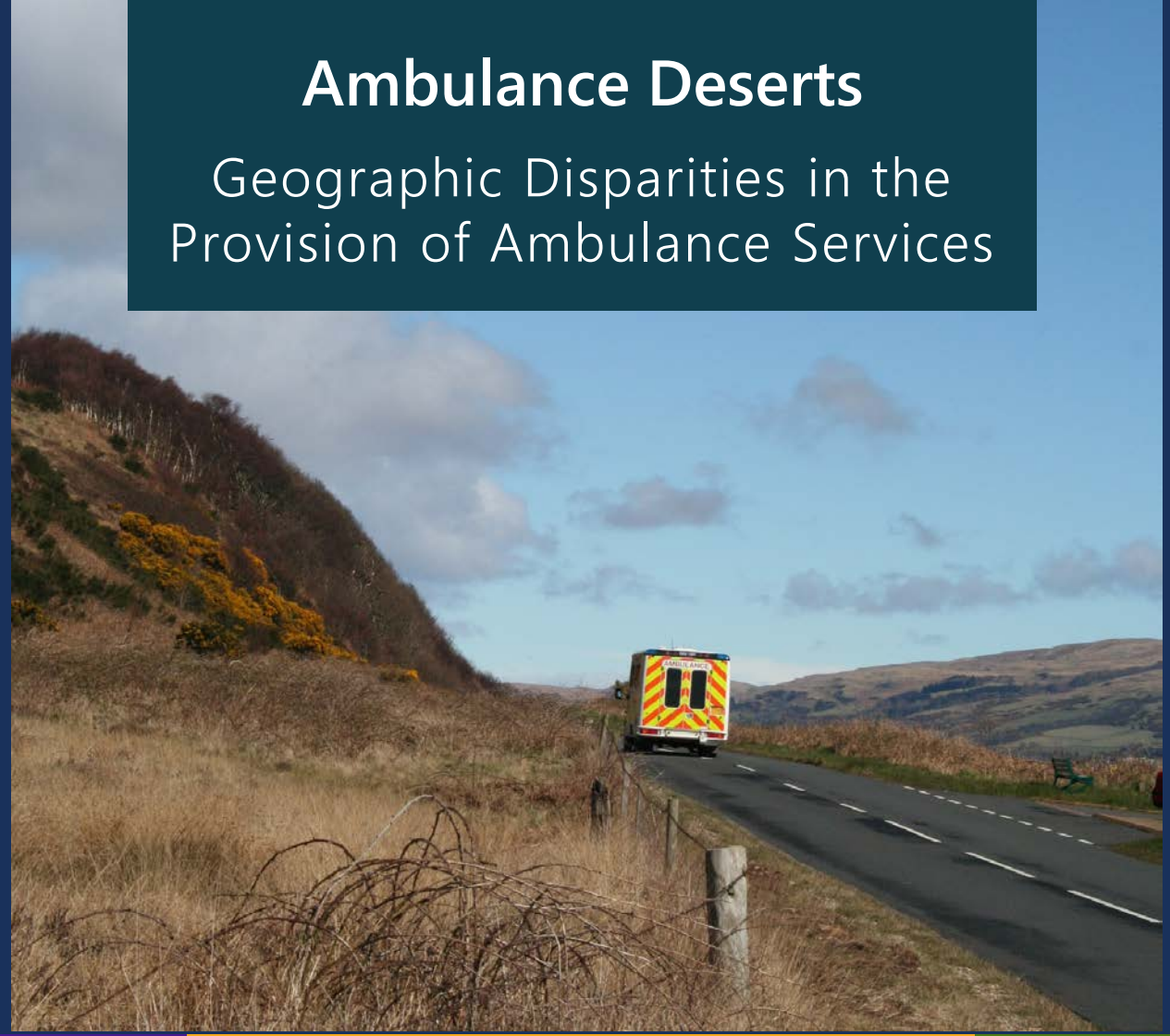
Ambulance Deserts

Geographic Disparities in the Provision of Ambulance Services



Maine Rural Health Research Center

Rural Health Research Gateway
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University of Southern Maine
Muskie School of Public Service

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Agenda

- Study rationale and purpose
- Definitions
- Methods
- Preliminary results

Study Rationale & Purpose

Rationale

- Declining numbers of rural hospitals and ambulance services:
  → remaining ambulance services are being tasked to play a greater role in delivering emergency services, and
  → their service areas are expanded.[1-5]
- Delivery of ambulance services has not been systematically integrated, particularly in rural areas.[6]
- Lack of systems planning has led to gaps in the provision of ambulance services, also known as “ambulance deserts”.
- Lack of data on ambulance service locations at the national level.

- To assist state and regional policymakers in formulating strategic plans to address these gaps, this project employs a systematic methodology within a geographic information system (GIS) framework for identifying ambulance deserts and addressing access.

Study Objectives

Study aims were to identify geographic disparities in accessing ambulance services by

1. Building a database of ambulance service locations
    - preferably broken out by transporting/non-transporting
    - focused on mapping transporting service locations
2. Identifying and creating maps of ambulance deserts within each of the states
3. Characterizing who lives in ambulance deserts
4. Understanding the health care landscape for those living in ambulance deserts

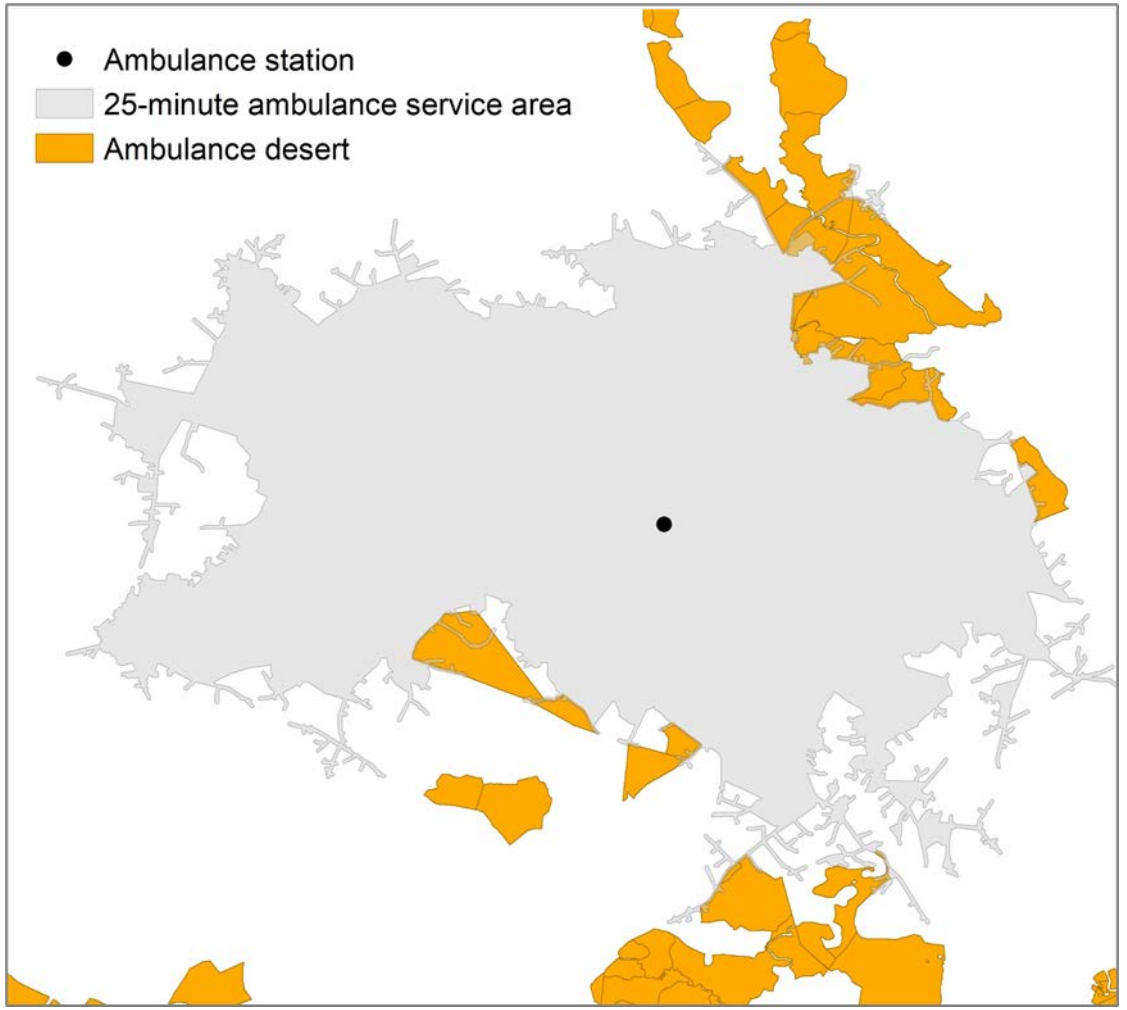
Research Questions

1. What areas of the states are ambulance deserts; how prevalent are they?
2. What percentage of each state's population lives in an ambulance desert? Are there rural-urban or regional differences in the share of residents living in these deserts?
3. What are the demographic and socioeconomic characteristics of people living in ambulance deserts?
4. For those living in ambulance deserts, are there other access barriers to obtaining care?

Definitions

Definitions

- **Ambulance station:** The physical location of a ground transport-capable EMS service
- **Ambulance service area:** A geographic area encompassing all roads that can be accessed within a 25-minute drive time from an ambulance station
- **Ambulance desert:** A populated census block with its geographic center *outside* of a 25-minute ambulance service area



Methods

Methods

- **Ambulance deserts** were defined as populated areas of the state that are not within a *25-minimum minimum access standard* of an existing ambulance service.
- Created state maps in ArcGIS Desktop ArcMap version 10.8.1
- Geocoded ambulance station addresses using Esri World Geocoding Service
- Estimated 25-minute ambulance service areas using ArcGIS Ready-To-Use Services (Generate Service Areas tool)
- Mapped ambulance deserts in relation to ambulance stations and healthcare facilities (hospitals, Federally Qualified Health Centers, Rural Health Clinics)
- Analyzed county-level differences in ambulance access by rural-urban location using Rural-Urban Continuum Codes (RUCCs)

Methods

By stratifying the percent of county populations living in ambulance deserts (ADs) into quartiles:

- We identified counties with a high (top quartile) and low (bottom quartile) percentage of their populations living within an AD.

- Comparing high AD (H-AD) rural county populations and low AD (L-AD) rural county populations
  - the socioeconomic profiles and
  - differences in their access to health care providers and facilities.

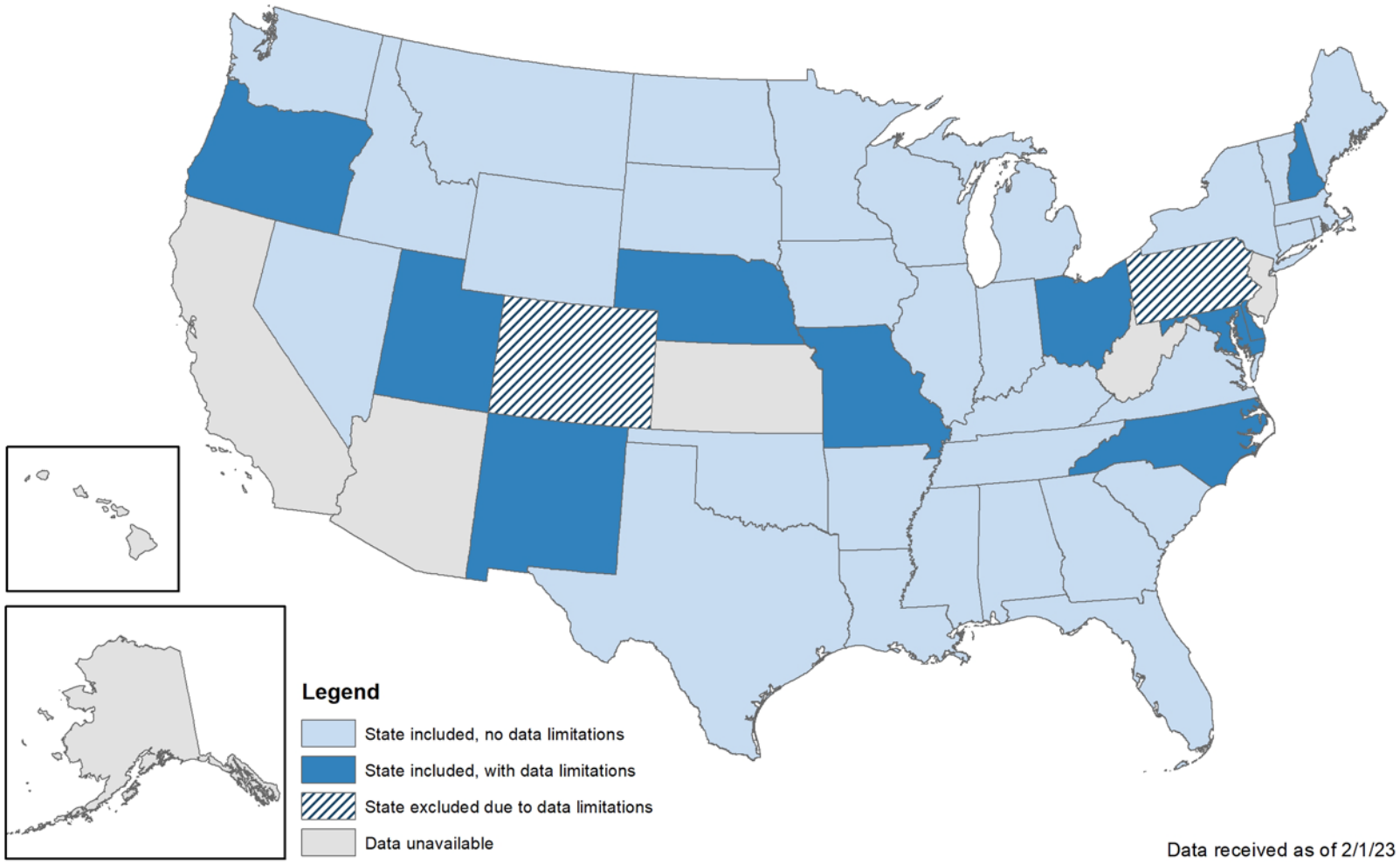
Data Sources

- **Census block-level ambulance desert data** compiled by the Maine Rural Health Research Center
- **Cartographic boundary files** (states, counties, census tracts): US Census Bureau
- **2020 Census block-level population data:** Esri, US Census Bureau
- **Road network data**: Esri, ArcGIS Online Ready-To-Use Services
- **Rural-urban continuum codes (RUCCs):** USDA, Economic Research Service
- **Healthcare facility locations:** Health Resources & Services Administration
- **American Community Survey** five-year estimates (2016-2020)
- **County Health Rankings** (Robert Wood Johnson Foundation)
- **Area Health Resources Files** were used to describe socioeconomic and market factors associated with counties lacking adequate access to ambulance services.

Data Collection

Data requests sent to all 50 state EMS offices.

- Data provided by 41 states
  - 31 - filled the request
  - 10 – minor data limitations
- Remaining 9 states
  - 2 - major data limitations
  - 7 - data unavailable or request denied



Results

TABLE 1. Prevalence of Ambulance Deserts in Rural-Urban Counties Across 41 States, 2021-2022

	Rural Counties	Urban Counties	All Counties
Number of counties (in 41 states)	1,723	1,003	2,726
Number (%) of counties with at least one AD at the census block level	1,455 (84.4%)	771 (76.9%)	2,226 (81.7%)
Percent of population living in ADs:			
Average across all counties	9.3%	3.5%	7.2%
Average across counties with ADs	11.0%	4.6%	8.8%
Total AD populations (n)	2,310,920	2,200,364	4,511,284

Notes: AD = Ambulance Deserts; All counties in these analyses are populated; only populated census blocks were included.
Population Data Source: United States Census Bureau, American Community Survey, www.census.gov/surveys/acs

Figure 2. Percent of Rural and Urban County Populations Living in Ambulance Deserts, 2021-2022

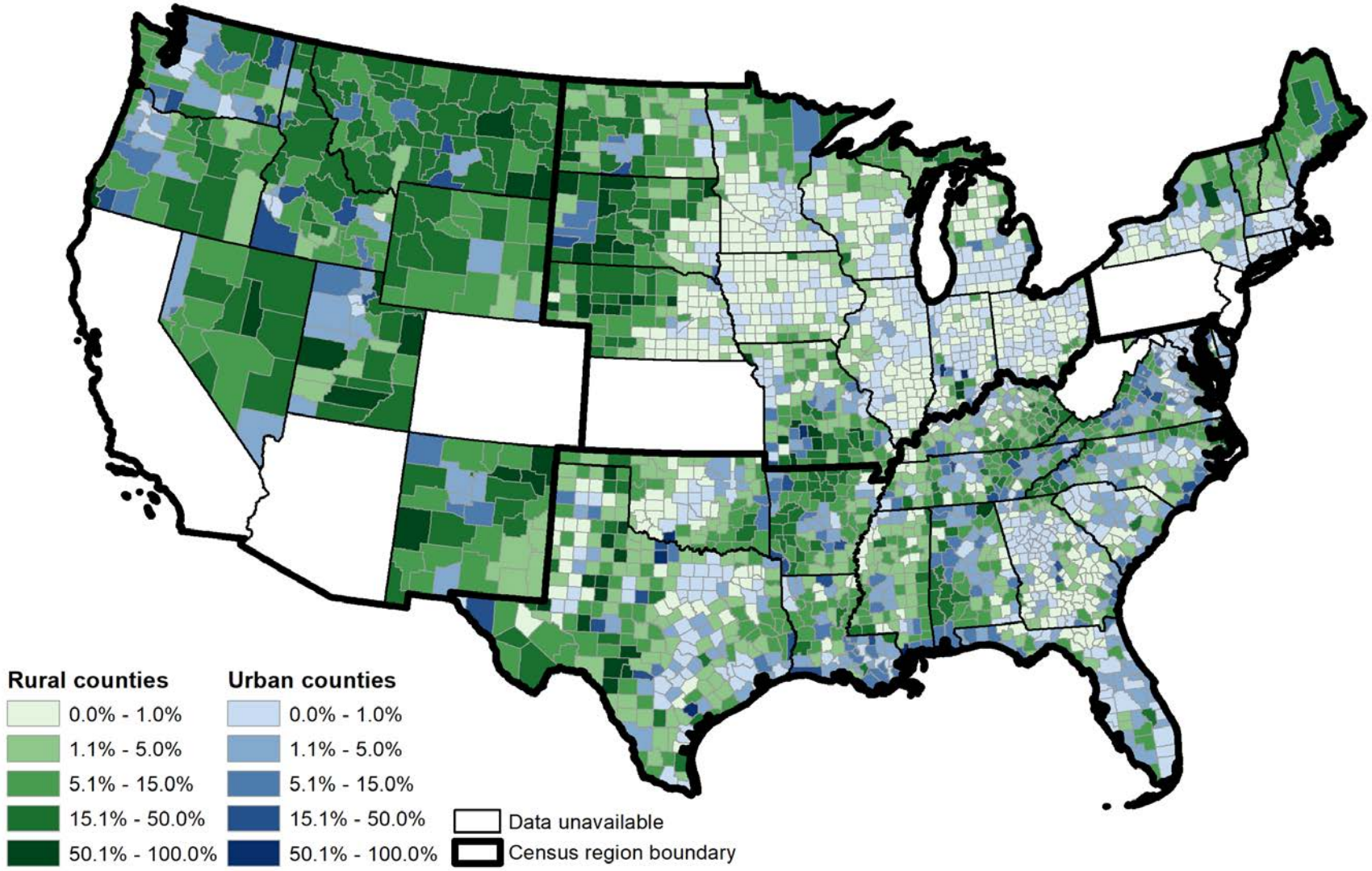
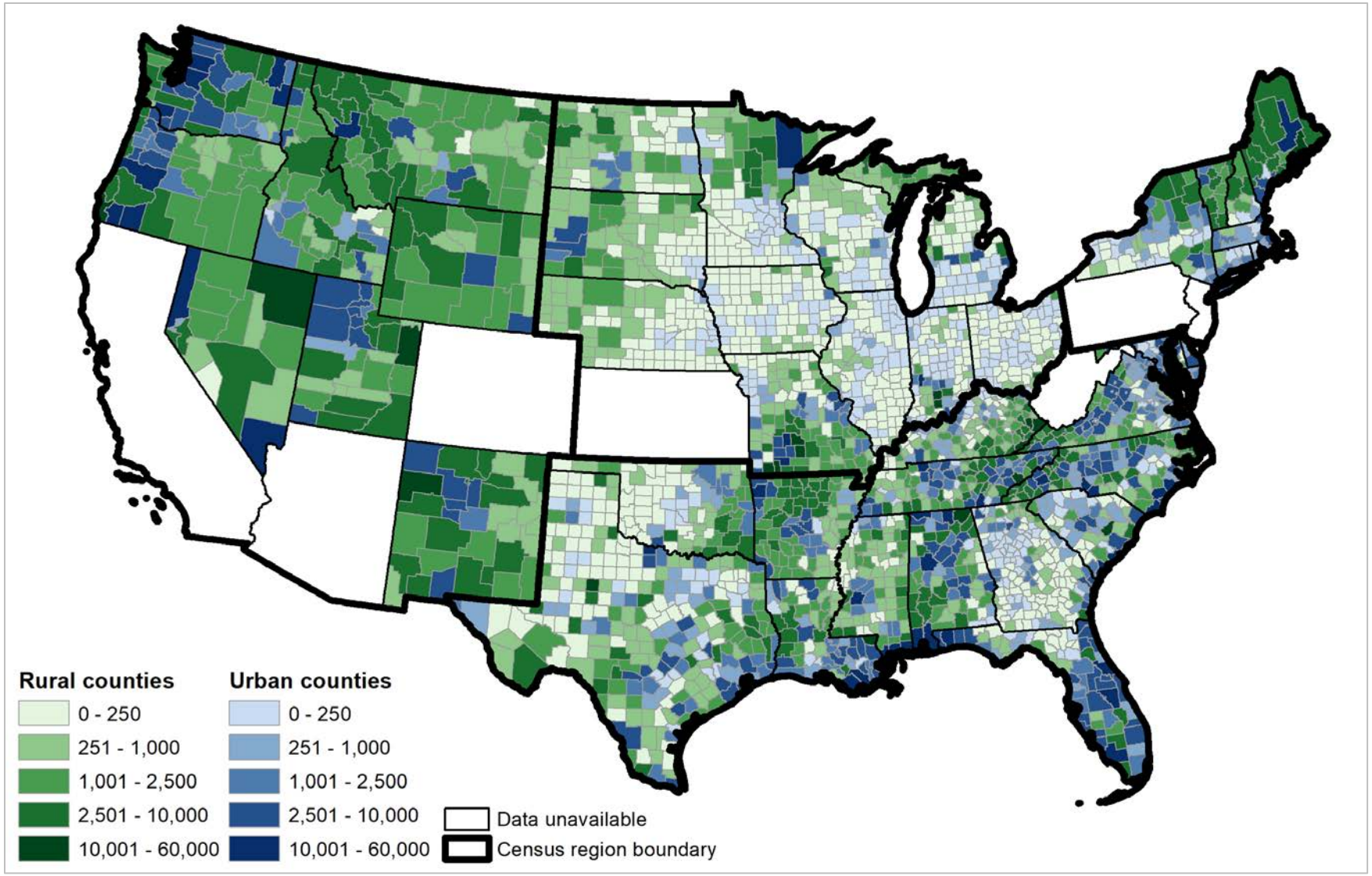


Figure 3. Number of People Living in Ambulance Deserts by County Rurality, 2021-2022

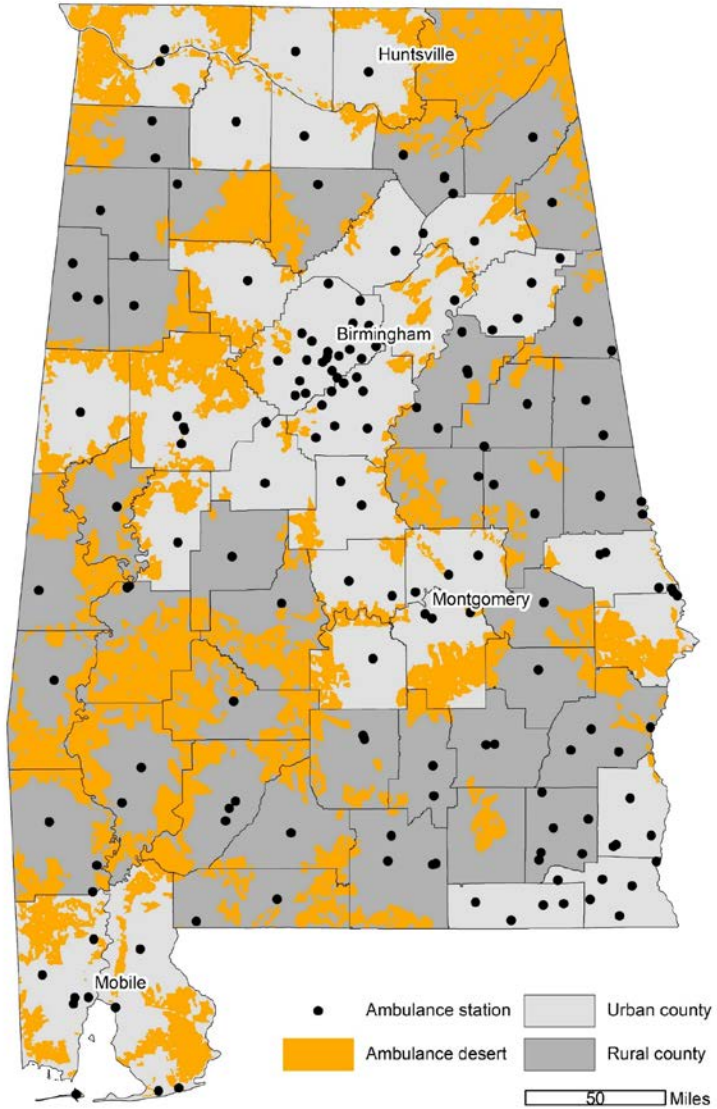


Alabama

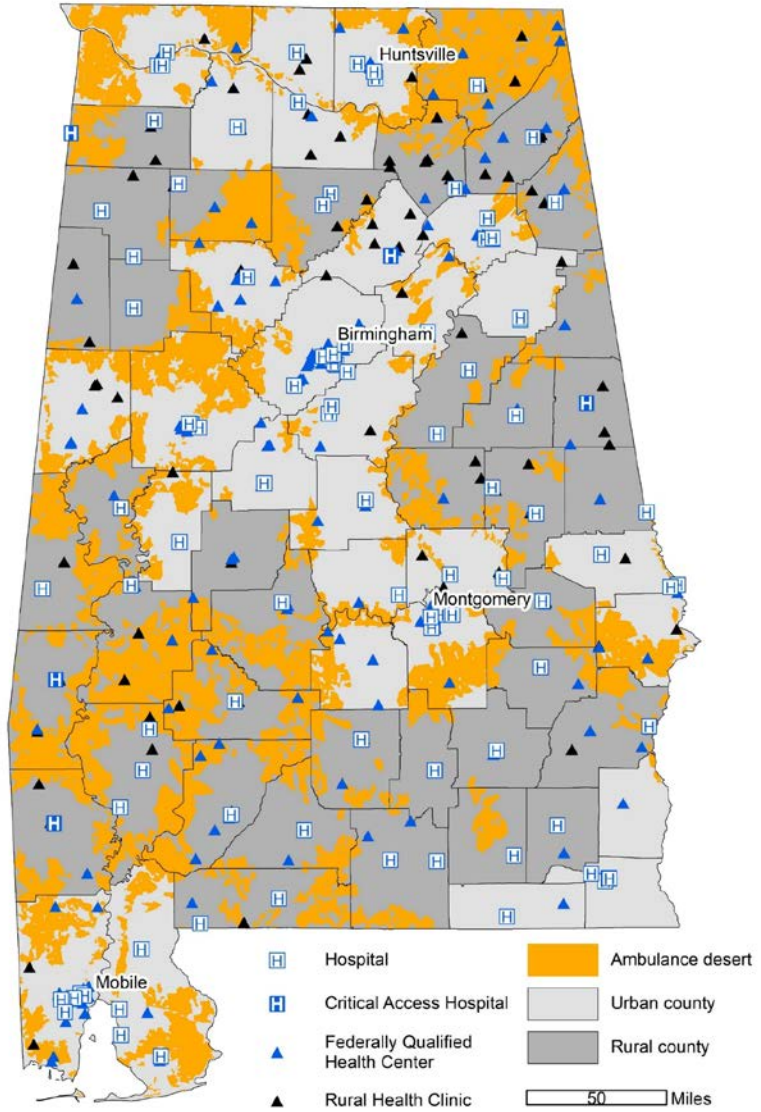
Ambulance stations	172
Estimated ambulance desert population	314,841
Total population in a desert	6.3%
Rural county desert population (% of total)	144,260 (45.8%)
Percent of rural population in a desert	12.6%

Data sources: Alabama Public Health - Office of EMS, Esri, US Census Bureau, Health Resources & Services Administration, USDA Economic Research Service

Ambulance Locations and Deserts



Healthcare Facilities and Deserts

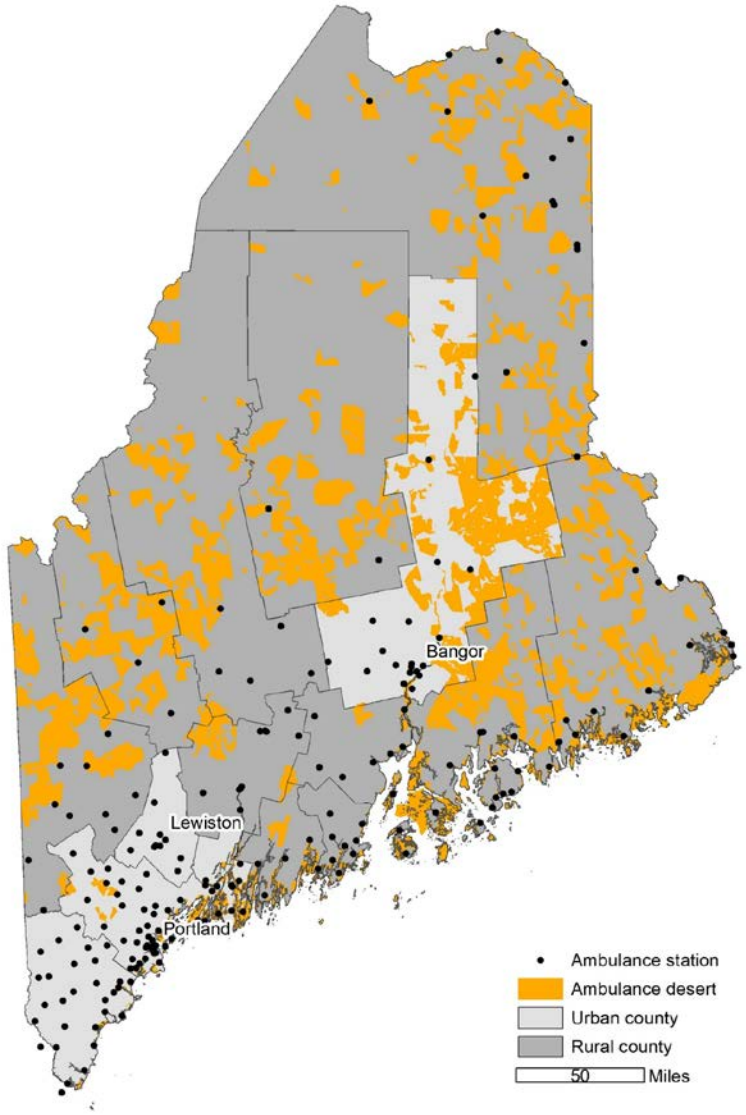


Maine

Ambulance stations	215
Estimated ambulance desert population	82,346
Total population in a desert	6.0%
Rural county desert population (% of total)	54,278 (65.9%)
Percent of rural population in a desert	9.9%

Data sources: Maine EMS, Esri, US Census Bureau, Health Resources & Services Administration, USDA Economic Research Service

Ambulance Locations and Deserts



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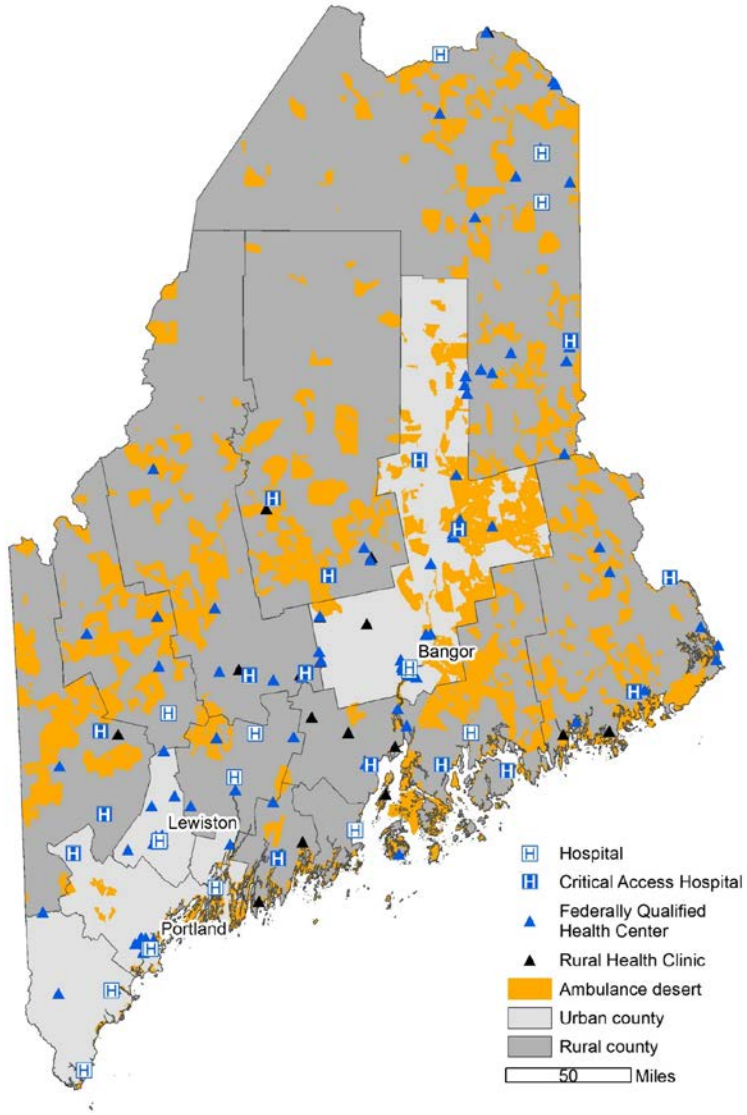
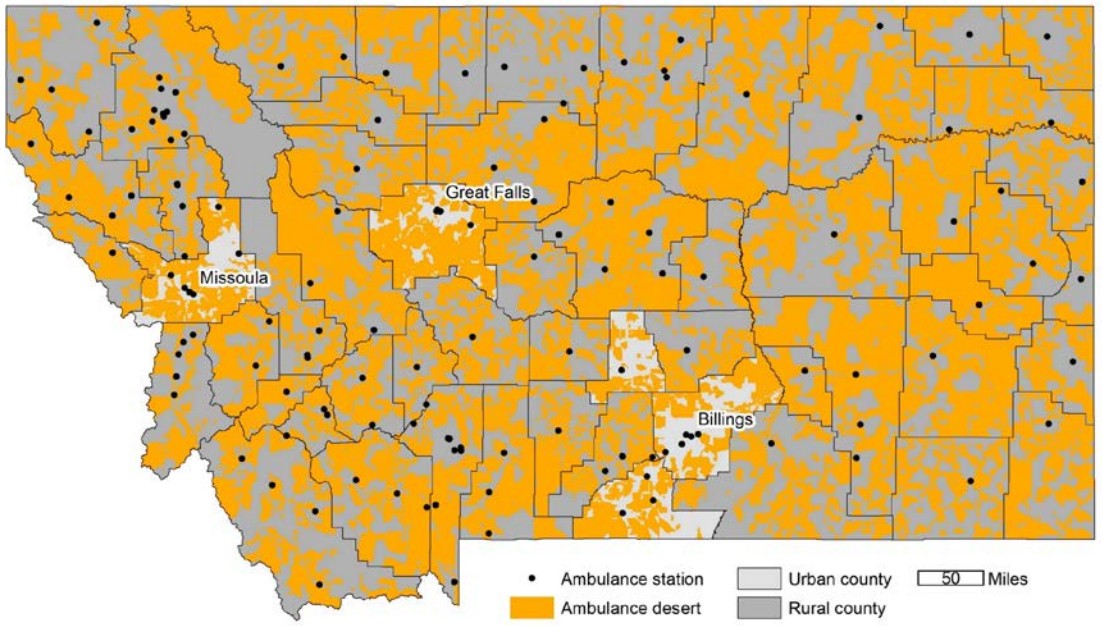


Montana

Ambulance Locations and Deserts



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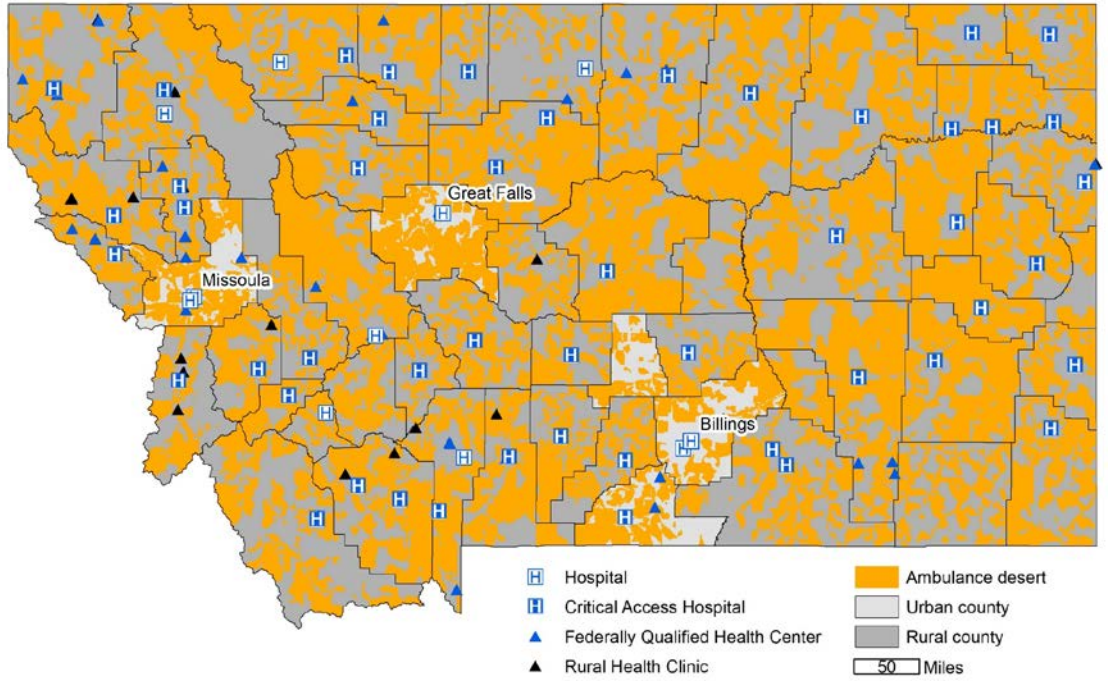


Ambulance stations	142		
Estimated ambulance desert population	140,365	Rural county desert population (% of total)	112,824 (80.4%)
Total population in a desert	12.9%	Percent rural population in a desert	16.0%

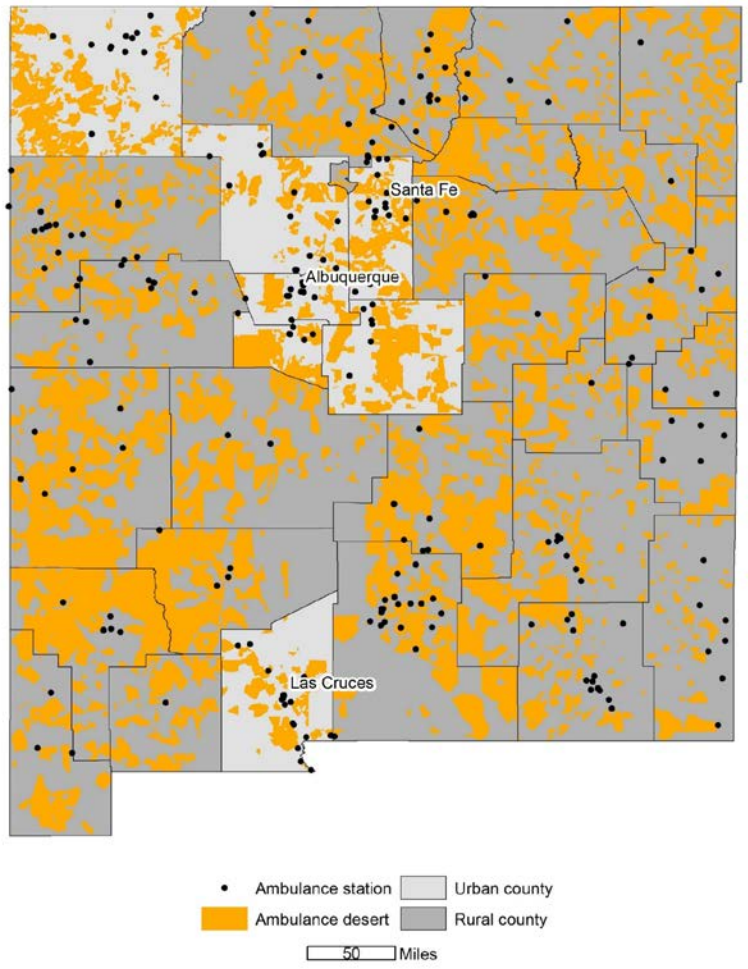
Data sources: Montana Department of Public Health and Human Services, Esri, US Census Bureau, Health Resources & Services Administration, USDA Economic Research Service

New Mexico

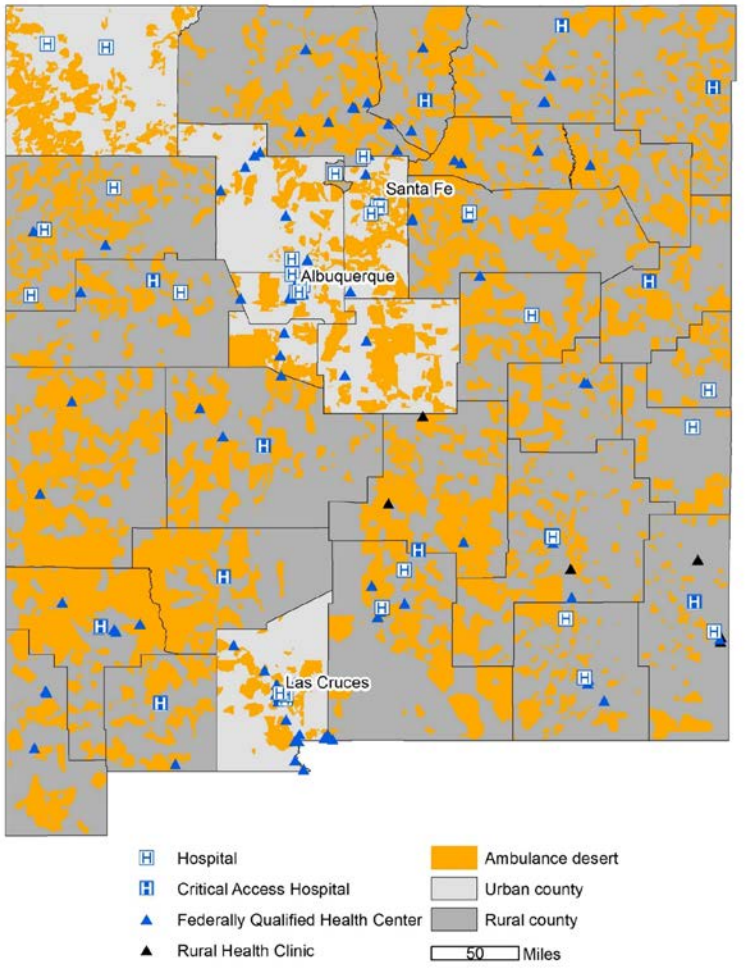
Ambulance stations	246
Estimated ambulance desert population	119,854
Total population in a desert	5.7%
Rural county desert population (% of total)	81,399 (67.9%)
Percent of rural population in a desert	11.6%

Data sources: New Mexico Department of Health, Esri, US Census Bureau, Health Resources & Services Administration, USDA Economic Research Service

Ambulance Locations and Deserts

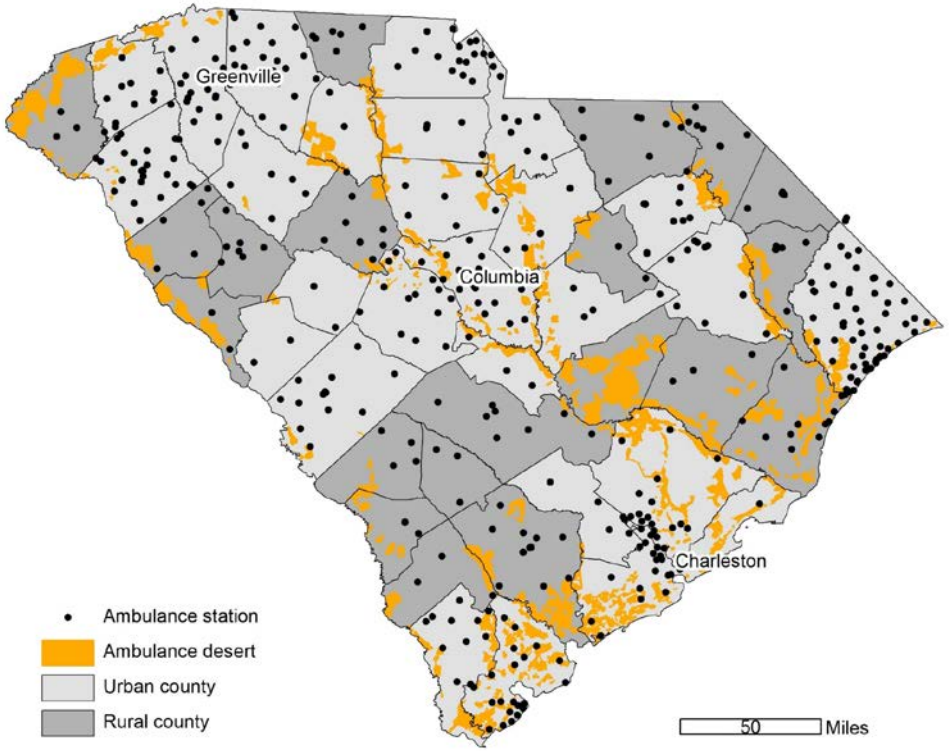


Healthcare Facilities and Deserts

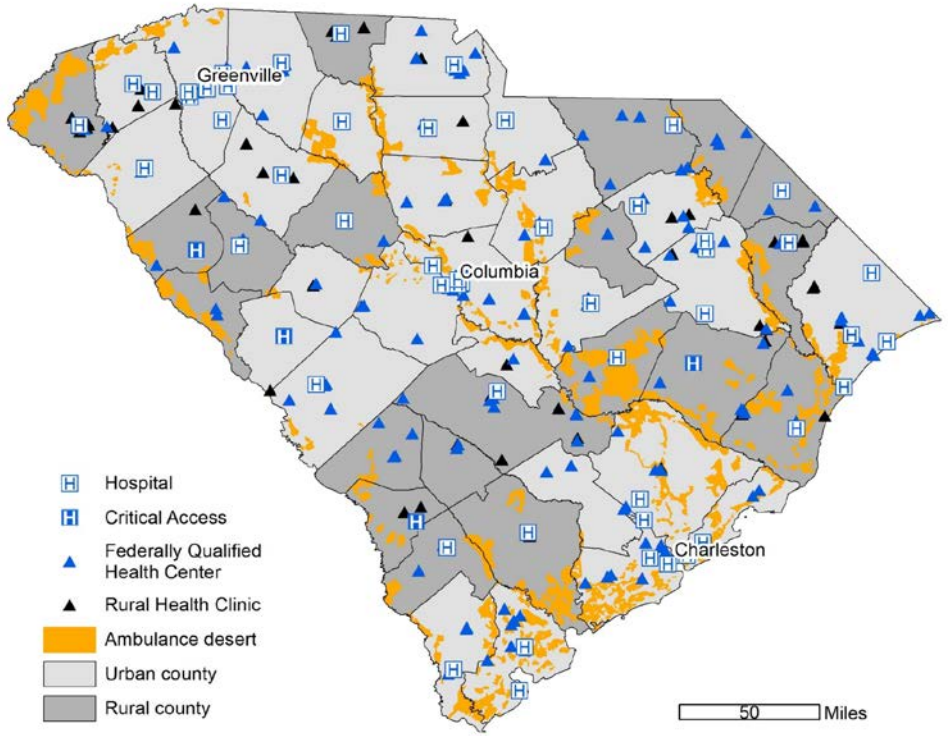


South Carolina

Ambulance Locations and Deserts



Ambulance Deserts and Healthcare Facilities



Ambulance stations	461		
Estimated ambulance desert population	83,587	Rural county desert population (% of total)	24,569 (29.4%)
Total population in a desert	1.6%	Percent rural population in a desert	3.4%

Data sources: South Carolina Department of Health and Environmental Control, Esri, US Census Bureau, Health Resources & Services Administration, USDA Economic Research Service

Discussion/Conclusions

- A substantial majority of counties in the 41 states contained ambulance deserts at the census block level (84% in rural; 77% in urban), demonstrating the gravity of the issue of ensuring access to ambulance services.
- Rural counties were more likely to have ambulance deserts , and in 23 of the 41 states, over half (range 56% - 96%) of state populations living in ambulance deserts were living in rural counties.
- Rural counties tend to be sparsely populated, which contributes to the challenge of providing ambulance service coverage.

Discussion/Conclusions

- In the Western and Midwestern states, the prevalence of ambulance deserts appears related to sparsely populated rural areas, making it challenging to provide adequate ambulance service coverage.
- The relatively high percentages of their county populations living in ambulance deserts (e.g., 100% for all the Western states) stands in stark contrast to the relatively high number of ambulance stations per capita.
- Because the counties in these states are large (in terms of square miles) and their populations are spread out (i.e., population densities are low), ambulances are likely traveling long distances, contributing to high rates of their county populations living in ambulance deserts.
- Eight states had fewer than three ambulances covering every 1,000 square miles of land area (the Western states of Nevada, Wyoming, Montana, Utah, New Mexico, and Idaho; and the Midwestern states of North Dakota and South Dakota).

Discussion/Conclusions

- Alternatively, the relatively low number of ambulance stations per capita and high population densities are factors contributing to high numbers of people living in ADs in the South (e.g., North Carolina, Alabama, Texas, and Tennessee).
- Although the Southern states tend to have relatively low percentages of their AD populations living in rural counties, the exceptions include Kentucky (81%), Oklahoma (73%), Arkansas (66%), and Texas (56%).

Finally, the national maps highlighted the following geographic areas of concern:

- Southern states (particularly within the Appalachian region);
- Western states with difficult mountainous terrain;
- the jagged coastal areas and the rural mountainous areas of Maine, Vermont, Oregon, and Washington had high percentages and/or high numbers of people living in ADs.

Policy Implications

- This study is the first known to document coverage gaps in the provision of ambulance services across geographic areas in the U.S., and the degree to which socially vulnerable populations are living in ambulance deserts.
- In light of the current funding and reimbursement challenges associated with the provision of ambulance services, policymakers may need to consider the appropriate availability of ambulance services within the existing fabric of the health care system.
- Given the higher prevalence of ambulance deserts in rural areas and the persistent threat of rural hospital closures, the need to develop funding and reimbursement strategies capable of sustaining rural ambulance services and ensuring access to emergent health care is of pressing importance.

Thank You!

Any Questions?

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