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Rural-Urban Differences in Medicare Quality Scores Persist After Adjusting for Sociodemographic and Environmental Characteristics

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Abstract

Purpose: Quality scores are strongly influenced by sociodemographic characteristics and health behaviors, many of which lie outside of the clinician's control. As a result, there is vigorous debate about whether, and how, to risk-adjust quality measures. Yet, rurality has been largely missing from this debate, even though population and environmental characteristics are demonstrably different by rurality. We addressed this gap by examining the influence of county-level population sociodemographic, environmental, and health characteristics on 3 Medicare quality measures.

Methods: We used a cross-sectional analysis of 2016 County Health Rankings data to estimate differences in 3 Medicare quality scores (preventable hospitalizations, HbA1c monitoring, and mammography screening) by rurality. We then adjusted for county-level sociodemographic and environmental characteristics in multivariable regression models in order to see whether the association between rurality and quality was impacted.

Findings: Both micropolitan and noncore counties exhibited lower quality scores than metropolitan counties for all 3 measures. After adjustment, noncore counties still had poorer quality on all 3 measures, while micropolitan counties improved on 2 measures. Several county-level sociodemographic and environmental characteristics were associated with quality, although the direction of association depended on the quality measure.

Conclusions: Differences in Medicare quality scores by rurality cannot be entirely explained by differences in population or environmental characteristics. Still, to the extent that clinicians are evaluated—and paid—based on measures that are influenced by both population sociodemographic characteristics and geographic location without adequate risk adjustment, the challenges of delivering care in rural areas will only be exacerbated.

Key words health services research, Medicare, quality of health care, rural health services, social determinants of health.

In spite of a growing recognition of the role of geography and place in determining health outcomes and quality-of-care scores,[1-3] most research on health care quality is done at the individual level, often overlooking the role of community-level characteristics altogether. Little is currently known about whether, or how, quality-of-care scores differ by county-level sociodemographic characteristics and, in particular, whether rurality influences county-level quality-of-care outcomes. However, there is evidence that rural-urban differences in mortality can be largely explained away by risk adjustment.[4] There is also evidence that differences in patient characteristics

influence rural-urban differences in outcomes in small-volume hospitals[5] and in home health care settings.[6] Yet, less is known about how population sociodemographic and environmental characteristics impact other rural-urban differences in broader population health and health care quality.

We know that population health is influenced by factors outside of the clinical realm, including socioeconomic and demographic characteristics, health behaviors, and the environment.[2] There are stark differences in physical environment, community characteristics, access to health care, and sociodemographic characteristics by rurality,[7,8] which, in turn, could influence population health and health care quality scores.[3,9] Findings linking health and geography are particularly salient in an era of assessment and payment of health care providers and facilities based on the quality outcomes of the population they serve.[10] In particular, the Centers for Medicare & Medicaid Services are increasingly using value-based purchasing programs designed to incentivize high-quality care, rather than relying on a traditional fee-for-service model. Such programs tie Medicare reimbursement to quality scores, comparing facilities against each other and against their own baseline on a variety of quality measures, including hospital readmission, mortality, patient experience and satisfaction, and process measures for specific conditions.[10]

However, many community and individual-level factors lie outside of the control of clinicians.[11] No matter how skilled and well-intentioned clinicians might be, they may find themselves being penalized (eg, financially or through low ratings) for poor quality outcomes for complex patients, especially in the absence of adequate resources or comprehensive risk-adjustment mechanisms.[11,12] Medicare uses some individual-level risk adjustment in its value-based purchasing programs, and such risk-adjustment strategies have improved in recent years to better account for patient-level variation. Nonetheless, accurately calculating condition severity is difficult,[13,14] and much of the variation in patient outcomes and health care quality remains unexplained by current adjustment strategies.[3,15] A better understanding of how geography and community characteristics contribute to variation in quality of care will inform discussions on risk-adjustment strategies.

Although 21% of the US population lives in rural areas, only 10% of all physicians practice in these areas.[16,17] Many rural clinicians work in hospitals and clinics that serve populations with complex health needs (eg, obesity and chronic heart disease) and barriers to good health.[11] In these settings, quality measurement can be substantially affected by the socioeconomic status (SES) of patients and the environment within which they reside. In turn, clinician evaluation and reimbursement can be adversely affected by socioeconomic and community-level parameters that are not in their control.[18,19] Further, population health is inherently complex, as health is multifaceted, with various predisposing factors.[12] These factors can be grouped into multiple domains known to influence population health, including individual health behaviors, social and economic characteristics (of both individuals and communities), and physical environment.[20] Together, these domains constitute a majority of all health influences, and they have a much larger impact on health outcomes than clinical care.[20] Additionally, sociodemographic and environmental characteristics differ by geography,[3] making it essential to examine rural-urban differences in any risk-adjustment model.

Population-level rankings, including county health characteristics, can be useful for informing policy and identifying population-level interventions to improve the quality of care and population health.[21] There is evidence that rurality matters for quality of care and that patient populations and health care service delivery systems are markedly different in rural and urban settings.[8,22,23] Yet, few studies have focused on community-level influences on quality of care scores. Even fewer have looked at differences in community characteristics and quality by rurality. This study seeks to address that gap, using county-level data on rurality, quality measures, and population sociodemographic and environmental characteristics to identify population-level influences on Medicare quality measures. The results from this study will help to illuminate potential community-level and geographic influences on population health and quality of care.

Methods

Data and Study Sample

We used data from the 2016 County Health Rankings (CHR) database, which includes various health and sociodemographic measures at the county level compiled from a variety of sources by the University of Wisconsin Population Health Institute.[20] We included all counties with complete information on quality measures and sociodemographic characteristics, for a total of 2,846 counties (representing more than 90% of all counties across the United States). Counties in Hawaii and Alaska were excluded because they did not have environmental data reported. Of remaining counties, remote, noncore counties were slightly more likely to be excluded, owing to data suppression for low population sizes. To define rurality, we used the National Center for Health Statistics classification scheme for counties.[24] We combined all metropolitan counties into 1 category and compared

them with micropolitan and noncore rural counties. Micropolitan counties were defined as nonmetropolitan statistical areas with an urban cluster population of no more than 49,999. Noncore rural counties were defined as those without an urban cluster of 10,000 or more.[24]

Measures

We measured health care quality using 3 measures for Medicare enrollees at the county level.[20] The first was the number of hospital stays for ambulatory-care sensitive condition hospitalizations (eg, preventable hospitalizations) in the county for each 1,000 Medicare enrollees.[25,26] The second was the percentage of Medicare enrollees with diabetes ages 65–75 in the county receiving HbA1c (glycohemoglobin) monitoring in the past year.[27,28] The third was the percentage of female Medicare enrollees ages 67–69 who had at least 1 mammogram over a 2-year period.[23,29] While mammography is used in women younger than 67, the CHR limits this measure to women aged 67–69 because screening accuracy and breast cancer prevalence go up as women get older.[20,29] All 3 measures and specified age ranges were originally derived from the Dartmouth Atlas of Health Care project,[20] and they are the only quality measures available within the CHR.

We used these measures to investigate separate domains of quality of care: preventable hospitalizations as an outcome measure, HbA1c monitoring as a process measure, and completed mammograms as a patient behavior measure (in that it depends on patients following through on provider referrals). We acknowledge, however, that these domains are not mutually exclusive. For example, receiving appropriate HbA1c monitoring relies on both the provider to administer the test and the patient to visit the doctor. Understanding how the same risk-adjustment approach will affect each type of quality measure will be useful to deciding whether, and how, to adjust each type of measure in future models.

We adjusted for several county-level sociodemographic and environmental characteristics in our analyses, similar to prior studies.[3,7,23] In choosing characteristics to include, we focused on health factors from domains that are known to influence population health: health behaviors, social/economic characteristics, and physical environment.[20] For health behavior, we included the percentage of adults who are current smokers, have a body mass index (BMI) of 30 or greater, or report binge drinking or heavy drinking. For environmental factors, we chose a food environment index,[30] which includes access to healthy foods and ranking of food insecurity (ranked from worst to best on a 0–10 scale); percentage of the population with access to exercise opportunities (including parks and recreational facilities within 1 mile in urban areas and within 3 miles in rural areas); and presence of air pollution (measured as the average density of fine particulate matter). Air pollution has been linked to mortality,[31,32] cancer risk,[33-35] and diabetes-related morbidity.[36]

For social/economic factors, we included a measure of social associations (the number of membership organizations per 10,000 people: recreational and fitness clubs and centers, civic organizations, political organizations, religious organizations, and business/professional organizations). Given the multifaceted nature of SES,[37] we used several measures to capture SES at the county level. We included the percentage of the population with at least some college, the county unemployment rate, rate of income inequality[38] (defined as the ratio of household income at the 80th percentile to household income at the 20th percentile), and median household income (divided into quartiles.) Each of those is related, but distinct, constructs. Finally, we accounted for the percentage of the nonelderly population without health insurance, as uninsurance can lead to poorer health outcomes and quality of care[39] and there are rural-urban differences in the relationship between insurance status and health.[40] Further, since uninsurance estimates are based on the income-to-poverty ratio of individuals living within each county,[41] they offer additional information on county-level SES. While we examined outcomes for Medicare beneficiaries ages 65 and older, the uninsurance rate of people younger than 65 could influence outcomes for all individuals living in the county, as greater health insurance coverage has been linked to better access and better outcomes for the whole population.[42]

To measure demographic factors, we included the percentage of the population age 18 and younger, the percentage of the population age 65 and older, the percentage of the population who were non-Hispanic white, and the percentage of the population who were nonnative English speakers. Finally, we included a measure of primary care physicians per 100,000 people as a way to estimate access to care.[23] All variables were reported as county averages. We checked our data for multicollinearity across all of our variables by calculating variance inflation factors and found nothing of concern (all factors were less than 3.5, with a mean of 2.2, well below the standard threshold of 10).

Analysis

We first ran bivariate statistics, comparing differences in county-level sociodemographic and environmental characteristics across levels of rurality using paired *t* tests of significant differences in county averages. We also

Table 1 Community Characteristics by Rurality

	Metropolitan		Micropolitan		Rural Noncore	
	Mean	SD	Mean	SD	Mean	SD
Social associations per 10,000 people	10.90	3.97	13.54***	4.18	16.24***	7.48
Adult smoking	0.18	0.03	0.19***	0.03	0.19***	0.04
Adult obesity	0.30	0.04	0.31***	0.05	0.32***	0.04
Adult drinking	0.17	0.03	0.166***	0.03	0.16***	0.03
Food environment (scale 0–10; 10 = best)	7.32	1.00	6.89***	1.12	6.88***	1.18
Access to exercise	0.72	0.21	0.63***	0.18	0.49***	0.22
Air pollution (avg. density)	11.73	1.56	11.65	1.54	11.60*	1.48
Percent with some college	0.61	0.11	0.55***	0.10	0.52***	0.11
Unemployment	0.06	0.02	0.065***	0.02	0.065***	0.03
Income inequality (ratio of top 80th to bottom 20th)	4.48	0.66	4.58**	0.72	4.52	0.70
Median income (mean, in $)	53,452	13,591	44,554***	9,345	42,161***	8,423
Population 18 and younger	0.23	0.03	0.23	0.03	0.22***	0.03
Population 65 and older	0.16	0.04	0.17***	0.04	0.20***	0.04
Non-Hispanic white	0.75	0.18	0.77**	0.20	0.80***	0.19
Nonnative English speakers	0.02	0.03	0.02	0.03	0.01***	0.02
Uninsured	0.16	0.05	0.17***	0.05	0.18***	0.05
Primary care physicians per 100,000	62.59	36.86	58.41*	28.37	48.60***	29.93
N	1,122		613		1,111	

Data came from the 2016 County Health Rankings.
Significant differences from metropolitan counties at $^{*}P < .05$, $^{**}P < .01$, and $^{***}P < .001$.

computed bivariate statistics comparing quality scores for metropolitan, micropolitan, and noncore rural counties. Next, we ran regression models predicting each quality outcome, adjusting for rurality and county-level characteristics listed above. We used Poisson regression to model preventable hospital stays (a count variable) and ordinary least squares (OLS) regression to model HbA1c and mammography. For hospital stays, we ran sensitivity analyses using OLS models and found that the model fit was better with Poisson regression. In all models, we also included a state-level fixed effect to adjust for unobserved state-level differences, an approach that has been used in other county-level health research to reduce bias introduced by differences in state policies and environments.[43,44] For preventable hospitalizations, smaller coefficients indicate better outcomes; the reverse is true for HbA1c monitoring and mammography screening.

We included the full suite of covariates in modeling each of the 3 quality measures for analytic consistency across outcomes. Since future risk-adjustment strategies may use similar modeling for a range of quality scores, we believed it was useful to see how quality measures might react differently to the same risk-adjustment procedure. That said, we did conduct sensitivity analyses, with and without the most obvious covariates for each quality measure, and we found that our main findings, especially around rurality, were consistent.

Results

There were significant differences in community sociodemographic and environmental characteristics by rurality, as shown in Table 1. Compared with metropolitan counties, rural (both micropolitan and noncore) counties had higher rates of social associations and noncore counties had lower levels of air pollution. On most other measures, metropolitan counties were less disadvantaged than rural counties, although the actual differences were sometimes small. Compared with metropolitan counties, the rates in micropolitan and noncore rural counties for smoking, drinking, and obesity were higher; food environment and access to exercise were more limited; income and education were lower; and uninsurance rates were higher. Rural counties, including both micropolitan and noncore, had fewer primary care physicians per capita and significantly older populations, with a greater percentage of the population age 65 and older, compared with metropolitan counties.

Table 2 shows differences in Medicare quality scores by rurality. For all 3 measures, preventable hospitalizations, diabetic monitoring, and mammography screening, rural areas (micropolitan and noncore counties) fared worse than their metropolitan counterparts. For example, an average of 71 Medicare enrollees per 1,000 were hospitalized for preventable reasons in noncore counties,

Table 2 Differences in Quality Scores by Rurality

	Preventable Hospitalizations per 1,000 Medicare Enrollees		Percentage of Medicare Enrollees With Diabetes Receiving HbA1c Monitoring		Percentage of Female Medicare Enrollees Ages 67–69 Receiving Mammograms	
	Mean	SD	Mean	SD	Mean	SD
Metropolitan	56.14	16.81	0.86	0.04	0.62	0.07
Micropolitan	61.84***	21.75	0.84***	0.07	0.61***	0.08
Rural, noncore	71.40***	30.07	0.84***	0.07	0.59***	0.09

N = 2,846 counties.
Data came from the 2016 County Health Rankings.
Significant differences from metropolitan counties at ***$P < .001$.

compared with 56 per 1,000 in metropolitan counties. In both micropolitan and noncore counties, 84% of Medicare enrollees with diabetes had received appropriate HbA1c monitoring versus 86% in metropolitan counties. And, 59% and 61% of female Medicare enrollees ages 67–69 had received a mammography in noncore and micropolitan counties, respectively, compared with 62% in metropolitan counties. Differences by geographic location were significant at $P < .001$ for all 3 quality measures, although the absolute differences were largest for preventable hospitalizations. Notably, quality scores across all 3 measures were less than perfect for any level of geography, indicating that more needs to be done to improve health care quality and population health in all areas.

Results from the regression models are shown in Table 3. Before adjusting for any county-level characteristics, rural (micropolitan and noncore) counties performed worse on all 3 Medicare quality measures. After adjusting for county-level sociodemographic and environmental characteristics, micropolitan counties had lower rates of HbA1c monitoring, compared with metropolitan counties, and noncore counties continued to have poorer rates of all 3 quality measures. However, after adjusting for all covariates, micropolitan counties had slightly lower rates of preventable hospitalizations than metropolitan counties. Several county-level sociodemographic characteristics were significantly associated with the 3 different quality measures, although the direction of the association was not always consistent. For instance, having a higher percentage of obese adults and a higher level of air pollution were both associated with more preventable hospitalizations, but both were also associated with better performance on HbA1c monitoring and mammography screening. In contrast, having a higher percentage of adults who smoked was associated with poorer performance on all 3 quality measures. Better access to exercise opportunities was associated with fewer preventable hospitalizations and more mammography, but it had no significant association with HbA1c screening.

In general, lower income and educational attainment and higher income inequality were associated with worse performance on all 3 quality measures. However, income was less closely associated with mammography screenings than the other 2 measures, possibly because Medicare covers mammography without any out-of-pocket cost for the beneficiary. Having a higher percentage of children in the population was associated with worse performance on HbA1c monitoring and mammography screening, while having a higher percentage of older adults was associated with better performance on preventable hospitalizations and mammography screening.

Discussion

In this paper, we identified significant differences in county-level Medicare quality scores and sociodemographic characteristics by rurality. In particular, we found that all rural areas—both micropolitan and noncore rural counties—consistently had worse outcomes for the 3 Medicare quality measures we examined, compared with urban (metropolitan) counties before controlling for sociodemographic characteristics. We also noted that rural areas tended to be socioeconomically and environmentally disadvantaged. These findings imply that rurality is associated with both population-level characteristics and health care quality. Failing to account for rurality or geographic location in quality-adjustment models may lead to biased quality scores, given that many aspects of those environments—including sociodemographic characteristics of the population, pollution, and access to food and exercise opportunities—largely lie outside the control of providers. Still, to the extent that providers have the capacity to advocate for broader community health promotion activities and policy changes, rural providers may be in a unique position to speak to the importance of addressing social determinants of health as a means to improve health care quality and, ultimately, population health in the long term.

Table 3 Regression Models Predicting Performance on Quality Measures

	Preventable Hospitalizations (Lower = Better)				Hba1C Monitoring (Higher = Better)				Mammography Screenings (Higher = Better)			
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Rurality												
Metropolitan (reference)												
Micropolitan	0.06***	0.007	−0.05***	0.01	−0.01***	0.003	−0.01***	0.003	−0.02***	0.00	−0.003	0.004
Noncore	0.21***	0.01	0.06***	0.01	−0.02***	0.003	−0.02***	0.003	−0.04***	0.00	−0.03***	0.004
Social associations			0.00	0.00			0.00	0.00			0.001***	0.00
Adult smoking			0.46***	0.11			−0.42***	0.05			−0.11	0.06
Adult obesity			1.54***	0.08			0.22***	0.03			0.19***	0.04
Adult drinking			−1.92***	0.11			−0.04	0.04			0.35***	0.05
Food environment			−0.008*	0.003			0.00	0.001			0.01***	0.002
Access to exercise			−0.17***	0.01			0.01	0.01			0.03***	0.01
Air pollution			0.02***	0.00			0.003***	0.001			0.004***	0.001
Percent with some college			−0.79***	0.04			−0.02	0.02			0.09***	0.02
Unemployment			0.08	0.16			0.00	0.07			0.15	0.08
Income inequality			0.10***	0.00			0.00	0.002			−0.01***	0.002
Median income (quartiles)												
Bottom (reference)												
Third			−0.06***	0.01			−0.01***	0.003			−0.002	0.004
Second			−0.10***	0.01			−0.01***	0.004			0.002	0.005
Top			−0.06***	0.01			−0.02***	0.01			−0.0002	0.01
Percent of population 18 and younger			−0.16	0.11			−0.38***	0.05			−0.41***	0.06
Percent of population 65 and older			−0.89***	0.10			−0.05	0.04			0.36***	0.05
Percent non-Hispanic white			0.33***	0.02			0.08***	0.01			−0.06***	0.01
Percent of nonnative English speakers			1.62***	0.13			0.46***	0.06			−0.08	0.07
Uninsured			−0.28***	0.08			−0.32***	0.03			−0.32***	0.04
Primary care physician rate			0.0001	0.0001			0.00	0.00			0.002***	0.00
Intercept	−4.82***	0.01	−5.06***	0.08	0.85***	0.00	0.92***	0.04	0.63***	0.00	0.51***	0.04
Adjusted R^2	0.08		0.40		0.02		0.24		0.04		0.36	

Source: 2016 County Health Rankings.

N = 2,846 counties for all models.

*$P < .05$; ***$P < .001$.

The relationship between rurality and quality diminished after adjusting for sociodemographic and environmental characteristics for micropolitan counties, but it remained consistent for the most rural counties (noncore areas). These findings indicate that there are differences in quality scores even across rural areas, and that very rural (noncore) counties are associated with poorer quality, above and beyond the composition of the community and above and beyond primary care physician supply. This may be partly attributable to unobservable cultural differences in attitudes toward health care use or health, in general.[45-47] Certainly, there are marked differences by geography in access to care, travel time, and distance to health care providers, and other factors that we did not observe or adjust for in our analyses.[46,47] This is not to say that clinicians should not be held accountable for the quality of care that they provide; rather, it suggests that care is provided within different contexts, and many population-level and environmental characteristics lie outside of the control of individual clinicians and health care facilities.

Our findings are consistent with other research showing that risk-adjustment for sociodemographic characteristics is not sufficient to explain geographic differences in outcomes, indicating that other factors may be at play.[3,12,48] For example, longer distances to health care services or difficulty accessing specific services (eg, mammography) may present unique obstacles to quality in particularly remote rural locations. In general, health behavior is complex and it is difficult to quantify all of its contributing factors.[3,49] In particular, it is difficult to disentangle how much of quality is related to patient behavior, population characteristics, and provider treatment patterns; this complexity makes it complicated to choose "the right" risk-adjustment model that will treat patients and providers alike fairly. The results from this study indicate that there are rural differences in Medicare quality scores, although more research is needed to understand the precise mechanisms behind those differences, especially to determine whether there are factors driving differences in health outcomes and quality of care that are amenable to intervention or whether there are inherent differences by degree of rurality itself that should be adjusted for.

These results are particularly pertinent at this time due to the Medicare Access & CHIP Reauthorization Act of 2015 (MACRA), which uses a Quality Payment Program to incentivize high-quality care.[50] Though some rural clinicians may not be subject to MACRA provisions due to volume or minimum billing requirements,[50,51] quality metrics form an important part of the payment model under MACRA. It will be important to factor geography into the proposed payment models and in future iterations of value-based payment programs that will likely increasingly affect rural providers over time. Further, to the extent that counties are ranked and pitted against each other by researchers and policymakers based on their population health outcomes and quality of care scores, it is important to understand the underlying mechanisms that contribute to intercounty differences and which can and should be acted upon.

Above and beyond rurality, we found several county-level sociodemographic and environmental characteristics that were significantly associated with quality. For example, income and income inequality were associated with poorer performance across the 3 measures. These findings are particularly concerning for quality in rural communities, as these areas had populations with significantly lower levels of income and education. Having a high percentage of children in the community was associated with lower rates of diabetic monitoring and mammography for Medicare enrollees. While the connection between children and Medicare quality may not be immediately obvious, clinicians may be attuned to the needs of the population they serve. If they serve a community with a younger population, they may be less focused on the particular needs of older adults.[52]

In fact, we found that having a higher percentage of adults age 65 and older was associated with fewer preventable hospitalizations and higher mammography screening. This may be due to these being established measures of Medicare quality, where clinicians serving older populations have focused most on improvement. This suggests that clinicians are responsive to quality measurement and that they may make particular efforts to meet recommended guidelines when serving the population(s) targeted by performance metrics and when quality scores are publicized.[53,54] Indeed, incentivizing quality through carefully designed Medicare pay-for-performance models can have positive ramifications for patients and the health care system generally.[55] Still, doing so requires appropriate risk-adjustment strategies to avoid unfairly penalizing providers serving the most complex patients.

We found that several county-level characteristics had inconsistent associations across the 3 types of quality measures we evaluated: outcome (preventable hospitalizations), process (diabetic monitoring), and patient behavior (mammography). Policymakers making decisions about appropriate risk-adjustment methods must be mindful of the fact that not all quality measures will react similarly to the same modeling strategy.[56] Instead, it is important to find the "right" model for each measure, rather than apply a blunt risk-adjustment procedure to all quality scores. Specifically, this will require research to determine whether a unique modeling strategy should

be employed for rural noncore counties. Quality measurement and value-based payment systems that do not take community-level SES into account may unfairly penalize rural clinicians for population-level characteristics out of their control and may even lead to greater disparities in health.[57] Further, efforts to improve population health must address root causes of health disparities, such as rural-urban differences in income and education.

Limitations

This study should be considered in light of some limitations. First, the data are cross-sectional, so we cannot determine the direction of causality, and the bidirectional nature of the socioeconomic gradient in health is well established.[58] While it is possible that people might relocate to a community based on its health providers' quality scores, it seems unlikely and, instead, far more plausible that community characteristics impact quality, rather than the other way around. Second, due to data availability, we only look at quality measures for the Medicare population, although we took into account the composition of the entire community. Quality scores for younger, or uninsured populations, may show different patterns by rurality and sociodemographic characteristics. Third, we examined both quality and sociodemographic characteristics on a county level, which may mask heterogeneity within counties. County-level statistics are also unable to shed light on the role of individual personality and preferences around health care use, which are associated with health care behavior.[15] It would also be useful to examine data at a more local level than the county in order to address the heterogeneity within counties. However, county-level measures may still be useful because some of the characteristics we included require policy, population, or environmental, rather than individual, interventions, so it is appropriate to demonstrate their impact on county-level health. Finally, not all counties were included in the analysis because of missing data and those counties most likely to be excluded were noncore counties. It is possible that this led us to underestimate differences in outcomes by rurality.

Conclusions

Overall, this study uncovered evidence of a relationship between rural location and poorer Medicare quality scores. Yet, these findings were sensitive to the type of quality being measured, as were the relationships between quality and sociodemographic and environmental characteristics. These findings led us to several conclusions. First, quality varies by rurality, but a portion of that variation can be explained by community-level sociodemographic composition, which lies outside of the control of individual clinicians and health care delivery systems. This was especially true for micropolitan rural counties, rather than noncore counties. Second, the relationship between quality, rurality, and sociodemographic/environmental characteristics varies by the quality measure being examined, making it important to examine quality-adjustment strategies differently for each outcome measured. Third, any discussion about quality measurement and risk-adjustment should take rurality into account, as it impacts quality above and beyond sociodemographic and environmental characteristics, especially for the most rural counties. Additional research is needed to identify specific mechanisms that lead to rural-urban differences in quality that are amenable to interventions. Ultimately, the goal of any quality-incentivizing risk-adjustment strategy should be to adjust for sociodemographic and environmental factors that matter for population health, but which are out of the control of the clinician, without incentivizing a 2-tier system. Our findings demonstrate that no such strategy would be complete without accounting for geography and geographic differences in population characteristics, especially in remote rural locations.

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