

# The Role of Primary Care in Improving Access to Medication-Assisted Treatment for Rural Medicaid Enrollees with Opioid Use Disorder



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**BACKGROUND:** The opioid epidemic has disproportionately affected rural areas, where a limited number of health care providers offer medication-assisted treatment (MAT), the mainstay of treatment for opioid use disorder (OUD). Rural residents with OUD may face multiple barriers to engagement in MAT including long travel distances.

**OBJECTIVE:** To examine the degree to which rural residents with OUD are engaged with primary care providers (PCPs), describe the role of rural PCPs in MAT delivery, and estimate the association between enrollee distance to MAT prescribers and MAT utilization.

**DESIGN:** Retrospective cohort study.

**PARTICIPANTS:** Medicaid-enrolled adults diagnosed with OUD in 23 rural Pennsylvania counties.

**MAIN MEASURES:** Primary care utilization, MAT utilization, distance to nearest possible MAT prescriber, mean distance traveled to actual MAT prescribers, and continuity of pharmacotherapy.

**KEY RESULTS:** Of the 7930 Medicaid enrollees with a diagnosis of OUD, a minority (18.6%) received their diagnosis during a PCP visit even though enrollees with OUD had 4.1 visits to PCPs per person-year in 2015. Among enrollees with an OUD diagnosis recorded during a PCP visit, about half (751, 50.8%) received MAT, most of whom (508, 67.6%) received MAT from a PCP. Enrollees with OUD with at least one PCP visit were more likely than those without a PCP visit to receive MAT (32.7% vs. 25%;  $p < 0.001$ ), and filled more buprenorphine and naltrexone prescriptions (mean = 11.1 vs. 9.3;  $p < 0.001$ ). The median of the distances traveled to actual MAT prescribers was 48.8 miles, compared to a median of 4.2 miles to the nearest available MAT prescriber. Enrollees traveling a mean distance greater than 45 miles to MAT prescribers were less likely to receive continuity of pharmacotherapy (OR = 0.71, 95% CI = 0.56–0.91,  $p = 0.007$ ).

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**CONCLUSIONS:** PCP utilization among rural Medicaid enrollees diagnosed with OUD is high, presenting a potential intervention point to treat OUD, particularly if the enrollee's PCP is located nearer than their MAT prescriber.

**KEY WORDS:** primary care; medication-assisted treatment; rural; opioid use disorder.

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## INTRODUCTION

Medication-assisted treatment (MAT) is the standard of care for opioid use disorder (OUD).<sup>1</sup> Approved pharmacotherapies for OUD—buprenorphine, naltrexone, or methadone—differ substantially in the providers with authority to prescribe or dispense these medications. Naltrexone may be prescribed by any provider licensed to prescribe medications; buprenorphine may be prescribed only by providers who complete the DATA 2000 waiver training; methadone is only dispensed from specific licensed clinics. Under the current regulatory framework governing MAT providers, the emphasis of US policymakers has been on increasing access to office-based, mostly primary care, providers as opposed to clinics dispensing methadone. Indeed, the significant growth in supply of MAT providers in recent years was driven largely by physicians waived to prescribe buprenorphine.

Unfortunately, improvements in MAT provider supply have not reached many rural areas; over 60% of small nonmetropolitan county residents still lived in an opioid treatment shortage area as of 2011.<sup>2</sup> Limits on the supply of MAT in rural areas is a critical public health problem given that rural areas in some states experienced nearly twofold higher increases in hospitalizations for opioid overdoses relative to urban areas in the last 15 years.<sup>3</sup> Supply of MAT providers<sup>4</sup> is limited in rural areas due to several factors, including provider attitudes towards addiction,<sup>5</sup> a lack of provider

training,<sup>6,7</sup> and a limited supply of behavioral health providers.<sup>8,9</sup> Furthermore, rural populations often travel long distances for primary and specialty health care, which can be associated with reduced utilization and poor health outcomes.<sup>10,11</sup> The effect of distance to MAT providers on utilization and treatment outcomes is unknown.<sup>12</sup>

We seek to understand the potential for rural primary care providers (PCPs) to deliver MAT to patients with OUD by examining the following: (1) the degree to which rural residents with OUD are engaged in primary care, (2) rural PCPs current role in the delivery of MAT (buprenorphine and naltrexone), and (3) the association between distances from patients to MAT prescribers and utilization of MAT. We focus on Medicaid as our study setting as non-elderly adult Medicaid enrollees account for 12% of the adult population but 38% of those with an OUD.<sup>13</sup>

## METHODS

### Overview

We focused our analyses on adult Medicaid enrollees diagnosed with OUD, and within that group, enrollees with at least one primary care visit, and enrollees who received MAT. We conducted a cross-sectional comparison between enrollees with OUD who had  $\geq 1$  primary care visit versus enrollees with OUD and no primary care visits. We conducted logistic regression analyses to estimate the association between distance to MAT prescribers and the likelihood that enrollees with OUD initiated MAT and received continuity of pharmacotherapy.

### Data

We obtained Medicaid claims, encounter, and enrollment data for fee-for-service and managed care enrollees from 2014 to 2015 from the Pennsylvania Department of Human Services. Pennsylvania is the 7th largest Medicaid program by enrollment<sup>14</sup> and the 4th largest by expenditure<sup>15</sup> and mirrors national averages on health care utilization although it has higher overdose death rates. Pennsylvania has the 3rd largest rural population.<sup>16</sup> Pennsylvania expanded Medicaid under the Affordable Care Act in 2015, which some studies have shown to improve access to OUD treatment.<sup>17</sup>

### Patient Sample

We included all full-benefit Medicaid-enrolled adults (age 18–64) who were not dually eligible for Medicare. We limited our sample to residents of 23 rural counties with OUD prevalence and/or opioid/heroin overdose rates above the national average. Enrollees were included if they had  $\geq 1$  claim with a diagnosis of OUD (international classifications of diseases (ICD) version 9 and 10; see Appendix Table 4) in any diagnosis field during 2015. Diagnosis codes for OUD tend to

have low sensitivity but high specificity,<sup>18,19</sup> so we may underestimate the prevalence.

### MAT Utilization and MAT Setting

As our focus was on MAT delivered by PCPs, our primary definition of MAT included buprenorphine and injectable or oral naltrexone but not methadone. We counted the number of fills or injections for buprenorphine (specifically formulations indicated for the treatment of OUD) or naltrexone per enrollee. We did, however, construct a variable for inclusion in descriptive analyses that measured the use of methadone, a potential substitute for buprenorphine or naltrexone, provided by methadone clinics based on procedure code. We categorized enrollees diagnosed with OUD in any of five service settings based on claim-level information: PCP visit, emergency department (ED) visit, acute care hospitalization, behavioral health visit (if the visit was covered by the enrollee's behavioral health managed care organization), or other (if they did not fit into one of the previous categories).

### Primary Care Utilization

We constructed three measures of contact between patients with OUD and primary care: the number of primary care visits per person-year; how frequently enrollees who were diagnosed with OUD during a PCP visit received any MAT, and how frequently these enrollees received MAT from a PCP. We also identified if the enrollee had any claims for behavioral health counseling using a set of procedure codes. See Appendix Tables 5 and 6.

### Key Dependent Variables

In our multivariable analyses, we had two key outcomes of interest: the likelihood that enrollees with OUD had any use of MAT (either buprenorphine or naltrexone) and the continuity of pharmacotherapy, which was defined using National Quality Forum specifications. Specifically, we identified enrollees with OUD initiating treatment with buprenorphine, naltrexone, and methadone who received  $\geq 180$  days of continuous pharmacotherapy with no more than a 7-day gap.<sup>20</sup>

### Key Independent Variable—Distance to MAT Provider

To understand rural enrollees' access to MAT, we measured two distances: That between enrollees with OUD and the nearest possible MAT prescriber, and the distance traveled by enrollees to their actual MAT prescribers. For nearest possible MAT prescribers to enrollees in our study sample, we included prescribers with  $\geq 1$  Medicaid-paid prescription fill for buprenorphine or naltrexone. We then identified the prescriber nearest to the center of each zip code, the geographic identifier available to us for enrollees, and measured the driving distance to the provider's office address using ArcGIS. We also examined distance to the nearest prescriber of

buprenorphine or naltrexone to at least 10 Medicaid enrollees as some providers may prescribe to very few patients. To measure distance traveled to actual prescribers, we measured driving distance from the center of the enrollee's zip code to the prescribing provider's office address per prescription to account for prescriptions from different providers and providers that practice in multiple locations. We then took the mean of the distances traveled for the given enrollee. To be included in this measure, enrollees needed complete prescriber information (both on the claim and a valid address in the provider file) and continuous Medicaid enrollment without any gaps in coverage. We calculated the distribution of each distance measure by minimum, maximum, median, interquartile range, and 90th percentile.

## Covariates

We included demographic characteristics including age, gender, race, and type of Medicaid eligibility: disabled, newly eligible (i.e., eligible through Medicaid expansion), non-disabled, and other. We also included measures of relevant comorbidities including anxiety, mood disorders, and schizophrenia and other psychotic disorders.<sup>21</sup> We grouped enrollees into one of three regions in Pennsylvania: Northeast, Northwest, and Southwest. We calculated the number of chronic conditions for each enrollee using a modified version of the Elixhauser Comorbidity Index which used both inpatient and outpatient claims to identify conditions.<sup>22</sup> We included indicators for which type of provider prescribed the greatest number of days supply of MAT: a PCP or a non-PCP. We categorized enrollees with at least one fill of methadone into a separate category since these patients are likely systematically different and PCPs cannot prescribe methadone.

## Statistical Analysis

To test for differences between enrollees with OUD and  $\geq 1$  primary care visit and enrollees with OUD and no primary care utilization, we used *t* tests and chi-square tests as appropriate. To understand the association between distance to MAT prescribers and MAT treatment patterns, we used two logistic regression models. First, we estimated the association between distance to the nearest MAT prescriber on the likelihood of enrollees with OUD receiving MAT, controlling for the covariates listed above (except PCP or non-PCP MAT prescriber type). In this model, distance was specified as a continuous variable in miles, and we only included providers that prescribed to 10 or more enrollees, as including all prescribers may have underestimated distances to an active prescriber. Second, we estimated the association between the mean distance traveled to actual MAT prescribers and the likelihood of continuity of pharmacotherapy. We tested the mean distance traveled as both a continuous and a categorical variable. As a categorical variable, we created two groups based on mean distances traveled greater or less than 45 miles, as Pennsylvania regulations for Medicaid managed care organizations

require that 90% of enrollees outside of metropolitan areas be located within 45 miles of primary and specialty care providers.<sup>23</sup> In this model, we included the same covariates used in the model described above as well as PCP vs. non-PCP prescriber type.

We conducted two sensitivity analyses. First, we restricted the sample to those enrollees whose mean distance traveled was less than 270 miles to determine the influence of outliers on our estimates. The odds ratios and statistical significance were comparable to the main model. Second, we specified the mean distance traveled as a continuous variable in the model. The direction of the association and statistical significance remained the same as the categorical specification. We present the latter for ease of interpretation and for policy relevance given the 45-mile managed care regulation.

All analyses were conducted using SAS version 9.4. This study was approved under an expedited review by the University of Pittsburgh Institutional Review Board.

## RESULTS

We identified 7930 Medicaid-enrolled adults who resided in the 23 rural counties and were diagnosed with an OUD in 2015 (Table 1). Among enrollees with OUD, 2361 (29.8%) received MAT in 2015. Just over 55% were enrolled through Medicaid expansion. Behavioral health diagnoses were highly prevalent: 42.5% were diagnosed with an anxiety disorder, 48.6% with a mood disorder, and 6.2% with schizophrenia or other psychotic disorder. Enrollees with OUD had 4.1 primary care visits per person-year.

Approximately 62% of rural enrollees with OUD had at least 1 primary care visit. Enrollees with a primary care visit were more likely to be older (mean age = 34.9 vs. 30.9;  $p < 0.001$ ) and female (58.7% vs. 41%;  $p < 0.001$ ) compared to those without a primary care visit. Over two-thirds of enrollees without primary care utilization were eligible through Medicaid expansion, compared to 47.7% of enrollees with a primary care visit. MAT utilization was higher among enrollees with primary care use, both in terms of the proportion receiving any MAT (32.7% vs. 25%;  $p < 0.001$ ), and in the mean number of buprenorphine or naltrexone fills/injections (11.1 vs. 9.3;  $p < 0.001$ ). Enrollees with primary care use were slightly less likely than those without to have any behavioral health counseling (37% vs. 42.5%;  $p < 0.001$ ). Among enrollees with a primary care visit, 1478 enrollees (30.1%) had their OUD diagnosis recorded on a PCP visit claim. Of that group, about half (751, 50.8%) received MAT. Most of these enrollees (508, 67.6%) received MAT from a PCP.

## Distance and MAT Utilization Analysis

The median distance to the nearest possible MAT prescriber was 4.2 miles among rural enrollees with OUD (Fig. 1). The 90th percentile distance was 13.3 miles, and the maximum

Table 1 Comparison of Enrollees with OUD in Sample Rural Counties Based on Primary Care Utilization, 2015

	Enrollees with an OUD Diagnosis			<i>p</i>
	All	Enrollees who did not have a primary care visit	Enrollees who had ≥ 1 primary care visit	
Number of enrollees, <i>N</i> (%)	7930	3015 (38)	4915 (62)	
Mean age, SD	33.4 (9.8)	30.9 (8.1)	34.9 (10.4)	< 0.001
18–29 (%)	3561 (44.9)	1625 (53.9)	1936 (39.4)	< 0.001
30–39 (%)	2669 (33.7)	1028 (34.1)	1641 (33.4)	
40–49 (%)	1004 (12.7)	247 (8.2)	757 (15.4)	
50–64 (%)	696 (8.8)	115 (3.8)	581 (11.8)	
Female, <i>N</i> (%)	4123 (52)	1236 (41)	2887 (58.7)	< 0.001
Eligibility type, <i>N</i> (%)				
Disabled	1562 (19.7)	341 (11.3)	1221 (24.8)	< 0.001
Newly eligible	4383 (55.3)	2039 (67.6)	2344 (47.7)	
Non-disabled adults	1652 (20.8)	578 (19.2)	1074 (21.9)	
Other	333 (4.2)	57 (1.9)	276 (5.6)	
Race, <i>N</i> (%)				
Non-Hispanic White	7620 (96.1)	2887 (95.8)	4733 (96.3)	0.562
Non-Hispanic Black	174 (2.2)	74 (2.5)	100 (2)	
Hispanic	74 (0.9)	31 (1)	43 (0.9)	
Other	62 (0.8)	23 (0.8)	39 (0.8)	
Enrollees with a behavioral health diagnosis, <i>N</i> (%)				
Anxiety disorder	3369 (42.5)	715 (23.7)	2654 (54)	< 0.001
Mood disorder	3850 (48.6)	937 (31.1)	2913 (59.3)	< 0.001
Schizophrenic and other psychotic disorders	488 (6.2)	127 (4.2)	361 (7.3)	< 0.001
Enrollees who received MAT, <i>N</i> (%)	2361 (29.8)	754 (25)	1607 (32.7)	< 0.001
Number of MAT fills, mean (SD)	10.6 (8.3)	9.3 (7.7)	11.1 (8.5)	< 0.001
Enrollees with a claim for counseling, <i>N</i> (%)	3114 (39.3)	1281 (42.5)	1833 (37.3)	< 0.001
Number of primary care visits per person-year	4.1	0	6.2	
Number of primary care visits, mean (SD)	3.5 (5.2)	0 (0)	5.6 (5.7)	
OUD diagnosed during PCP visit, <i>N</i> (%)	1478 (18.6)	N/A	1478 (30.1)	
Enrollees who received MAT among those diagnosed during PCP visit, <i>N</i> (%)	751 (50.8)	N/A	751 (50.8)	
Enrollees who received MAT from a PCP, among those diagnosed during PCP visit, <i>N</i> (%)	508 (34.4)	N/A	508 (34.4)	
Diagnosed with OUD in other places of service, <i>N</i> (%)				
ED Visit	784 (9.9)	283 (9.4)	501 (10.2)	0.243
Acute care hospitalization	589 (7.4)	182 (6)	407 (8.3)	< 0.001
Behavioral health visit	5684 (71.7)	2474 (82.1)	3210 (65.3)	< 0.001
Other	3688 (46.5)	1198 (39.7)	2490 (50.7)	< 0.001

MAT includes buprenorphine, injectable naltrexone, and oral naltrexone

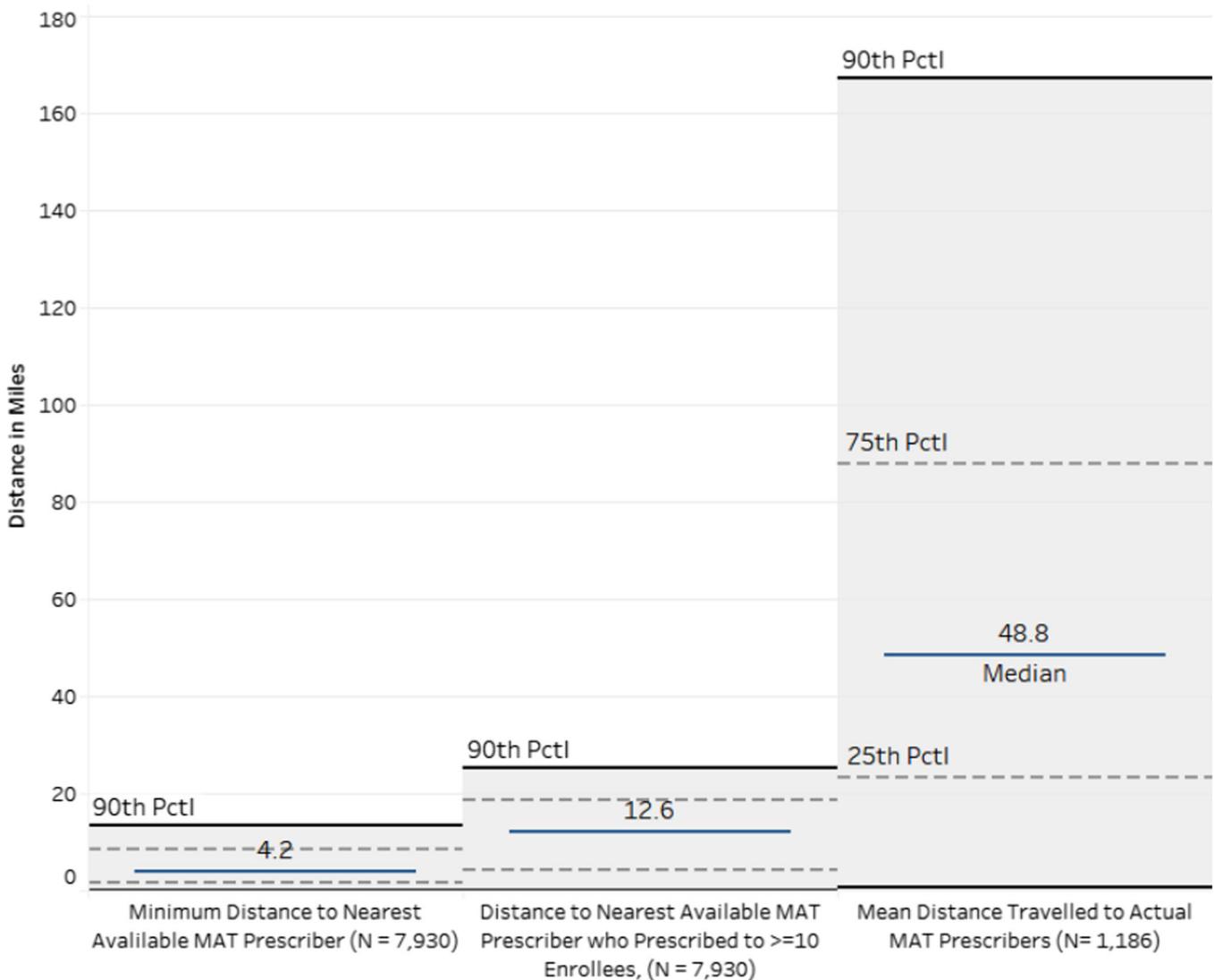
was 44.1 miles and, thus, within the 45-mile managed care requirement. When restricted to providers who prescribed MAT to at least 10 enrollees, the median increased to 12.6 miles, the 90th percentile to 25.4 miles, and the maximum to 65.8 miles. We identified 1186 enrollees (50.2%) with OUD receiving MAT who met our criteria to be included in the distance traveled to the actual MAT prescriber measure. Among this population, the mean distance traveled to actual prescribers ranged from 0.8 to 395.9 miles, with a median of 48.8 miles, and an interquartile range of 23.3 to 87.8 miles. Approximately 88% (1049 enrollees) received a prescription for MAT from a provider who prescribed to 10 or more patients.

The distance to the nearest MAT prescriber was significantly associated with the likelihood of receiving any MAT (OR = 0.988; 95% CI = 0.983–0.993;  $p < 0.001$ ), indicating that every additional mile was associated with a 1.2% reduction in the odds of receiving any MAT (Table 2).

Among enrollees with OUD who received MAT and had complete prescriber information ( $n = 1186$ ), 580 (48.9%) received continuity of pharmacotherapy for at least 180 days.

We found a number of variables were important in maintaining pharmacotherapy continuity (Table 3). Enrollees who traveled a mean distance of 45 miles or more had approximately 29% lower odds in receiving continuity of pharmacotherapy for OUD relative to those who traveled less than 45 miles (OR = 0.71; 95% CI = 0.56–0.91;  $p = 0.007$ ). In addition, enrollees with a diagnosis of schizophrenia or other psychotic disorder were significantly less likely to have continuity of pharmacotherapy (OR = 0.43; 95% CI = 0.23–0.82;  $p = 0.01$ ). Each additional comorbidity from the Elixhauser Index was associated with a decrease of 10% (OR = 0.90; 95% CI = 0.82–0.98;  $p = 0.016$ ) in the odds of continuity of pharmacotherapy. Finally, enrollees who received the majority of their MAT from a non-PCP provider were more likely to have continuity of pharmacotherapy than enrollees who received the majority of their MAT from a PCP (OR = 1.33; 95% CI = 1.0–1.7;  $p = 0.04$ ). Enrollees with any methadone fill were substantially less likely to have continuity of pharmacotherapy relative to enrollees who received their MAT from a PCP (OR = 0.27; 95% CI = 0.16–0.45;  $p < 0.001$ ).

### Distribution of Distances to Nearest MAT Prescriber and Mean Distance Travelled to MAT Prescribers, in Miles (2014-2015)



**Fig. 1** Distribution of Distances to Nearest MAT Prescriber and Mean Distance Traveled to MAT Prescribers, in Miles (2014–2015). MAT prescriber includes the service location of a provider who prescribed buprenorphine, injectable naltrexone, or oral naltrexone to any Medicaid enrollee in 2015. Distance was taken from the center of the patient’s zip code to the service location address of the provider, and measured as a driving distance. Mean distance traveled to MAT prescriber was calculated across all of 2014 and 2015 for adult enrollees who were eligible for the NQF Continuity of Pharmacotherapy measure. To be included, enrollees had to (1) be diagnosed with OUD; (2) have ≥ 1 claim for buprenorphine, injectable naltrexone, or oral naltrexone; (3) be continuously enrolled for at least 6 months; (4) have no missing prescriber IDs for MAT in the pharmacy file; and (5) have valid service location addresses for each MAT prescriber. Interquartile, median, and 90th percentile presented. 90th percentile presented instead of maximum for presentation purposes. Maximum values were the following: minimum distance to nearest available MAT prescriber = 44.1 miles; distance to nearest available MAT prescriber who prescribed to ≥ 10 enrollees = 65.8 miles; mean distance traveled to actual MAT prescribers = 395.9 miles.

### DISCUSSION

We found that Medicaid-enrolled adults with OUD in rural areas use primary care frequently, but that less than 20% are diagnosed with their OUD during a PCP visit. The proportion of enrollees with a buprenorphine or naltrexone fill/injection and the mean number of fills/injections were higher for enrollees who had at least one PCP visit compared to enrollees with no primary care visits. Rural Medicaid enrollees with OUD traveled distances nearly 4 times longer to their actual

MAT prescribers than the median distance of the MAT prescriber nearest to all enrollees with OUD, and that greater distances to MAT prescriber were associated with lower odds of receiving any MAT and receiving continuity of pharmacotherapy for OUD.

An important finding from this analysis is that rural Medicaid enrollees with OUD have substantial contact with their PCPs, with over 4 visits per person-year. This demonstrates that PCPs are well-positioned to treat patients with OUD. PCPs may be reluctant to provide MAT services in part due

**Table 2 Logistic Regression on the Likelihood of Receiving MAT, 2015 (N=7930)**

	Odds ratio (95% CI)	p
Distance to nearest MAT provider	0.988 (0.983–0.993)	< 0.001
Age (ref = 50–64)		
18–29	2.24 (1.75–2.87)	< 0.001
30–39	2.49 (1.94–3.19)	< 0.001
40–49	1.75 (1.33–2.28)	< 0.001
Race (ref = White)		
Non-White	0.58 (0.43–0.78)	< 0.001
Gender (ref = male)		
Female	1.22 (1.10–1.35)	< 0.001
Eligibility (ref = non-disabled)		
Disabled	0.76 (0.64–0.89)	0.001
Newly eligible	0.65 (0.57–0.74)	< 0.001
Other	0.73 (0.55–0.97)	0.028
MCO region (ref = Northwest)		
Northeast	1.03 (0.92–1.15)	0.623
Southwest	0.87 (0.76–1.00)	0.052
Anxiety disorder	1.27 (1.14–1.43)	< 0.001
Mood disorder	1.12 (0.99–1.27)	0.067
Schizophrenia and other psychotic disorder	0.76 (0.60–0.97)	0.025
Elixhauser Index	0.90 (0.87–0.93)	< 0.001

2361 enrollees (29.8%) received MAT. Nearest MAT provider was restricted to providers that prescribed buprenorphine or naltrexone to at least 10 enrollees during 2015. In addition, among prescribers that only prescribed naltrexone, we restricted to prescribers who prescribed to at least one enrollee diagnosed with OUD, as naltrexone can be prescribed for alcohol use disorder as well

to stigma towards patients with addiction.<sup>5</sup> By showing PCPs that they already serve patients with OUD, and that by adopting MAT they would not need to expand patient volume, payers and policymakers may encourage MAT delivery by PCPs to patients they routinely serve. We also found that the majority of enrollees with at least one primary care visit were never diagnosed with their OUD in a primary care setting, which may be due to suboptimal screening for OUD in primary care. However, it is of interest that over half of enrollees diagnosed with OUD during a PCP visit received MAT, and often from a PCP versus only 29.8% of all rural enrollees with OUD. This could indicate that when PCPs identify OUD, they play a crucial role in MAT initiation.

The relationship between travel distance and MAT treatment points to the importance of referring patients to more conveniently located MAT providers whenever possible. In addition, if the enrollee's PCP is closer than their MAT prescriber, this demonstrates another potential benefit to delivering MAT within primary care; however, we did find that enrollees who received the majority of their MAT from a PCP were less likely to achieve continuity of pharmacotherapy than those who received the majority of their MAT from a non-PCP. This association could be due to differences in the quality of care or to differences in the patient populations that we were not able to control for in this observational study.

Our analysis is subject to a few important limitations. First, like all claims-based analyses, our results are influenced by how providers bill for their services and which diagnoses they code. Second, we based our definition of PCPs on provider type and specialty codes which may have led to misclassifications of certain providers. We took an additional step of

**Table 3 Logistic Regression on the Likelihood of Receiving Continuity of Pharmacotherapy, 2014–2015 (N=1186)**

	Odds ratio (95% CI)	p
Mean distance traveled (ref ≤ 45 miles)		
≥ 45 miles	0.71 (0.56–0.91)	0.007
Age (ref = 50–64)		
18–29	0.86 (0.47–1.56)	0.614
30–39	1.07 (0.59–1.94)	0.822
40–49	1.02 (0.53–1.97)	0.961
Race (ref = White)		
Non-White	0.37 (0.15–0.93)	0.033
Gender (ref = male)		
Female	1.39 (1.06–1.81)	0.016
Eligibility (ref = non-disabled)		
Disabled	1.03 (0.77–1.38)	0.849
Newly eligible	0.34 (0.22–0.53)	< 0.001
Other	1.13 (0.65–1.98)	0.657
MCO region (ref = Northwest)		
Northeast	0.59 (0.44–0.78)	< 0.001
Southwest	0.88 (0.62–1.24)	0.468
Anxiety disorder	1.01 (0.77–1.32)	0.950
Mood disorder	1.03 (0.76–1.41)	0.831
Schizophrenia and other psychotic disorder	0.43 (0.23–0.82)	0.010
Elixhauser Index	0.90 (0.82–0.98)	0.016
Majority of MAT days (ref = majority of buprenorphine/naltrexone prescribed by PCP)		
Any days on methadone	0.27 (0.16–0.45)	< 0.001
Majority of buprenorphine/naltrexone prescribed by non-PCP	1.33 (1.01–1.74)	0.040

580 enrollees (48.9%) met the criteria for continuity of pharmacotherapy. By majority of MAT days group, this figure was 49.5% for PCPs (n = 366); 52.9% for non-PCPs (n = 709); and 21.6% for those with any methadone fill (n = 111). Mean distance traveled to MAT prescribers was calculated across all of 2014 and 2015 for adult enrollees who were eligible for the NQF Continuity of Pharmacotherapy. To be included, enrollees had to (1) be diagnosed with OUD; (2) have ≥ 1 claim for buprenorphine, injectable naltrexone, or oral naltrexone; (3) be continuously enrolled for at least 6 months; (4) have no missing prescriber IDs for MAT in the pharmacy file, and (5) have valid service location addresses for each MAT prescriber

examining subspecialties listed in NPPES to address this issue, and thus believe it is a minor concern. Third, without access to enrollee address, we mapped the center of the enrollee's zip code to provider address to measure distance thus introducing some measurement error in provider distances. In addition, some distances traveled at the higher end of the distribution could be due to enrollment or claims data errors; however, our results were consistent in the sensitivity analysis when these distances were excluded. Finally, while we controlled for demographic and health-related conditions in our logistic regression models, our models may be subject to unmeasured confounding related to enrollee transportation access and health status.

Our analysis shows that while Medicaid enrollees in rural areas face challenges to obtaining MAT services, there is an opportunity to expand access to MAT through primary care. Medicaid-enrolled adults with OUD are already using primary care services, serving as an intervention point for the health care system. Policymakers should consider efforts that encourage MAT adoption among PCPs to expand access to opioid addiction treatment in rural areas. Furthermore, given our findings on the association between distance and MAT

utilization, policymakers should focus on rural areas where Medicaid enrollees are traveling long distances to their MAT prescriber. Future research should explore the reasons behind rural Medicaid enrollee travel patterns for MAT, and why they might bypass prescribers that are substantially closer.

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#### Compliance with Ethical Standards:

**Conflict of Interest:** The authors declare that they do not have a conflict of interest.

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## APPENDIX

Table 4 Diagnosis Codes Used to Identify OUD

Any ICD-9-CM that starts with	Any ICD-10-CM that starts with
3040	F11
3047	
3055	

## PCP Identification

PCPs were identified based on provider specialty, place of service, and procedure code criteria. First, we classified providers as PCPs if they indicated a specialty of pediatrics, family health, nurse practitioner (in a primary care setting), physician assistant, family practice, general practitioner, internal medicine, or general internist in the Pennsylvania Medicaid provider file. To distinguish between internal medicine physicians with and without sub-specialty training we linked to National Plan and Provider Enumeration System (NPPES) data and classified physicians as PCPs if they only listed specialties included in the list above.

Next, we identified primary care-related visits to these providers if the claim had one of the following procedure code types: evaluation and management visits, consultations, physical exams, annual wellness visits, and federally qualified health center (FQHC) or rural health center (RHC) specific procedure codes, and office, out-patient hospital, FQHC, or RHC places of service.

**Table 5 Procedure Codes Used in Primary Care Visit Criteria**

For primary care performing providers	For FQHC/RHC performing providers
99201–99205	T1015, with MOD1 not in (“HE”, “U9”, “HF”)
99211–99215	
99381–99387	
99241–99245	
99271–99275	
99499	
G0402	
G0438	
G0439	

**Table 6 Procedure Codes Used to Identify Counseling Claims**

H0049	H0050	H2034	H2035	H2036	H0047
H0014	H0012	H0013	H0008	H0007	H0015
H0004	H0005	H0028	T1006	H0001	H0006

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