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FINDINGS BRIEF

RURAL & MINORITY Health Research Center

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# Availability of Substance Use Disorder Treatment in Minoritized Racial/Ethnic Group Areas

**Key Points**

- Minoritized Areas: We use the term "minoritized" to refer to groups that have historically been marginalized by society and government institutions. ZIP Code Tabulation Areas (ZCTAs) were classified as a top minoritized place if the proportion of persons in the ZCTA who identified as a specific minoritized racial/ethnic group (MRG) met or exceeded the 95th percentile for the proportion of those residents in all rural or all urban ZCTAs respectively. Top MRG ZCTAs are not necessarily "majority" populations for each group.
- Substance Use Disorder Treatment and rural in general: Substance use disorder treatment program information was obtained from the Substance Abuse and Mental Health Services Administration provider location website. Findings:
  - Opioid treatment that includes methadone was not available within 30 straight-line miles for 65.5% of rural ZCTAs versus 12.9% of urban ZCTAs. Rural ZCTAs were a median of 40.5 straight-line miles to the nearest facility versus 10.8 miles for urban ZCTAs.
  - Substance use disorder treatment facilities that did not offer methadone were located a median of 11.9 miles from rural ZCTAs versus 4.6 miles for urban ZCTAs. Only 10.5% of rural ZCTAs were more than 30 miles from the nearest provider.
  - Buprenorphine prescribers: Only 10.8% of rural ZCTAs and 0.6% of urban ZCTAs were more than 30 miles distance from the nearest buprenorphine provider.
- Substance use treatment in MRG areas:
  - Top rural ZCTAs for American Indian/Alaska Native (AI/AN) and Hispanic populations had the poorest access to treatment. Top AI/AN rural ZCTAs were farther than other ZCTAs from the nearest treatment facility offering methadone (median of 52.8 miles) and Hispanic populations were furthest from other substance use disorder treatment (18.8 miles).
  - Top rural ZCTAs for non-Hispanic Asian residents were *closer* than other rural ZCTAs to substance use disorder treatment facilities that does not include methadone (10.0 miles versus 11.4 miles) and the nearest buprenorphine provider (8.3 miles verses 10.4 miles).

The current findings brief is one of a series of reports documenting disparities in geographic access to health services for places that have a relatively high proportion of residents from minoritized racial and ethnic groups (MRG). We use the term "minoritized" to refer to groups that have historically been marginalized by society and government institutions. This wording, rather than the terms "minority" or "minorities," highlights the intentional social, economic, and political discrimination that these populations have experienced.[1] Work from this series has also been adapted into a web visualization[2] and a peer reviewed publication[3] both in *Health Affairs*.

## INTRODUCTION

Substance use disorder is a medical condition affecting millions of Americans every year.[4] In 2019, more than 20 million individuals ages 12 and older met the criteria for substance use disorder in the United States.[4] In addition to the negative impact of substance use disorder on individuals, families, and communities, the economic burden of the illness is substantial totaling over one trillion dollars annually for opioid use disorder alone.[5] Despite a large body of research demonstrating the effectiveness of evidence-based psychosocial interventions and medications to treat substance use disorder,[6-8] a significant gap in use of treatment persists.[9]

There is substantial variation in access to substance use disorder treatment across geographic areas within the United States. Availability of treatment services is a significant barrier for rural areas.[10] In a 2010 survey, rural Federally Qualified Health Centers (FQHCs) were less likely to provide on-site medications for opioid use disorder services and less likely to be interested in expanding treatment availability than FQHCs in urban and suburban areas.[11] In a more recent study of treatment providers, just under half (49.0%) of small and rural counties had providers with a Drug Enforcement Administration (DEA) waiver to prescribe buprenorphine to treat opioid use disorder compared to 84.7% of urban counties.[12] A census-tract examination of availability of medication assisted substance use disorder treatment, adjusting for need, found that urban areas have more providers than would be anticipated while the reverse is true in rural areas. [13] These differences are salient because spatial access to opioid treatment programs, one form of substance use disorder treatment, has been associated with better adherence.[14]

Access to substance use disorder treatment has been lower for historically minoritized racial/ethnic groups (MRGs) than for white populations in the United States.[15-17] Barriers to access for MRGs include social and cultural stigma, lower perceived need, discrimination, lower insurance coverage, risk of treatment discontinuation, lower socio-economic status, and transportation challenges.[18-23] Cummings, Wen, & Ko determined rural counties with a high percentage of Black residents were significantly less likely to have an outpatient facility for substance use disorder treatment.[24] Another study found counties with higher percentages of Black and Latino Medicare Part D enrollees were less likely to have reasonable geographic access to buprenorphine prescribers than counties with higher percentages of white enrollees.[25]

While previous research demonstrates a disparity in access to substance use disorder treatment among MRGs and in rural geographic areas, little research has focused on the intersection of rurality with racial and ethnic minoritization. While Cummings et al.[16] illustrated disparities within the Medicaid population, there remains a need for broad, population-based research assessing the potential cumulative disadvantage faced by MRGs in rural communities. The analyses presented here illustrate spatial availability and travel burden for substance use disorder care at the ZIP Code Tabulation Area (ZCTA) level. ZCTAs are used, rather than larger geographic areas such as counties, to allow identification of small areas for calculation of approximate distances to care.

## METHODS

Defining ZCTAs with a high proportion of minoritized racial/ethnic group residents

ZCTAs (n = 32,670) were first classified as rural or urban using Rural Urban Commuting Area definitions with ZCTAs classified as 1 through 3 defined as urban and those classified as 4 through 10 defined as rural.[26] Given differences in the demographic profile of rural and urban places, rural and urban ZCTAs were examined separately.

ZCTAs were classified as being a "top" place for a specific racial/ethnic group if the proportion of persons who identified as that group in the ZCTA met or exceeded the 95th percentile for the proportion of those residents in all rural or all urban ZCTAs respectively. With the exception of non-Hispanic white residents, the "top 5%" for any one population group was consistently less than a majority, and for some populations was fairly low (Table 1, at right).

**Table 1. Proportion of residents needed to meet or exceed the 95 percentile [a] by race/ethnicity and rurality**

| | Rural | Urban |
|---|---|---|
| Non-Hispanic Black | 34.4% | 49.3% |
| Hispanic | 23.8% | 34.1% |
| Non-Hispanic American Indian/Alaska Native | 11.8% | 2.2% |
| Non-Hispanic Asian | 2.5% | 15.3% |
| Non-Hispanic White | 100.0% | 100.0% |

[a] Percentiles derived from population data obtained from the American Community Survey.

"Hispanic" included all persons of Hispanic ethnicity, regardless of race. ZCTAs that fell in the top category for more than one MRG population were grouped separately so that categories do not overlap. Thus, the final analysis included seven separate categories within both rural and urban ZCTAs: top ZCTAs for Black, Asian, American Indian/Alaska Native, Hispanic, and multiple MRG populations, non-Hispanic white, and a referent category which included all other ZCTAs (see Table 2 and Figure 1, next page).

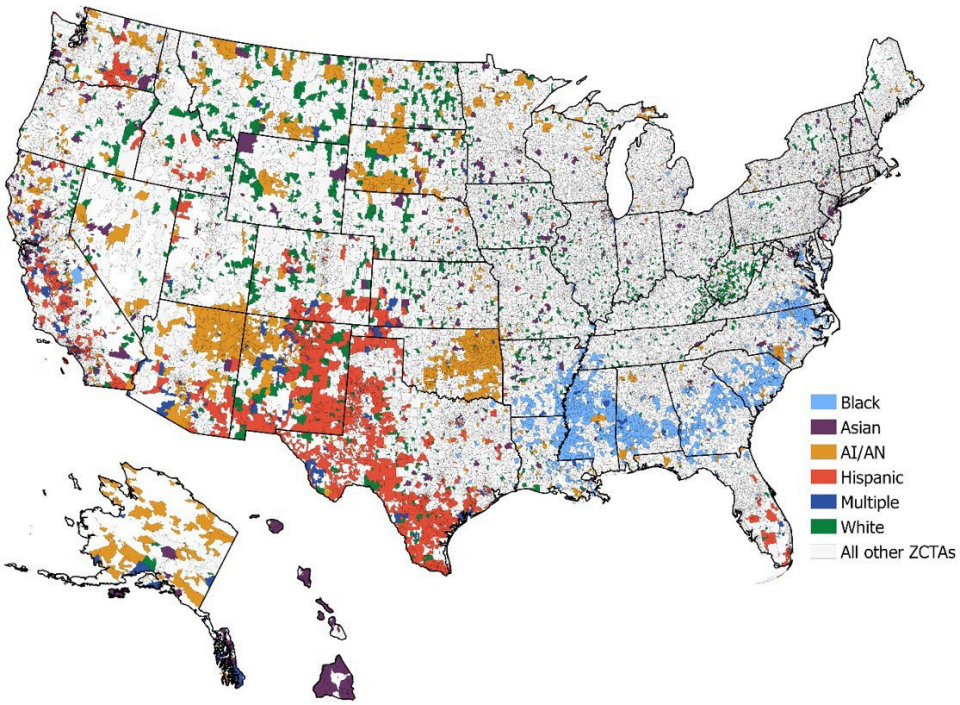
Note that MRG ZCTAs are not "majority minoritized" places; rather, they are ZCTAs in which the proportion of each group is at the top of the distribution compared to other ZCTAs. The geographic location of MRG ZCTAs is shown in Figure 1, next page. Demographic characteristics of rural and urban ZCTAs by high racial/ethnic group status are presented in the Appendix.

**Table 2. Distribution of ZCTAs in the top 5th percentile for racial/ethnic group populations by rurality and racial/ethnic group (2015-2019 American Community Survey)**

| Racial/ethnic group categories: | Urban ZCTAs | | Rural ZCTAs | | Total, all ZCTAs | |
|---|---|---|---|---|---|---|
| **Minoritized groups** | n | % | n | % | n | % |
| Hispanic* | 755 | 4.2 | 594 | 4.0 | 1,349 | 4.1 |
| NH* American Indian/Alaska Native | 825 | 4.6 | 668 | 4.5 | 1,493 | 4.6 |
| NH* Asian | 851 | 4.8 | 622 | 4.2 | 1,473 | 4.5 |
| NH* Black | 874 | 4.9 | 709 | 4.8 | 1,583 | 4.9 |
| > 1 MRG | 127 | 0.7 | 156 | 1.1 | 283 | 0.9 |
| **Non-minoritized** | | | | | | |
| NH* White | 1,203 | 6.8 | 2,177 | 14.6 | 3,380 | 10.3 |
| All other ZCTAs (excludes NH White) | 13,160 | 74.0 | 9,949 | 66.9 | 23,109 | 70.7 |
| Total | 17,795 | 100.0 | 14,875 | 100.0 | 32,670 | 100.0 |

Note: Percentiles derived from population data obtained from the 2015-2019 American Community Survey. More than 5% of ZCTAs in both urban and rural areas had 100% white populations; all such ZCTAs were classified as high NH white ZCTAs.
*Hispanic includes all racial identities. All other racial/ethnic groups classified as "non-Hispanic" (NH).

**Figure 1. Geographic distribution of ZCTAs meeting the 95th percentile threshold by racial and ethnic group [a,b]**




[a] Data from the 2015-2019 American Community Survey [b] This map was adapted from Eberth et al,2022.[3]

How we studied substance use disorder treatment facilities

Lists of opioid treatment providers were obtained from the Substance Abuse and Mental Health Services Administration (SAMHSA) Behavioral Health Treatment Services Locator.[27] We report on three types of service:

- *Opioid Treatment including Methadone* (OTM): The provider offers opioid treatment with methods that include methadone. Some of these providers also offered buprenorphine and/or naltrexone; these are not separated out in the analysis. Inpatient, intensive outpatient, and outpatient services are included. (n = 1,826 for the contiguous 48 states)
- *Opioid Treatment Services Other* (SUO): The provider offers opioid treatment but does *not* offer methadone. Some of these providers also offered buprenorphine and/or naltrexone; these are not separated out in the analysis. Inpatient, intensive outpatient, and outpatient services are included. (n = 9,905 for the contiguous 48 states)
- *Buprenorphine Practitioners*: Buprenorphine is a synthetic opioid that is used to treat opioid use disorder. Because it is a controlled medication, providers (physicians, advance practice nurses, physician assistants) must receive a special waiver to provide it. The SAMHSA list includes both facilities and individual practitioners. (n = 31,301 for the contiguous 48 states)

Provider participation in the SAMHSA website, as opposed to registering with the Drug Enforcement Agency or applicable state regulators, is voluntary. Providers are encouraged, but not required, to link to the SAMHSA website. Studies indicate that the SAMHSA site lists fewer providers than are licensed to provide services.[28] Thus, the SAMHSA list constitutes a minimum estimate of the total number and location of practitioners. Nonetheless, the SAMHSA list is important as persons seeking treatment who might not be familiar with programs and providers in their community are likely to use this website as their first resource.

How we measured distance

Working from the addresses provided in the SAMHSA list, locations of substance use disorder treatment facilities were geocoded using ArcGIS Pro v2.8. Distance calculations were restricted to the contiguous 48 states excluding Alaska and Hawaii. The unusual geography of these two states would distort distance values for the rest of the nation. For the 48 states plus the District of Columbia, we calculated the straight-line distance from the population-weighted centroid of the ZCTA, a point marking the center of the ZCTA based on where people live, to the nearest facility. Actual driving distances will be longer, so the information provided here is a conservative estimate of travel distances.

For comparative analyses, we calculated the median distance to the nearest treatment facility plus the percent of ZCTAs that were within 15 miles and 30 miles of each facility.

## FINDINGS

### Access to Opioid Treatment Programs Offering Methadone

Straight-line distances to 1,826 opioid treatment programs offering methadone (OTM) are summarized in Table 3 below. Across all rural ZCTAs, the median distance to the nearest methadone treatment program was 40.5 miles markedly greater than the 10.8 mile distance for urban ZCTAs. Top rural ZCTAs for the proportion of the population identifying as non-Hispanic AI / AN and Hispanic /Latino had significantly higher median distance to methadone care than the referent category ZCTAs with no population group at the top of the distribution (52.8 and 51.1 miles respectively).

Substantial portions of the rural U.S. lack close access to methadone treatment for opioid use disorder as illustrated in Figure 2 (next page). A substantial proportion of all rural ZCTAS (65.5%) were more than 30 miles from the nearest program offering methadone; this rose to 81.3% for ZCTAs in the top 95$^{th}$ percentile for AI/AN residents.

**Table 3. Access to Opioid Treatment Facilities Offering Methadone by rurality and 95th percentile MRG population status, 48 contiguous states, 2020a**

| Racial/ethnic group categories: | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Median Miles | % with no access within: | | Median Miles | % with no access within: | |
| | | 15 miles | 30 miles | | 15 miles | 30 miles |
| **All** | 40.5 | 89.0% | 65.5% | 10.8 | 37.8% | 12.9% |
| **Minoritized groups:** | | | | | | |
| NH Black | 37.7 | 90.7% | 66.0%†† | 5.0* | 20.6% | 9.3% |
| Hispanic/Latino | 51.1* | 94.1%†† | 79.8%†† | 4.8* | 18.9% | 6.1%† |
| NH American Indian / Alaska Native | 52.8* | 96.8%†† | 81.3%†† | 18.4* | 56.8%†† | 27.8%†† |
| NH Asian | 36.9 | 84.9%† | 60.1% | 4.2* | 6.8%† | 0.9% |
| Multiple Groups | 44.5* | 91.7% | 72.7%†† | 3.4* | 24.4% | 7.9% |
| **Nonminoritized groups:** | | | | | | |
| NH White | 43.4* | 88.4% | 66.4%†† | 19.1* | 65.4%†† | 24.2%†† |
| All other ZCTAs | 39.1 | 88.5% | 63.8% | 11.3 | 38.4% | 12.5% |

Note: Distance was measured from each ZCTA's population-weighted geographic centroid to the address of the closest facility. ZCTAs included in the above analysis met the 95th percentile criteria for each racial/ethnic
group. Referent group, "all other ZCTAs," includes ZCTAs that did not qualify for the 95% percentile for any minoritized racial/ethnic group.

a All rural median values are significantly greater than the equivalent urban value at $p < .01$.

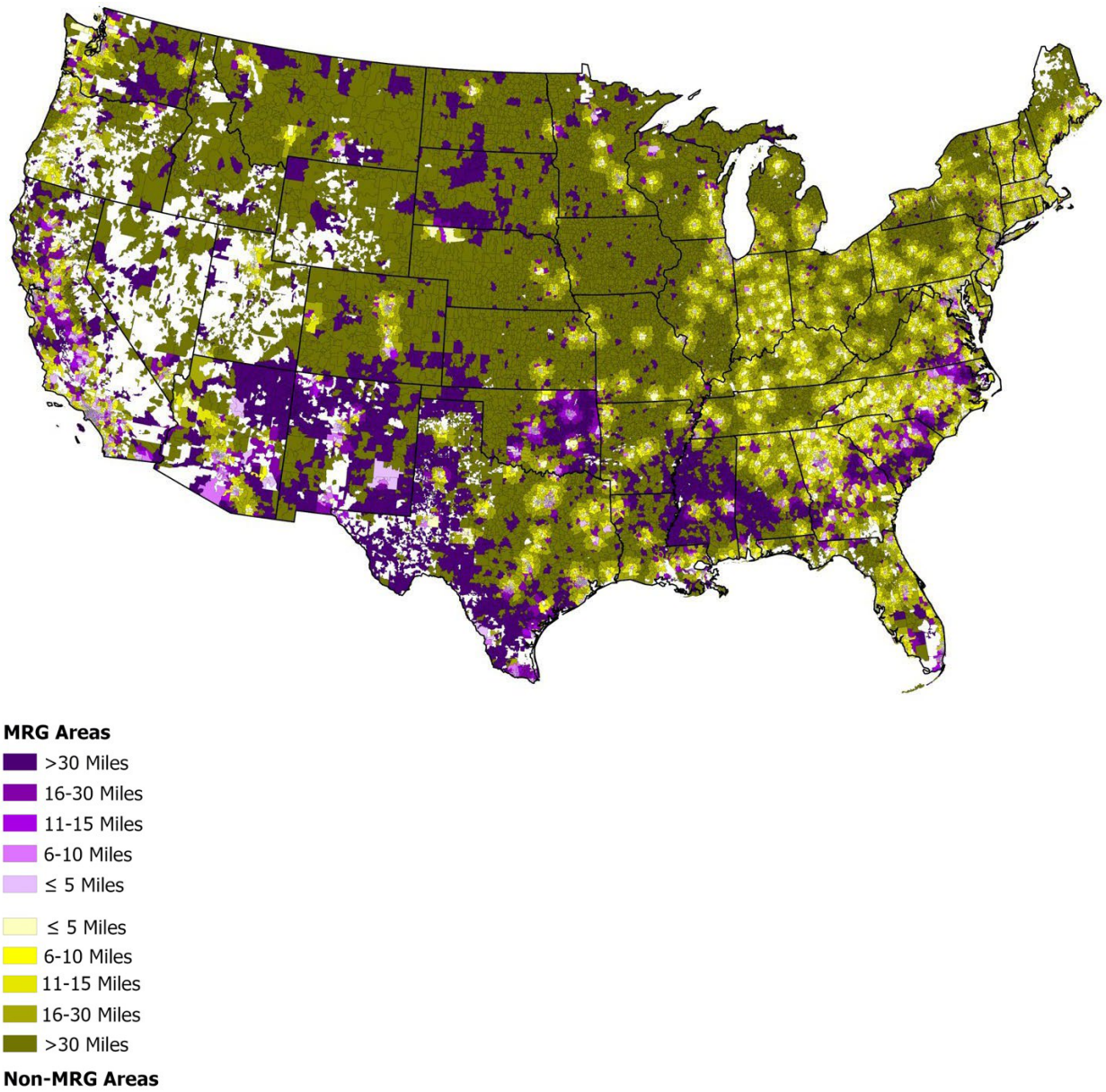
* Indicates that the median differs from the referent category, All other ZCTAs, at $p < .05$

† Indicates that the flagged percentage is significantly lower than the referent category, All Other ZCTAs, at $p < .05$ or less.

†† Indicates that the flagged percentage is significantly higher than the referent category, All Other ZCTAs, at $p < .05$ or less.

**Figure 2. Straight-line distance in miles to substance use disorder treatment facilities offering methadone for opioid use disorder by minoritized racial/ethnic group (MRG) ZCTA status, 48 contiguous states**

(Note: white spaces indicate ZCTAs with no population)



### Access to Substance Use Disorder Treatment Facilities That Do Not Offer Methadone

With 9,905 facilities identified through the SAMHSA facility locator, distances to substance use disorder care sites that did not potentially include methadone for patients with opioid use disorder were shorter than was the case for access to methadone treatment. Nonetheless, all rural ZCTAs were located farther from care at a median of 11.9 versus 4.6 straight-line miles. Within the 95th percentile MRG ZCTAs, all rural ZCTAs were significantly further from care when compared to the referent group with the exception of ZCTAs with a high representation for more than one MRG.

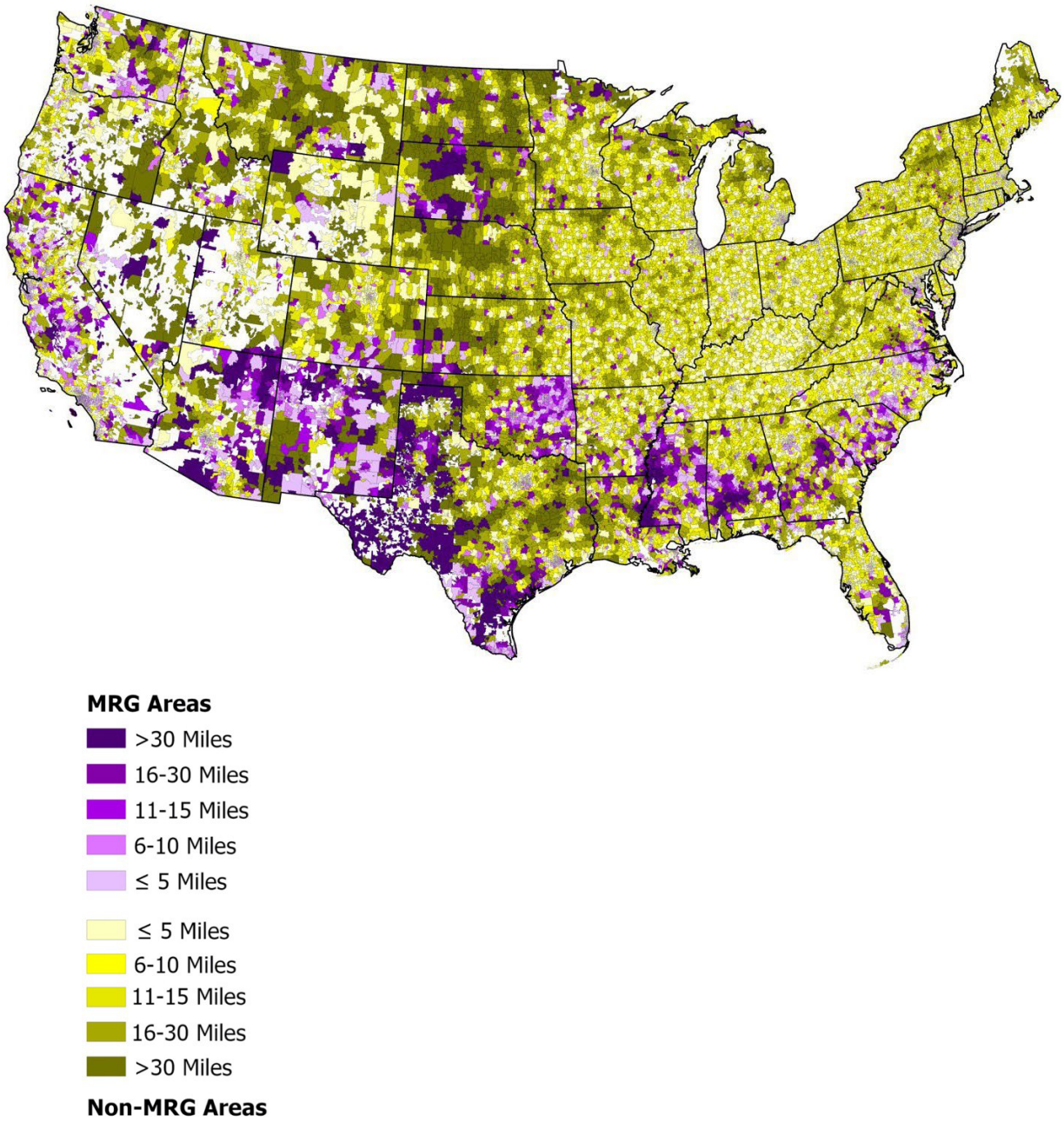
**Table 4. Access to specialty substance use disorder treatment that does not include methadone for patients with opioid use disorder by rurality and 95th percentile MRG population status, 48 contiguous states, 2020**

| Racial/ethnic group categories: | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Median Miles | % with no access within: | | Median Miles | % with no access within: | |
| | | 15 miles | 30 miles | | 15 miles | 30 miles |
| **All** | 11.9 | 37.5% | 10.5% | 4.6 | 9.7% | 0.9% |
| **Minoritized groups:** | | | | | | |
| NH Black | 13.8* | 46.0%†† | 10.4% | 1.9* | 8.8% | 0.5% |
| Hispanic/Latino | 18.8* | 58.9%†† | 30.3%†† | 2.2* | 8.4% | 1.9%†† |
| NH American Indian / Alaska Native | 13.6* | 45.2%†† | 16.0%†† | 8.0* | 21.4%†† | 3.2%†† |
| NH Asian | 10.0* | 29.4%† | 8.7% | 1.8* | 0.4%† | 0.1% |
| Multiple Groups | 12.4 | 39.4% | 19.7%†† | 1.5* | 7.1% | 1.6% |
| **Nonminoritized groups:** | | | | | | |
| NH White | 13.1* | 43.3%†† | 14.5%†† | 9.7* | 23.1%†† | 2.8%†† |
| All other ZCTAs | 11.4 | 34.3% | 8.1% | 4.8 | 8.5% | 0.6% |

Note: Distance was measured from each ZCTA's population-weighted geographic centroid to the address of the closest facility. ZCTAs included in the above analysis met the 95th percentile criteria for each racial/ethnic
group. Referent group, "all other ZCTAs," includes ZCTAs that did not qualify for the 95% percentile for any minoritized racial/ethnic group.
a All rural median values are significantly greater than the equivalent urban value at $p < .01$.
* Indicates that the median differs from the referent category, All other ZCTAs, at $p < .05$
† Indicates that the flagged percentage is significantly lower than the referent category, All Other ZCTAs, at $p < .05$ or less.
†† Indicates that the flagged percentage is significantly higher than the referent category, All Other ZCTAs, at $p < .05$ or less.

**Figure 3. Straight-line distance in miles to specialty substance use disorder treatment facilities that do not offer methadone, 48 contiguous states, by minoritized racial/ethnic group (MRG) ZCTA status**

(Note: white spaces indicate ZCTAs with no population)



## Access to Buprenorphine Prescribers

Table 5 shows straight-line distances to the nearest buprenorphine prescriber listed on the SAMHSA website by ZCTA type. Overall, rural ZCTAs were more distant from the nearest buprenorphine provider than urban ZCTAs at a median of 10.7 versus 2.4 miles respectively. Rural distances ranged from a median of 8.3 to a maximum of 12.8 miles with few differences based on race/ethnicity of residents. Overall, access appeared poorest for top Hispanic/Latino ZCTAs with 22.6% of rural ZCTAs being more than 30 miles from the nearest buprenorphine provider and 45.8% of rural ZCTAs being more than 15 miles from the nearest buprenorphine provider.

Figure 4 (next page) geographically illustrates access to SAMHSA-listed buprenorphine providers.

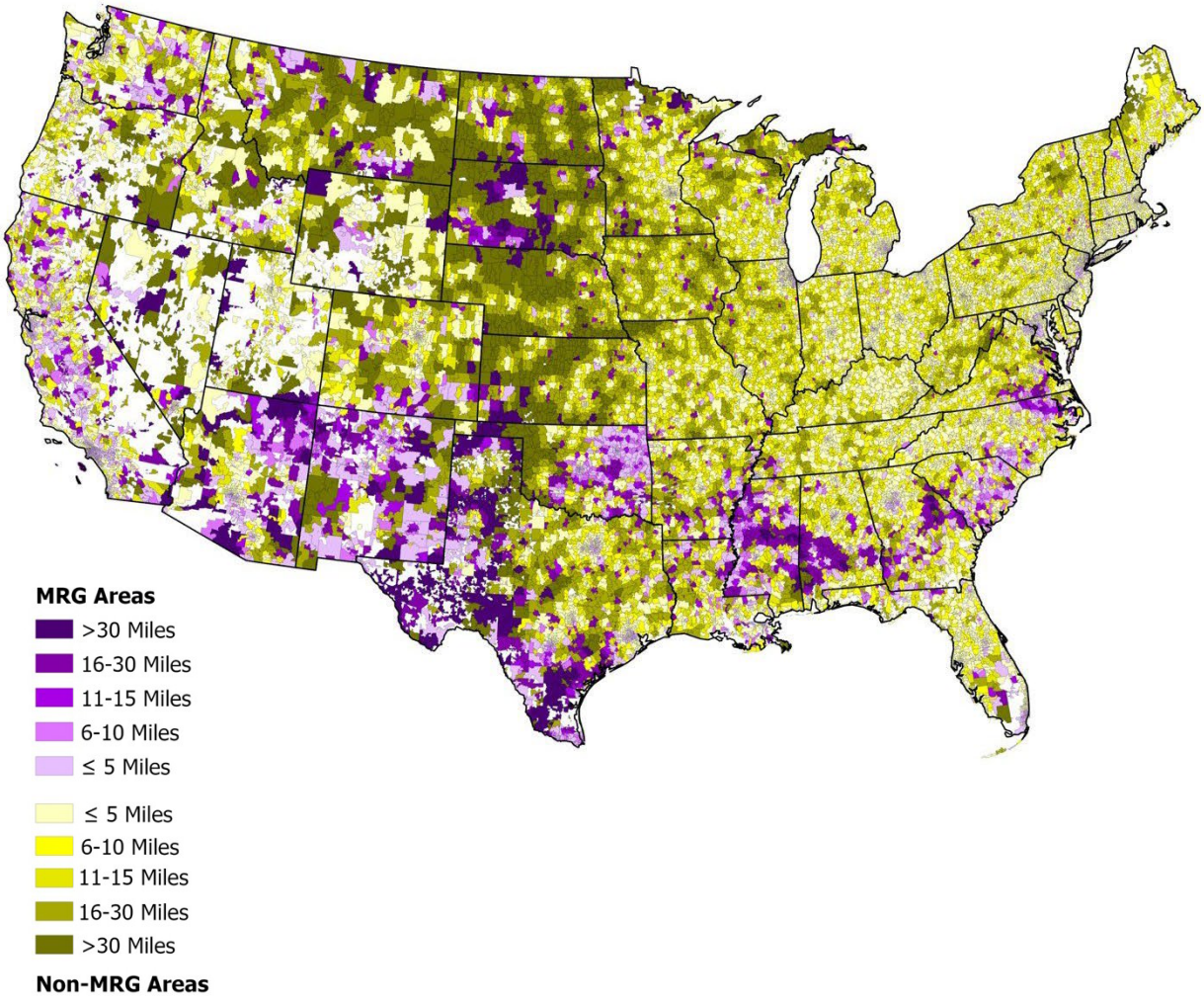
**Table 5. Access to buprenorphine providers in ZIP Code Tabulation Areas (ZCTAs) by minoritized racial/ethnic groups (MRG) representation and rurality**

| Racial/ethnic group categories: | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | Median Miles | % with no access within: | | Median Miles | % with no access within: | |
| | | 15 miles | 30 miles | | 15 miles | 30 miles |
| **All** | 10.7 | 34.2% | 10.8% | 2.4 | 7.4% | 0.6% |
| **Minoritized groups:** | | | | | | |
| NH Black | 10.8 | 32.0% | 3.8%† | 1.2* | 6.9% | 0.2% |
| Hispanic/Latino | 12.7* | 45.8%†† | 22.6%†† | 1.2* | 4.9% | 1.1%†† |
| NH American Indian / Alaska Native | 12.8* | 42.0%†† | 14.7%†† | 5.9* | 17.3%†† | 2.1%†† |
| NH Asian | 8.3* | 26.1%† | 8.9% | 0.7* | 0.2%† | 0.1% |
| Multiple Groups | 10.0 | 33.3% | 10.6% | 1.0* | 3.9% | 0.0% |
| **Nonminoritized groups:** | | | | | | |
| NH White | 12.6* | 42.1%†† | 16.2%†† | 7.8* | 18.0%†† | 2.3%†† |
| All other ZCTAs | 10.4 | 32.0% | 9.2% | 2.4 | 6.5% | 0.4% |

Note: Distance was measured from each ZCTA's population-weighted geographic centroid to the address of the closest facility. ZCTAs included in the above analysis met the 95th percentile criteria for each racial/ethnic
group. Referent group, "all other ZCTAs," includes ZCTAs that did not qualify for the 95% percentile for any minoritized racial/ethnic group.
a All rural median values are significantly greater than the equivalent urban value at $p < .01$.
* Indicates that the median differs from the referent category, All other ZCTAs, at $p < .05$
† Indicates that the flagged percentage is significantly lower than the referent category, All Other ZCTAs, at $p < .05$ or less.
†† Indicates that the flagged percentage is significantly higher than the referent category, All Other ZCTAs, at $p < .05$ or less.

**Figure 4. Straight-line distance in miles to buprenorphine prescribers by minoritized racial/ethnic group (MRG) ZCTA status, 48 contiguous states**

(Note: white spaces indicate ZCTAs with no population)



## DISCUSSION

All substance use disorder treatment facilities or providers were located farther from rural than from urban ZCTAs. However, the extent of the disparity varied with the type of program. Opioid treatment facilities that included methadone in their treatment options were fewest in number on the SAMHSA provider locator site (1,826 for the 48 contiguous states); these facilities were a median of 40.5 straight-line miles from rural ZCTAs. Substance use disorder treatment facilities that did not offer methadone were next most frequent across the 48 states (9,905 facilities); these facilities were located a median of 11.9 miles from rural ZCTAs. Finally, the 31,301 buprenorphine prescribers were a median of 10.7 miles from rural ZCTAs. While all of these median distances exceeded the urban equivalent, there was a clear relationship between the number of providers available and reduced rural distances.

Considering high travel distance as a potential burden to care, opioid treatment that includes methadone was not available within 30 straight-line miles for 65.5% of rural ZCTAs versus 12.9% of urban ZCTAs. This was the only treatment mode for which a relatively substantial portion of rural communities were disadvantaged by high distances. Only 10.5% of rural ZCTAs were more than 30 miles from the nearest substance use disorder program that did not offer methadone, and only 10.8% of rural ZCTAs were more than 30 miles from the nearest buprenorphine provider.

Rural ZCTAs in the top 5$^{th}$ percentile for the proportion of residents identifying as American Indian/Alaska Native (AI/AN) and top Hispanic ZCTAs were consistently more likely to be 30 miles or more distance from the nearest substance use disorder care than other rural ZCTAs. These ZCTAs are clustered in the Mountain West, West North Central, and West South Central Census regions which are areas of relatively low population density and associated greater distances to care. In addition, it is possible that Indian Health Services facilities, given the specialized population whom they treat, may have elected not to register with the SAMHSA provider listing site. In this case, the current brief would understate the actual availability of care in high AI/AN rural ZCTAs.

A number of strategies could potentially increase access to substance use disorder treatment in rural communities. Telemedicine for substance use disorder treatment has shown favorable outcomes when used in conjunction with in-person care.[29,30] In addition, tele-education, such as the Project for Extension for Community Health Outcomes (ECHO) model, can help increase rural provider knowledge of and confidence in substance abuse disorder treatment modes such as buprenorphine prescribing.[31] However, many rural counties need to address gaps in broadband internet availability to make telemedicine and tele-education broadly feasible. There are a number of associations urging congress to develop enhanced broadband internet infrastructure in order to address these gaps;[32] however, further action is required by states as well.

The Rural Communities Opioid Response Program – Medication Assisted Treatment Access (RCORP-MAT) seeks to increase the number of rural practitioners, including FQHCs and Rural Health Clinics, able to offer medication assisted treatment for opioid or alcohol use disorder.[33] While the effects of the RCORP-MAT program are not yet documented, there appears to be ample room for provider expansion. According to the 2020 SAMHSA annual survey, while nearly all FQHCs offer some form of substance abuse treatment (89.9%), only 46.9% offer medication assisted treatment (either methadone, buprenorphine, or naltrexone).[34] Comparable data for RHCs is not available. Treatment programs that engage community pharmacies in methadone dispensing with appropriate waivers could also increase access to this type of substance use disorder treatment.[35,36] Finally, monitoring the availability of substance use disorder treatment across all levels of rural areas is needed to ensure equitable access across communities.

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## APPENDIX

### *Data Sources*

Data on the racial/ethnic composition of ZCTAs and their socioeconomic characteristics were obtained from the U.S. Census Bureau's American Community Survey (ACS) 2015-2019 5-year estimates.[37]

Information regarding specialty substance use disorder treatment facilities in operation in 2019 were taken from the Substance Abuse and Mental Health Service Administration's Behavioral Health Treatment Services Locator.[27] We identified 1,826 substance use disorder treatment facilities offering methadone treatment in the 48 contiguous states and the District of Columbia. Similarly, we identified 9,905 facilities offering substance abuse treatment not including methadone in the treatment options. Finally, we identified waivered buprenorphine providers (n = 31,301).

### *Rurality*

Rurality was defined using the ZIP approximated Rural Urban Commuting Area (RUCA) codes.[38] Specifically, ZCTAs were assigned the RUCA code for the matching ZIP even if additional ZIP codes were included in the creation of the ZCTA boundary. Those ZCTAs with a ZIP matched RUCA code of 1-3 were designated as urban while those with a RUCA code of 4-10 were designated as rural. This corresponds to the Office of Management & Budget metropolitan/nonmetropolitan distinction.

The Uniform Data System (UDS) Mapper was used to identify the corresponding ZCTA for each ZIP code.[39] The UDS Mapper is a mapping tool operated primarily by data from the Uniform Data System to analyze service area of health centers. Since the U.S. Census Bureau does not release an official crosswalk between ZIP Codes and ZCTAs, the UDS Mapper was used to identify ZCTAs using patient data that was matched from the Uniform Data System. Each ZCTA code was added to the dataset using a left join via ZIP codes. Since there were multiple ZIP codes for some ZCTA codes, unique CMS Certification Numbers (CCN) were counted for each ZCTA code. The procedure worked well as there were no ZIP codes used for multiple ZCTA codes.

Minoritized racial/ethnic group area: ZCTAs were defined as "top" area if proportion of residents of a specific racial/ethnic identity within the ZCTA was at or above the 95$^{th}$ percentile of that group's proportion of the population across all ZCTAs. Because we created mutually exclusive categories for ZCTAs that fall into the top 5$^{th}$ percentile for each minoritized racial/ethnic group (MRG), plus a category for ZCTAs at the top for 2 or more MRGs, the total proportion of MRG ZCTAs equals 18.9% of all ZCTAs.

### *Demographic characteristics of top MRG ZCTAs*

Top MRG ZCTAs could differ from other ZCTAs in the U.S. on characteristics that affect both demand for and local ability to support and retain services. To provide context for our substance abuse treatment availability results, we compared MRG ZCTAs, defined as those in the 95$^{th}$ percentile for the proportion of each group, to all other ZCTAs (labeled "all other;" Table A-1, next page).

- Across both rural and urban ZCTAs, the proportion of the population that is age 65 or older is significantly lower in MRG ZCTAs than in "all other" ZCTAs while that same proportion is higher in top NH white ZCTAs. A younger population base might have more need for substance abuse disorder treatment services.
- High proportions of uninsured persons within a population can reduce the willingness of providers to locate in or serve the area. The proportion of the population lacking health

insurance was higher among most MRG ZCTAs than the "all other" group. High Asian and high White ZCTAs had lower rates for uninsurance.

- We examined vehicle availability within the household as an indicator of residents' ability to leave home for care particularly in rural places.
  - Within rural MRG ZCTAs, ZCTAs in the top group for AI/AN, Black, and multiple MRG population had higher proportions of households that lacked a vehicle. The top A/PI ZCTAs did not differ from the "all other" group while top White ZCTAs had lower proportions of households without a vehicle.
  - The top AI/AN ZCTAs were the only group for which the proportion of households without a vehicle was significantly higher among rural than among urban ZCTAs (rural 19.0%, urban 5.8%).
- Broadband access is important for residents' ability to access telehealth and telemedicine services as a supplement to or alternative for substance use disorder services at a physical treatment location.
  - All rural ZCTAs, within each racial/ethnic category, had a lower proportion of households with broadband access than among the equivalent urban ZCTAs.
  - Within urban and rural places, all top MRG ZCTAs except the A/PI group had lower access to broadband than the "all other" category. Within top rural Black ZCTAs, only 58.2% of households reported broadband access.
- Community poverty can make an area unattractive for health care providers of all kinds because persons who are uninsured or whose care is funded by lower-paying insurers, such as Medicaid, offer lower payment for the provider. The proportion of households with incomes at or below 200% of the Federal Poverty Level were higher among MRG ZCTAs than the "all other" group for all except high A/PI ZCTAs.

Even within the "minoritized population" category, rural ZCTAs can experience disadvantage when compared to urban ZCTAs in the same population group. With some exceptions, noted in the table, ALL rural metrics differ significantly and in a direction of greater disadvantage than the corresponding values for urban MRG ZCTAs.

### *Statistical and Spatial Analysis*

We calculated mean values of ACS estimates across rural-urban and MRG ZCTA groupings. Using ArcGIS Pro v2.8, we used the ArcGIS world geocoding service to geocode substance use disorder treatment addresses to obtain XY geographic coordinates of each unique substance use disorder treatment location. Using population weighted ZCTA centroids (an area's geographic center), we calculated the straight-line distance in miles to the nearest substance use disorder treatment.

**Table A-1. Characteristics of Top ZCTAs when compared to all other ZCTAs by rurality[1] in percent** (Data from the 2015-2019 American Community Survey)

| | **Population characteristics** | | | | | | **Household characteristics:** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Females age 15 – 44 | | Lack health insurance | | Unemployment rate | | Have broadband | | 200% Federal Poverty Level | |
| | % | | | | % | | | | | |
| **Rural ZCTAs (14,875)** | | | | | | | | | | |
| **Minoritized groups:** | | | | | | | | | | |
| Hispanic (594) | 33.9% | *** | 15.1% | *** | 6.9% | | 68.5% | *** | 45.4% | *** |
| NH Black (709) | 33.2% | *** | 12.6% | *** | 8.9% | *** | 58.2% | *** | 51.6% | *** |
| NH Am. Ind./ Alaska Nat. (668) | 32.1% | *** | 20.5% | *** | 12.6% | *** | 60.9% | *** | 49.5% | *** |
| NH Asian (622) | 32.4% | ** | 7.4% | *** | 5.2% | | 78.1% | *** | 32.8% | * |
| >1 MRG (156) | 32.6% | *** | 15.6% | *** | 8.0% | *** | 66.6% | *** | 45.0% | *** |
| **Non-minoritized & other** | | | | | | | | | | |
| NH White (2,177) | 23.3% | *** | 7.5% | *** | 4.5% | ** | 71.9% | *** | 35.2% | * |
| All other ZCTAs (9,949) | 26.8% | | 8.4% | | 4.7% | | 74.4% | | 34.4% | |
| **Urban ZCTAs (17,795)** | | | | | | | | | | |
| **Minoritized groups:** | | | | | | | | | | |
| Hispanic (755) | 27.8% | ** | 17.0% | *** | 6.7% | *** | 73.8% | *** | 48.1% | *** |
| NH Black (874) | 30.4% | *** | 11.3% | *** | 10.0% | *** | 68.7% | *** | 49.0% | *** |
| NH Am. Ind./ Alaska Nat. (825) | 28.2% | *** | 11.2% | *** | 6.4% | | 74.8% | *** | 36.7% | *** |
| NH Asian (851) | 28.4% | ** | 5.3% | *** | 4.5% | *** | 89.0% | *** | 21.65 | *** |
| >1 MRG (127) | 27.0% | ** | 14.6% | *** | 7.1% | *** | 74.5% | *** | 49.3% | *** |
| **Non-minoritized & other** | | | | | | | | | | |
| NH White (1,203) | 23.7% | *** | 6.6% | ** | 4.8% | * | 75.6% | *** | 31.8% | *** |
| Referent ZCTAs (13,160) | 26.2% | | 7.2% | | 4.6% | | 82.3% | | 27.1% | |

[1] Note: With the exception of lack of health insurance and lack of a vehicle in >1 MRG rural ZCTAs, all rural values differ significantly from the corresponding urban value. [2] NH = Non-Hispanic

[3] Statistical indicators: Group differs from Referent ZCTA within either all rural or all urban ZCTAs. * = $p < .05$; ** = $p < .01$; *** $p < .001$