EHR data elements based on reliable measures. Patients with CUD in this study represent those in several states with legal access to cannabis, with legalization in the U.S. expected to continue expanding. Although the rates of initiation and treatment among CUD patients in this study were low, several health systems included have initiated efforts to improve access to appropriate AOD treatment.³⁶

In summary, among patients with a new episode of CUD, rates of HEDIS-defined AOD treatment initiation and engagement were generally low, demonstrating missed opportunities to initiate and retain patients in treatment, yet highlighted important variation in these measures across health care setting and AOD comorbidity. These findings indicate that efforts to improve recognition and diagnosis of CUD, linkage to care and retention in evidence-based treatment for CUD, and attention to the impact of comorbidity are needed.

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Appendix

Appendix A.

Patient characteristics associated with initiation & engagement in treatment

	All patients with CUD						CUD only						CUD plus other AOD					
	No I&E (14,887)	I&E (315)	n	%	p-value		No I&E (11,220)	I&E (118)	n	%	p-value		No I&E (3,667)	I&E (197)	n	%	p-value	
Gender					0.002					0.154							0.078	
Female	5,523	90	37.1	(28.6)		4,334	38	38.6	(32.2)		1,189	52	32.4	(26.4)				
Male	9,364	225	62.9	(71.4)		6,886	80	61.4	(67.8)		2,478	145	67.6	(73.6)				
Age categories					0.002					0.960							0.003	
18-29	7,107	155	47.7	(49.2)		5,345	58	47.6	(49.2)		1,762	97	48.1	(49.2)				
30-49	3,930	104	26.4	(33.0)		2,867	31	25.6	(26.3)		1,063	73	29.0	(37.1)				
50-64	2,828	46	19.0	(14.6)		2,189	21	19.5	(17.8)		639	25	17.4	(12.7)				
65	1,022	10	6.9	(3.2)		819	8	7.3	(6.8)		203	2	5.5	(1.0)				
Race/ethnicity					0.188					0.889							0.469	
Black/African American	2,530	39	17.0	(12.4)		2,005	18	17.9	(15.3)		525	21	14.3	(10.7)				
Hispanic	2,985	69	20.1	(21.9)		2,234	23	19.9	(19.5)		751	46	20.5	(23.4)				
White	7,763	171	52.1	(54.3)		5,790	64	51.6	(54.2)		1,973	107	53.8	(54.3)				
Other/Unknown	1,609	36	10.8	(11.4)		1,191	13	10.6	(11.0)		418	23	11.4	(11.7)				
Insurance					0.000					0.369							0.000	
Commercial/ Private pay	10,429	257	70.1	(81.6)		7,777	84	69.3	(71.2)		2,652	173	72.3	(87.8)				
Medicare	1,822	28	12.2	(8.9)		1,418	18	12.6	(15.3)		404	10	11.0	(5.1)				
State Subsidized	2,134	27	14.3	(8.6)		1,657	15	14.8	(12.7)		477	12	13.0	(6.1)				
Unknown	502	3	3.4	(1.0)		368	1	3.3	(0.8)		134	2	3.7	(1.0)				
Other AOD disorder diagnoses at index																	0.000	
1	2782	114	18.7	36.2		na	na	na	na		2,782	114	75.9	(57.9)				
2	885	83	5.9	26.3		na	na	na	na		885	83	24.1	(42.1)				
Charlson Comorbidity score 3 in prior year	1,207	30	8.1	(9.5)	0.363	950	20	8.5	(16.9)	0.001	257	10	7.0	(5.1)	0.298			
Any AOD in prior year to index	5,964	184	40.1	(58.4)	0.000	4,135	77	36.9	(65.3)	0.000	1,829	107	49.9	(54.3)	0.225			
Any mental health disorder in prior year	7,338	202	49.3	(64.1)	0.000	5,267	85	46.9	(72.0)	0.000	2,071	117	56.5	(59.4)	0.421			
Utilization in 60 days prior to index episode																		

	All patients with CUD				CUD only				CUD plus other AOD							
	No I&E (14,887)	%	n	%	I&E (315)	%	n	%	No I&E (11,220)	%	n	%	I&E (197)	%	n	%
Emergency department 1 visit	2,912	(19.6)	95	(30.2)	0.000	2,053	(18.3)	40	(33.9)	0.000	859	(23.4)	55	(27.9)	0.148	
Primary care 1 visit	5,616	(37.7)	107	(34.0)	0.173	4,418	(39.4)	48	(40.7)	0.773	1,198	(32.7)	59	(29.9)	0.427	
Mental health/psychiatry 1 visit	1,034	(6.9)	38	(12.1)	0.000	715	(6.4)	19	(16.1)	0.000	319	(8.7)	19	(9.6)	0.647	
Other specialty 1 visit	2,873	(19.3)	58	(18.4)	0.693	2,306	(20.6)	26	(22.0)	0.692	567	(15.5)	32	(16.2)	0.768	
<u>Index identification setting</u>					0.000					0.000					0.000	
Inpatient	3,487	(23.4)	101	(32.1)		2,392	(21.3)	44	(37.3)		1,095	(29.9)	57	(28.9)		
Emergency department	4,377	(29.4)	39	(12.4)		3,302	(29.4)	14	(11.9)		1,075	(29.3)	25	(12.7)		
Primary care	5,065	(34.0)	32	(10.2)		4,327	(38.6)	22	(18.6)		738	(20.1)	10	(5.1)		
Addiction treatment (outpatient)	447	(3.0)	109	(34.6)		93	(0.8)	19	(16.1)		354	(9.7)	90	(45.7)		
Mental health & psychiatry	1,511	(10.1)	34	(10.8)		1,106	(9.9)	19	(16.1)		405	(11.0)	15	(7.6)		

* Initiation & engagement was estimated among all patients in each CUD group

Appendix B.

Adjusted* prevalence of initiation and engagement across CUD index groups

	**			***			#			
	Initiation			Engagement						
	All patients with CUD (n 11,607)	CUD only (n 8,896)	CUD plus other AOD (n 2,711)	All patients with CUD (n 4,554)	CUD only (n 2,921)	CUD plus other AOD (n 1,633)	%	95% CI	%	95% CI
Gender										
Female	8.0 (7.4–8.5)	4.9 (3.9–5.8)	18.2 (16.1–20.2)	6.2 (5.2–7.1)	3.6 (2.8–4.3)	11.2 (9.4–13.0)				
Male	9.1 (8.4–9.8)	5.9 (5.2–6.5)	19.6 (18.2–21.0)	7.3 (5.5–9.1)	4.3 (3.6–5.1)	12.4 (8.7–16.2)				
Age categories										
18–29	9.1 (8.4–9.9)	6.5 (5.6–7.5)	18.1 (16.6–19.5)	7.5 (5.3–9.7)	4.7 (3.6–5.8)	12.5 (8.3–16.6)				
30–49	8.8 (7.9–9.7)	4.9 (3.8–6.0)	21.6 (19.7–23.5)	7.6 (6.9–8.3)	4.3 (3.5–5.0)	13.4 (11.5–15.3)				
50–64	7.5 (6.3–8.7)	4.2 (3.2–5.1)	18.2 (15.3–21.2)	5.7 (4.4–6.9)	3.3 (2.5–4.0)	10.1 (6.8–13.4)				
65	7.4 (4.9–10.0)	4.3 (2.7–5.8)	17.7 (10.6–24.8)	3.8 (2.1–5.4)	2.5 (1.0–3.9)	4.2 (2.4–6.1)				
Race/ethnicity										
Black/AA	8.5 (7.9–9.0)	5.2 (4.4–6.0)	19.4 (16.4–22.4)	5.6 (4.9–6.3)	3.7 (3.2–4.2)	9.0 (7.5–10.4)				
Hispanic	8.2 (7.0–9.3)	5.1 (3.6–6.6)	18.1 (16.5–19.8)	7.7 (5.8–9.6)	4.4 (3.8–5.1)	13.3 (8.6–18.0)				
White	9.0 (8.4–9.5)	5.7 (4.7–6.7)	20.0 (18.5–21.6)	6.9 (5.7–8.2)	4.0 (3.6–12.2)	12.2 (9.7–14.7)				
Other/unknown	8.5 (6.1–11.0)	5.9 (3.7–8.1)	16.6 (11.7–21.6)	7.4 (5.3–9.4)	4.0 (2.6–5.5)	13.2 (9.2–17.3)				
Insurance										
Commercial/ Private pay	9.2 (8.6–9.8)	5.8 (5.3–6.4)	20.2 (18.3–22.1)	7.0 (5.6–8.4)	3.9 (3.3–4.6)	12.6 (10.0–15.2)				
Medicare	8.0 (6.9–9.2)	5.3 (4.0–6.6)	17.1 (14.8–19.3)	7.7 (5.4–10.0)	5.3 (3.5–7.2)	11.1 (5.5–16.6)				
State Subsidized	7.3 (5.5–9.1)	4.5 (2.8–6.2)	16.2 (13.3–19.2)	6.0 (4.5–7.6)	3.8 (2.0–5.6)	9.2 (4.4–14.0)				
Unknown	5.7 (4.1–7.4)	4.2 (2.2–6.1)	10.1 (8.6–11.5)	4.1 (1.0–7.3)	1.7 (–2.8–6.1)	8.3 (6.6–10.0)				
Other AOD disorder diagnoses at index										
1	12.1 (10.4–13.8)	na	16.5 (14.7–18.4)	8.5 (5.8–11.2)	na	11.9 (8.6–15.2)				
2	18.7 (17.0–20.4)	na	25.6 (23.7–27.5)	8.3 (6.3–10.3)	na	12.3 (9.6–14.9)				
Charlson Comorbidity score 3 in prior year	9.7 (5.3–14.1)	7.4 (2.4–12.5)	15.1 (9.5–20.7)	9.5 (7.8–11.1)	6.8 (5.4–8.2)	13.1 (9.9–16.2)				
Any AOD in prior year to index	12.6 (11.1–14.1)	8.9 (7.9–9.9)	24.9 (20.4–29.3)	6.9 (5.8–8.0)	4.7 (3.6–5.7)	11.1 (8.3–13.8)				
Any mental health disorder in prior year	9.8 (9.0–10.5)	6.6 (5.7–7.6)	20.3 (19.7–20.8)	7.5 (5.7–9.2)	4.5 (4.0–5.0)	12.6 (9.4–15.7)				
Utilization in 60 days prior to index episode										

	***			Engagement [‡]		
	All patients with CUD (n 11,607)	CUD only (n 8,896)	CUD plus other AOD (n 2,711)	All patients with CUD (n 4,554)	CUD only (n 2,921)	CUD plus other AOD (n 1,633)
	%	95% CI	%	95% CI	%	95% CI
Emergency department 1 visit	18.2	(13.1–23.3)	12.8	(8.8–16.7)	35.9	(27.2–44.6)
Primary care 1 visit	8.6	(7.2–10.0)	5.7	(4.6–6.8)	17.7	(15.3–20.2)
Mental health/psychiatry 1 visit	12.1	(9.8–14.4)	8.3	(6.0–10.6)	24.6	(21.5–27.7)
Other specialty 1 visit	7.7	(7.1–8.3)	4.7	(3.4–6.0)	17.6	(13.3–21.8)
			7.1	(5.9–8.4)	3.5	(2.5–4.5)
			7.5	(6.2–8.8)	4.4	(3.7–5.2)
			6.2	(4.8–7.5)	3.6	(2.7–4.5)
			7.8	(3.2–12.5)	6.1	(3.0–9.2)
			7.1	(5.9–8.4)	3.5	(2.5–4.5)
			12.7	(9.9–15.6)	10.7	(8.9–12.5)
			10.6	(4.3–16.9)	14.7	(8.2–21.2)

* Adjusted for age, gender, race/ethnicity, health insurance, Charlson comorbidity, any mental health and any AOD disorder diagnoses in year prior to index, and utilization in 60 days prior to index

** Initiation estimates excluded patients diagnosed inpatient

‡ Engagement was estimated among all patients who initiated, including patients with an index inpatient identification encounter (n 4,554)

CUD=cannabis use disorder; AOD=alcohol and other drugs

REFERENCES

1. National Survey on Drug Use and Health. Key Substance Use and Mental Health Indicators in the United States: Results from the 2016 National Survey on Drug Use and Health. <https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.pdf>.
2. Hasin DS, Kerridge BT, Saha TD, et al. Prevalence and Correlates of DSM-5 Cannabis Use Disorder, 2012–2013: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions-III. *Am J Psychiatry*. 2016;173(6):588–599. [PubMed: 26940807]
3. Hasin DS, Saha TD, Kerridge BT, et al. Prevalence of Marijuana Use Disorders in the United States Between 2001–2002 and 2012–2013. *JAMA Psychiatry*. 2015;72(12):1235–1242. [PubMed: 26502112]
4. Hall W, Weier M. Assessing the public health impacts of legalizing recreational cannabis use in the USA. *Clin Pharmacol Ther*. 2015;97(6):607–615. [PubMed: 25777798]
5. Kerridge BT, Pickering R, Chou P, Saha TD, Hasin DS. DSM-5 cannabis use disorder in the National Epidemiologic Survey on Alcohol and Related Conditions-III: Gender-specific profiles. *Addict Behav*. 2018;76:52–60. [PubMed: 28755613]
6. Hasin DS, O'Brien CP, Auriacombe M, et al. DSM-5 Criteria for Substance Use Disorders: Recommendations and Rationale. *Am J Psychiatry*. 2013;170(8):834–851. [PubMed: 23903334]
7. National Committee for Quality Assurance. HEDIS 2015 Technical Specifications. Vol 2 Washington, D.C.2015.
8. Garnick DW, Lee MT, Horgan C, et al. Lessons from five states: public sector use of the Washington Circle performance measures. *J Subst Abuse Treat*. 2011;40(3):241–254. [PubMed: 21257282]
9. Garnick DW, Horgan CM, Chalk M. Performance measures for alcohol and other drug services. *Alcohol Res Health*. 2006;29(1):19–26. [PubMed: 16767849]
10. National Committee for Quality Assurance. The state of health care quality. Available from: <http://www.ncqa.org/report-cards/health-plans/state-of-health-care-quality/2017-table-of-contents/alcohol-treatment>. Accessed February 1, 2018 2017.
11. Harris AH, Bowe T, Finney JW, Humphreys K. HEDIS initiation and engagement quality measures of substance use disorder care: impact of setting and health care specialty. *Popul Health Manag*. 2009;12(4):191–196. [PubMed: 19663621]
12. Kerridge BT, Mauro PM, Chou SP, et al. Predictors of treatment utilization and barriers to treatment utilization among individuals with lifetime cannabis use disorder in the United States. *Drug Alcohol Depend*. 2017;181:223–228. [PubMed: 29107786]
13. Weisner C, Mertens J, Tam T, Moore C. Factors affecting the initiation of substance abuse treatment in managed care. *Addiction*. 2001;96(5):705–716. [PubMed: 11331029]
14. Garnick DW, Lee MT, Horgan CM, Acevedo A. Adapting Washington Circle performance measures for public sector substance abuse treatment systems. *J Subst Abuse Treat*. 2009;36(3):265–277. [PubMed: 18722075]
15. Charlson M, Szatrowski TP, Peterson J, Gold J. Validation of a combined comorbidity index. *J Clin Epidemiol*. 1994;47(11):1245–1251. [PubMed: 7722560]
16. D'Hoore W, Bouckaert A, Tilquin C. Practical considerations on the use of the Charlson comorbidity index with administrative data bases. *J Clin Epidemiol*. 1996;49(12):1429–1433. [PubMed: 8991959]
17. Bradley KA, Chavez LJ, Lapham GT, et al. When quality indicators undermine quality: bias in a quality indicator of follow-up for alcohol misuse. *Psychiatr Serv*. 2013;64(10):1018–1025. [PubMed: 23852137]
18. van der Pol P, Liebrechts N, de Graaf R, Korf DJ, van den Brink W, van Laar M. Facilitators and barriers in treatment seeking for cannabis dependence. *Drug Alcohol Depend*. 2013;133(2):776–780. [PubMed: 24035185]
19. Gates P, Copeland J, Swift W, Martin G. Barriers and facilitators to cannabis treatment. *Drug Alcohol Rev*. 2012;31(3):311–319. [PubMed: 21521384]
20. Kleinman LC, Norton EC. What's the Risk? A simple approach for estimating adjusted risk measures from nonlinear models including logistic regression. *Health Serv Res*. 2009;44(1):288–302. [PubMed: 18793213]

21. Basu A, Rathouz PJ. Estimating marginal and incremental effects on health outcomes using flexible link and variance function models. *Biostatistics*. 2005;6(1):93–109. [PubMed: 15618530]
22. Stata Statistical Software: Release 15.0 [computer program]. College Station, TX: StataCorp LP; 2017.
23. Harris AH, Humphreys K, Finney JW. Veterans Affairs facility performance on Washington Circle indicators and casemix-adjusted effectiveness. *J Subst Abuse Treat*. 2007.
24. Bensley KM, Harris AH, 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. [PubMed: 28017181]
25. MacLean CH, Marnoch E, Sun Z, et al. Quality Varies Across Health Insurance Marketplace Pricing Regions. *Med Care*. 2015;53(7):607–618. [PubMed: 26067884]
26. Harris AH, Ellerbe L, Phelps TE, et al. Examining the Specification Validity of the HEDIS Quality Measures for Substance Use Disorders. *J Subst Abuse Treat*. 2015;53:16–21. [PubMed: 25736624]
27. Campbell CI, Bahorik AL, Kline-Simon AH, Satre DD. The role of marijuana use disorder in predicting emergency department and inpatient encounters: A retrospective cohort study. *Drug Alcohol Depend*. 2017;178:170–175. [PubMed: 28651153]
28. Charilaou P, Agnihotri K, Garcia P, Badheka A, Frenia D, Yegneswaran B. Trends of Cannabis Use Disorder in the Inpatient: 2002 to 2011. *Am J Med*. 2017;130(6):678–687 e677. [PubMed: 28161344]
29. Hayley AC, Stough C, Downey LA. DSM-5 cannabis use disorder, substance use and DSM-5 specific substance-use disorders: Evaluating comorbidity in a population-based sample. *Eur Neuropsychopharmacol*. 2017;27(8):732–743. [PubMed: 28663122]
30. John WS, Wu LT. Problem alcohol use and healthcare utilization among persons with cannabis use disorder in the United States. *Drug Alcohol Depend*. 2017;178:477–484. [PubMed: 28711814]
31. Bahorik AL, Satre DD, Kline-Simon AH, Weisner CM, Campbell CI. Alcohol, Cannabis, and Opioid Use Disorders, and Disease Burden in an Integrated Health Care System. *J Addict Med*. 2017;11(1):3–9. [PubMed: 27610582]
32. Polen MR, Whitlock EP, Wisdom JP, Nygren P, Bougatsos C. Screening in Primary Care Settings for Illicit Drug Use: Staged Systematic Review for the U.S. Preventive Services Task Force. Rockville, MD: AHRQ; 1 2008.
33. Institute of Medicine. Improving the quality of health care for mental and substance-use conditions. Washington DC: The National Academies Press; 2006.
34. Demyttenaere K, Bruffaerts R, Posada-Villa J, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *JAMA*. 2004;291(21):2581–2590. [PubMed: 15173149]
35. Lapham GT, Lee AK, Caldeiro RM, et al. Frequency of Cannabis Use Among Primary Care Patients in Washington State. *J Am Board Fam Med*. 2017;30(6):795–805. [PubMed: 29180554]
36. Bobb JF, Lee AK, Lapham GT, et al. Evaluation of a Pilot Implementation to Integrate Alcohol-Related Care within Primary Care. *Int J Environ Res Public Health*. 2017;14(9).
37. Harris AH, 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. [PubMed: 18770044]
38. Harris AH, 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. [PubMed: 18835678]
39. Dunigan R, Acevedo A, Campbell K, et al. Engagement in outpatient substance abuse treatment and employment outcomes. *J Behav Health Serv Res*. 2014;41(1):20–36. [PubMed: 23686216]
40. Garnick DW, Horgan CM, Acevedo A, et al. Criminal justice outcomes after engagement in outpatient substance abuse treatment. *J Subst Abuse Treat*. 2014;46(3):295–305. [PubMed: 24238717]
41. Acevedo A, Garnick DW, Dunigan R, et al. Performance measures and racial/ethnic disparities in the treatment of substance use disorders. *J Stud Alcohol Drugs*. 2015;76(1):57–67. [PubMed: 25486394]

42. Danovitch I, Gorelick DA. State of the art treatments for cannabis dependence. *Psychiatr Clin North Am.* 2012;35(2):309–326. [PubMed: 22640758]
43. Marshall K, Gowing L, Ali R, Le Foll B. Pharmacotherapies for cannabis dependence. *Cochrane Database Syst Rev.* 2014;12(12):CD008940.
44. Gates PJ, Sabioni P, Copeland J, Le Foll B, Gowing L. Psychosocial interventions for cannabis use disorder. *Cochrane Database Syst Rev.* 2016;5(5):CD005336.

Table 1.

Patients with an index cannabis use disorder (CUD) diagnosis

	CUD only		CUD plus other AOD		All patients with CUD	
	(n 11,338)		(n 3,864)		(n 15,202)	
	n	%	n	%	n	%
Female	4,372	(38.6)	1,241	(32.1)	*	5,613 (36.9)
Age categories					*	
18–29	5,403	(47.7)	1,859	(48.1)		7,262 (47.8)
30–49	2,898	(25.6)	1,136	(29.4)		4,034 (26.5)
50–64	2,210	(19.5)	664	(17.2)		2,874 (18.9)
65	827	(7.3)	205	(5.3)		1,032 (6.8)
Race/ethnicity					*	
Black/African American	2,023	(17.8)	546	(14.1)		2,569 (16.9)
Hispanic	2,257	(19.9)	797	(20.6)		3,054 (20.1)
White	5,854	(51.6)	2,080	(53.8)		7,934 (52.2)
Other/Unknown	1,204	(10.6)	442	(11.4)		1,645 (10.8)
Insurance					*	
Commercial/Private Pay	7,861	(69.3)	2,825	(73.1)		10,686 (70.3)
Medicare	1,436	(12.7)	414	(10.7)		1,850 (12.2)
State Subsidized	1,672	(14.7)	489	(12.7)		2,161 (14.2)
Unknown	369	(3.3)	136	(3.5)		505 (3.3)
<u>Other AOD disorder diagnoses at index</u>						
Alcohol	--	--	2,254	(58.3)	*	2,254 (14.8)
Opioid	--	--	530	(13.7)	*	530 (3.5)
Stimulants	--	--	1,075	(27.8)	*	1,075 (7.1)
Other	--	--	1,141	(29.5)	*	1,141 (7.5)
Carlson Comorbidity score 3 in prior year	970	(8.6)	267	(6.9)	*	1,237 (8.1)
Any AOD disorder in year prior to index	4,212	(37.1)	1,936	(50.1)	*	6,148 (40.4)
Cannabis	3,929	(34.7)	1,630	(42.2)	*	5,559 (36.6)
Nicotine	2,492	(22.0)	1,201	(31.1)	*	3,693 (24.3)
Alcohol	601	(5.3)	1,139	(29.5)	*	1,740 (11.4)
Opioid	155	(1.4)	358	(9.3)	*	513 (3.4)
Stimulants	240	(2.1)	618	(16.0)	*	858 (5.6)
Other Drug*	57	(0.5)	116	(3.0)	*	173 (1.1)
Any mental health disorder diagnosis**	5,352	(47.2)	2,188	(56.6)	*	7,540 (49.6)
Anxiety	3,101	(27.4)	1,247	(32.3)	*	4,348 (28.6)
Depression	3,179	(28.0)	1,313	(34.0)	*	4,492 (29.5)
Serious mental illness†	1,799	(15.9)	937	(24.2)	*	2,736 (18.0)
<u>Utilization in 60 days prior to index episode</u>						
Emergency department 1 visit	2,093	(18.5)	914	(23.7)	*	3,007 (19.8)
Primary care 1 visit	4,466	(39.4)	1,257	(32.5)	*	5,723 (37.6)

		CUD only		CUD plus other AOD		All patients with CUD	
		(n 11,338)		(n 3,864)		(n 15,202)	
		n	%	n	%	n	%
Mental Health & psychiatry	1 visit	734	(6.5)	338	(8.7)	*	1,072 (7.1)
Other specialty	1 visit	2,332	(20.6)	599	(15.5)	*	2,931 (19.3)
<u>Index identification setting</u>						*	
	Inpatient	2,436	(21.5)	1,152	(29.8)		3,588 (23.6)
	Emergency Department	3,316	(29.3)	1,100	(28.5)		4,416 (29.1)
	Primary care	4,349	(38.4)	748	(19.4)		5,097 (33.5)
	Addiction treatment (outpatient)	112	(1.0)	444	(11.5)		556 (3.7)
	Mental Health & psychiatry	1,125	(9.9)	420	(10.9)		1,545 (10.2)

* Chi-square test of independence significant at p-value <0.000

** In year prior to index diagnosis

CUD=cannabis use disorder; AOD=alcohol and other drugs

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Table 2.

Among patients with an index diagnosis of CUD, the adjusted* prevalence of initiation and engagement in AOD treatment by index identification setting

	Inpatient (n 3,588)		Emergency Department (n 4,416)		Primary care (n 5,097)		Addiction treatment (n 556)		Mental Health & Psychiatry (n 1,545)		Total (n 15,202)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Initiation**												
All patients with a CUD	na	na	9.2	(6.4–12.0)	6.2	(4.7–7.6)	25.0	(22.5–27.6)	5.5	(2.5–8.5)	na	na
CUD only	na	na	6.8	(4.1–9.4)	4.4	(3.6–5.1)	21.6	(19.7–23.6)	3.8	(1.9–5.9)	na	na
CUD plus other AOD	na	na	17.1	(14.0–20.2)	11.7	(8.0–15.4)	42.9	(37.4–48.4)	10.4	(4.3–16.5)	na	na
Engagement (among those who initiated)‡												
All patients with a CUD	2.9	(2.0–3.9)	7.3	(5.1–9.6)	15.8	(11.9–19.7)	40.9	(34.8–47.0)	31.3	(12.7–49.9)	6.9	(5.6–8.2)
CUD only	2.3	(1.8–2.7)	5.7	(4.6–6.8)	12.7	(9.5–15.9)	35.4	(26.8–44.1)	26.4	(8.1–44.8)	5.6	(4.7–6.4)
CUD plus other AOD	4.2	(2.1–6.2)	10.2	(5.9–14.5)	21.4	(14.9–27.9)	50.6	(45.4–55.8)	40.1	(20.8–59.4)	8.4	(6.1–10.7)
Initiation & engagement (among all patients)‡												
All patients with a CUD	2.0	(1.2–2.8)	1.0	(0.5–1.4)	0.9	(0.7–1.1)	12.5	(10.0–15.1)	2.2	(–0.2–4.7)	2.1	(1.7–2.4)
CUD only	1.4	(0.8–2.0)	0.7	(0.4–0.9)	0.6	(0.5–0.8)	9.8	(7.3–12.4)	1.5	(–0.2–3.3)	1.4	(1.1–1.6)
CUD plus other AOD	3.8	(2.1–5.5)	1.8	(0.9–2.7)	1.7	(1.4–2.0)	22.5	(19.8–25.2)	4.1	(–0.2–8.4)	3.1	(2.5–3.7)

* Adjusted for age, gender, race/ethnicity, health insurance, Charlson comorbidity, any mental health and any AOD disorder diagnoses in year prior to index, and utilization in 60 days prior to index

** Initiation estimates excluded inpatient index identification setting

‡ Engagement was estimated among all patients who initiated, including patients with an index inpatient encounter (n 4,554)

‡ Initiation & engagement was estimated among all patients

CUD=cannabis use disorder; AOD=alcohol and other drugs

Table 3.

Adjusted* prevalence of initiation & engagement** across CUD index groups

	All patients with CUD (n 15,202)		CUD only (n 11,338)		CUD plus other AOD (n 3,864)	
	%	95% CI	%	95% CI	%	95% CI
Gender						
Female	1.7	(1.4– 2.1)	0.9	(0.6– 1.1)	4.5	(3.5– 5.6)
Male	2.2	(1.8– 2.7)	1.2	(0.9– 1.5)	5.3	(4.3– 6.4)
Age categories						
18–29	2.2	(1.6– 2.8)	1.3	(1.0– 1.7)	4.9	(3.5– 6.2)
30–49	2.4	(2.1– 2.6)	1.1	(0.8– 1.4)	6.2	(5.8– 6.5)
50–64	1.6	(1.3– 2.0)	0.7	(0.5– 1.0)	4.4	(3.5– 5.2)
65	1.2	(0.4– 1.9)	0.6	(0.2– 1.0)	1.8	(0.8– 2.9)
Race/ethnicity						
Black/African American	1.7	(1.5– 1.9)	0.9	(0.7– 1.1)	4.0	(2.8– 5.2)
Hispanic	2.2	(1.6– 2.7)	1.0	(0.8– 1.2)	5.4	(3.7– 7.1)
White	2.1	(1.8– 2.4)	1.1	(0.8– 1.4)	5.2	(4.6– 5.8)
Other/Unknown	2.2	(1.7– 2.7)	1.0	(0.4– 1.7)	5.3	(4.6– 6.0)
Insurance						
Commercial/ Private pay	2.2	(1.8– 2.6)	1.0	(0.8– 1.3)	5.5	(4.7– 6.2)
Medicare	2.1	(1.5– 2.8)	1.4	(1.0– 1.7)	4.1	(2.2– 6.0)
State Subsidized	1.6	(1.0– 2.2)	0.9	(0.2– 1.7)	3.4	(2.2– 4.6)
Unknown	0.8	(0.2– 1.3)	0.3	–(0.4– 0.9)	2.2	(1.5– 2.9)
Other AOD disorder diagnoses at index						
1	2.8	(2.2– 3.5)	na	na	4.6	(3.7– 5.5)
2	3.6	(2.9– 4.4)	na	na	6.1	(5.2– 7.0)
Charlson Comorbidity score 3 in prior year	3.0	(2.2– 3.8)	2.2	(1.3– 3.1)	4.9	(3.3– 6.5)
Any AOD in prior year to index	2.3	(1.9– 2.7)	1.3	(0.8– 1.7)	5.1	(4.4– 5.8)
Any mental health disorder in prior year	2.3	(1.8– 2.7)	1.2	(0.9– 1.5)	5.3	(4.4– 6.2)
<u>Utilization in 60 days prior to index episode</u>						
Emergency department 1 visit	2.9	(2.4– 3.4)	1.6	(1.0– 2.1)	6.7	(5.8– 7.6)
Primary care 1 visit	1.9	(1.4– 2.4)	1.0	(0.6– 1.3)	4.6	(3.7– 5.4)
Psychiatry 1 visit	2.7	(0.9– 4.6)	1.9	(0.5– 3.4)	5.2	(2.2– 8.2)
Other specialty 1 visit	2.2	(1.9– 2.5)	0.9	(0.7– 1.1)	6.3	(4.1– 8.5)

* Adjusted for age, gender, race/ethnicity, health insurance, Charlson comorbidity, any mental health and any AOD disorder diagnoses in year prior to index, and utilization in 60 days prior to index

** Initiation & engagement was estimated among all patients in each index CUD group

CUD=cannabis use disorder; AOD=alcohol and other drugs