

Running the Numbers

*A Periodic Feature to Inform North Carolina Health Care Professionals
About Current Topics in Health Statistics*

Regional Variation in Quality of Health Care Across North Carolina's 100 Counties

In this issue of the NCMJ, various authors discuss the quality of health care in North Carolina, but only a few of these authors (eg, DuBard) look at geographic variations in quality of care [1]. To fill this gap, this column examines regional variations in the quality of care provided to Medicare beneficiaries across North Carolina's 100 counties.

There are many reasons to expect that quality of care may vary across North Carolina. Variations in quality of care are commonly observed in national data, although debate is ongoing about what causes these variations. One view, often associated with the Dartmouth Institute for Health Policy and Clinical Practice, is that this geographic variation is produced by physician practice patterns—that it results from learned behavior. Other theories focus on the characteristics of the health professionals providing the care (eg, variations in the training they received, the specialty they chose, or their experience) or on the socioeconomic characteristics of the population receiving care (eg, areas with higher poverty rates may have poorer medication adherence and thus poorer outcomes).

For this analysis, I used 2010 data from the Dartmouth Institute for Health Policy and Clinical Practice. Specifically, I looked at 3 county-level, quality-of-care measures for the Medicare population: the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, the average annual percentage of Medicare enrollees with diabetes aged 65-75 years who have had their glycosylated hemoglobin (HbA_{1c}) level checked, and the rate of preventable hospital admissions (the rate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees). (The rates for these measures are available in a spreadsheet that can be downloaded by clicking on the county-level 2010 link found at <http://www.dartmouthatlas.org/tools/downloads.aspx#primary>.) These measures

capture 3 distinct elements of quality of care in the ambulatory setting: secondary prevention, chronic disease management, and outcomes. My goal was to determine whether these measures are correlated—whether there are regions of the state with generally high (or low) values for all 3 measures.

The maps in Figure 1 show the data for each of the 3 quality-of-care measures. On each map, every county is colored in 1 of 4 different shades, with darker shades representing poorer quality of care. In certain parts of the state—the Research Triangle, Moore County, and the Kinston–New Bern region—quality of care is high for all 3 measures. In contrast, the southeastern part of the state generally has lower quality of care on all 3 measures.

Visual inspection suggests that most of the state's other counties perform well on some measures and poorly on others. However, statistical analysis shows that the measures are highly correlated. Despite the fact that 3 different elements of health care quality are being measured, counties with a rate indicative of high quality on 1 measure also tend to have rates indicating high quality on the other 2 measures. Indeed, Spearman correlation coefficients show that the correlations between the 3 quality measures are statistically significant (Table 1). When reviewing these correlations, note that higher levels of preventable admissions are a signal of poorer quality, in contrast to the other 2 measures (for which higher levels are a signal of better quality).

One possible explanation for this correlation is that these quality measures are simply a marker for

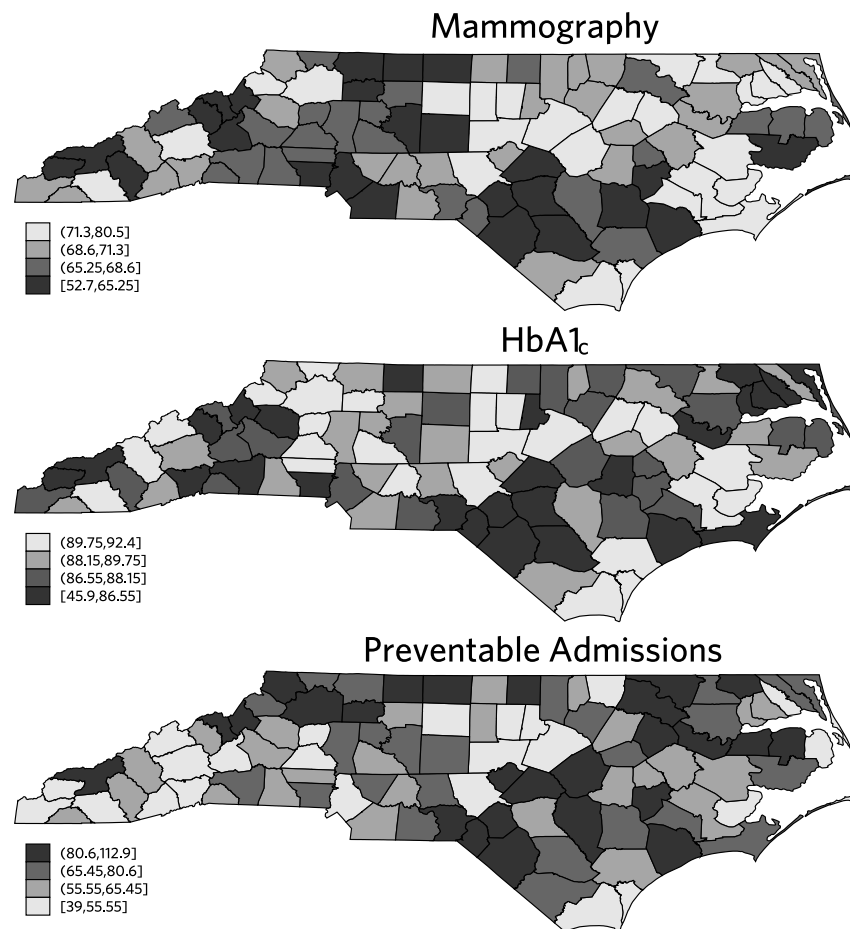
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FIGURE 1.
Quality of Health Care Provided to Medicare Enrollees in North Carolina's 100 Counties



Note. The top map depicts the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, the center map depicts the county's average annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA_{1c}) level checked, and the bottom map depicts the county's rate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees. The keys show the rates for which each shade was used. Darker shading represents lower quality of care, and use of a parenthesis rather than a bracket before or after a number indicates an endpoint that is excluded from the set.
Source of data: Dartmouth Institute for Health Policy and Clinical Practice.

some other factor. For example, perhaps Medicare beneficiaries with low socioeconomic status are less likely to receive high-quality care because they experience difficulties in accessing the health care system (eg, an inadequate physician supply or difficulty in obtaining transportation to a location that offers mammography), because they do not comply with provider recommendations (because of cost or failure to understand the recommendations), or because they encounter other barriers.

Additionally, the health care system may be overburdened in areas with a high proportion of residents of low socioeconomic status, in which case the health care system may not have the capacity to deliver the recommended care. For example, a shortage of practitioners offering mammography services may directly lead to low values for that measure.

To explore the possibility that mammography, HbA_{1c} testing, and preventable admissions are

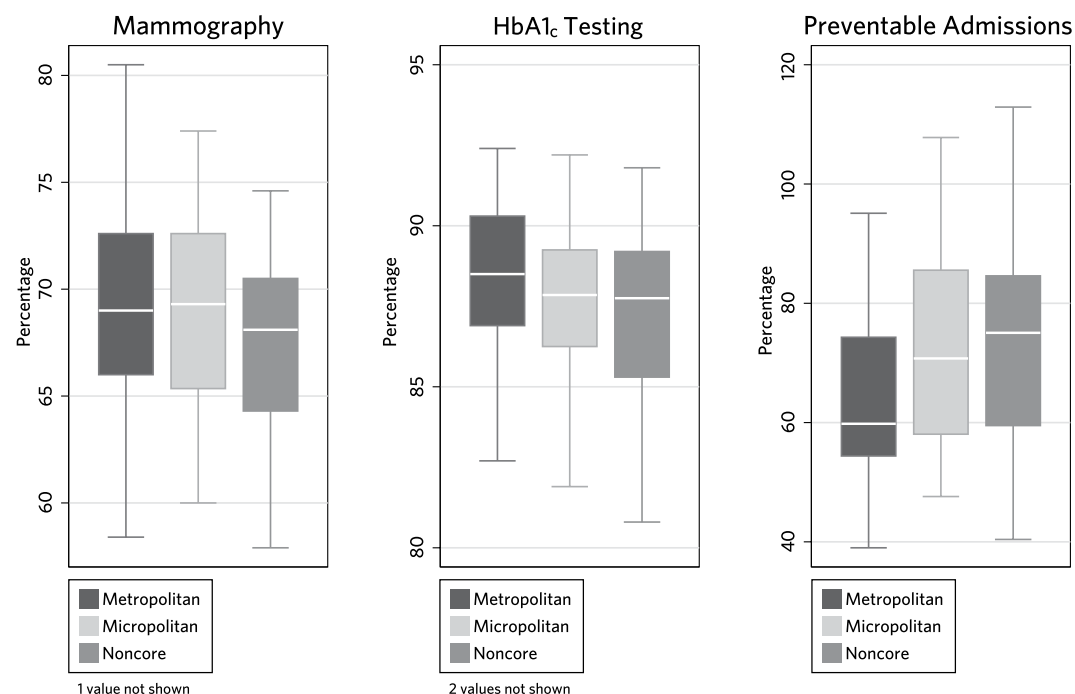
markers for low socioeconomic status, I included the estimated percentage of county residents whose household income is below the federal poverty level as an additional covariate. Previous studies have shown that communities with higher poverty rates have higher rates of hospital admission for preventable conditions, and the data for North Carolina counties confirm this observation. However, the data did not show an association between poverty rates and either mammography rates or rates of HbA_{1c} testing (Table 1). While poverty rates may be insufficient to capture the relationship between local circumstances and quality of care, this analysis suggests that variations in quality-of-care measures may be due to factors other than poverty.

If these data reflect genuine regional varia-

tions in quality of care, how might this variation be explained? One interpretation of these data is that state-based efforts to improve health care quality may be more effective if they are regional in nature. Indeed, this is one of the core tenets of the local stakeholder-driven approach taken by Community Care of North Carolina. The clustering of counties with lower measures of health care quality suggests that regional-based interventions and quality-improvement strategies may channel resources more effectively.

Further analysis of the data shows that quality-of-care measures are associated with the rurality of the county. For this analysis, counties were categorized using 2013 Office of Management and Budget data as metropolitan (having an urban core with a population of 50,000 or more), micropoli-

FIGURE 2.
Associations Between 3 Measures of Quality of Health Care and Rurality



Note. Mammography indicates the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, HbA_{1c} testing indicates the average annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA_{1c}) level checked, and preventable admissions indicates the rate of discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees. Note that the y axes for these measures differ. The horizontal line in the middle of each box indicates the median rate, the top and bottom borders of the box mark the 75th and 25th percentiles, and the whiskers represent the range of the bulk of the remaining data. Metropolitan, having an urban core with a population of 50,000 or more; micropolitan, having an urban core with a population of at least 10,000 but less than 50,000; noncore, rural (having no urban core). Source of data on rurality of counties: Office of Management and Budget. Source of data on quality of care: Dartmouth Institute for Health Policy and Clinical Practice.

TABLE 1.
Spearman Correlation Coefficients for Poverty and for 3 Measures of
Health Care Quality in 100 North Carolina Counties in 2010

	Mammography ^a	HbA1c testing ^b	Preventable admissions ^c	Poverty ^d
Mammography ^a	1			
HbA1c testing ^b	0.4179*	1		
Preventable admissions ^c	-0.3782*	-0.3226*	1	
Poverty ^d	-0.0503	-0.1324	0.3308*	1

^aPercentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period.

^bAverage annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA1c) level checked.

^cRate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees.

^dPercentage of county residents in 2011 with incomes below the federal poverty level. Data are from the Small Area Income and Poverty Estimates of the US Census Bureau.

*P<0.05.

Source of data on health care quality: Dartmouth Institute for Health Policy and Clinical Practice.

tan (having an urban core with a population of at least 10,000 but less than 50,000), or noncore (having no urban core; rural). Figure 2 shows that metropolitan counties in North Carolina had higher rates of mammography and HbA1c testing in 2010 than did rural counties, and metropolitan counties had lower rates of preventable admissions than did either micropolitan or non-core counties. Thus Medicare beneficiaries in rural counties in North Carolina tended to have lower values for these quality-of-care measures. Understanding the reason for these lower values will be important if we want to ensure that peo-

ple across North Carolina have access to—and are receiving—high-quality health care. **NCMJ**

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Reference

1. DuBard CA. Improving the quality of care for Medicaid patients with chronic diseases: Community Care of North Carolina. *N C Med J*. 2013;74(2):142-147.