Rural Regions

The Regional Distribution of Doctors

The first research note in this series considered some regional aspects of hospital closures. This second note looks at the distribution of primary care physicians (PCP), which is remarkably similar to the distribution of other services, including grocery stores. A number of fairly recent media stories have documented a shortage of doctors in rural areas (see here and here for examples), although the topic is hardly new.

Texas Department of State Health Services data indicate that 29 Texas Counties had no primary care physicians (PCP) in 2016. An additional 27 counties had only one PCP (Figure 1). Primary care doctors are an important part of the health care system. Most of us probably interact with our PCP more than other physicians. Access to these providers is likely important to health outcomes. The purpose of this research note is to consider relevant economic and regional factors related to the presence of PCP in rural areas. This note does not advocate policy actions or positions. The reader is encouraged to explore the Texas county data set accompanying this research note.

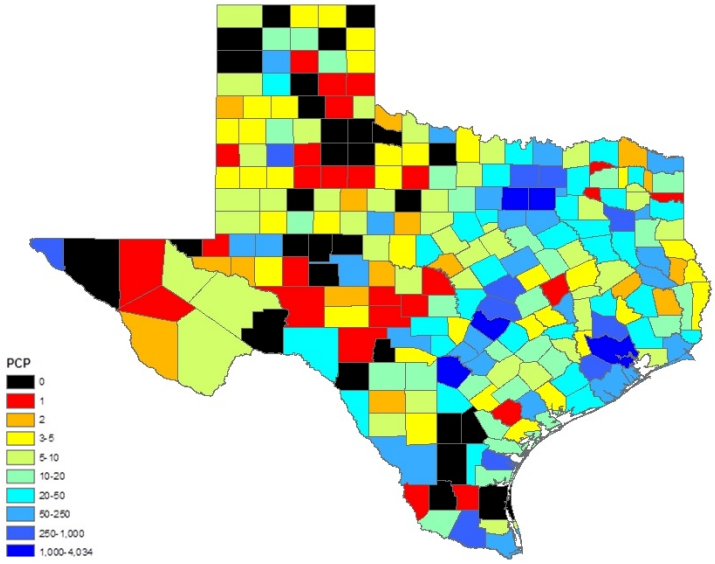

Figure 1. Primary care physicians by county, 2016. Data from TX DSHS.

A lack of doctors tends to be a rural phenomenon, particularly when data are analyzed at the county level. However, there are many ways to define rural. Table 1 presents the USDA Economic Research Service's Rural-Urban Continuum Code (RUCC) typology, which is used here. Counties in large metropolitan areas have the smallest codes along the 1-9 range, while counties in codes 8 and 9 completely rural or have less than 2,500 people in urban areas. Counties with small, sparse populations can be considered part of a metro area if there is significant commuting into the metro. For example, Oldham County (2015 population 2,069) is part of the Amarillo Metropolitan Statistical Area (MSA).

Table 1. 2013 Rural-Urban Continuum Codes.

Code	Description
	Metro counties:
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
	Nonmetro counties:
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

Table copied from USDA-ERS, 2013.

Table 2 presents the number of PCP by RUCC. Keep in mind, this data presents on PCP and not specialists, who also tend to cluster in MSAs. Metropolitan counties average more PCP, although there is substantial variability between counties within each code. Three fringe metro counties have no PCP: Armstrong and Oldham (Amarillo) and Hudspeth (El Paso). Each of these counties has a population less than 3,400. Counties without PCP tend to be more rural counties (codes 8 and 9). Counties with no PCP have a much lower average population density than their peers, which is even more pronounced in the fringe metro counties.

Table 2. Total PCP by County Rural-Urban Continuum Code, 2016.

RUCC	County Count	Mean	Median	Min	Max	Counties w 0 PCP	Density of all counties	Density of 0 Counties
1	35	419.2	59	3	4,034	0	474.6	--
2	25	112.7	21	0	494	3	170.4	1.4
3	22	68.5	54	0	269	2	105.1	5.8
4	13	26.4	24	15	53	0	50.5	--
5	6	42.5	35	23	79	0	55.0	--
6	65	9.8	9	0	32	1	23.9	4.7
7	39	7.3	5	0	37	3	14.5	4.4
8	20	1.7	1.7	0	5	7	12.1	3.5
9	29	0.9	1	0	4	13	2.9	1.6

Author calculations based on TX DSHS and Census Bureau data.

Of course, fewer doctors are needed to serve smaller populations in rural counties. Figure 2 and Table 3 present PCP per 100,000 population, providing a comparison of counties on a per capita basis. While counties with urban populations of 20,000 or more have per capita service comparable to that of metro areas, counties with urban populations less than 20,000 have fewer PCP per capita, with the most rural counties averaging far fewer physicians relative to the population. If the counties with no PCP are excluded, PCP per 100,000 people is much more stable across the urban-rural spectrum. However, this

ignores the populations of counties with no local PCP, and these PCP may be accessing care from a doctor in another county.

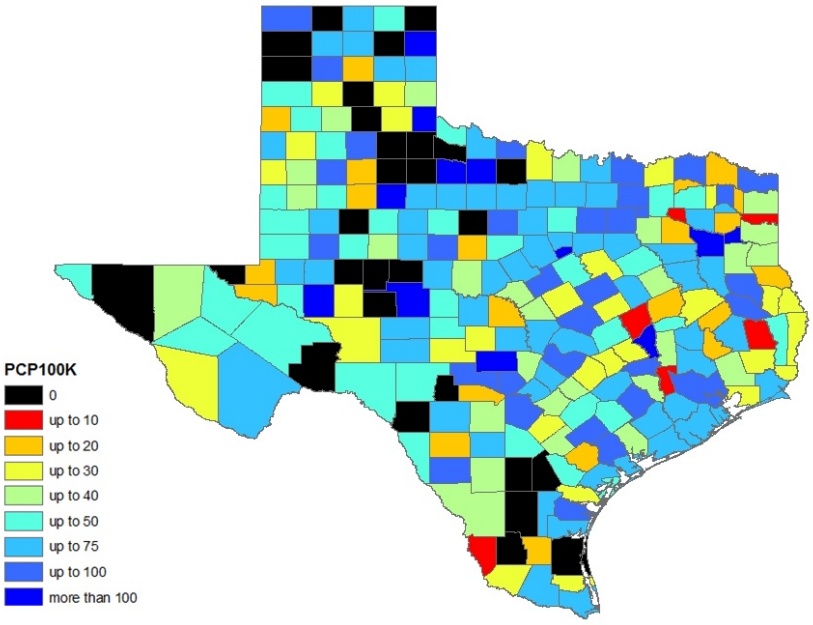

Figure 2. Primary care physicians per 100K population, 2016. Data from TX DSHS.

Table 2. PCP per 100,000 Population by County Rural-Urban Continuum Code, 2016.

RUCC	County Count	Mean	Median	Min	Max	Count of 0s	Mean if 0 Counties Excluded	Means of 0s Counties if 1 PCP Present
1	35	56.7	57.2	5.8	103.7	0	56.7	--
2	25	41.9	32.0	0	99.2	3	47.6	43.1
3	22	57.2	64.3	0	117.4	2	62.9	37.9
4	13	52.5	51.2	22.8	98.2	0	52.5	--
5	6	67.7	74.5	40	86.5	0	67.7	--
6	65	45.3	45.9	0	94.7	1	46.0	19.2
7	39	46.9	42.9	0	126.0	3	50.8	17.7
8	20	27.4	27.4	0	134.4	7	42.1	59.8
9	29	28.2	24.1	0	124.1	13	51.2	172.3

Author calculations based on TX DSHS and Census Bureau data.

It is interesting to observe the effects of adding just one PCP to a county that currently has none. Keep in mind there are only a few observations in each RUCC, which limits the generalizability of this information. However, if one doctor sets up practice in a county with 2,500-19,999 people, that county still has fewer than half the doctors per capita of similarly sized counties. On the other hand, if the most rural counties in RUCC 9 without a PCP had just one doctor, their PCP per 100,000 people would be more than 3 times that of both metro areas and small counties that do have doctors. This suggests that these small, rural counties are simply unable to sustain a PCP based on their populations. Of course,

there are also other factors influencing doctors' (and medical systems') location choices. Another way to view the data is simply by county population, which tells a similar story (Table 3).

Table 3. PCP by County Population, 2016.

County Population	County Count	% Metro Counties	PCP in all Counties	Avg. PCP	Avg. PCP to 100K	Count of 0s	Percent 0s	% Frontier
Under 2,500	24	12.5%	7	0.3	17.5	17	70.8%	100.0%
2,500-4,999	25	4.0%	39	1.6	39.5	7	28.0%	100.0%
5K-9,999	37	18.9%	128	3.5	44.4	3	8.1%	35.1%
10K-24,999	65	13.8%	447	6.9	38.0	2	3.1%	3.1%
25K-49,999	40	25.0%	758	19.0	48.8	0	--	--
50K-99,999	24	54.2%	932	38.8	51.6	0	--	--
100K-249,999	19	100.0%	2222	116.9	72.6	0	--	--
250K+	20	100.0%	16,045	802.3	71.8	0	--	--

Author calculations based on TX DSHS and Census Bureau data.

A lack of doctors in some counties reflects both small populations and social and economic linkages to adjacent counties and trade centers. If counties are combined into USDA ERS commuting zones, which account for some economic linkage between counties, only one commuting zone (the Dickens-Motley zone) has no PCP. The Edwards-Real zone has one PCP, and two zones (Donley-Hall and Kent-Stonewall) have two PCP. Perhaps not surprisingly, these eight counties are all considered Frontier counties, which are identified based on population density and time and distance to a regional trade center. Almost by definition, these counties are dependent upon services outside the county. Economic theory suggests these counties lack the critical mass to achieve sufficient local supply and demand.

Reasons frequently cited as contributors to rural doctor shortages include low Medicare and Medicaid reimbursement rates in areas with larger than average shares of older and low-income residents; the growth in specialization of physicians, and a lack of amenities and like-educated professionals in rural areas. Stories of towns without doctors often include commentary on other amenities, businesses and services that are lacking locally. These are essentially characteristics of Frontier counties. Indeed, there is a very strong correlation between the total number of PCP, population, grocers, and lawyers (see the "Correl" sheet of the accompanying data). This is, of course, not a surprise. The correlation between these variables simply points to the relationship between the number of people and the number of businesses needed to serve them along the highly variable range of counties from population 112 (Loving) to 4,538,028 (Harris). Unsurprisingly, I can predict a county's total PCP based on the number of grocery stores or law offices almost as well as based on population or total income.

Unfortunately, the correlations are much weaker on a per capita basis. A simple OLS regression estimating the number of PCP per 100K population on grocery store per 100K population performs terribly. There is substantially less variation in the per capita measures, and that issue is potentially compounded by added noise in terms of differences in how services are provided in different-sized

communities and even between similarly sized communities. In other words, there are additional underlying factors, many of which may be intangible.

After exploring a number of variables, those consistently and significantly associated with fewer PCP per 100,000 people are the percent of rural land and urban clusters of less than 50,000 (as opposed to urbanized areas), percent of households without broadband, and the percent of workers who commute outside the county to work. In models excluding commuting, frontier status is also associated with fewer PCP. A larger share of rural space is correlated with population density but also reflects the dispersion of people across the county; two counties with identical population could be fully dispersed with people in different parts of the county pulled to surrounding counties for services or have population clustered on one urbanized side of the county that does provide services. Households without broadband are included to reflect infrastructure and technology available to doctors as well as households. More workers leaving the county for work indicates a stronger economic connection to surrounding counties and trade centers, which can be expected to affect where goods and services, including healthcare, are obtained. The share of Hispanic residents was associated with fewer doctors.

In models excluding race and ethnicity, variables associated with increased PCP per 100,000 people are the percent of the population with private insurance and the number of law offices per 100,000 people. Private insurance has a stronger relationship to PCP than does public insurance (Medicare and Medicaid) or uninsurance, and insurance types are highly correlated, which precludes their mass inclusion in regression models. Rural counties had a higher share of the population with public insurance and a smaller share with private insurance than did metro counties, which is consistent with other research on rural healthcare, demographics, and poverty (Table 4). The Hispanic share of population has a fairly strong negative correlation with private insurance, and insurance is not significant in regressions including the Hispanic variable. Law offices are included as a proxy for other services available regionally and other educated professionals with whom doctors might find common ground.

Table 4. Insurance Coverage by RUCC, 2011-2015.

RUCC	Uninsured %	Public Coverage %	Medicare alone %	Medicaid alone %	Private Ins %
1	17.6	26.8	4.3	10.0	65.7
2	20.2	33.6	4.8	14.4	57.2
3	18.8	31.0	4.6	11.2	62.5
4	21.7	34.2	5.3	14.6	54.5
5	22.4	35.0	5.2	15.7	52.4
6	20.9	36.2	5.9	14.1	55.5
7	22.1	33.9	5.6	12.9	55.9
8	19.5	35.7	6.6	10.6	59.8
9	21.5	36.8	6.5	10.8	56.8

Data from Census Bureau American Community Survey, 2011-2015 data.

Supermarkets per 100,000 people and increased distance to a metropolitan central city were associated with more doctors in some models, although less strongly. Distance to a metro area is also moderately correlated with percent of land outside urbanized areas, and underlying factors associated with these variables are likely also correlated so distance is usually excluded from the models. Two simple OLS models using commuting data and frontier designation, as well as a correlation table, can be seen in the data workbook.

The goal of this research is a better understanding of the regional nature of health services provision. At this point, population density and a clustered critical mass (presence of an urbanized area of at least 50,000 people) are key measures to explain the availability of PCP. Commuting patterns, private insurance, and the presence of other professionals and services also appear important. A number of factors remain for future study. Other pieces of information that would be particularly useful include data on intercounty primary care visits and how health systems plan regional service. More sophisticated econometric models will undoubtedly be needed as the dataset is expanded to other states.

References (additional materials linked in the text):

Texas Department of State Health Services. 2016. Primary Care Physicians by County, 2016. Austin, TX. http://www.dshs.texas.gov/chs/hprc/tables/2016/16PC.aspx Accessed 8/8/2017.

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