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## Access to Primary Care: Comparing driving distance from Health Professional Shortage Area (HPSA) counties versus non-HPSA counties

### Abstract

The criteria used to identify Health Professional Shortage Areas dates back to the 1970's and very little has changed since then. This study examined driving distance from patient address to provider address as one component of a geographical HPSA. Primary care-related services located in adjacent areas to whole-county HPSAs are considered excessively distant when travel time exceeds 30 minutes or the equivalent of 20 miles in this study. We found similarities in travel distance to primary care-related services from patients living in HPSA counties compared to those living in non-HPSA counties. This could indicate the need to re-examine HPSA definitions to more accurately identify truly underserved populations in rural areas.

### Keywords

rural health, geocoding, access to care, Medicaid, healthcare utilization

### Cover Page Footnote

We would like to thank Community Care Inc. of North Carolina and the North Carolina State Department of Health and Human Services-Division of Medical Assistance for their role in the data collection process for this study. We also acknowledge Dr. Katherine Rickett, Dr. Lauren Whetstone and Natalie Jackson for their contributions to this study.

## INTRODUCTION

While approximately 20% of the US population lives in a rural area, only about 11% of physicians practice in these areas.<sup>1-2</sup> Individuals living in small and isolated rural areas have less access to healthcare, have fewer visits to providers and are less likely to obtain recommended preventive services than their urban counterparts.<sup>3-4</sup> In an effort to increase access to health services the Health Resources and Services Administration (HRSA) established Health Professional Shortage Areas (HPSAs) These are classified in three categories, 1) Geographic area, 2) Population groups and 3) Facilities.<sup>5</sup>

In this study we focused on geographic area HPSAs and examined the distance (in miles) that Medicaid patients travel to obtain primary medical care, comparing those who live in counties defined by HRSA as HPSA versus non-HPSA. First, we calculated distance travelled (in miles) to access primary care related services among North Carolina-Medicaid patients residing in HPSA counties versus non-HPSA counties. We examined how these distances compared with one of the criteria within the HRSA definition of a geographic area HPSA. This criteria defines excessively distant as equivalent to more than 30 minutes travel time (defined as more than 20 miles under normal conditions on primary roads).<sup>5</sup> Results indicate that travel distance over 20 miles may present just as many challenges for residents in rural non HPSA counties as those which are defined as Health Professional Shortage Areas.

## METHODS

This study aimed to investigate differences in travel distance (in miles) to primary medical care by Medicaid patients within currently designated whole-county geographic HPSAs compared to those living in non-HPSA counties. Current definitions by HRSA include distances measured from population centers and ‘excessively distant’ is defined as being more than thirty minutes travel time from the population center.<sup>5</sup> Travel times of thirty minutes are calculated based on distances corresponding to the following:

- (i) In flat terrain or areas connected by an interstate: 25 miles
- (ii) Under normal conditions on primary roads: 20 miles
- (iii) In mountainous terrain or only on secondary roads: 15 miles

The study setting included nine counties in eastern North Carolina. Five counties in eastern North Carolina are classified as whole county geographical HPSAs and all five counties were selected for this study. Comparison counties were selected on the basis of being located in eastern North Carolina and having no whole or partial HPSA designation. Partial HPSAs were excluded due to the fact that travel distance is not a factor in the designation of a population group or facility HPSA. Six counties met the criteria. Counties were then matched according to eight variables including: population 2010, persons under 18, percent female, percent white, percent black, percent below poverty, percent uninsured and percent Medicaid. Of the six non-HPSA counties two were excluded based on missing data for one or more of the above variables, leaving 4 comparison counties for analysis. Table 1 presents this data. To ensure that the HPSA counties were not significantly different from the non-HPSA counties based on the eight demographic variables, a Wilcoxon two-sample test was conducted. There were no statistically significant differences in the means of the eight demographic variables between HPSA (n=5) and non-HPSA (n=4) counties at the significance level  $p < 0.05$ .

Data were collected from the State Center for Medicaid Services databank. This databank holds all billing records for all individuals enrolled in Medicaid in the state of North Carolina. Records for all Medicaid participants in the nine selected eastern North Carolina counties for 2009-2011 included billing records with patient street address and zip code, provider office address and zip code, patient age, gender, race and living arrangement (e.g., assisted living, private living as indicated by the billing record) and the following billing codes: 99xxx-99xxx, 10060, 11300-11313, 36415, 93000, 93015-93018, 99281-99285, 20600-20610, 90655, 90633, 90634, 90700, 76801-76828, 59025, 99241-99245, 82962, 25500-25695, 27750-27848, 71020, 94640. These codes were identified by a Family Practice Billing Manager as the most common codes seen in a primary care facility. Data were cleaned to remove duplicate records such as multiple visits to the same location due to the scope of analysis being focused on distance rather than utilization. Those in living arrangements other than private living as indicated in the billing record were also excluded. A waiver of informed consent was approved by the East Carolina University HIPAA Privacy Office. This study was approved by the University & Medical Center Institutional Review Board.

Driving distance between patient address and physician practice was calculated using batch geocoding with Google's Application Programming Interface (API). Data were cleaned to remove addresses which could not be geocoded (e.g., post office box). Manual methods were used to identify missing addresses. A 1% sample was manually tested for accuracy using Googlemaps.com resulting in a match rate of 96%. A new variable, distance (in miles), was added in SPSS version 19 (SPSS Inc., Chicago, IL).

The unit of analysis was the patient visit. Each unique patient to practice visit was included. The following new variables were created prior to analysis: (1) HPSA (versus non-HPSA), and (2) distance category, broken down in five mile increments up to fifty miles. Frequencies were calculated using cross-tabulation of HPSA/non-HPSA and distance categories. SPSS version 19 (SPSS Inc., Chicago, IL) was used for all analyses.

## **RESULTS**

Our results indicate that of the 31,927 patient visits analyzed, 81.7% required travel of less than 20 miles (Table 2). Of the 9,400 patient visits from HPSA counties, 64.3% required travel of less than 20 miles while only 35.7% required travel of greater than 20 miles. Of the 22,527 patient visits from non-HPSA counties 89% required travel less than 20 miles and 11% travelled greater than 20 miles. This study also revealed that among those travelling more than 20 miles (n=5,842) for primary care-related services almost half (42.5%) resided in non-HPSA counties.

## **IMPLICATIONS**

Results indicate that patients residing in non-HPSA counties often travel greater than 20 miles to receive primary care related services. Our results suggest that using distance to define those patients who are underserved may not be the best way to measure who has access to care. Health Professional Shortage Area definitions and classifications should be re-examined to better identify the truly underserved. It should be noted that the data analyzed for this study was part of a much larger data set of Medicaid billing records. Future studies should not only include comparisons of counties across the state but rural counties in other states to determine if our results are unique to rural counties in eastern North Carolina. Further, they should also examine the relationship between travel distance and utilization of primary care services. Other studies could include analysis of Medicare and private insurance utilization and travel distance.

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**Table 1-County Level Data**

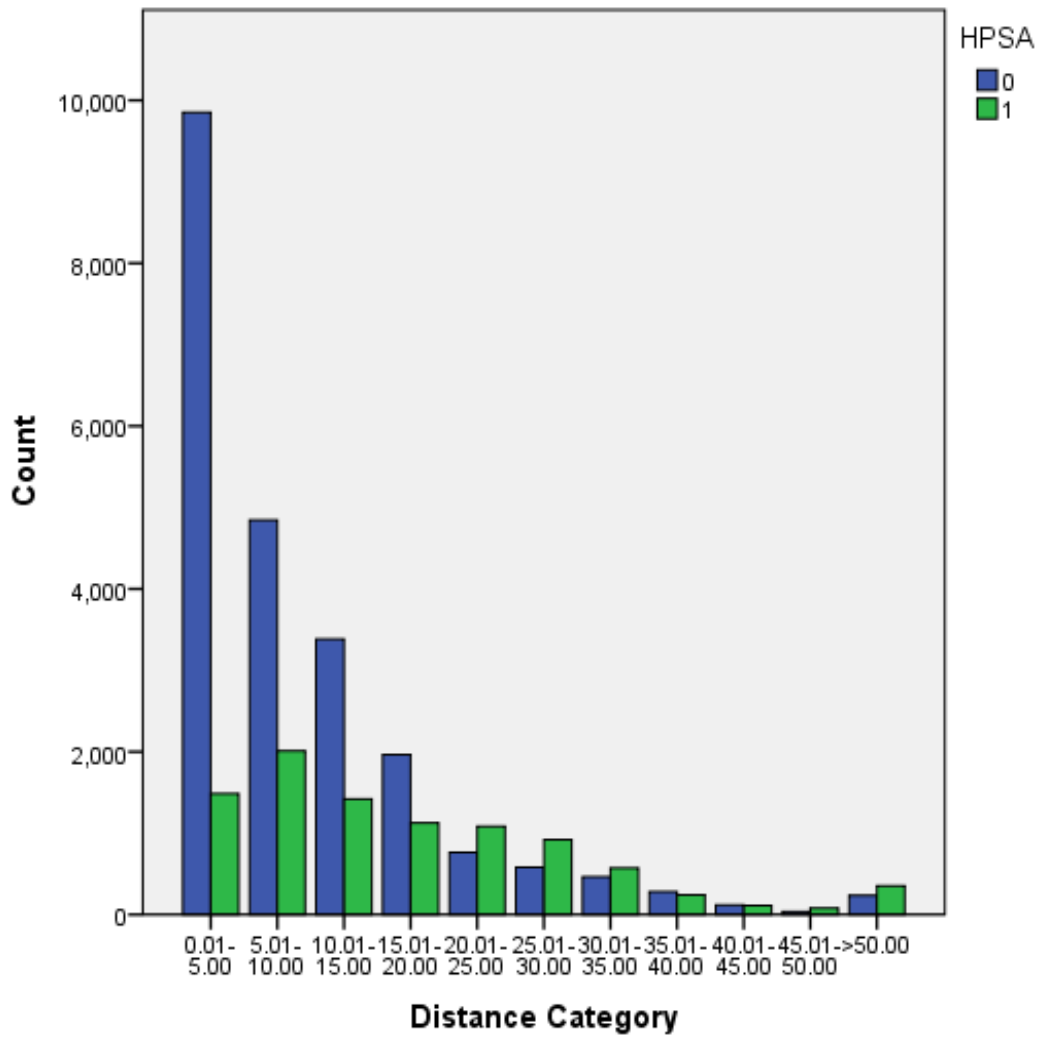
HPSA Status	2010 Pop*	# Persons Under 18*	% Female*	% White*	% Black*	% Below Poverty*	% Un-Insured**	% Medi-Caid**
0	12197	23.80	51.10	63.70	33.20	20.50	20.00	5.09
0	23547	23.70	50.40	90.30	5.80	8.50	20.00	3.49
0	22099	20.80	51.50	39.20	58.40	21.70	22.00	8.54
0	4407	18.00	44.80	54.50	38.20	21.90	29.00	11.28
0	13228	23.00	53.00	46.00	49.80	24.80	22.00	15.56
1	66469	18.90	50.60	89.30	6.10	12.20	20.00	10.27
1	14793	22.40	52.50	62.00	34.30	17.40	21.00	21.48
1	10153	21.70	51.90	63.00	32.40	16.80	21.00	9.00
1	40661	22.60	50.90	56.70	37.80	18.10	21.00	17.66

**Table 2- Categorical distribution of distance travelled from HPSA/Non-HPSA**

**Total**

			<b>Non-HPSA</b>	<b>HPSA</b>		
<b>Distance Category</b> <b>0.01-20.00 Miles</b>	0.01-5.00	Count	9853	1486	11339	
		% within HPSA	43.7%	15.8%	35.5%	
		% of Total	30.9%	4.7%	35.5%	
	5.01-10.00	Count	4844	2010	6854	
		% within HPSA	21.5%	21.4%	21.5%	
		% of Total	15.2%	6.3%	21.5%	
	10.01-15.00	Count	3382	1418	4800	
		% within HPSA	15.0%	15.1%	15.0%	
		% of Total	10.6%	4.4%	15.0%	
	15.01-20.00	Count	1965	1127	3092	
		% within HPSA	8.7%	12.0%	9.7%	
		% of Total	6.2%	3.5%	9.7%	
			<hr/>			
			<b>Count</b>	<b>20044</b>	<b>6041</b>	
			<b>%within HPSA</b>	<b>89.0%</b>	<b>64.3%</b>	
			<b>% of Total</b>	<b>62.8%</b>	<b>18.9%</b>	
			<hr/>			
<b>Distance Category</b> <b>20.01-&gt;50.00 Miles</b>	20.01-25.00	Count	763	1084	1847	
		% within HPSA	3.4%	11.5%	5.8%	
		% of Total	2.4%	3.4%	5.8%	
	25.01-30.00	Count	581	921	1502	
		% within HPSA	2.6%	9.8%	4.7%	
		% of Total	1.8%	2.9%	4.7%	
	30.01-35.00	Count	465	570	1035	
		% within HPSA	2.1%	6.1%	3.2%	
		% of Total	1.5%	1.8%	3.2%	
	35.01-40.00	Count	282	243	525	
		% within HPSA	1.3%	2.6%	1.6%	
		% of Total	.9%	.8%	1.6%	
	40.01-45.00	Count	119	110	229	
		% within HPSA	.5%	1.2%	.7%	
		% of Total	.4%	.3%	.7%	
	45.01-50.00	Count	36	79	115	
		% within HPSA	.2%	.8%	.4%	
		% of Total	.1%	.2%	.4%	
	>50.00	Count	237	352	589	
		% within HPSA	1.1%	3.7%	1.8%	
		% of Total	.7%	1.1%	1.8%	
				<hr/>		
				<b>Count</b>	<b>2483</b>	<b>3359</b>
				<b>%within HPSA</b>	<b>11.0%</b>	<b>35.7%</b>
			<b>% of Total</b>	<b>7.8%</b>	<b>10.5%</b>	
			<hr/>			
<b>Total</b>	<b>Count</b>		<b>22527</b>	<b>9400</b>	<b>31927</b>	
	<b>%within HPSA</b>		<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	
	<b>% of Total</b>		<b>70.6%</b>	<b>29.4%</b>	<b>100.0%</b>	

**Figure 1**  
**Comparison of travel distance categories by HPSA/Non-HPSA\***



\*0=Non-HPSA, 1=HPSA