Enduring Racial and Ethnic Inequities in Travel Times to Access Acute Care in the Rural U.S. South, 2007-2018

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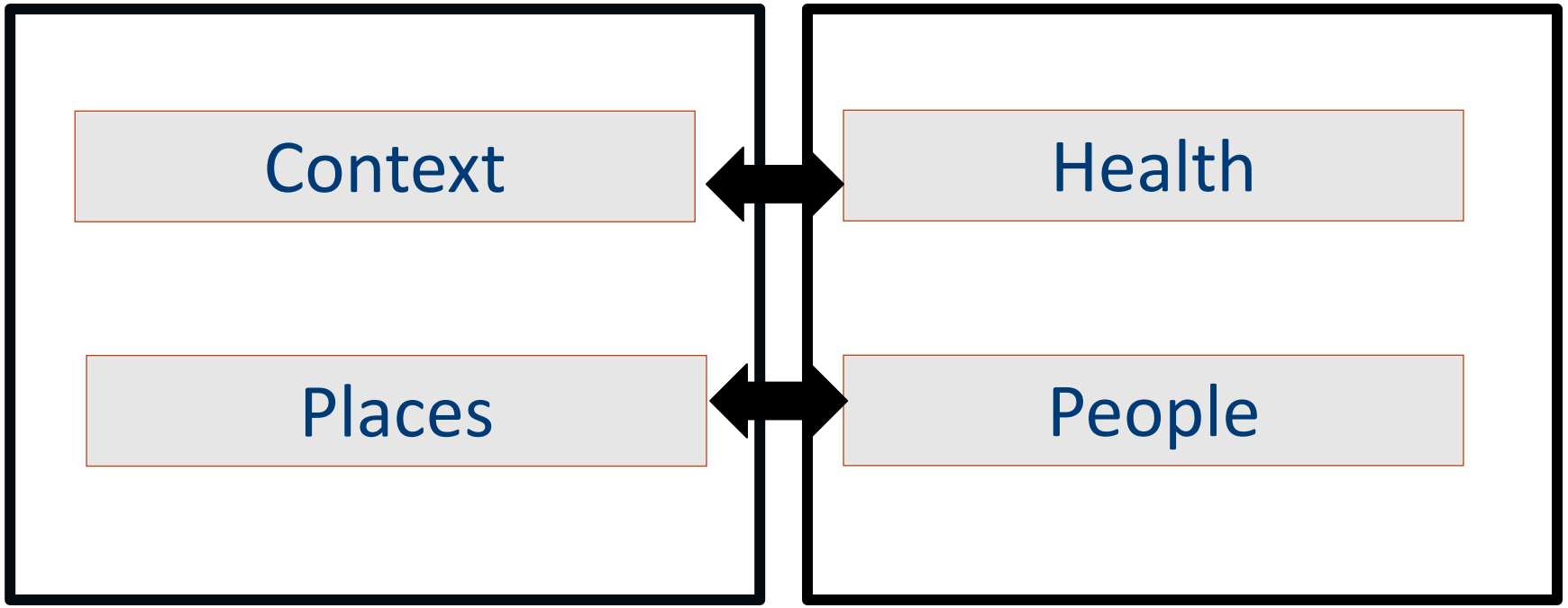
What is Health/Medical Geography?

In a nutshell, the study of health and well-being in place. The interplay between:

- Composition: characteristics of people and their representation in the population
- Context: characteristics of places; the contexts of daily life
- Collective: relationships among people and groups; social relations

Methods span qualitative and quantitative. The quantitative medical geography tradition is closely related with social and spatial epidemiology and disease ecology.

Relational Perspectives in Health Geography



Spatial Processes

Ecological, historical, political-economic processes & policies; path dependencies

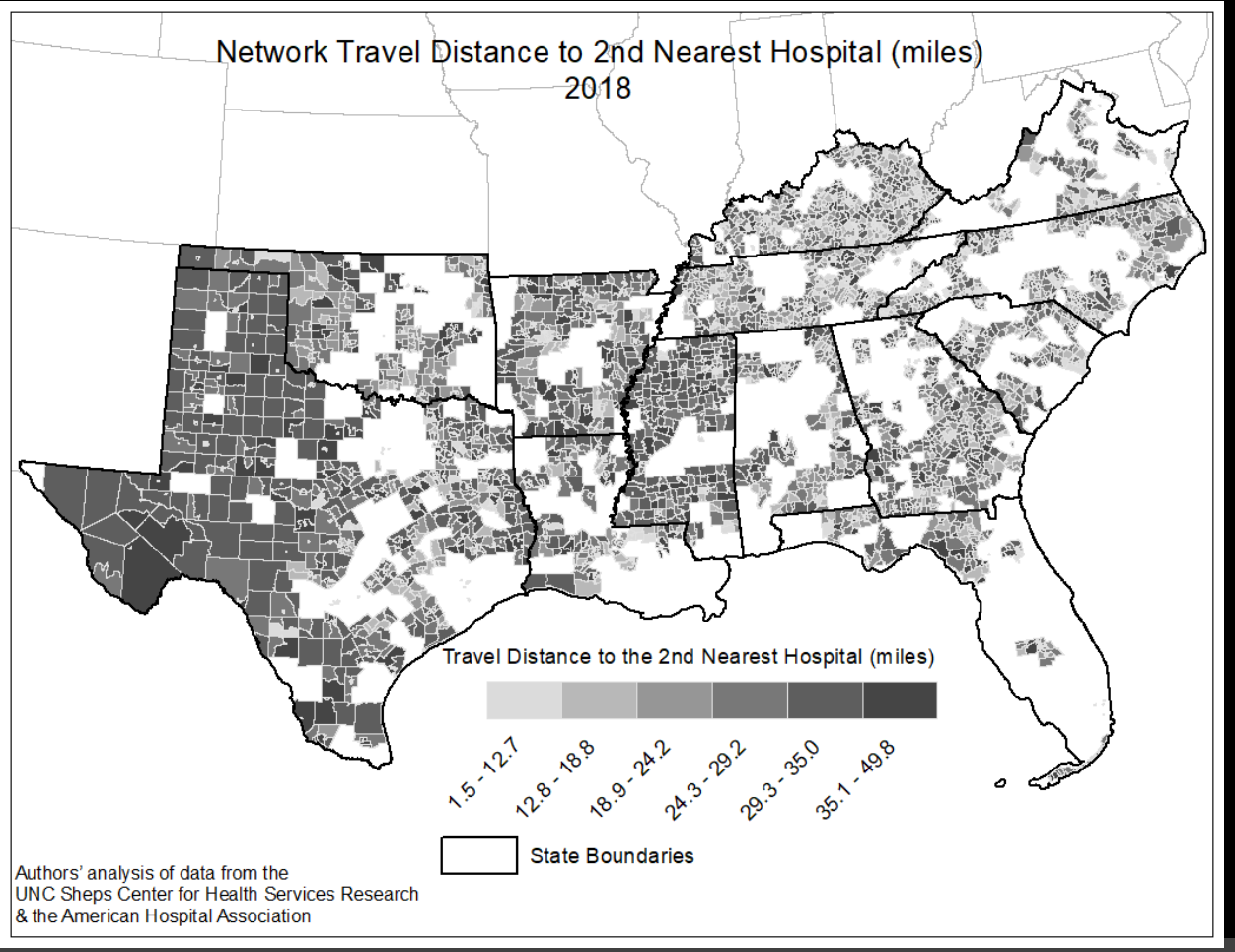
Mobility, behaviors, perceptions, experiences, individual and social differences

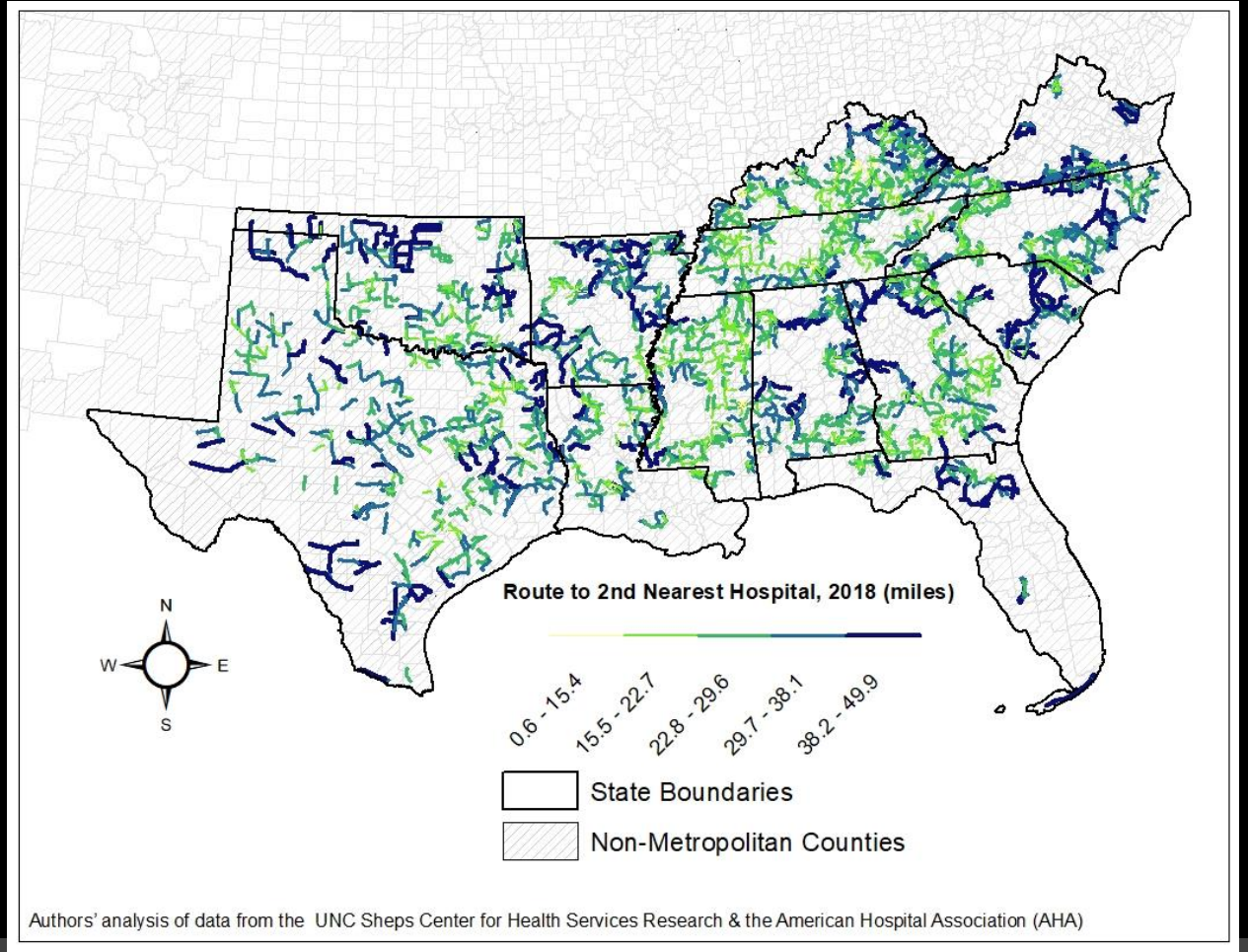
Credit: Sara L. McLafferty

Defining & Conceptualizing Structural Racism

"The **macrolevel systems, social forces, institutions, ideologies & processes** that interact with one another to **generate & reinforce inequalities** among racial & ethnic groups."

(Gee & Ford, 2011)





NETWORK TRAVEL DISTANCE + ROUTES TO SECOND NEAREST HOSPITAL, 2018

"What kind of geography for what kind of public policy?" – David Harvey

The neoliberal, experimental turn in U.S. policymaking exacts a tax on the most impoverished.

Growing body of work on administrative burdens- or the onerous burdens placed on people/communities in greatest need.

- Administrative burdens associated with accessing health care increase likelihood of foregone care among Black and disabled patients (Kyle & Frakt, 2021)
- Requiring in-person appointments to continue eligibility for nutrition programs for women, infants, & children (Vasan et al 2021)
- "Work requirements" requiring up to 40 hours of active job searching to maintain eligibility for Medicaid
- Cutting unemployment benefits to induce re-entry into the workforce after pandemic job losses (Altonji et al, 2021)

A less-examined facet: Time

- The emphasis in policy evaluation work is frequently on whether an implemented policy achieved its stated aims ("fidelity"), and whether there were disparate impacts.
  - Less examined: the time burdens of social policies and programs (e.g. administrative burdens) & the costs that they impose on those who can least afford it
  - These inequities arise from pre-existing, spatially uneven distributions of resources like healthcare, social services, affordable housing, and jobs.

e.g. **In the U.S., nearly 110,000 disabled people (~1.2% of applicants), died prior to receiving a final decision about their appeal for Social Security Insurance (SSI) between 2008-19** (GAO, 2020)


Why time?

Time as a Social Determinant of Health

- **Time is a resource that is socially patterned, and this patterning is fundamentally shaped by the spatial allocation of key resources, including jobs and healthcare facilities (White, Haas, & Williams, 2012).**
- In addition to longer wait times for needed care, Black and Latinx people in the U.S. frequently have travel times to access needed care.
- **Overall, POC experience high degrees of time scarcity** attributable, in part, to their disproportionate occupational sorting into precarious jobs without paid sick leave, longer work commutes borne of the spatial mismatch between where they live and work
  - Disabled WOC (esp. Black women) face the most severe trade-offs between wages, commute times, and housing affordability (Wong et al, 2020)
- Moreover, in the context of higher chronic disease prevalence in Black and Latinx communities, time scarcity is associated with greater difficulty in chronic disease management, such as diet modification.

Time as Exposure & Resource

The **spatially uneven (& racially disparate) distribution of resources and hazards** (e.g. chronic stress in segregated neighborhoods; exposures borne of environmental racism) & their (inequitable) downstream effects

Time use (e.g. time costs of commuting to work, accessing healthcare services…)

- (Stradzins et al, 2011; Gee et al, 2019)

Wages (trade-offs between wages, commute times, and housing affordability)

- **Rich literature on spatial mismatch that jointly considers time costs with social & monetary costs borne of the allocation of resources that favors white & wealthy people in segregated social space**

Implications for healthcare (in)equity

- For rural residents, travel distance to care is a key barrier to health care utilization, not only impacting the frequency, timing, and cost of hospital visits, but also potentially affecting health outcomes.
- **Longer travel times to access care = downstream implications for patients**, including:
  - hospitalizations for ambulatory care sensitive conditions (Laditka, Laditka, and Probst, 2009)
  - longer ambulance travel times and worse survival rates for emergent conditions (Troske & Davis, 2019)
  - lower rates of post-hospitalization follow-up care, higher rates of Emergency Department use (Toth et al, 2015)
  - delayed diagnoses and worse severity of conditions (Huang et al, 2009)

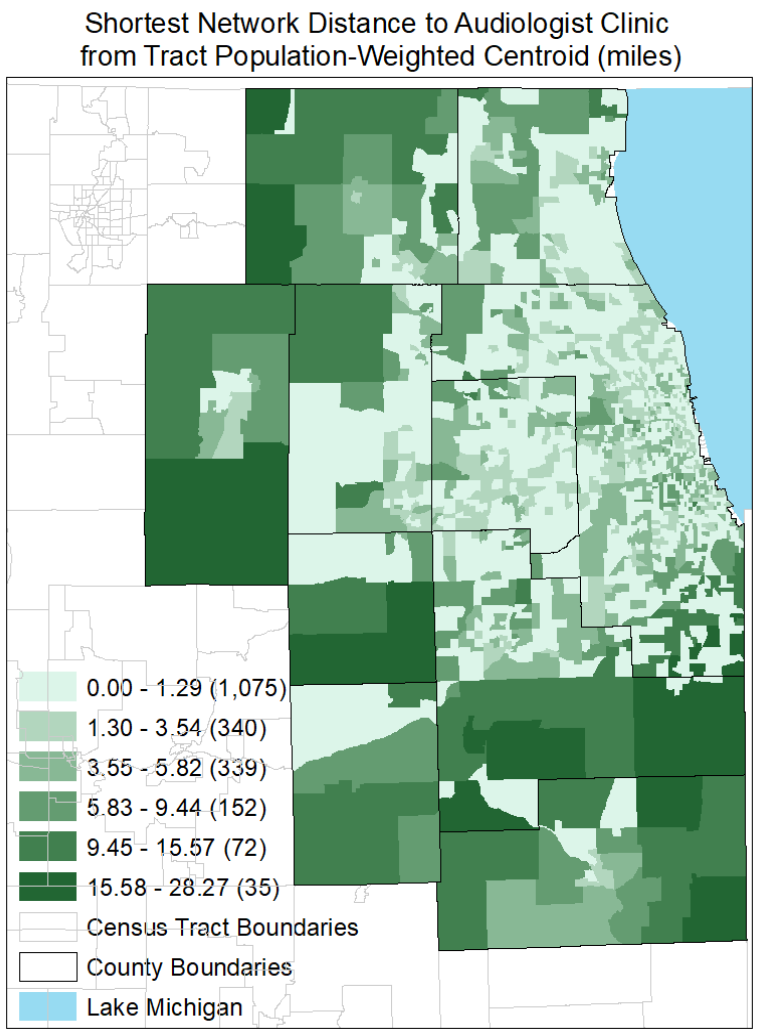
Why does this matter amid COVID-19?

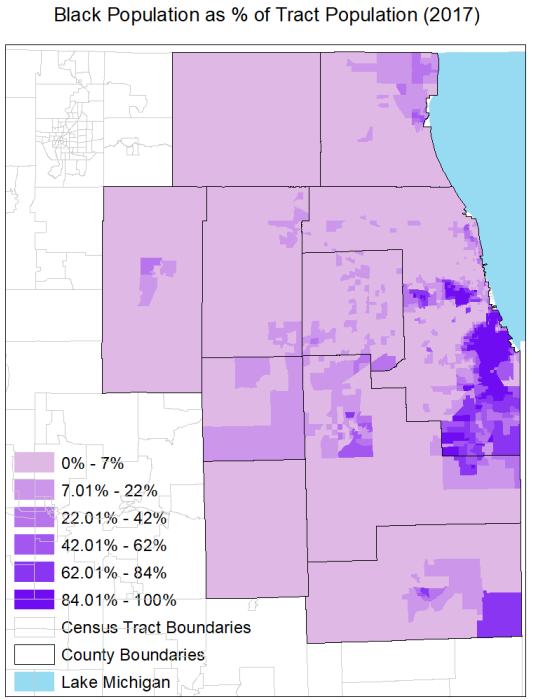
The least-vaccinated groups in the U.S. are working-age adults who work low-wage jobs

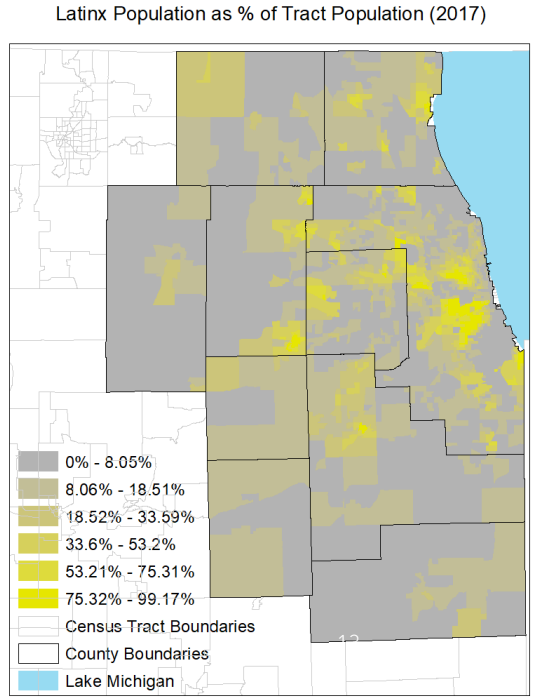
- This includes Black and Latinx workers, who are disproportionately infected and dying because they are less likely to have the option to work remotely compared with their white counterparts (U.S. Bureau of Labor Statistics, 2019).
- Lack of paid sick leave is a commonly cited barrier to receiving the COVID-19 vaccines.

Unequal travel burdens by race, ethnicity, & class

In prior work, I found that specialist(audiologist) co-location with referring PCPs reinforces class, racial, & ethnic disparities in spatial access to care within the segregated Chicagoland metro region.







What about racial & ethnic inequities in travel burdens to access to care in rural contexts?

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Research Questions

1. How have distances to hospital-based acute care changed between 2007-2018 in the U.S. South, after accounting for closures, mergers, and conversions?
2. What are population, health system and policy characteristics associated with travel time to the nearest & 2nd nearest short-term acute hospital?

Study Area, Data, & Methods

Study Area: 3567 census tracts nested within 790 rural counties in the U.S. South (defined as including TX, OK, AR, LA, MS, AL, TN, KY, VA, NC, SC, GA, and FL), which includes 12.6 million rural residents

Data Sources: American Hospital Association (AHA) annual survey (2007; 2018); U.S. Census Bureau (ACS 2014-18; Decennial 2010) data; RWJF County Health Rankings dataset, 2017; NC Rural Health Research Program Rural Hospital Closures dataset, 2005-2020

Analysis: Network analysis; Descriptive statistics characterizing tract-level travel distance and times by racial and ethnic composition; 3-level mixed effects generalized linear models (state and county fixed effects)

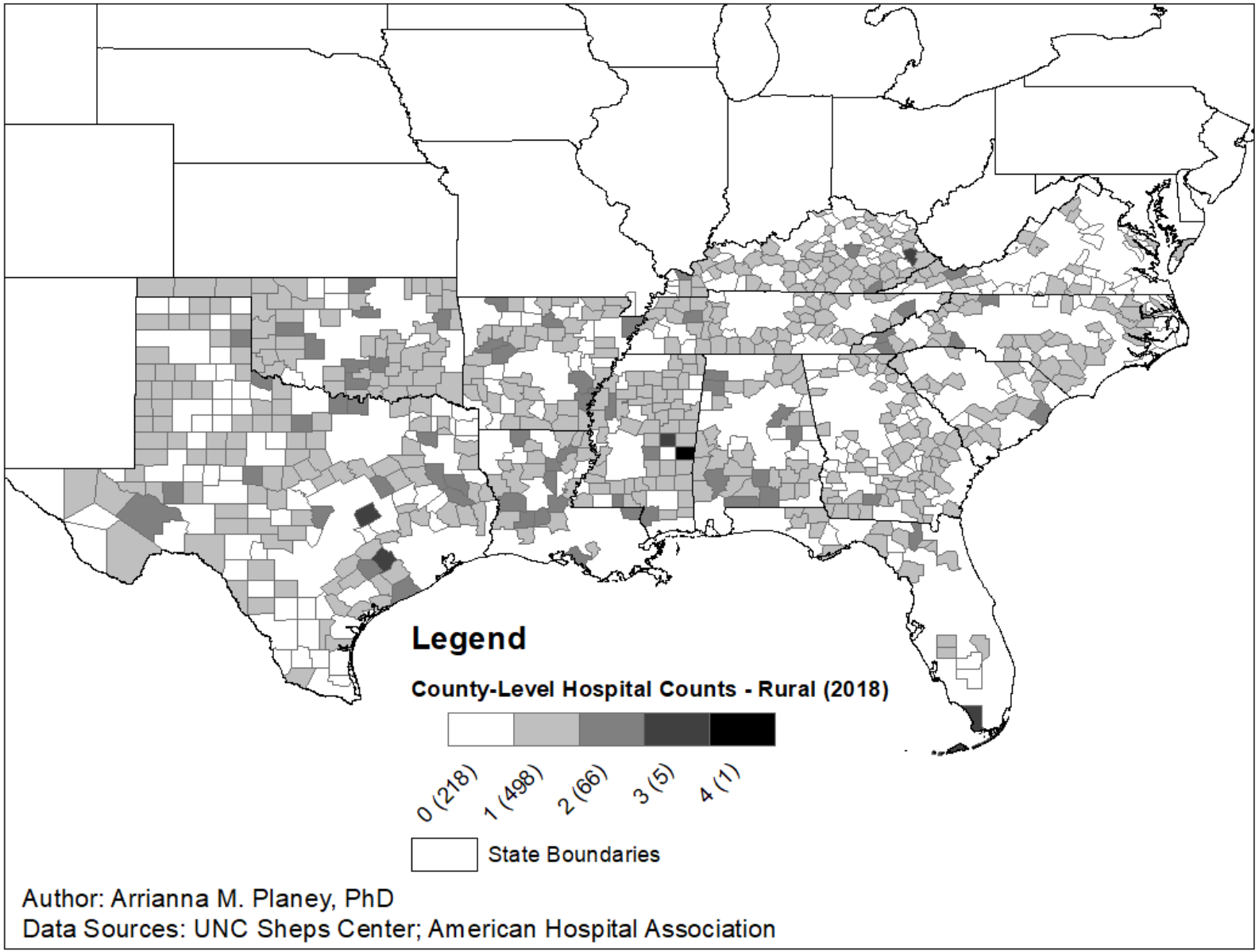
Variables

Dependent Variables

- Tract-level travel times to nearest acute care hospital
- Tract-level travel times to 2nd nearest acute care hospital

Covariates

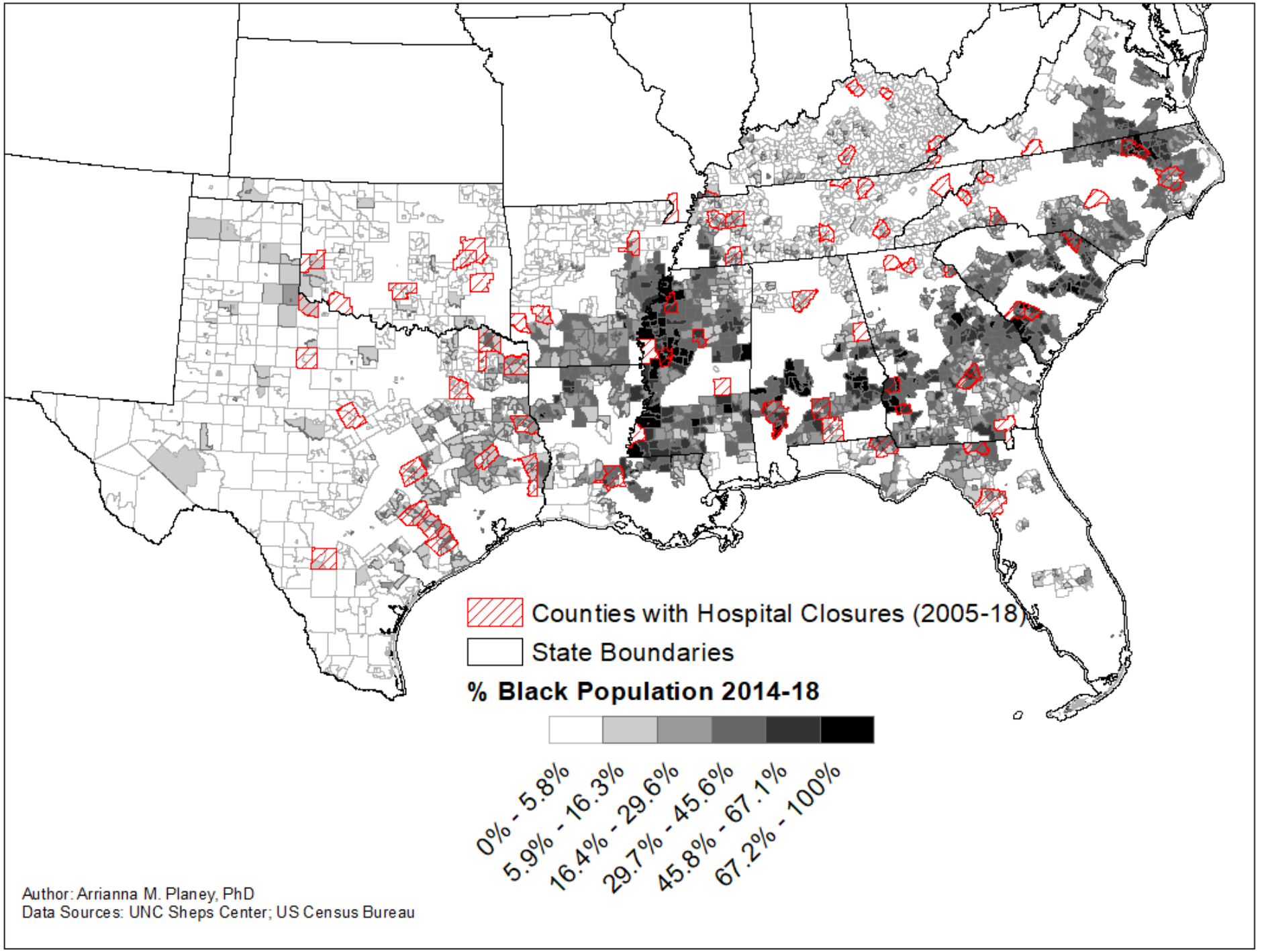
- Tract
  - % Black
  - % Latinx
  - Median household income
  - Gini Coefficient
- County
  - Rurality (RUCC 2013)
  - Closure status
  - Uninsured rate (<65)
  - Median age
  - Age dependency ratio (change between 2010-18)
- State
  - Health insurance market concentration
  - Medicaid expansion status, 2018



Counties with ≥1 Hospital in FY 2018

Between 2007-18, **the number of rural counties in the U.S. South with no hospitals increased** from 177 (22.4%) to 218 (27.6%). Of those, **33 lost their remaining hospital due to a closure.**

Relatedly, the number of rural counties with more than one hospital decreased from 140 (17.1%) to 72 (9.1%)

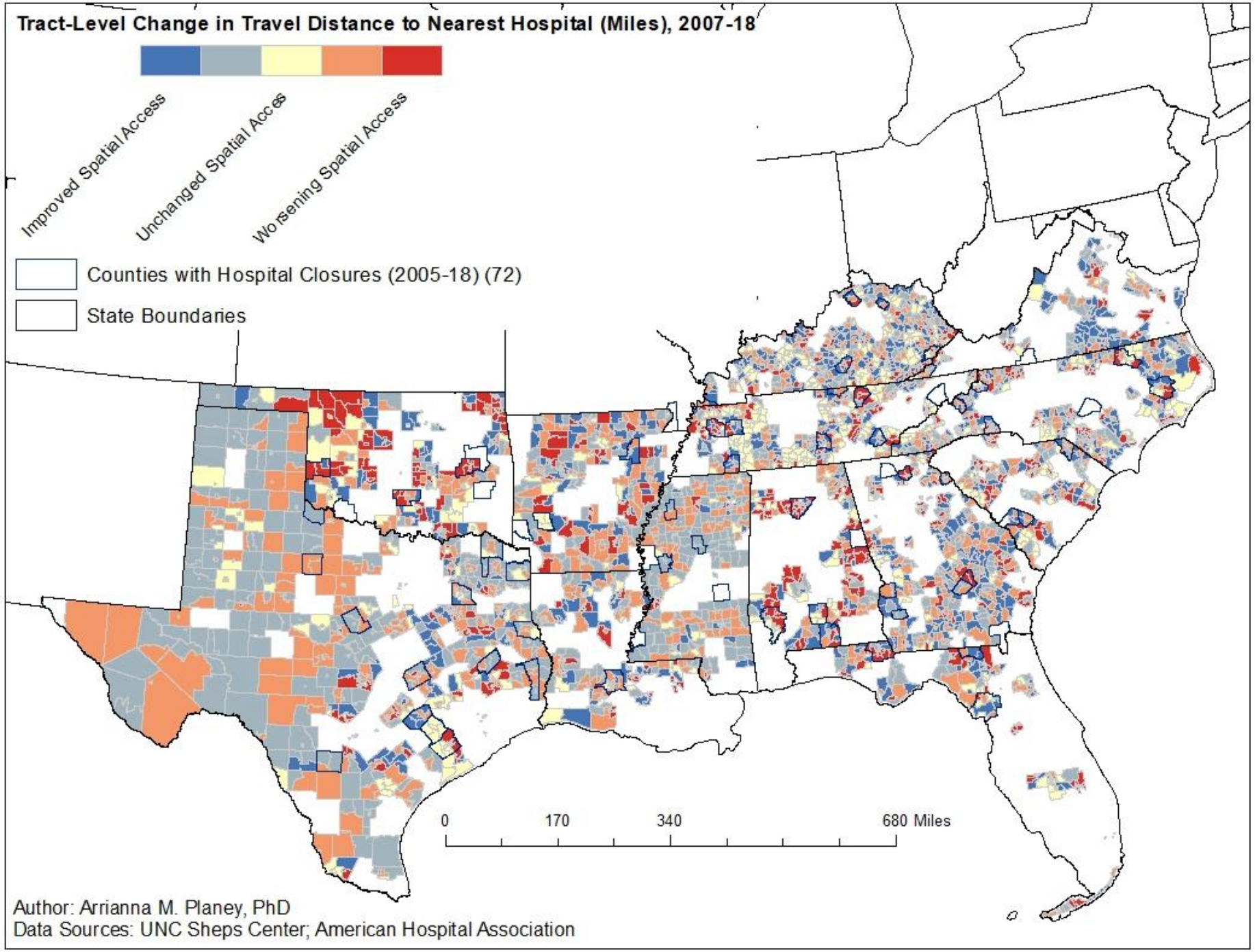


The contemporary wave of rural hospital closures has had racially disparate impacts. Majority-Black rural communities are at elevated risk (Thomas et al 2016)

Counties with hospital closures overlaid on the tract-level share of Black residents

(2014-18)

RQ1: How have distances to hospital-based acute care changed between 2007-2018 in the U.S. South, after accounting for closures, mergers, and conversions?



Changes in Spatial Accessibility of Hospital-Based Care in Rural Places

(2007-2018)

Blue = Improved spatial access (1,643 Tracts)

Yellow = Unchanged spatial access (336 Tracts)

Red = Worsened spatial access (1,588 tracts)

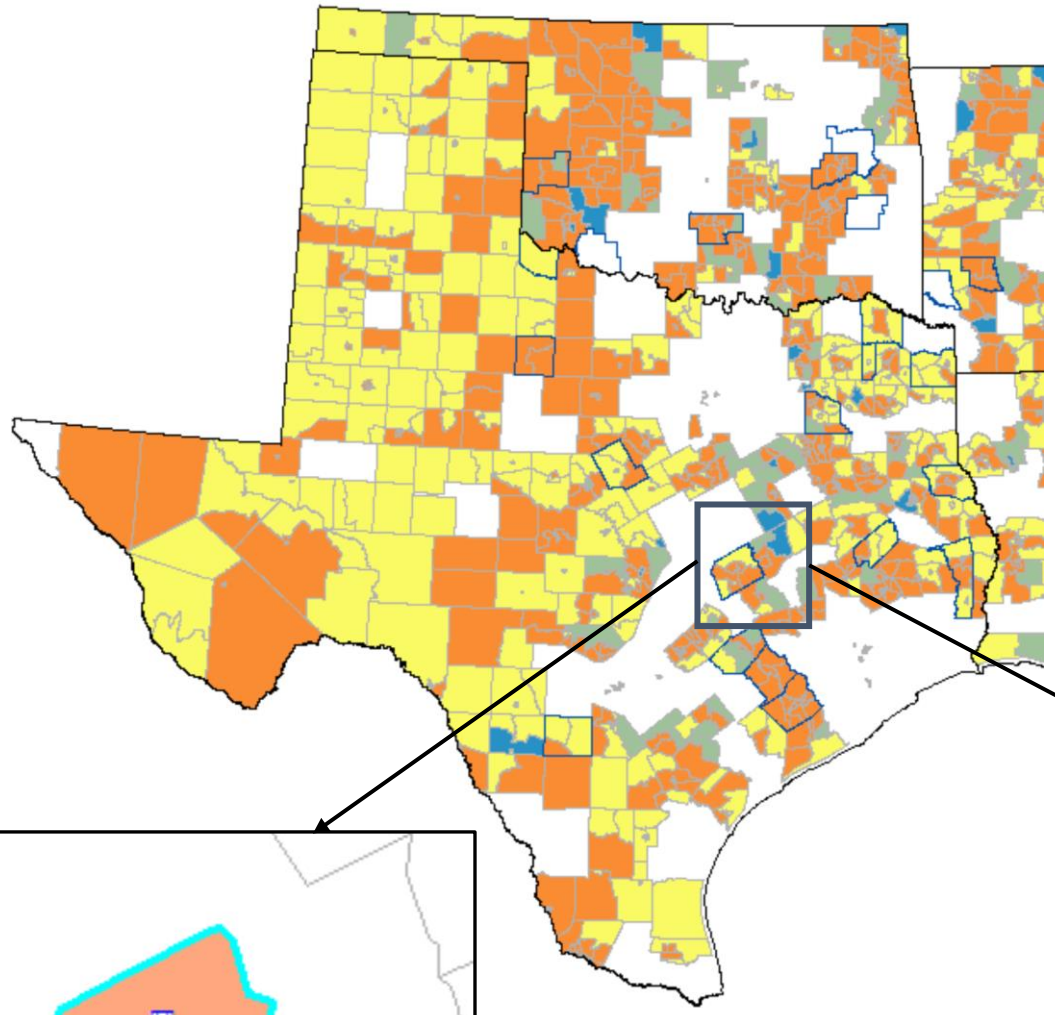
Change in Tract-Level Spatial Accessibility of Nearest Hospital within Rural Counties in the U.S. South (2007-2018)

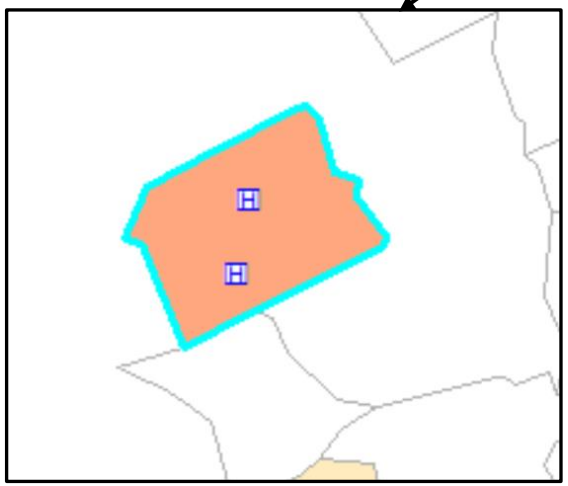
	Changes in Spatial Accessibility of Hospitals (2005-19)		
Degree of Rurality (Rural-Urban Continuum Codes 2013)	**Improved** 1,643 Tracts	**Unchanged** 336 Tracts	**Worsened** 1,588 tracts
4 – Nonmetro - Urban population of 20,000 or more, adjacent to a metro area	260 (15.8%)	44 (32.4%)	342 (21.5%)
5 – Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area	101 (6.1%)	18 (5.4%)	107 (6.7%)
6 – Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area	667 (40.6%)	138 (41.1%)	625 (39.4%)
7 – Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area	324 (19.7%)	87 (25.9%)	310 (19.5%)
8 – Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area	151 (9.2%)	22 (6.5%)	111 (7.0%)
9 - Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro area	140 (8.5%)	27 (8.0%)	93 (5.9%)

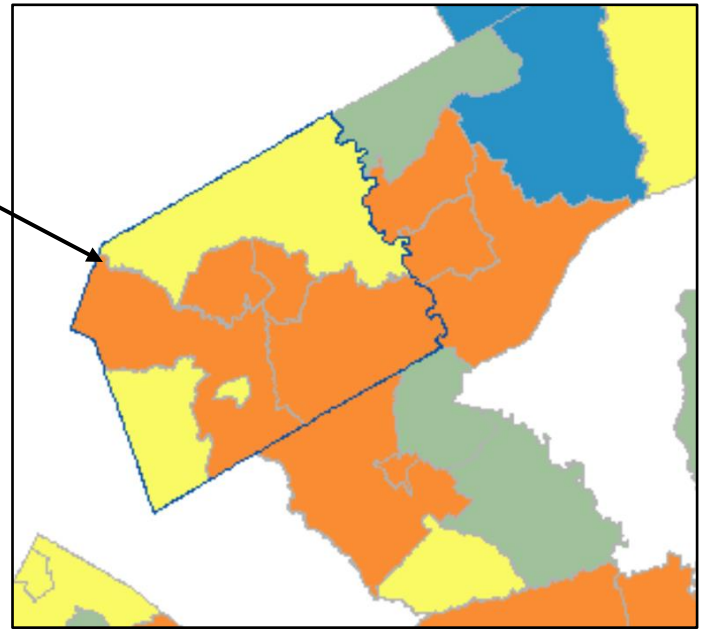
Are there racial & ethnic disparities in how distances to care have changed between 2007-2018?

Racial & Ethnic Disparities in Changes in Spatial Access to Nearest Hospital across the Rural U.S. South, 2007-2018

	Majority-Black Tracts (n = 221)	Majority-Latinx Tracts (n = 207)	Majority-American Indian Tracts (n = 6)	Majority-white Tracts (n = 2763)
Improved Accessibility	106 (48.0%)	101 (48.8%)	4 (66.6%)	1249 (45.2%)
Unchanged Accessibility	15 (6.8%)	6 (2.9%)	0 (0%)	366 (13.2%)
Worsened Accessibility	100 (45.2%)	100 (48.3%)	2 (33.3%)	1148 (41.5%)



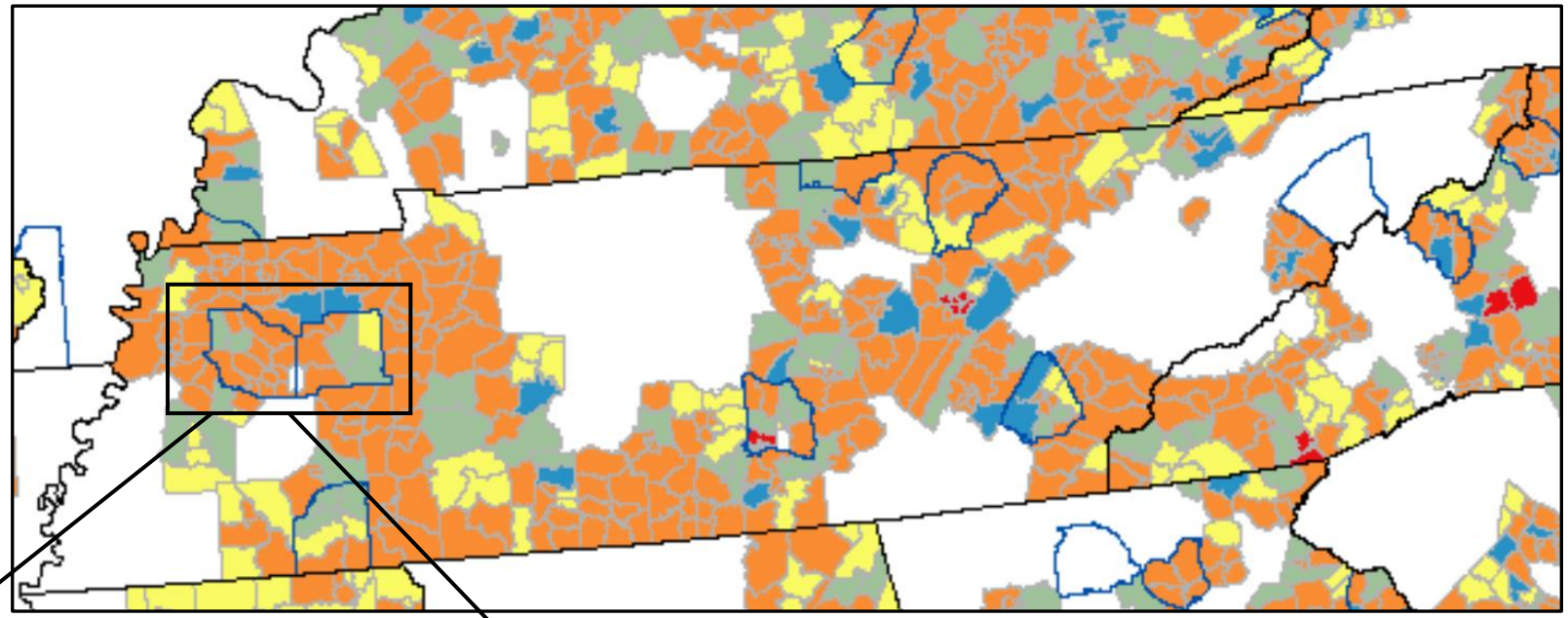


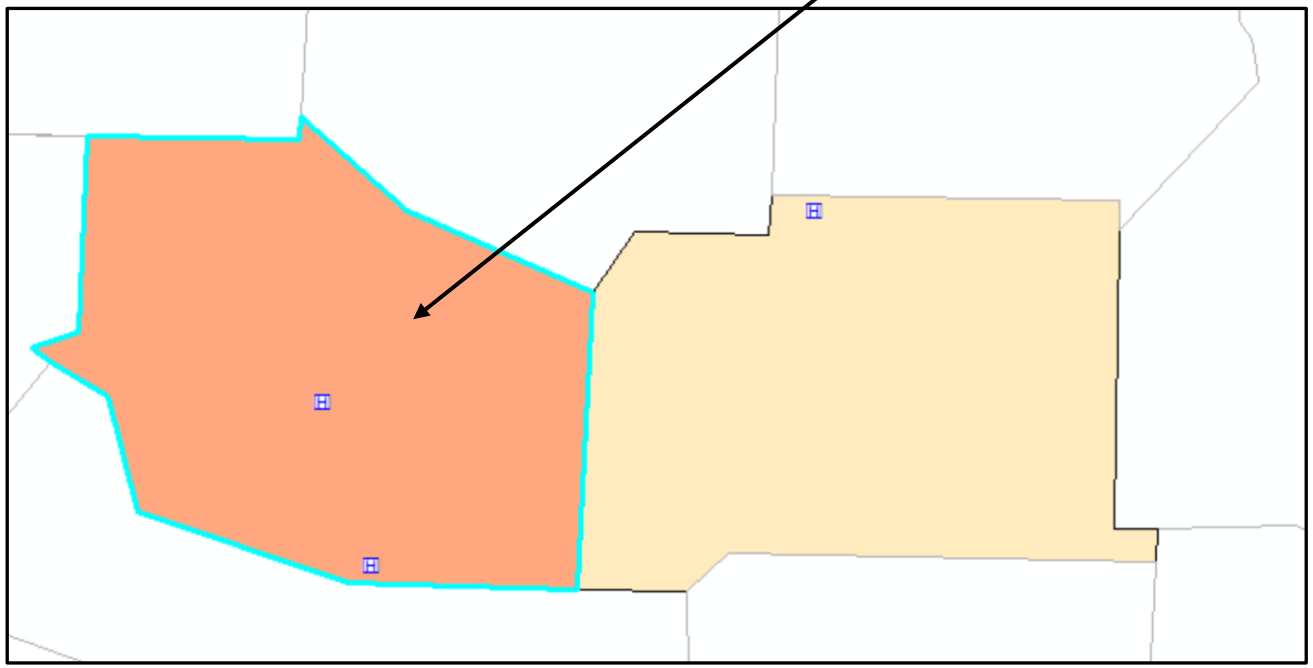


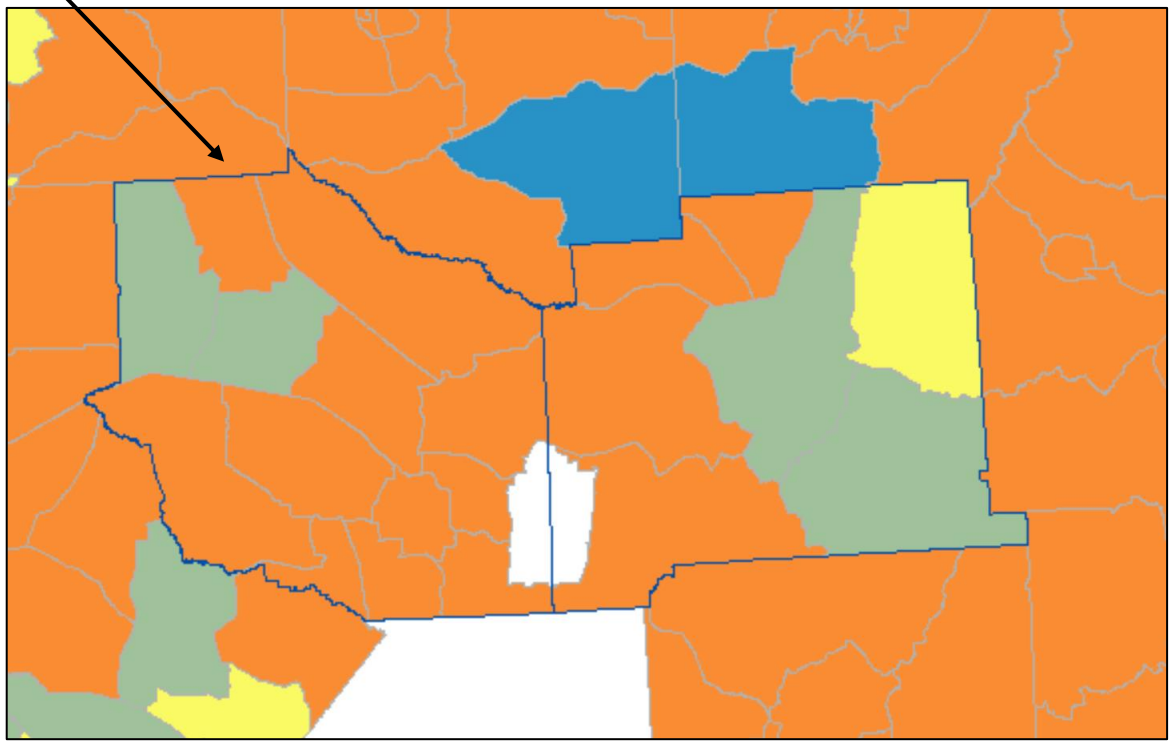
While most counties with closures had one rural hospital closure, two counties had 2 closures: Milam County, TX (59 beds lost) and Gibson County, TN (83 beds lost).

Note that tracts within Milam County, TX were differentially affected by closures, and spillover effects of closures can be observed in tracts in neighboring counties.

A similar pattern can be observed for tracts within Gibson County, TN, which also had 2 closures in the study period.



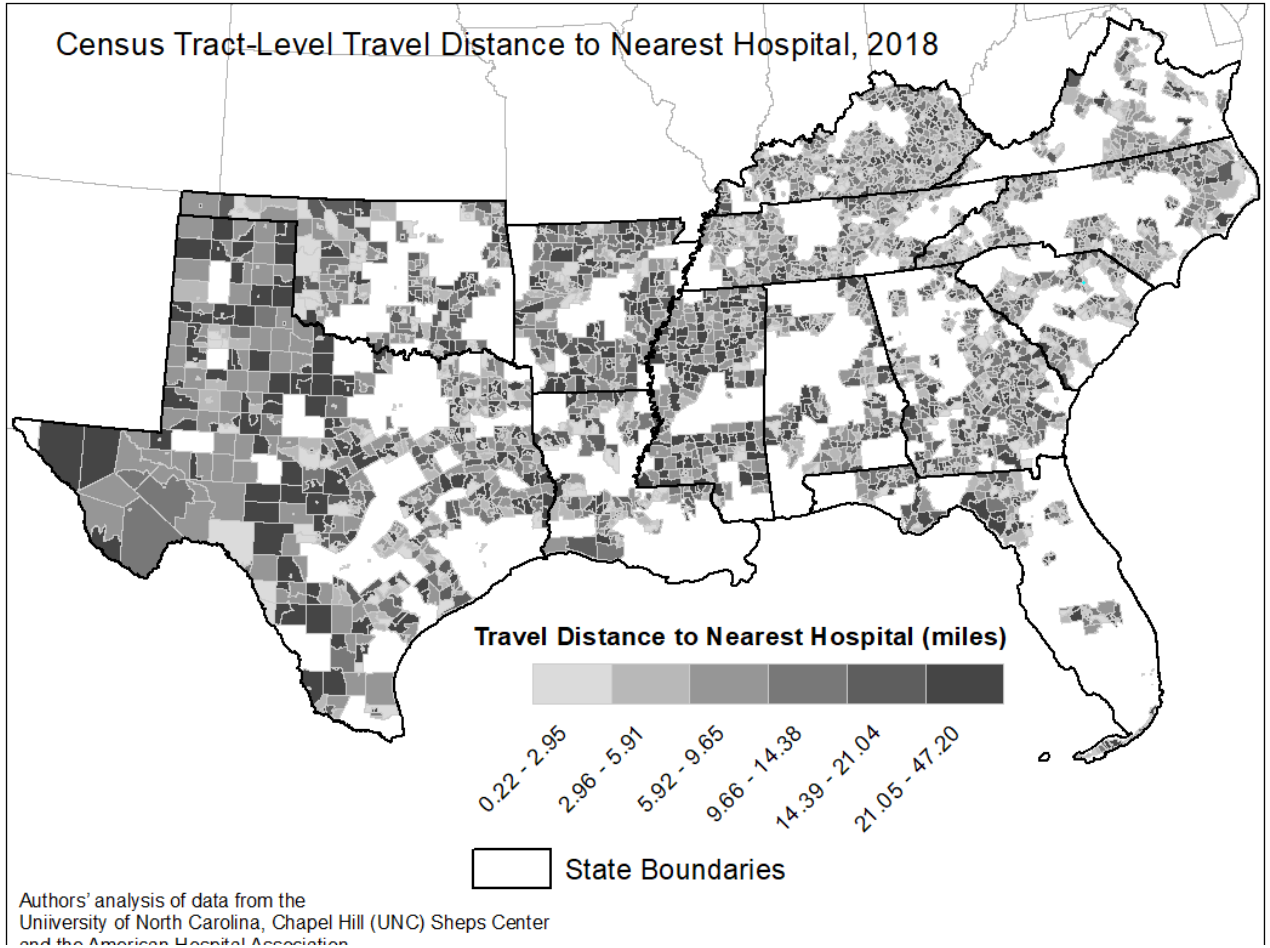


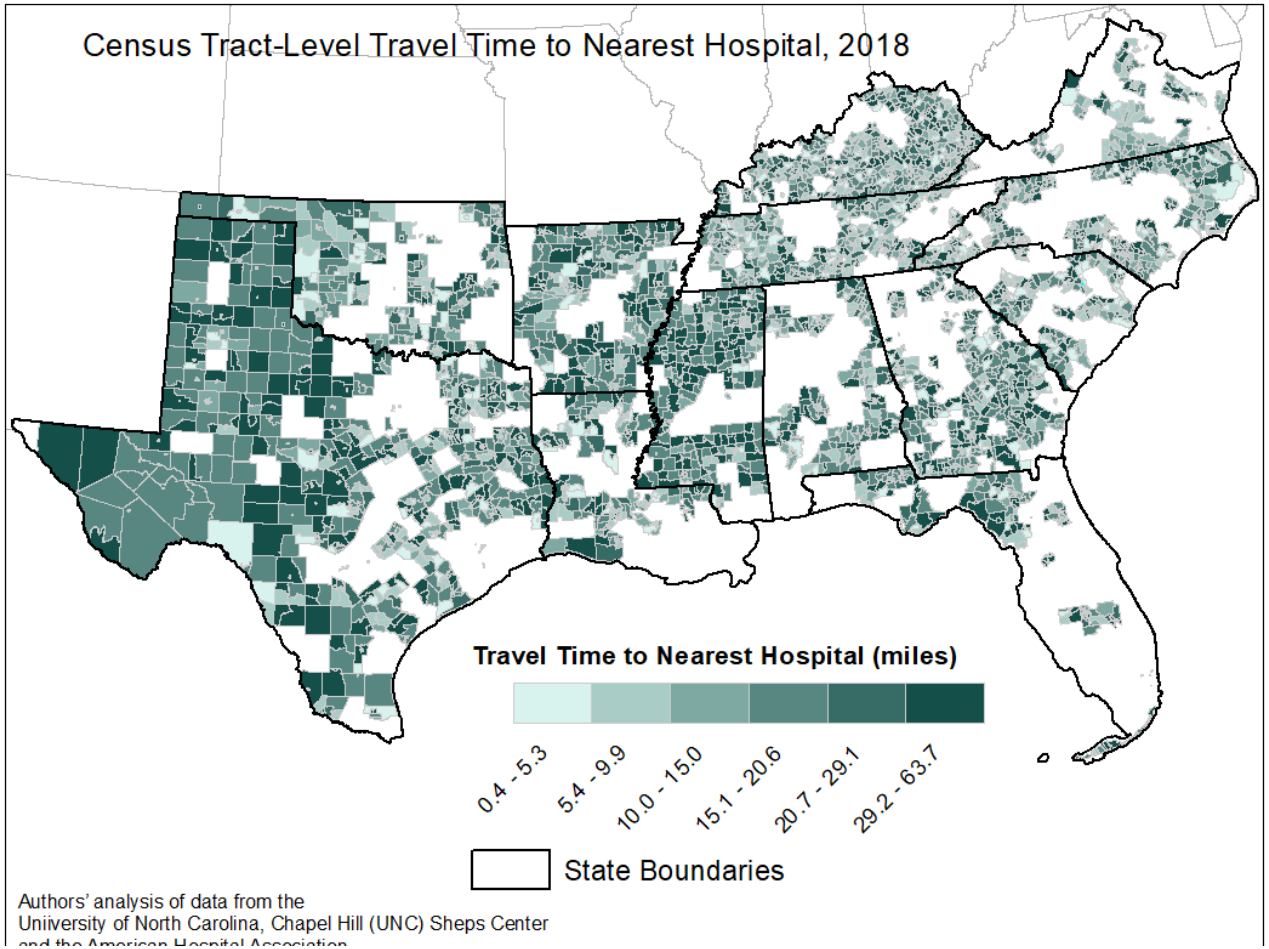


RQ2: What are Population, Health System and Policy Characteristics Associated with Travel Time to 2nd Nearest Short-Term Acute Care Hospital?

MEAN NETWORK TRAVEL TIME AND DISTANCE TO ACCESS NEAREST AND NEXT NEAREST HOSPITAL BY RURALITY
(2018)

	Nearest Hospital		Next Nearest Hospital	
Degree of Rurality (Rural-Urban Continuum Codes 2013)	**Travel Distance (miles)**	**Travel Time (minutes)**	**Travel Distance (miles)**	**Travel Time (minutes)**
4 – Nonmetro - Urban population of 20,000 or more, adjacent to a metro area	15.6 (10.3)	10.1 (8.5)	34.6 (11.5)	25.6 (9.1)
5 – Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area	14.1 (9.4)	8.7 (7.2)	33.5 (11.5)	25.1 (9.2)
6 – Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area	17.9 (11.1)	11.8 (8.8)	35.5 (9.6)	26.6 (7.5)
7 – Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area	19.1 (11.1)	12.7 (8.6)	36.5 (10.3)	27.3 (7.6)
8 – Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area	21.0 (10.6)	13.8 (8.2)	36.1 (9.4)	27.0 (7.0)
9 - Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro area	20.7 (10.1)	13.6 (8.0)	36.9 (8.6)	27.6 (6.5)





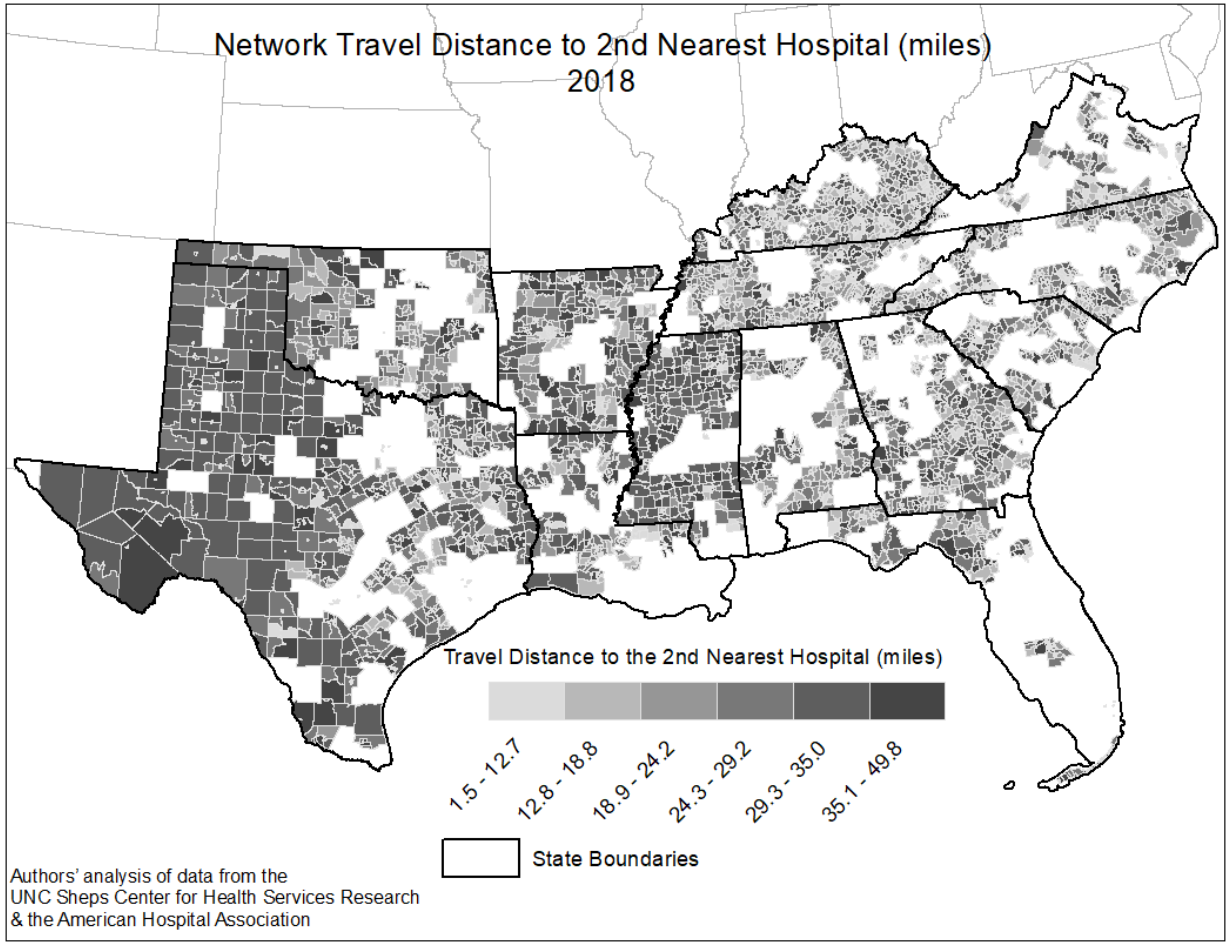
NETWORK TRAVEL DISTANCE/TIME TO NEAREST HOSPITAL, 2018

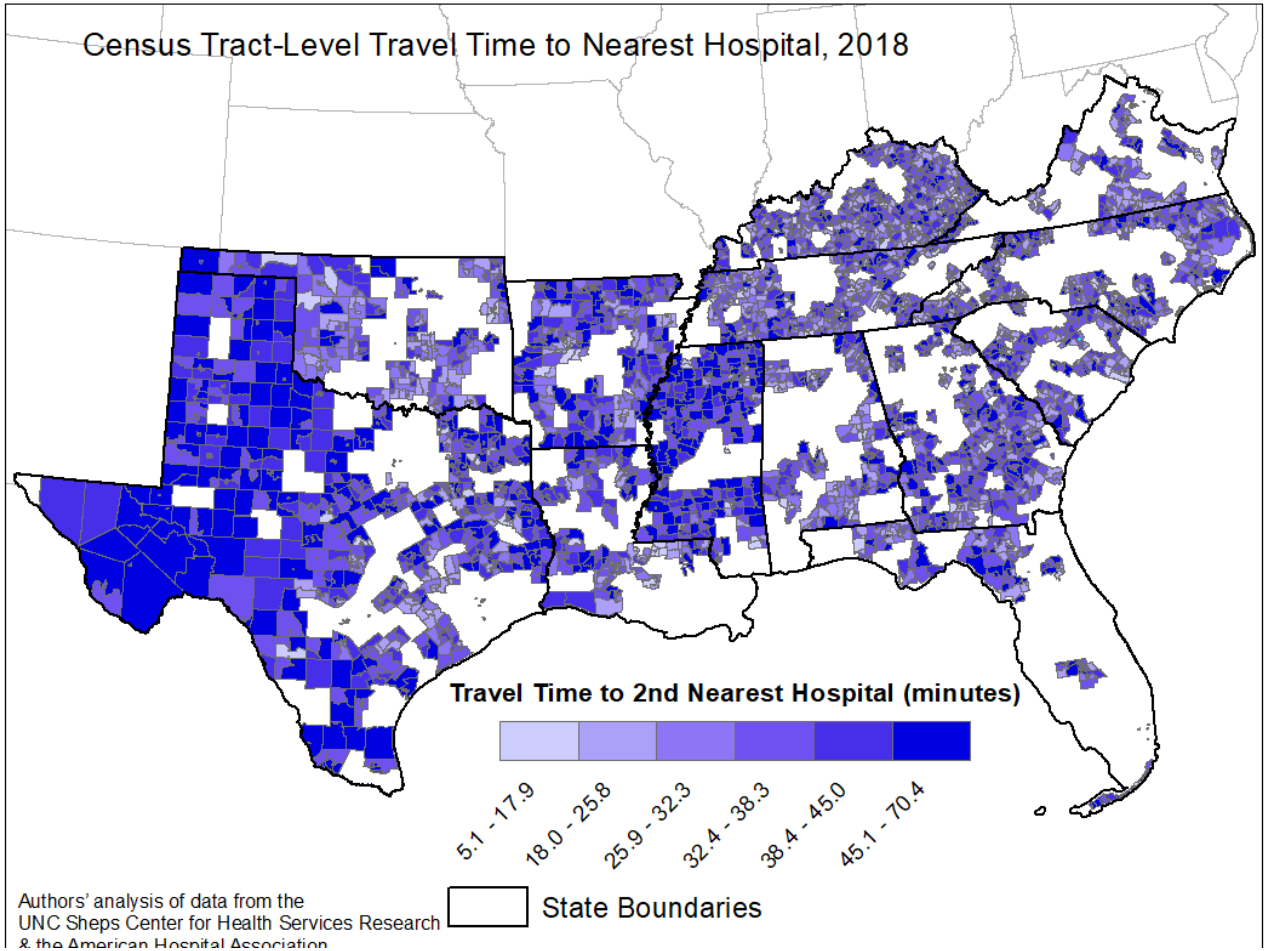
Tract-Level Network Travel Distance & Travel Time to Hospital-Based Acute Care By Racial & Ethnic Composition (2018) - mean(SD)

		Majority-Black Tracts		Majority-Latinx Tracts		Majority-White Tracts	
		Travel Distance (mi)	Travel Time (min)	Travel Distance (mi)	Travel Time (min)	Travel Distance (mi)	Travel Time (min)
2018	Nearest Hospital	15.4 (8.6) miles	22.2 (10.1) minutes	19.1 (13.1) miles	24.3 (13.7) minutes	16.2 (9.5) miles	22.8 (11.2) minutes
	Next Nearest Hospital	28.2 (6.6) miles	37.4 (8.4) minutes	28.9 (7.5) miles	38.2(9.9) minutes	26.3 (7.9) miles	35.2 (10.3) minutes

Network travel distance and time between population-weighted census tract centroids and nearest and second-nearest operating rural hospital in 2018 (AHA dataset)

In 2018, across the rural U.S. South, residents in majority-Latinx tracts had the longest travel distances/times (19.1 miles/24.3 min) to the nearest hospital compared with residents in majority-Black (15.4 miles/22.2 min) and majority-white tracts (16.2 miles/22.8 min)





NETWORK TRAVEL DISTANCE/TIME TO SECOND NEAREST HOSPITAL, 2018

Tract-Level Network Travel Distance & Travel Time to Hospital-Based Acute Care By Racial & Ethnic Composition (2018) - mean(SD)

		Majority-Black Tracts		Majority-Latinx Tracts		Majority-White Tracts	
		Travel Distance (mi)	Travel Time (min)	Travel Distance (mi)	Travel Time (min)	Travel Distance (mi)	Travel Time (min)
2018	Nearest Hospital	15.4 (8.6) miles	22.2 (10.1) minutes	19.1 (13.1) miles	24.3 (13.7) minutes	16.2 (9.5) miles	22.8 (11.2) minutes
	Next Nearest Hospital	28.2 (6.6) miles	37.4 (8.4) minutes	28.9 (7.5) miles	38.2(9.9) minutes	26.3 (7.9) miles	35.2 (10.3) minutes

Network travel distance and time between population-weighted census tract centroids and nearest and second-nearest operating rural hospital in 2018 (AHA dataset)

However, residents in majority-Black (28.2 miles/37.4 minutes) and majority-Latinx (28.9 miles/38.2 min) rural tracts had the longest travel distances to the next nearest operating short-term acute care hospital, compared with residents in majority-white tracts.

This is despite the fact that majority-white rural tracts are more likely to be remote.

Additional Travel Time (minutes) to Access the Next Nearest Acute Care Hospital Across the Rural South (2018)

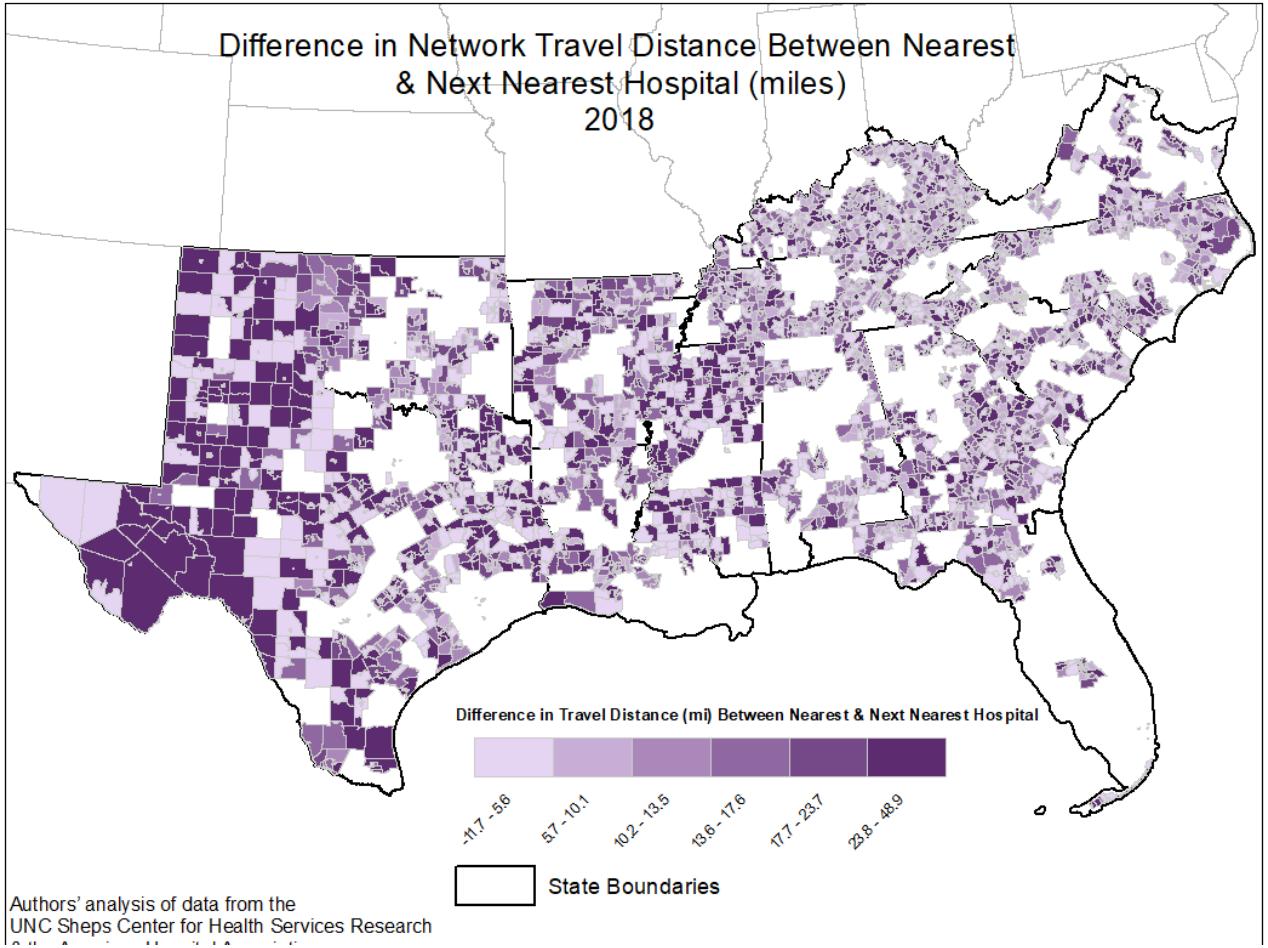
	Number of rural tracts (%)	Population (2014-18)
≥ 15 minutes	2,450 (57.1%)	10,115,458
≥ 30 minutes	606 (14.1%)	2,514,013
≥ 45 minutes	71 (1.7%)	279,014
≥ 60 minutes	1 (0.02%)	5,634

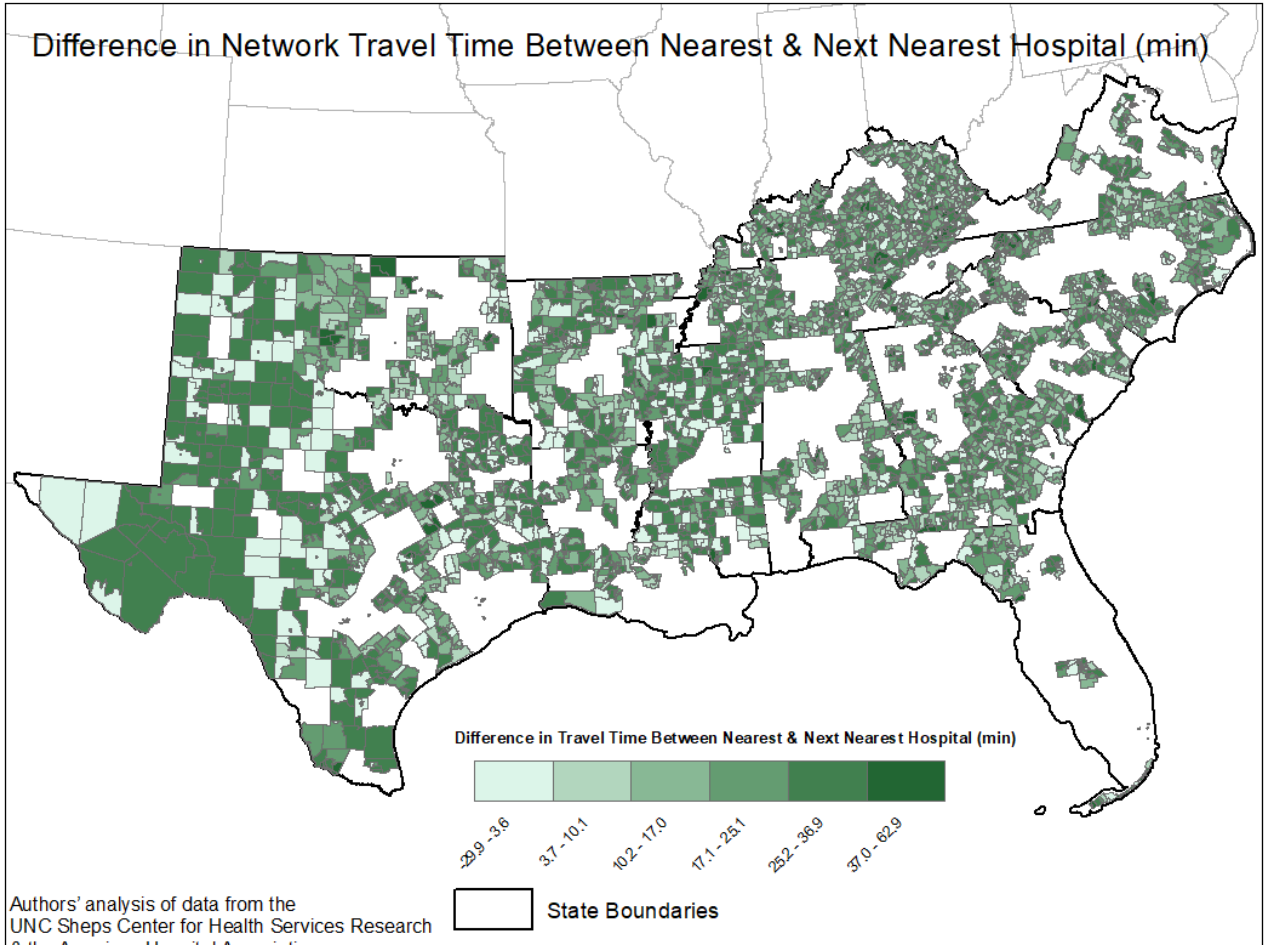
Note: In 1,842 out of 4,292 rural tracts in the study area (or 42.9%), differences in the network travel distances between the nearest and next nearest hospitals were <15 minutes in 2018

Appendix Exhibit A4 (Table):
Differences in Network Travel Times Between the Nearest and Next Nearest Hospital (2018)

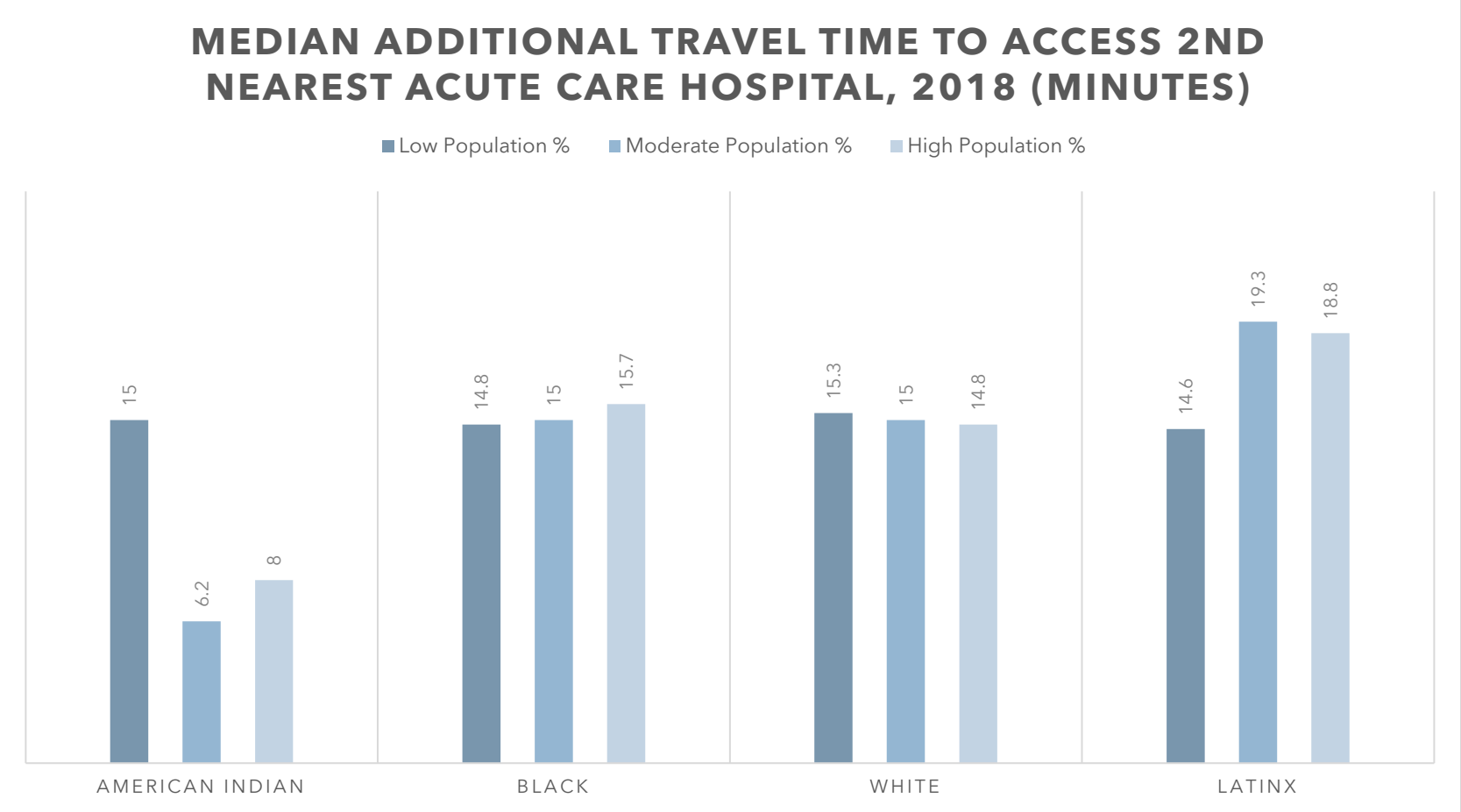
Residents in 57.1% of rural tracts in the U.S. South (approximately 10.1 million people, or 80.3% of rural residents) had to travel an additional 15 minutes or more to access their next nearest hospital.

Of those, over 2.5 million rural residents had to travel an additional 30 minutes or more to access the next nearest hospital.





DIFFERENCE IN NETWORK TRAVEL DISTANCE & TIME TO NEAREST & NEXT NEAREST ACUTE CARE HOSPITAL, 2018



Generally, in 2018, as the tract-level proportion of Black residents increased, so did the additional travel times to access the next nearest open hospital.

The opposite pattern holds for the white share of population in rural tracts in the U.S. South.

Interestingly, the additional travel time to access the 2nd nearest hospital was highest in tracts with a moderate share (30-59%) of Latinx residents

Additional Travel Time (minutes) to Access Next Nearest Hospital By Tract Racial & Ethnic Composition, 2018

	Low Population %		Moderate Population %		High Population %	
	Median	**IQR**	**Median**	**IQR**	**Median**	**IQR**
American Indian	15.0	7.1 - 23.7	6.2	2.2 - 12.3	8.0	3.0 - 9.8
Black	14.8	6.8 - 23.6	15.0	7.1 - 23.6	15.7	9.0 - 24.9
White	15.3	8.6 - 24.9	15.0	7.1 - 22.6	14.8	6.9 - 23.7
Latinx	14.6	6.8 - 22.9	19.3	9.5 - 28.8	18.8	9.2 - 28.9

“High population %” is defined as <60%, while “moderate population %” is defined as having a 30-59% share of the specified groups, and “low population %” is defined as <30% population share of the specified groups.

Results - Regression Models – Nearest Hospital

- **Tracts nested within rural counties that had no closure had shorter driving times, compared with tracts in closure counties** (β= -2.088; *p*= 0.037)
- Tracts with higher median household incomes (β= 0.0003; *p*=0.018) longer driving times to access the nearest short-term acute care hospital.
- **Tracts nested in RUCC 8 counties (β= 1.893; *p*=.007) had longer driving times to access the nearest short-term acute care hospital.**
- **State-level concentration of health insurance markets was negatively associated with travel times in both models** (β = -5.002; *p*<.001).

Results - Regression Model – Second Nearest Hospital

- Consistent with the descriptive statistics, we find that **rural tracts with moderate** (β = 1.135; *p*=.028) **and high shares of Black residents** (β = 2.039; *p*=.017) **had longer driving times to access the second nearest open acute-care hospital.**
- Tract-level **median household income was also positively associated with travel time to the second nearest hospital** (β = 0.00004 ; p=.002).
- Tract-level **median age was negatively associated with travel time (β = -0.146; *p*<.001)**
- **Tracts located within RUCC 8 counties** ("non-metropolitan counties with <2500 urban population and adjacent to a metro area") **had *shorter* driving times to the second nearest hospital in 2018 compared with tracts located within RUCC 4 counties** ("non-metropolitan counties with an urban population of ≥20,000 or more, adjacent to a metro area") (β = -1.645; *p*=.039).

Takeaways

- **Racial disparities in rural travel times to acute care are more apparent when we account for travel times to the next nearest hospital**
  - These disparities are starkest in rural tracts with moderate (30-59.9%) and high (60-100%) shares of Black residents
- Efforts to improve access to acute care in the most remote rural communities (e.g. RUCC 8-9) are apparent in the travel times/distances to access the nearest and next nearest hospital

Project Contributions

Moves beyond provider and facility counts to measure changes in potential accessibility of hospital-based services after rural hospital closures

- ❑Conceptually, this allows for border-crossing in health services use
- ❑Also highlights within-county variation in potential effects of rural hospital closures
- ❑Focus on spatial accessibility is also novel in HSR

Can be extended to study bypass behaviors pre- and post-closures within rural counties, using these spatial accessibility measures as a baseline or covariate

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