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Pharmacy-based methadone dispensing and drive time to methadone treatment in five states within the United States: a cross-sectional study

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Abstract

Background: Within the United States, there is a shortage of opioid treatment programs (OTPs), facilities which dispense methadone for opioid use disorder. It is unknown how pharmacy-based methadone dispensing, as available internationally, could affect methadone access. We aimed to

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CONFLICT OF INTEREST

SK consults for Abt associates on a Department of Public Health project to expand access to medications for opioid use disorder in post-acute care facilities. All authors have no additional declarations or conflict of interests to report.

compare drive times to the nearest OTP with drive times to the nearest chain pharmacy in urban and rural census tracts.

Methods: Cross-sectional geospatial analysis of 2018 OTP location data and 2017 pharmacy location data. We included census tracts with non-zero population in Indiana, Kentucky, Ohio, Virginia, and West Virginia, states with highest rates of opioid overdose deaths. Our outcome was minimum drive time in minutes from census tract mean center of population to the nearest dispensing facility.

Results: Among 7,918 census tracts, median (IQR) drive time to OTPs increased from urban to increasingly rural census tract classification [16.1 minutes (10.2 – 25.9) to 48.4 minutes (34.0 – 63.3); p <.001]. Median (IQR) drive time to OTPs was greater than drive time to chain pharmacies among all census tracts: 19.6 minutes (11.6 – 35.1) versus 4.4 minutes (2.9 – 7.7) respectively; p <.001. The median (IQR) difference in drive time was greater for increasingly rural census tracts [11.5 minutes (6.1 – 19.2) to 35.2 minutes (19.6 – 49.7); p <.001] with pharmacy-based methadone dispensing.

Conclusion: Rural census tracts have disproportionately long drive times to OTPs. Drawing from policies to increase methadone access in countries like Canada and Australia, this geographic methadone disparity could be mitigated through implementation of pharmacy-based methadone dispensing.

Keywords

Methadone; Access; Pharmacy; Opioid use disorder

1. INTRODUCTION

In 2017, there were 70,237 drug overdose deaths in the United States, the majority of these deaths were opioid related (Rudd, 2016; Scholl et al., 2018). The epidemic of drug overdose deaths has impacted both urban and rural communities. Over the preceding two decades, the age-adjusted rate of drug overdose deaths (per 100,000) increased from 6.4 to 22.0 in urban counties and from 4.0 to 20.0 in rural counties (Hedegaard et al., 2019). Methadone is one of three Food and Drug Administration approved medications for opioid use disorder (MOUD), and people living in rural communities are less likely to receive methadone for opioid use disorder (OUD) relative to urban communities (Leshner and Mancher, 2019; Stein et al., 2012). Overwhelming evidence demonstrates methadone prevents opioid overdose deaths (Larochelle et al., 2018; Sordo et al., 2017). Each MOUD should be available in all treatment settings (National Academies of Sciences and Medicine, 2019), and the availability of methadone is particularly important when buprenorphine (partial opioid agonist) does not align with patient preferences or a full opioid agonist medication is required for cravings and withdrawal symptoms (Kakko et al., 2007; Pinto et al., 2010; Ridge et al., 2009).

Among the 14,000 substance use treatment facilities in the United States identified by the National Survey of Substance Abuse Treatment Services, fewer than half provide MOUD (Mojtabai et al., 2019), and only 1,500 facilities, or federal-approved opioid treatment programs (OTPs) (SAMHSA, 2015), dispense methadone for OUD in the United States. A

minority of United States counties contain one or more OTP (Abraham et al., 2018; Dick et al., 2015). The number of OTPs has only slightly increased since 2015 (Alderks, 2017; Mojtabai et al., 2019), leading to renewed interest in alternative models of methadone delivery, including integrating into primary care settings (Calcaterra et al., 2019; Nosyk et al., 2013; Samet et al., 2018). Alternative methadone delivery models exist in Canada and Australia, where primary care physicians prescribe methadone for OUD and community pharmacies dispense the medication for expanded rural access (Nosyk et al., 2013). Within the United States, primary care prescribing of methadone for OUD within Federally Qualified Health Centers could reduce long drive times to the nearest OTPs (Joudrey et al., 2019), but would require partnerships with local pharmacies for observed methadone dispensing.

Current federal regulations allow local pharmacies to serve as satellite medication units for observed methadone dispensing following initiation by an OTP (McBournie A, 2019). To date, only a few states have supported pharmacies developing these relationships to expand access (McBournie A, 2019). In Canada, pharmacists are permitted to dispense daily methadone for OUD after a physician prescribes the treatment (The College of Physicians and Surgeons of Ontario, 2011). Similar dispensing practices have been adopted in Australia (Chaar et al., 2011), and the United Kingdom (International Expert Working Group, 2017). Nearly 90% of individuals in the United States live within five miles of a pharmacy (Kelling, 2015; National Association of Chain Drug Stores, 2014), suggesting they are valuable sites for healthcare delivery. Many pharmacies already provide services such as vaccinations in private areas set apart from the medication pick-up window, which has contributed to increased immunization rates and a reduction in vaccine-preventable illnesses (Burson et al., 2016). Pharmacy-based methadone dispensing would expand upon existing pharmacy initiatives to reduce opioid overdose, such as naloxone distribution (CVS Pharmacy, 2015; Shafer et al., 2017). Uptake of pharmacy-based methadone dispensing may reduce drive time to methadone treatment by increasing the number of facilities available for observed administration. Therefore, we compared drive times to the nearest OTP in urban and rural census tracts in five states within the United States with the highest county rates of opioid overdose mortality (Dwyer-Lindgren et al., 2018) to drive times to the nearest chain pharmacy as potential methadone dispensing locations.

2. MATERIAL AND METHODS

We obtained street addresses for all OTPs on May 18, 2019 from the Substance Abuse Mental Health Services Administration (SAMHSA) Behavioral Health Treatment Services Locator, which derive from 2018 National Survey of Substance Abuse Treatment Services data (SAMHSA, 2019). We obtained street addresses for 2017 chain pharmacies (CVS, Rite Aid, Walgreens, and Walmart) from the University of Pennsylvania Wharton Research Data Services database which represented the four most prevalent pharmacy chains within the five states examined (Goodrx 2019; Ellison, 2016). We used street address data rather than latitude and longitude coordinates to ensure accuracy of destination geocoordinates. The latitude and longitude coordinates of census tract mean center of population were obtained from the United States Census Bureau 2010 census geography reference (US Census Bureau 2019). Census tract mean center of population represents a population balance point when

equal weight is assigned to the location of one person while ignoring changes in elevation (US Census Bureau, 2011). We obtained 2010 census tract Rural-Urban Commuting Area (RUCA) codes from the United States Department of Agriculture Economic Research Service (inclusive of July 3rd 2019 revision to codes) (Rural-Urban Communiting Area Codes, 2016). Census tract total population and worker transportation data were obtained from the United States Census Bureau 2013-2017 American Community Survey 5-year estimate (US Census Bureau, 2010). Yale Institutional Review Board determined the study did not involve human subjects and was exempt from review.

2.1 Study population

We included all census tracts in Indiana, Kentucky, Ohio, Virginia, and West Virginia which have the highest rates of overdose deaths according to 2014 death records from the National Center for Health Statistics (Dwyer-Lindgren et al., 2018). Any census tracts with a population of zero were excluded. To allow for travel across state lines to access the nearest dispensing facility, we included all OTPs and chain pharmacies in the five states plus the bordering states: Michigan, Illinois, Missouri, Tennessee, North Carolina, Maryland, and Pennsylvania. We included only OTPs identified as providing methadone within the SAMHSA Behavioral Health Treatment Services Locator (5% of OTPs elect to only offer buprenorphine or naltrexone) (SAMHSA, 2018). OTP and chain pharmacy street addresses were geocoded using a three-step process (Appendix 1) in accordance with best practices (Goldberg et al., 2008; McLafferty et al., 2012; Swift et al., 2008). Street addresses matched to a polygon location (i.e. center point of postal code), with a tied highest match score, or with a match score of less than 80 were hand reviewed using Google Maps. We excluded addresses when the street address location could not be confirmed.

2.2 Study Variables

We stratified our sample of census tracts by a four-level urban-rural classification scheme according to the 2010 RUCA census tract codes (Figure 1). We divided census tracts into four commonly used categories: 1) urban (codes 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1, indicating metropolitan area core: primary commuter flow within an Urbanized Area [UA] over 50,000), 2) large rural (codes 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1 indicating primary commuter flow within an Urban Cluster [UC] of 10,000 to 49,999), 3) small rural (codes 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, and 9.2 indicating primary commuter flow within an UC of 2,500 to 9,999), and 4) isolated rural (codes 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6 indicating primary commuter flow to a tract outside UA or UC) (Kirchhoff et al., 2014; Morrill et al., 1999; Onega et al., 2019). For each census tract, we obtained estimates of population size, percentage of residents commuting using public transportation, and percentage of households with one or more vehicle (vehicle availability).

Our primary outcome was the minimum drive time in minutes from census tract mean center of population to the nearest methadone dispensing facility (either OTP or chain pharmacy) using the Esri ArcGIS Rural Drive-Time tool, which simulates automobile movement between two points along a national street network based on historical average speeds (Apparicio et al., 2008). We permitted travel on unpaved roads in rural areas and permitted travel across state lines to the nearest dispensing facility. First, we calculated minimum drive

times from the census tract mean center of population to the nearest OTP. Second, we calculated minimum drive times from the census tract mean center of population to the nearest chain pharmacy. To represent differing levels of uptake of pharmacy-based dispensing, we calculated drive times to the nearest CVS, Rite Aid, Walgreens, or Walmart, representing broad uptake among the top four chain pharmacies within the region. We then calculated drive times to the nearest CVS pharmacy alone, representing uptake limited to the largest chain pharmacy within the region (Goodrx 2019; Ellison, 2016). Lastly, we included a binary outcome of drive time to the nearest dispensing facility greater than 60 minutes (Yes/No). We selected 60 minutes because the United States Census Bureau defines a long daily commute as more than 60 minutes (McKenzie, 2013).

2.3 Statistical Analysis

First, we identified the count of census tracts in each state, census tract median population, total population, percentage who commute by public transportation, and percentage with one or more vehicles available, and used a chi-square test to compare the count of census tracts by RUCA urban-rural classification. We used a Kruskal-Wallis test to compare census tract median population.

Next, we assessed the association between RUCA urban-rural classification and drive time to the nearest dispensing facility (either OTP or chain pharmacy) using a Kruskal-Wallis test given drive time distributions were right skewed. We then used a Wilcoxon signed-rank test to compare drive times to the nearest OTP with drive times to the nearest chain pharmacy and to the nearest CVS pharmacy among all census tracts and across each RUCA urban-rural strata. To account for multiple comparisons, we used a Bonferroni correction. Then, we compared the mean difference in drive time between OTPs and pharmacies (chain pharmacies and CVS alone) across RUCA urban-rural strata using a Kruskal-Wallis test. As a sensitivity analysis, we repeated our analysis for OTPs and chain pharmacies while prohibiting travel across state lines as Medicaid requirements may prevent interstate methadone access. All hypothesis tests were two-sided. We completed our analyses in Stata 16 (StataCorp, College Station, Tx) and geocoding and mapping in Esri ArcGIS Online and ArcGIS Pro 2.4.1.

3. RESULTS

3.1 Census tracts, opioid treatment programs, and pharmacies

Of the 7,969 census tracts in the five-state region, we excluded 51 with a population of zero. Among included census tracts (n=7,918), 1,898 (24.0%) were classified as rural (large rural, small rural, or isolated rural) (Table 1). Rural census tracts contained 7.5 million individuals or 22.9% of the population. Among all census tracts, 92.6% of households had a vehicle available and only 2.2% of workers commuted to work by public transportation, with public transportation utilization ranging from 0.4% in isolated rural to 2.6% in urban census tracts.

Of 467 regional (five states plus eight surrounding states) OTP addresses, all 467 were successfully geocoded (Appendix Figure 1). Of 9,657 chain pharmacy addresses, we excluded 115 unmatched addresses; 9,542 were successfully geocoded of which 3,779

belonged to the CVS chain. Within the five-state region which was the primary focus of our analyses, there were 105 OTPs, 3,293 chain pharmacies, and 1,415 CVS pharmacies included. There were 0.3 OTPs, 10.0 chain pharmacies, and 4.3 CVS pharmacies per 100,000 people within the five states examined.

3.2 Drive times

Among all census tracts, the median drive time to the nearest OTP was 19.6 minutes, ranging from 1 to 161.5 minutes (Table 2). Median drive time to nearest OTP increased from urban to increasingly rural classification (urban 16.1 minutes, large rural 38.7, small rural 45.6, isolated rural 48.4; $p < .001$). Median drive time to the nearest OTP was greater than drive time to the nearest chain pharmacy among all census tracts (19.6 minutes versus 4.4 minutes respectively; $p < .001$) and for all RUCA urban-rural classifications (Table 2, Figure 2). The median difference in drive time between OTPs and chain pharmacies was 13.9 minutes among all census tracts. The median difference in drive time between OTPs and chain pharmacies was greater for increasingly rural census tracts (Table 3). Drive time to the nearest CVS was also less than drive time to the nearest OTP for all RUCA urban-rural classifications ($p < .001$) (Table 2).

A total of 513 census tracts (6.5%) had a drive time to the nearest OTP greater than 60 minutes, representing 1.9 million people or 6.0% of the study population. Among these census tracts, 350 (68.2%) were rural. In contrast, one census tract had a drive time of greater than 60 minutes to a chain pharmacy and 28 (0.4%) census tracts had a drive time of greater than 60 minutes to a CVS pharmacy, of which 22 were rural.

In our sensitivity analysis, prohibition of travel across state lines increased median drive time to the nearest OTP ($p<.001$) (Appendix Table 1) and chain pharmacies, but comparisons of urban-rural census tract variation and the impact of chain pharmacy dispensing on drive time did not differ from our primary results (data not shown).

4. DISCUSSION

In this cross-sectional geospatial analysis of 7,918 census tracts in five states disproportionally impacted by the overdose epidemic, rural census tract classification was associated with longer drive times to the nearest OTP, with the longest drive time being over two hours. Geographic access to OTPs was so limited that in 513 census tracts, of which over 60% were rural, the drive time was greater than 60 minutes, meaning on average people with OUD would have to drive at least two hours six days a week during the first 90 days of treatment to receive methadone. Our results demonstrate that uptake of a pharmacy-based methadone dispensing model, like those implemented in Canada, Australia, or the United Kingdom, could reduce drive time to the nearest methadone dispensing facility within the United States and may mitigate the urban-rural geographic disparity in methadone access.

Expanding access to methadone via pharmacy dispensation in the United States would expand availability without the financial expense of constructing additional specialized facilities. Unlike primary care prescribing of methadone, dispensing from pharmacies does not require passage of new federal legislation (McBournie A, 2019). In Australia, the cost of

pharmacy-based methadone was lower or competitive with private methadone clinics and patient retention was greater for pharmacy-based methadone relative to hospital-based methadone programs (Berbatis and Sunderland, 2000). The number of Australian pharmacies participating in methadone dispensing increased from 914 in 1994 to 2,543 in 2018 resulting in an increase to 10 pharmacies per 100,000 (persons) in major cities and 13 pharmacies per 100,000 in very remote areas (Australian Government Department of Health, 1995). Our results show uptake of pharmacy-based dispensing, approaching a density of 10 per 100,000, would reduce long drive times in isolated rural census tracts within the United States. As more states engage in pharmacy-based dispensing, planned placement of locations may allow for more efficient expansion of methadone access. Even dispensing methadone from CVS alone would result in a median reduction in drive times of over 20 minutes in rural census tracts, but represents a smaller density of pharmacies per 100,000 than what currently exist in Australia. At this lower density, a minority of census tracts still had drive times in excess of one hour.

Implementation of pharmacy-based methadone dispensing within the United States will require further research into the potential barriers and facilitators of adoption. Previous research on naloxone distribution within pharmacy settings suggests education of pharmacists, addressing stigma or people with substance use disorders, and identifying organizational champions will be required (Bakhireva et al., 2018; Wakeman et al., 2019). Among pharmacists and patients with OUD in the United Kingdom, implementation of pharmacy-based methadone was perceived as feasible and beneficial (Luger et al., 2000). While federal regulations provide a pathway for adoption of pharmacy-based dispensing, state regulations may require modification. Reliable access to urine drug screening will also be required. Currently, federal regulations allow pharmacists to supervise methadone dispensing and administer urine drug screening. Many chain pharmacies already offer onsite collection of common laboratory testing. Currently, OTPs are required to pair methadone treatment with behavioral treatments, a service pharmacies may not be equipped to offer. While evidence suggests contingency management improves retention in care at OTPs, evidence for other behavioral interventions is mixed (Dugosh et al., 2016). For this reason, the National Academy of Sciences and Medicine recommended patients have access to methadone regardless of availability of behavioral interventions (National Academies of Sciences and Medicine, 2019). Future research should examine the adaptation of contingency management to pharmacy-based settings.

The high travel burden associated with methadone may undermine its therapeutic potential. Longer drive times to the nearest OTP may affect treatment retention and quality of life among people with OUD in rural census tracts (Lister et al., 2019). For instance, rural substance use treatment counselors in Kentucky reported transportation and associated costs as a leading barrier to substance use treatment in rural communities (Pullen and Oser, 2014). Among patients engaged in a OTP in rural Vermont, 31% reported missing a dose due to transportation or transportation costs, and 22% reported travel time to the OTP interfered with employment (Sigmon, 2014). In Spokane Washington, patients who lived greater than 10 miles from the OTP were more likely to miss doses than patients who lived within five miles of the OTP (Amiri et al., 2018). Providers and patients at Veterans Health Administration primary care clinics in eight midwestern states reported travel distance as the

most important barrier to healthcare in rural communities, and the effect was compounded by health status, functional impairment, travel costs, and work and family obligations (Buzza et al., 2011). Long commutes to work have been shown to compete with other factors important for recovery, such as time spent with a spouse, children, and friends (Christian, 2012), and a daily commute greater than 20 minutes is associated with reduced psychological wellbeing and reduced access to social capital (Besser et al., 2008; Hilbrecht et al., 2014).

Our findings are consistent with previous research showing greater density of OTPs or shorter drive times in urban versus rural counties (Cummings et al., 2014; Dick et al., 2015; Hirchak and Murphy, 2017; Joudrey et al., 2019; Lenardson et al., 2008), and past work highlighting rural disparities in geographic access to healthcare, including greater travel times or distance to generalist and specialist providers (Chan et al., 2006; Stephens et al., 2013). Previous research estimating rural drive times among patients engaged in care for nine common diagnoses ranged from a median of 22.3 minutes (chronic obstructive pulmonary disease) to 42.0 minutes (malignancy) (Chan et al., 2006). Notably, these conditions do not require nearly daily visits like methadone signaling the additional burden of drive time for patients with OUD. These findings are consistent with previous research showing rural patients in care for OUD are less likely to receive methadone relative to urban patients (Stein et al., 2012). The potential impact of expanding geographic access to methadone via pharmacy-based dispensing on initiation and retention in methadone treatment in rural communities and its relationship to overdose deaths should be a focus of future research.

While rural census tracts were associated with longer drive times to the nearest OTP, long drives may be a barrier to methadone treatment in some urban census tracts. We found that nearly one third of census tracts with a drive time greater than 60 minutes were urban; pharmacy-based methadone dispensing reduced drive times to the nearest methadone dispensing facility by nearly 20 minutes or more in one quarter of urban census tracts. Previous transportation interventions within urban settings improved retention in methadone treatment. In Baltimore, patients receiving methadone at a mobile program had greater treatment retention relative to patients receiving methadone at fixed sites, and this difference was mediated by reduced travel times and transportation costs (Greenfield et al., 1996). Future research should examine how pharmacy-based dispensing impacts patient retention in methadone treatment in urban communities.

This study has several limitations. First, our drive times represent population estimates and cannot predict individual drive times. Second, the census tract distribution of people with OUD may not match the overall population distribution and may bias drive times in individual census tracts. Third, calculated drive times may underestimate true drive times as they do not account for traffic, construction, weather, or access barriers at the OTP (i.e. open treatment slots for initiation). Fourth, we did not account for public transportation. While drive times to OTPs were shorter in urban census tracts, this does not guarantee methadone access in these communities. Finally, census tracts in other regions, such as the mountain west, may face longer drive times to OTPs given the presence of isolated rural census tracts.

5. Conclusion

Long drive times to the nearest OTP disproportionately impact people with OUD in rural census tracts, creating a barrier to life-saving treatment with methadone in these communities. Drawing from policies to increase methadone access in other countries like Canada and Australia, the geographic disparity observed in methadone access could be mitigated through implementation of pharmacy-based methadone dispensing in the United States.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS

OUD	opioid use disorder
OTP	opioid treatment program
MOUD	medications for opioid use disorder
SAMHSA	Substance Abuse and Mental Health Services Administration
RUCA	Rural-Urban Commuting Area

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HIGHLIGHTS

There is a shortage of methadone dispensing facilities within the United States.

Cross-sectional geospatial analysis of drive time to the nearest dispensing facility

Rural census tracts have disproportionately long drive times to methadone.

This disparity could be mitigated by pharmacy-based methadone dispensing.

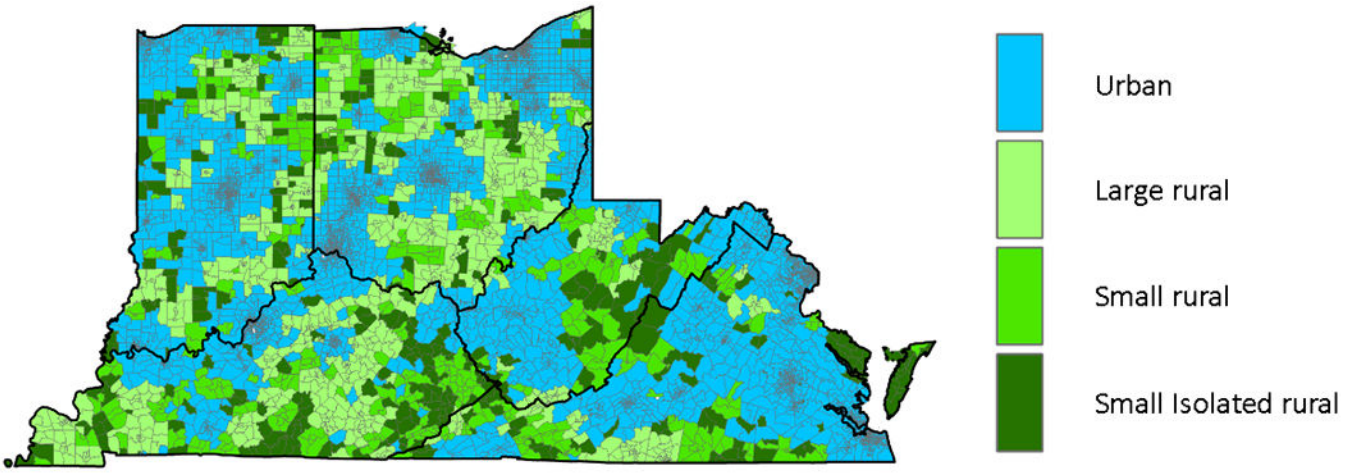

Figure 1:
2019 Rural-Urban Commuting Area (RUCA) codes urban-rural classification of census tracts

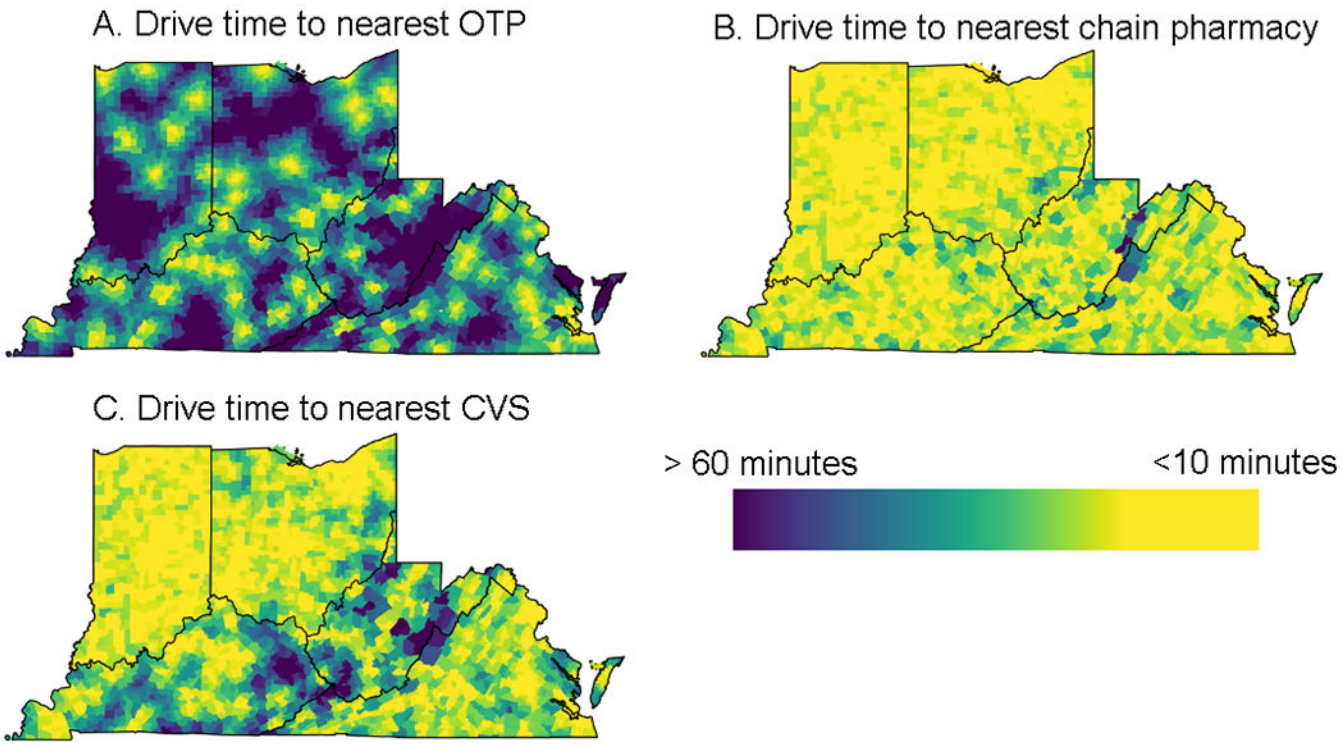

Figure 2:
Drive time from census tract mean center of population to the nearest opioid treatment program, chain pharmacy, and CVS pharmacy, 2019

Table 1:

Census tract characteristic by RUCA urban-rural classification (n=7,918)

Characteristic	All census tracts (n=7,918)	Urban[a] (n=6,020, 76.0%)	Large rural (n=1,081, 13.7%)	Small rural (n=506, 6.4%)	Isolated rural (n=311, 3.9%)	*p*-value
State, n (%)[b]						
Indiana	1,506 (19.0)	1,141 (19.0)	215 (19.9)	94 (18.6)	56 (18.0)	<.001
Kentucky	1,109 (14.0)	593 (9.9)	278 (25.7)	137 (27.1)	101 (32.5)	
Ohio	2,940 (37.1)	2,335 (38.8)	431 (39.9)	125 (24.7)	49 (15.8)	
Virginia	1,879 (23.9)	1,623 (27.0)	88 (8.1)	96 (19.0)	72 (23.2)	
West Virginia	484 (6.1)	328 (5.5)	69 (6.4)	54 (10.7)	33 (10.6)	
Census tract population, median (IQR)[d]	3,881 (2,791 – 5,209)	3,909 (2,712 – 5,340)	3,896 (3,031 – 4,942)	3,857 (3,026 – 4,826)	3,586 (2,673 – 4,617)	0.002
Total population in millions, n (%)[b]	32.8	25.3 (77.1)	4.4 (13.3)	2.0 (6.1)	1.1 (3.5)	<.001
Percentage of residents who commute by public transportation[be]	2.2	2.6	0.4	0.3	0.4	<.001
Percentage of households with one or more vehicle[be]	92.6	92.7	92.8	92.1	90.7	<.001

[a]Rural-Urban Commuting Area (RUCA) codes from the United States Department of Agriculture Economic Research Service urban-rural classification of census tracts

[b]Chi-squared test

[d]Kruskal-Wallis test

[e]American Community Survey 5-year estimates 2013-2017 percentage of workers who commute by public transportation excluding taxicabs and percentage of household with one or more vehicle

Table 2:

Drive time in minutes from census tract center of population to the nearest Opioid Treatment program (OTP), chain pharmacy, and CVS pharmacy by RUCA classification within a five state Ohio valley region in 2019 (n=7,918)

	Drive time in minutes, median (IQR)				
Classification[a]	**To OTP**	**To chain pharmacy**[c]	***p*-value**[b]	**To CVS**	***p*-value**[b]
All census tracts	19.6 (11.6 – 35.1)	4.4 (2.9 – 7.7)	<.001	6.1 (3.8 – 11.3)	<.001
Urban	16.1 (10.2 – 25.9)	4.1 (2.8 – 6.1)	<.001	5.5 (3.6 – 8.6)	<.001
Large rural	38.7 (25.4 – 52.5)	6.2 (3.6 – 11.0)	<.001	8.7 (4.7 – 16.0)	<.001
Small rural	45.6 (33.1 – 58.7)	6.8 (3.2 – 12.8)	<.001	15.2 (5.5 – 28.3)	<.001
Isolated rural	48.4 (34.0 – 63.3)	13.3 (8.4 – 18.7)	<.001	23.5 (13.7 – 36.4)	<.001

[a] Rural-Urban Commuting Area (RUCA) codes from the United States Department of Agriculture Economic Research Service urban-rural classification of census tracts

[b] Wilcoxon signed-rank test OTP vs chain pharmacy, OTP vs CVS, and chain pharmacy vs CVS

[c] Chain pharmacies were CVS, Rite Aid, Walgreens, and Walmart

Table 3:

Median difference in drive time to nearest facility by RUCA classification within a five state Ohio valley region in 2019 (n=7,918)

	Difference in drive time in minutes, median (IQR)			
Classification[a]	**To OTP vs To chain pharmacy**[c]	***p*-value**[b]	**To OTP vs To CVS**	***p*-value**[b]
All census tracts	13.9 (7.1 – 26.8)		11.2 (4.8 – 23.3)	
Urban	11.5 (6.1 – 19.2)	<.001	9.5 (4.3 – 16.8)	<.001
Large rural	31.5 (16.1 – 44.6)		27.7 (10.6 – 42.4)	
Small rural	36.2 (25.0 – 51.0)		29.4 (10.0 – 44.6)	
Isolated rural	35.2 (19.6 – 49.7)		22.9 (5.6 – 39.2)	

[a] Rural-Urban Commuting Area (RUCA) codes from the United States Department of Agriculture Economic Research Service urban-rural classification of census tracts

[b] Kruskal-Wallis test

[c] Chain pharmacies were CVS, Rite Aid, Walgreens, and Walmart