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# Critical access medication for opioid use disorder (MOUD) treatment facilities in the continental United States

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A B S T R A C T

*Research objective:* Medication opioid use disorder (MOUD) treatment is the first-line approach to the treatment of opioid use disorder (OUD). This analysis seeks to identify "critical access" MOUD facilities that ensure geographic access for MOUD patients. Using public-source data and spatial analysis, we identify the top 100 "critical access" MOUD units across the continental U.S.

*Study design:* We use locational data from SAMHSA's Behavioral Health Treatment Services Locator and DATA 2000 waiver buprenorphine providers. We identify the closest MOUDs to each ZIP Code Tabulation Area (ZCTA)'s geographic centroid. We then construct a difference-in-distance metric by computing the difference in this distance measure between closest and second-closest MOUD, multiplied by ZCTA population, ranking MOUDs by difference-distance scores.

*Population studied:* All listed MOUD treatment facilities and all listed ZCTA's across the continental U.S., and all listed MOUD providers proximate to these areas.

*Principal findings:* We identified the top 100 critical access MOUD units in the continental United States. Many critical providers were in rural areas in the central United States, as well as a band extending east from Texas to Georgia. Twenty-three of the top 100 critical access providers were identified as providing naltrexone. Seventy-seven were identified as providing buprenorphine. Three were identified as providing methadone.

*Conclusions:* Significant areas of the United States are dependent on a single critical access MOUD provider.

*Implications for policy or practice:* Place-based supports may be warranted to support MOUD treatment access in areas dependent upon critical access providers.

## 1. Introduction

Medication for opioid use disorder treatment (MOUD) improves medical outcomes, well-being, and social functioning for many patients who experience opioid use disorders (Johnson et al., 1992; Mattick et al., 2009; Minozzi et al., 2011). Ensuring proper access to MOUD is thus a key priority in public health. While patients in-need of MOUD often face financial (Liebling et al., 2016) or social (Schleimer et al., 2021) barriers to treatment access, simple geographic proximity is a basic concern for many patients (Saloner et al., 2022).

Previous work examining geographic factors and substance use disorder treatment adherence has found that travel distance was a pivotal factor in treatment adherence (Amiri et al., 2018; Amiri et al., 2020). While recent research has examined geographic availability by region(Cantor et al., 2021) and by urban-rural contrasts,(Kiang et al., 2021) we examine geographic availability relative to the presence/absence of other local MOUD providers. As there many barriers may hinder consistent treatment for opioid use disorder (OUD), including cost, transportation, and job schedules, we seek to explore the closest treatment facilities for three types of treatment and identify key strategic points to identify areas that may be under-served from local resources. Cole et al. (2019) found that every additional mile from an MOUD provider was associated with a 1.2% reduction in the odds of receiving MOUD (Cole et al., 2019 cited in Saloner et al., 2022). Geographic proximity is also associated with fewer missed methadone doses, and with longer duration of buprenorphine treatment (Cole et al., 2019).

Given the importance of such proximity, we seek in this short paper to identify MOUD providers who play a critical role in ensuring geographic proximity for nearby communities—providers whose absence might create a treatment 'desert' were they to shut down or prove unable to treat additional patients.

## 2. Methods

We measured geographic access to MOUD resources using the following data sources. The primary data source was the SAMHSA Behavioral Health Treatment Services Locater for all substance use treatment facilities providing methadone and extended-release naltrexone (derived from the 2019 National Survey of Substance Abuse Treatment Services) and DATA 2000 waiver buprenorphine providers, obtained on August

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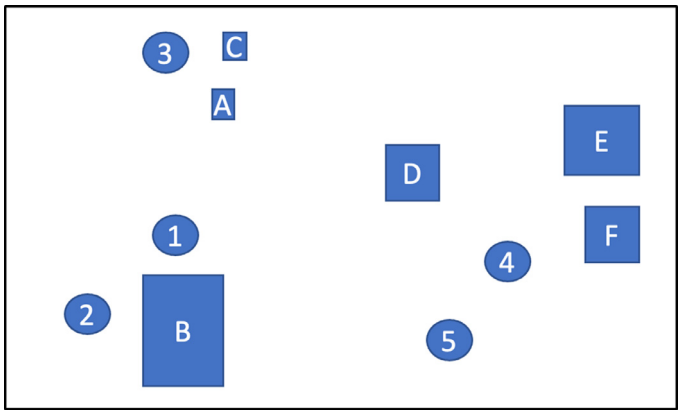


**Fig. 1.** Conceptual Illustration of critical access providers.

29, 2020. All analyses were conducted in R version 3.6.0. A total of 43,502 unique MOUD treatment providers were included in the analysis.

We included all ZIP Code Tabulation Areas (ZCTA)s in the U.S.. ZCTAs are generalized aerial representations of populated US Postal Service ZIP Code service areas. From every ZCTA in the US, we identify the top 5 closest providers to the geographic center (centroid) of the ZCTA and their corresponding distances. Distance was measured by Euclidean (straight line) distance, from each MOUD location to the ZCTA centroid, as an approximation of travel distance. Alaska and Hawaii were not included in this analysis. MOUD providers at the same physical location (as indicated by common latitude and longitude) were considered to be a common resource for the purposes of this analysis.

We then examine the difference in distances between the closest and second-closest provider from that area, to quantify the distance one must travel beyond the closest provider in order to reach the second provider if the closest were unavailable. We aggregate these additional distances from every zip code to characterize a notion of the strategic value of the provider with regards to distance traveled. We then weight distance metrics by population, to gage which units are critical access for many people.

Fig. 1 provides geographic intuition regarding the access challenge. Here MOUD treatment units are shown as circles. The zip codes that utilize a particular treatment center are shown as squares. The area of each square represents population size.

As shown, MOUD Unit 4 is the closest unit to zip codes D, E, and F. These zip codes are also reasonably populated. Unit 1 is the closest unit to a highly-populated zip code. However, Unit 2 is nearly the same distance from that service area. Unit 3is closest to several zip codes, but the affected service areas are thinly populated. On our population-weighted distance metric, Unit 4 would thus likely be judged the most important critical-access unit, given the combination of these factors.

The mathematics of our method is presented formally in Eq. (1) below. We may characterize the critical access value ($CAV$) of a particular clinic (denoted as $C_j$) out of the set of all providers ($C$) below for the centroid of a zip code ($z_i$) from the first zip code to the last by calculating the distance ($Dist$).

$$CAV(C_j) = \sum_{i=z_1}^{zn} I\left(\text{argmin}\left(Dist(C, z_i)_{(1)} == C_j\right) * \left(Dist(C, z_i)_{(2)} - Dist(C, z_i)_{(1)}\right)\right) \quad (1)$$

In our analysis, the critical-access value of a particular provider is dependent on the distance of the other providers available in adjacent areas, measuring additional travel distance as opposed to absolute travel distance. Thus, if the closest provider to a particular zip code is 50 miles away, and the second-closest is 51 miles away, our measure would characterize the critical-access value of that provider associated with that zip code as 1 mile. We weight these distances traveled by the zip code's population.

**Table 1**
Top 100 critical-access providers, Continental United States.

| Treatment | Number of Critical-access Providers | Proportion of Non-Critical-access Providers offering medication |
|---|---|---|
| Offers Naltrexone | 23 | 19.6% |
| Offers Buprenorphine | 77 | 80.7% |
| Offers Methadone | 3 | 2.93% |

We also threshold the traveling distance of the closest provider as needing to be within 100 miles away from the centroid of the zip code to have its critical-access value counted, under the assumption that people will not travel more than 100 miles to receive treatment. Based on this metric, we identify the top 100 critical-access MOUD providers in the continental United States. We then analyze characteristics of these providers (identified treatment type) and the areas surrounding it. Publicly available data from the U.S.Census describing the 2019 population showcase the population sizes of a zip code within that year.

## 3. Results

The top 100 critical-access MOUD units are mapped in Fig. 2 below (See Appendix Table A1 for more specific information.). Table 1 presents the corresponding treatment modality of critical-access units, compared with others.

We compare the proportion of different types of treatment available relative to the treatments offered by providers that aren't in this subset in Table 1 (Percentages do not add to 100, because some providers offer multiple forms of MOUD.). Seventy-seven of the top 100 providers offered buprenorphine service, four of which also offered naltrexone or methadone services. Three of the top 100 units offered methadone services, one of which also offered buprenorphine. Twenty-three of the top 100 units offered naltrexone, two of which also offered buprenorphine.

Differences between these proportions in critical-access versus other units are not statistically significant ($\chi_2^2 = 0.765$, $p = 0.68$),. Binomial proportion tests indicate that the pairwise differences in the medication being dispensed are not statistically significant for buprenorphine ($\hat{p} = 0.77, p = 0.3742$) naltrexone ($\hat{p} = 0.23, p = 0.3791$), and methadone ($\hat{p} = 0.03, p = 0.7695$), indicating no difference in the top 100 providers relative to the overall sample.

**Robustness analysis**: Our methodological assumptions are reasonable but arbitrary. We therefore varied these assumptions to examine whether these alter our qualitative results. In particular, we analyzed our data with a 50-mile rather than a 100-mile threshold. This lower threshold might be somewhat more realistic in suburban or urban areas. Although this reanalysis changes the dependence metrics and the subsequent ordering of critical access providers, we identify precisely the same list of the top 100 providers, indicating that our findings are robust to this assumption.

To assure the robustness of our results, we also examined the top 200 critical-access providers (See Fig. A1 and Table A1). We found generally similar geographic patterns to the top 100 providers, with one exception. We did identify more providers in the Illinois-Indiana-Kentucky tristate area areas distinctively affected by the opioid overdose epidemic.

## 4. Discussion

Geography poses important barriers to initiation and continued engagement with MOUD treatment. In this analysis, we identify the top

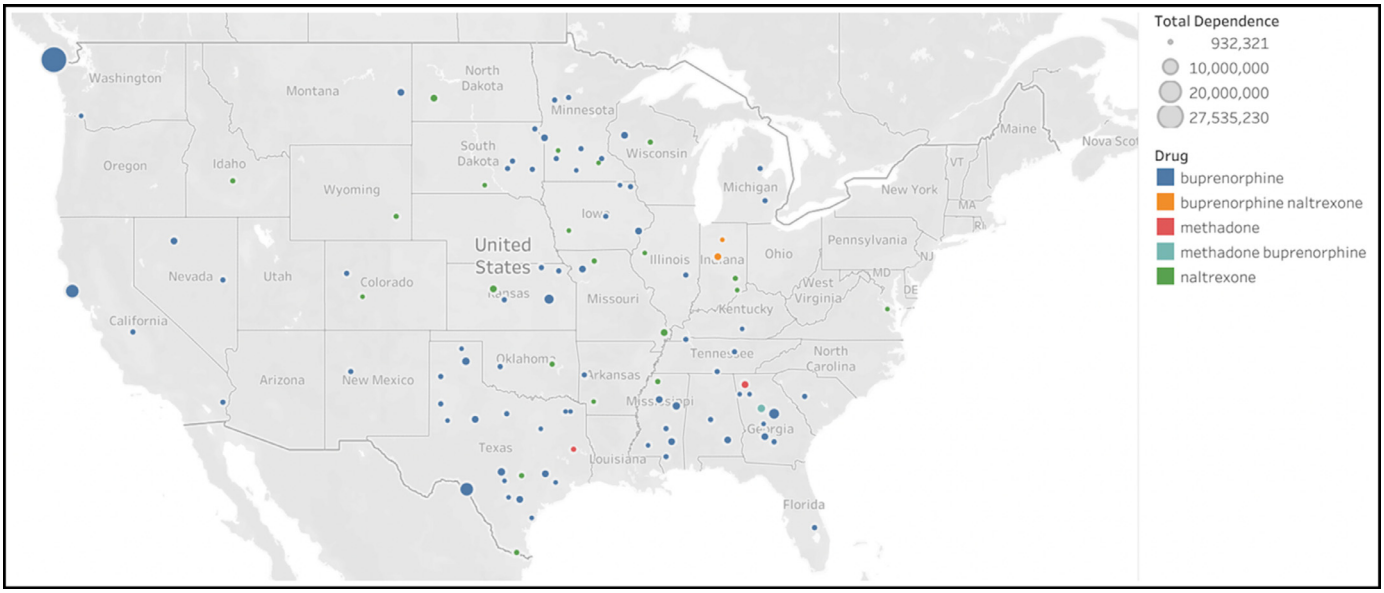


**Fig. 2.** Top 100 Critical Access MOUD treatment facilities, Continental United States.

100 critical access providers in the continental United States, whose presence specifically reduces these geographic barriers.

A conspicuous proportion of critical access providers are located in the central United States, roughly within a north-south segment bounded by Texas, Wisconsin, and North Dakota, and an additional ribbon extending east from Texas to Georgia in the Southeastern United States. Almost one-quarter of identified critical access providers are identified as providing naltrexone treatment. Only three of the top 100 critical access offer methadone treatment.

### *4.1. Study limitations*

Our findings should be considered in light of several study limitations.

First and foremost, our treatment access metric is based solely on geographic distance. Other barriers impact the practical accessibility and attractiveness of MOUD treatment beyond physical proximity. Euclidean distance may also provide a misleading metric for travel time in congested metropolitan areas. We will examine more realistic drive-time metrics in future work, drawing on zip-code-focused driving metrics now appearing in the literature (Hu et al., 2020).

Conversely, we do not consider geographic access barriers within a given zip code area. An MOUD provider is considered to have distance zero to any point within its own ZTAC. We also do not consider potential nonlinear relationships in our distance measures. If one MOUD provider is fifty miles from a ZTAC centroid and another is 51 miles away, our algorithm yields the same results as it would if one unit were three miles away, and another four miles away. Depending on local context, these may be qualitatively different situations, for example if patients are unwilling or unable to access treatment fifty miles away in the first example, or if patients lack access to an automobile.

We also do not model local demand for MOUD services. Given similar MOUD treatment capacity, areas with high concentration of OUD patients may experience greater access challenges. We hope to include these factors in future analyses, particularly given some patterns we observed in the set of top-200 critical-access providers.

Third, we provisionally accept as ground-truth the accuracy of our underlying SAMHSA treatment locator data. Existing studies underscore the limitations of these data (Beetham et al., 2019). Our data do not indicate whether a particular provider is accepting new patients and is well-equipped to serve those who seek MOUD care (Presnall et al., 2022). Some units may not be taking new patients or favor patients with specific forms of insurance coverage (Richards et al., 2022). We hope in future work to audit treatment availability at these providers.

## 5. Conclusion

Particularly, but not exclusively, in midwestern and southeastern states, some areas of the United States are strikingly dependent on a limited set of critical-access providers for proximate access to MOUD care.

Also concerning is the high representation of naltrexone-only units among critical access providers. A notable fraction of MOUD patients state a preference for methadone or buprenorphine over naltrexone (Brenna et al., 2022). These findings are also concerning because injectable extended-release naltrexone may be less effective than other forms of MOUD in reducing overdose and other substance use risks (Lee et al., 2018; Murphy et al., 2019; Waddell et al., 2021).

Geographic dependence is particularly important in light of evidence that proximity exerts a strong impact on treatment adherence and care continuity. Most care-seekers do not wish to travel far to receive care (Garnick et al., 2020; Rosenbaum et al., 2011). Critical access MOUD units that service high local demand may face capacity constraints that likewise hinder treatment quality or timeliness (Bouchery et al., 2015).

Place-based supports may thus be warranted to expand, sustain, and ensure quality of MOUD treatment in areas dependent upon critical access providers. Given the importance of such providers, state substance use agencies and SAMHSA might specifically monitor these providers, monitoring on an annual basis whether these providers remain open and able to accept new patients. States and SAMHSA might also provide focused investments for quality assurance, staff recruitment/retention, and expanded capacity at these critical access providers. States and SAMHSA might provide additional supports for expanded treatment capacity in opioid “treatment deserts,” and other local areas identified as dependent upon critical-access providers (Hyder et al., 2021).

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## Declaration of Competing Interest

No conflict declared.

## CRediT authorship contribution statement

**Harold A. Pollack:** Formal analysis, Writing – original draft, Writing – review & editing. **Francis Lee:** Formal analysis, Writing – original draft, Writing – review & editing. **Susan Paykin:** Data curation, Formal analysis, Writing – review & editing. **Javier Andres Rojas Aguilera:** Data curation, Formal analysis, Writing – review & editing.

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## Appendix A

**Table A1**
top 200 Critical access providers.

| | County | State | Medication(s) offered | Population-weighted Distance-dependence metric |
|---|---|---|---|---|
| 1 | CLALLAM | WA | buprenorphine | 27,535,230 |
| 2 | SONOMA | CA | buprenorphine | 7,666,646 |
| 3 | VAL VERDE | TX | buprenorphine | 7,189,558 |
| 4 | BALDWIN | GA | buprenorphine | 4,408,768 |
| 5 | LYON | KS | buprenorphine | 3,784,824 |
| 6 | OKTIBBEHA | MS | buprenorphine | 3,136,198 |
| 7 | GRAY | TX | buprenorphine | 3,124,979 |
| 8 | GILLESPIE | TX | buprenorphine | 2,908,022 |
| 9 | BUTTS | GA | Methadone, buprenorphine | 2,565,032 |
| 10 | SCOTT | MO | naltrexone | 2,386,473 |
| 11 | MUSCATINE | IA | buprenorphine | 2,363,868 |
| 12 | BARRON | WI | buprenorphine | 2,317,933 |
| 13 | CRISP | GA | buprenorphine | 2,270,888 |
| 14 | WASHINGTON | TX | buprenorphine | 2,222,640 |
| 15 | STARK | ND | naltrexone | 2,138,097 |
| 16 | JONES | MS | buprenorphine | 2,088,920 |
| 17 | DAWSON | MT | buprenorphine | 2,081,360 |
| 18 | GORDON | GA | methadone | 2,026,169 |
| 19 | CLINTON | IN | Buprenorphine, naltrexone | 2,024,639 |
| 20 | PIKE | AL | buprenorphine | 1,980,596 |
| 21 | BIG STONE | MN | buprenorphine | 1,980,049 |
| 22 | FISHER | TX | buprenorphine | 1,973,202 |
| 23 | KARNES | TX | buprenorphine | 1,910,213 |
| 24 | CLINTON | MO | buprenorphine | 1,767,173 |
| 25 | GRENADA | MS | buprenorphine | 1,757,270 |
| 26 | HUMBOLDT | NV | buprenorphine | 1,744,397 |
| 27 | ELLIS | KS | naltrexone | 1,730,476 |
| 28 | CALLOWAY | KY | buprenorphine | 1,685,738 |
| 29 | GRUNDY | MO | naltrexone | 1,625,589 |
| 30 | HOCKLEY | TX | buprenorphine | 1,616,198 |
| 31 | ANGELINA | TX | methadone | 1,593,926 |
| 32 | ALLAMAKEE | IA | buprenorphine | 1,582,640 |
| 33 | BARTON | KS | buprenorphine | 1,517,563 |
| 34 | RIVERSIDE | CA | buprenorphine | 1,517,490 |
| 35 | LYON | MN | buprenorphine | 1,509,129 |
| 36 | MCLEOD | MN | buprenorphine | 1,492,283 |
| 37 | WASHITA | OK | buprenorphine | 1,459,423 |
| 38 | DEAFSMITH | TX | buprenorphine | 1,445,785 |
| 39 | HUBBARD | MN | buprenorphine | 1,402,917 |
| 40 | BEN HILL | GA | buprenorphine | 1,361,640 |
| 41 | DECATUR | IN | naltrexone | 1,359,846 |
| 42 | LIVINGSTON | MI | buprenorphine | 1,356,314 |
| 43 | BEADLE | SD | buprenorphine | 1,355,987 |
| 44 | YOUNG | TX | buprenorphine | 1,330,806 |
| 45 | HIDALGO | TX | naltrexone | 1,324,484 |
| 46 | TRAVIS | TX | naltrexone | 1,310,891 |
| 47 | COLES | IL | buprenorphine | 1,308,716 |
| 48 | SCOTT | AR | buprenorphine | 1,302,085 |
| 49 | MARSHALL | KS | buprenorphine | 1,295,025 |
| 50 | SCOTT | MS | buprenorphine | 1,288,128 |
| 51 | BLAINE | ID | naltrexone | 1,287,290 |
| 52 | LEXINGTON | SC | buprenorphine | 1,287,129 |
| 53 | OKEECHOBEE | FL | buprenorphine | 1,279,762 |
| 54 | GARFIELD | CO | buprenorphine | 1,260,011 |
| 55 | LINCOLN | TN | buprenorphine | 1,251,945 |
| 56 | LAKE | SD | buprenorphine | 1,243,212 |

(*continued on next page*)

**Table A1** (*continued*)

| | County | State | Medication(s) offered | Population-weighted Distance-dependence metric |
|---|---|---|---|---|
| 57 | OKMULGEE | OK | naltrexone | 1,242,566 |
| 58 | BECKER | MN | buprenorphine | 1,241,088 |
| 59 | MARSHALL | IA | buprenorphine | 1,233,832 |
| 60 | LAMAR | MS | buprenorphine | 1,232,547 |
| 61 | TATE | MS | naltrexone | 1,212,351 |
| 62 | WHITE | TN | buprenorphine | 1,189,744 |
| 63 | CHILTON | AL | buprenorphine | 1,188,389 |
| 64 | CIBOLA | NM | buprenorphine | 1,184,767 |
| 65 | ROBERTS | SD | buprenorphine | 1,177,767 |
| 66 | MADERA | CA | buprenorphine | 1,170,371 |
| 67 | DAKOTA | MN | buprenorphine | 1,159,978 |
| 68 | ARENAC | MI | buprenorphine | 1,151,992 |
| 69 | BROWN | KS | buprenorphine | 1,147,845 |
| 70 | TAYLOR | WI | naltrexone | 1,134,844 |
| 71 | PLATTE | WY | naltrexone | 1,132,298 |
| 72 | WHITE PINE | NV | buprenorphine | 1,115,386 |
| 73 | JERAULD | SD | buprenorphine | 1,111,957 |
| 74 | SAN PATRICIO | TX | buprenorphine | 1,100,518 |
| 75 | LINCOLN | MS | buprenorphine | 1,089,591 |
| 76 | FRANKLIN | TX | buprenorphine | 1,081,251 |
| 77 | COBB | GA | buprenorphine | 1,079,470 |
| 78 | DAWSON | TX | buprenorphine | 1,068,801 |
| 79 | FULTON | IN | Buprenorphine, naltrexone | 1,061,478 |
| 80 | GUNNISON | CO | naltrexone | 1,057,167 |
| 81 | ATASCOSA | TX | buprenorphine | 1,051,482 |
| 82 | TITUS | TX | buprenorphine | 1,046,498 |
| 83 | KENDALL | TX | buprenorphine | 1,039,651 |
| 84 | YELLOW MEDICINE | MN | naltrexone | 1,039,026 |
| 85 | ELLIS | TX | buprenorphine | 1,036,821 |
| 86 | CASS | IA | naltrexone | 1,032,618 |
| 87 | POLK | GA | buprenorphine | 1,015,221 |
| 88 | RUSSELL | KY | buprenorphine | 1,012,203 |
| 89 | TRIPP | SD | naltrexone | 1009,282 |
| 90 | PEACH | GA | buprenorphine | 989,532 |
| 91 | HOWARD | IA | buprenorphine | 986,274 |
| 92 | RICE | MN | naltrexone | 975,829 |
| 93 | JEFFERSON | IN | naltrexone | 975,283 |
| 94 | CLARK | WA | buprenorphine | 970,830 |
| 95 | HEMPSTEAD | AR | naltrexone | 958,577 |
| 96 | FORT BEND | TX | buprenorphine | 951,938 |
| 97 | HANSFORD | TX | buprenorphine | 948,863 |
| 98 | PALM BEACH | FL | buprenorphine | 945,653 |
| 99 | RICHMOND | VA | naltrexone | 938,132 |
| 100 | MCDONOUGH | IL | naltrexone | 932,321 |
| 101 | OGLALA LAKOTA | SD | buprenorphine | 927,951 |
| 102 | JACKSON | IA | buprenorphine | 926,029 |
| 103 | CALHOUN | GA | buprenorphine | 902,845 |
| 104 | JACKSON | GA | methadone | 901,497 |
| 105 | REDWOOD | MN | buprenorphine | 899,177 |
| 106 | PRICE | WI | buprenorphine | 891,024 |
| 107 | FANNIN | GA | buprenorphine | 886,245 |
| 108 | SPOKANE | WA | naltrexone | 880,333 |
| 109 | KAUFMAN | TX | buprenorphine | 878,673 |
| 110 | MILLE LACS | MN | buprenorphine | 878,195 |
| 111 | STEPHENS | TX | buprenorphine | 870,981 |
| 112 | MARTIN | MN | naltrexone | 870,938 |
| 113 | CONECUH | AL | buprenorphine | 865,711 |
| 114 | WASHINGTON | MN | buprenorphine | 863,425 |
| 115 | PRENTISS | MS | buprenorphine | 862,274 |
| 116 | KERSHAW | SC | buprenorphine | 859,459 |
| 117 | GRANT | WA | naltrexone | 850,558 |
| 118 | GARVIN | OK | buprenorphine | 848,256 |
| 119 | MONTGOMERY | TX | buprenorphine | 840,649 |
| 120 | COLUMBIA | AR | buprenorphine | 837,775 |
| 121 | SHERBURNE | MN | buprenorphine | 835,301 |
| 122 | JEFFERSON DAVIS | LA | buprenorphine | 834,256 |
| 123 | VAN ZANDT | TX | naltrexone | 814,706 |
| 124 | HENDERSON | IL | buprenorphine | 813,552 |
| 125 | KAUFMAN | TX | naltrexone | 810,953 |
| 126 | CLAY | IA | buprenorphine | 810,209 |
| 127 | JEFFERSON | PA | naltrexone | 809,642 |
| 128 | WHITLEY | IN | Buprenorphine, naltrexone | 806,691 |
| 129 | OUACHITA | AR | buprenorphine | 806,639 |
| 130 | CLARE | MI | naltrexone | 806,298 |
| 131 | HUNTINGTON | IN | Buprenorphine, naltrexone | 804,546 |

(*continued on next page*)

**Table A1** (*continued*)

| | County | State | Medication(s) offered | Population-weighted Distance-dependence metric |
|---|---|---|---|---|
| 132 | DEKALB | TN | naltrexone | 796,619 |
| 133 | SEVIER | AR | buprenorphine | 793,737 |
| 134 | SENECA | OH | naltrexone | 790,865 |
| 135 | OCONTO | WI | buprenorphine | 789,830 |
| 136 | LABETTE | KS | buprenorphine | 786,944 |
| 137 | PAWNEE | KS | buprenorphine | 774,471 |
| 138 | MERCED | CA | buprenorphine | 771,770 |
| 139 | POLK | MO | naltrexone | 770,060 |
| 140 | CLARKE | IA | naltrexone | 768,588 |
| 141 | SCOTT | MN | buprenorphine | 766,138 |
| 142 | VERNON PARISH | LA | buprenorphine | 764,633 |
| 143 | GIBSON | IN | buprenorphine | 764,360 |
| 144 | MARION | IA | methadone, naltrexone | 762,957 |
| 145 | HARDEMAN | TN | buprenorphine | 747,544 |
| 146 | MARION | OR | naltrexone | 747,479 |
| 147 | PONDERA | MT | buprenorphine | 745,350 |
| 148 | GREENE | VA | buprenorphine | 743,584 |
| 149 | NICOLLET | MN | buprenorphine | 740,887 |
| 150 | GREENE | MO | buprenorphine | 737,733 |
| 151 | JEFFERSON DAVIS | MS | buprenorphine | 734,050 |
| 152 | ASCENSION | LA | buprenorphine | 733,767 |
| 153 | YADKIN | NC | naltrexone | 732,639 |
| 154 | ELLIS | TX | buprenorphine | 729,567 |
| 155 | BOND | IL | naltrexone | 723,735 |
| 156 | COAHOMA | MS | buprenorphine | 721,374 |
| 157 | MADISON | MO | naltrexone | 716,608 |
| 158 | SIOUX | ND | buprenorphine | 715,276 |
| 159 | KINGMAN | KS | buprenorphine | 709,199 |
| 160 | PAGE | VA | naltrexone | 709,110 |
| 161 | TIPPECANOE | IN | buprenorphine | 708,342 |
| 162 | SABINE PARISH | LA | buprenorphine | 706,437 |
| 163 | MAHASKA | IA | buprenorphine | 702,674 |
| 164 | LOGAN | IL | buprenorphine | 698,100 |
| 165 | FRANKLIN | KS | naltrexone | 696,224 |
| 166 | PALO ALTO | IA | buprenorphine | 684,732 |
| 167 | CHRISTIAN | IL | buprenorphine | 679,421 |
| 168 | DORCHESTER | SC | buprenorphine | 678,997 |
| 169 | OTOE | NE | buprenorphine | 674,897 |
| 170 | ANDERSON | KY | naltrexone | 674,889 |
| 171 | ST. CROIX | WI | naltrexone | 673,732 |
| 172 | ALAMEDA | CA | buprenorphine | 672,171 |
| 173 | YANCEY | NC | buprenorphine | 668,288 |
| 174 | TAZEWELL | IL | buprenorphine | 662,951 |
| 175 | SHARKEY | MS | buprenorphine | 662,025 |
| 176 | UVALDE | TX | buprenorphine | 660,173 |
| 177 | BUREAU | IL | buprenorphine | 659,628 |
| 178 | COWLEY | KS | naltrexone | 658,585 |
| 179 | WARREN | MO | naltrexone | 656,836 |
| 180 | GREGG | TX | buprenorphine | 656,119 |
| 181 | MOBILE | AL | buprenorphine | 651,260 |
| 182 | NAVAJO | AZ | naltrexone | 647,764 |
| 183 | ST FRANCOIS | MO | buprenorphine | 646,245 |
| 184 | TAMA | MT | buprenorphine | 642,348 |
| 185 | TELFAIR | GA | buprenorphine | 637,846 |
| 186 | GUADALUPE | TX | buprenorphine | 637,400 |
| 187 | WELLS | IN | naltrexone | 634,993 |
| 188 | SACRAMENTO | CA | buprenorphine | 633,898 |
| 189 | TULSA | OK | buprenorphine, naltrexone | 632,539 |
| 190 | WOODS | OK | buprenorphine | 632,259 |
| 191 | MARION | AL | buprenorphine | 627,502 |
| 192 | COPIAH | MS | naltrexone | 625,711 |
| 193 | ONEIDA | WI | buprenorphine | 624,605 |
| 194 | TODD | KY | buprenorphine | 624,462 |
| 195 | FLOYD | IA | buprenorphine | 624,130 |
| 196 | LASALLE | IL | naltrexone | 619,949 |
| 197 | COCONINO | AZ | buprenorphine | 619,660 |
| 198 | FOND DU LAC | WI | buprenorphine | 618,480 |
| 199 | ALLEN | KS | buprenorphine | 617,247 |
| 200 | CARROLL | ME | buprenorphine | 616,024 |

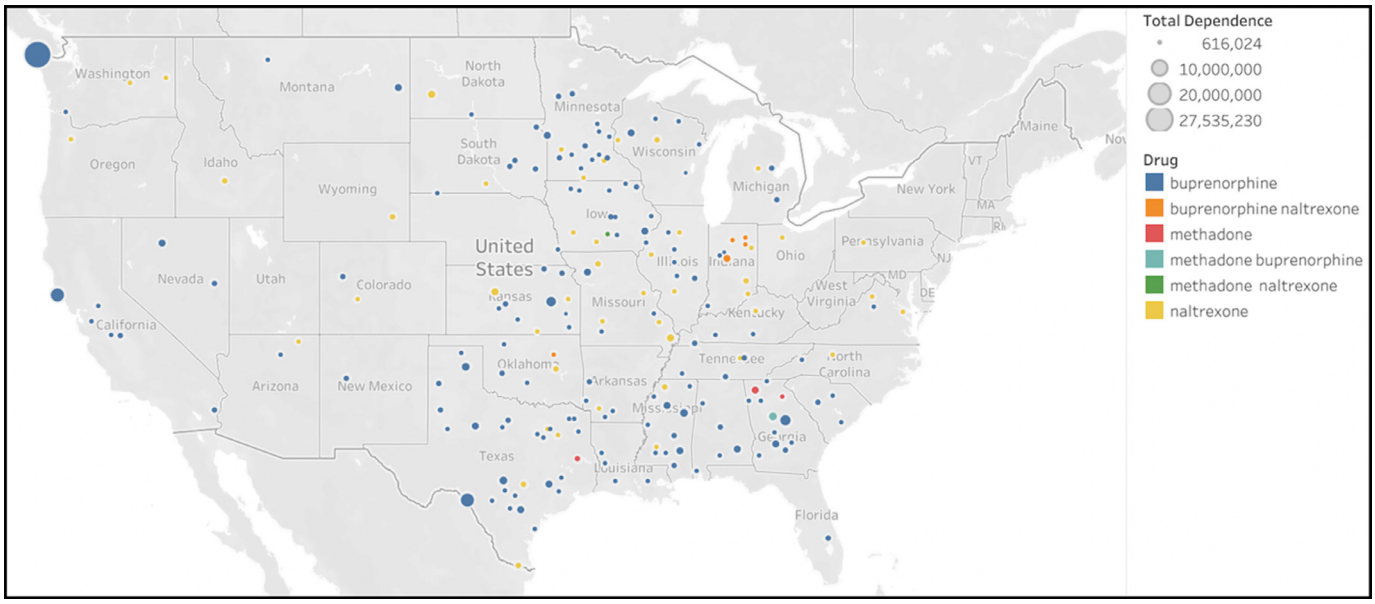


**Fig. A1.** Top 200 Critical Access MOUD treatment facilities, Continental United States.

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