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CMS Hierarchical Condition Category (HCC) 2014 Risk Scores Are Lower for Rural Medicare Beneficiaries than for Urban Beneficiaries

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OVERVIEW

In 2004, to adjust capitated payments for Medicare Advantage (MA), or Medicare Part C, the Centers for Medicare & Medicaid Services (CMS) developed a new risk adjustment model that improved on the explanatory power of previously developed models.[1] This model uses Hierarchical Condition Categories (HCCs) and demographic information to produce a risk score for a Medicare beneficiary. The risk score predicts next year's spending on a beneficiary compared to the average expected spending per beneficiary for the entire Medicare population. The risk adjustment model incorporates the health risk of beneficiaries by using multiple factors that influence health. These factors include the beneficiary's age; sex; eligibility for Medicaid; initial reason for Medicare qualification; residence in an institution such as a long-term care facility; and the diagnoses assigned to the beneficiary in inpatient, outpatient, and office-based settings during a base year. The CMS-HCC model normalizes scores so that the average beneficiary has a score of 1.0. Beneficiaries with a risk score below 1.0 are relatively more healthy, therefore predicted to be less costly.[1,2]

KEY FINDINGS

- The Centers for Medicare & Medicaid Services use Hierarchical Condition Categories and demographic information to calculate beneficiary risk scores, which predict expected Medicare spending by beneficiaries. Scores are normalized so that the average beneficiary has a score of 1.0. Beneficiaries with a risk score below (above) 1.0 are relatively more healthy (unhealthy), and therefore predicted to be less (more) costly.
- Previous studies across a variety of health measures suggest that rural Medicare beneficiaries are sicker than urban beneficiaries. However, this study finds that average risk scores are lower for community-dwelling and institutional setting beneficiaries in rural counties as compared to urban counties. In addition, the more rural an area, the lower the risk score.
- Furthermore, in both rural and urban counties, average risk scores are generally higher for Black and Indigenous beneficiaries as compared to beneficiaries of other races, and average risk scores are lowest for beneficiaries residing in the West census region as compared to other census regions. Among community-dwelling beneficiaries, risk scores are generally lower in rural counties when stratifying by census region and beneficiary race or ethnicity.
- An analysis of average utilization by health care setting for community-dwelling beneficiaries in metropolitan, micropolitan, and non-core area counties in the year prior to the calculated risk score revealed some differences in utilization count data, primarily in hospital outpatient and office-based settings. Thus, observed differences in risk scores in rural versus urban counties may be driven in part by differences in the intensity or types of health care interventions received. However, this study cannot rule out a role for coding practices and resources as a potential additional driver of the observed differences.

Initially, the CMS-HCC risk adjustment model was used solely to adjust capitated payments to MA plans. However, since 2004, its use has expanded to other Medicare payment programs. HCCs are incorporated throughout value-based payment programs authorized under the Patient Protection and Affordable Care Act (PPACA) of 2010 and the Medicare Access and Children's Health Insurance Program (CHIP) Reauthorization Act (MACRA) of 2015.[3,4] The goal of risk adjustment is to appropriately reimburse for intensive health care interventions and reduce barriers to treating patients needing complicated treatment. However, if CMS-HCC risk scores do not accurately reflect patient health status because of factors such as coding practices[5] or capacity, then payments may not be associated with the true cost of treatment.

Evidence suggests that CMS-HCC risk scores may not fully reflect the health status of rural patients. Rural populations experience worse health outcomes than their urban counterparts based on metrics such as mortality,[6,7] activity limitations due to chronic conditions, and having a diagnosable severe mental illness.[8] By contrast, rural Medicare beneficiaries have been shown to have lower average CMS-HCC risk scores than urban beneficiaries,[9,10] suggesting that rural beneficiaries are healthier and less costly. In addition, recent regression analysis has shown that after controlling for CMS-HCC risk scores, rural populations generally have higher health care utilization than their urban counterparts.[11] The goal of this study is to further investigate potential differences in rural and urban CMS-HCC risk scores by rurality, census region, and beneficiary race or ethnicity.

METHODS

CMS-HCC risk scores were obtained from the 2014 CMS Risk Score Files, the only year of data available at the time of this study.[12] The CMS Risk Score Files contain monthly segment codes and risk scores for each Medicare beneficiary. Segment codes define a beneficiary's status in a given month (for example, community dwelling, new enrollee, institutional, end-stage renal disease (ESRD), or chronic care special needs plan) and thus the HCC model that is used to produce that month's risk score. For each beneficiary, we calculated a single annual risk score as the average of the 12 monthly risk scores. Our analyses by segment code include only beneficiaries with the same segment code for all 12 months (e.g., beneficiaries who were community dwelling in all 12 months of 2014). Beneficiaries were assigned to rural versus urban locations by geocoding the ZIP Code provided in the Master Beneficiary Summary File[13] using the Office of Management and Budget (OMB) July 2015 delineation of counties into Core Based Statistical Areas (CBSAs), including metropolitan, micropolitan, and non-core areas.[14] We considered the non-metropolitan areas (micropolitan and non-core) to be rural. To investigate whether "exposure" to the health care system in 2013 may have influenced coding patterns and, in turn, risk scores, we also used the 2013 Master Beneficiary Summary File Cost and Utilization Segment[15] to calculate average utilization across different settings for rural and urban beneficiaries. In all analyses, we excluded 2,085,774 beneficiaries who were not in both the Risk Score Files and the Master Beneficiary Summary File, as well as 42,150 beneficiaries with missing data needed to determine metropolitan, micropolitan, or non-core area status. Our final sample included 37,133,799 unique beneficiaries.

RESULTS

Table 1 presents the distribution of beneficiaries by segment code in metropolitan, micropolitan, and non-core area counties. There are more beneficiaries classified as community-dwelling and fewer classified as new enrollees in rural counties as compared to urban counties.

Table 1. Beneficiaries by CMS-HCC Segment Code and Rural Status, 2014

	Metropolitan	Micropolitan	Non-Core
Total Beneficiaries	29,426,894	4,354,233	3,352,672
Percent of Sample			
Segment Code			
Community-Dwelling	74.58%	79.10%	80.04%
New Enrollee	18.27%	13.37%	12.15%
Institutional	1.43%	1.77%	2.03%
End-stage Renal Disease	1.11%	0.83%	0.75%
Other	4.60%	4.93%	5.03%

Table 2 shows average risk scores overall and by segment code in metropolitan, micropolitan, and non-core area counties. For all segment codes except new enrollees and end-stage renal disease, average risk scores are lower in rural counties as compared to urban counties. In addition, risk scores are lower for the more rural (non-core) areas. For example, overall average risk scores are 0.97, 0.95, and 0.93 in metropolitan, micropolitan, and non-core area counties, respectively; among community-dwelling beneficiaries, risk scores are 0.95, 0.91, and 0.88.

Table 2. Average Risk Scores by CMS-HCC Segment Code and Rural Status, 2014

Mean (Standard Deviation)	Metropolitan	Micropolitan	Non-Core
Overall	0.97 (0.90)	0.95 (0.86)	0.93 (0.85)
Segment Code			
Community-Dwelling	0.95 (0.85)	0.91 (0.81)	0.88 (0.78)
New Enrollee	0.67 (0.25)	0.67 (0.25)	0.68 (0.25)
Institutional	2.12 (1.31)	1.91 (1.12)	1.83 (1.06)
End-stage Renal Disease	1.36 (0.90)	1.35 (0.89)	1.36 (0.90)

Table 3 shows average risk scores by census region and beneficiary race or ethnicity for community-dwelling beneficiaries only in metropolitan, micropolitan, and non-core area counties. In all census regions and across virtually all race or ethnicity categories, average risk scores are lower in more rural areas. In both rural and urban counties, average risk scores are generally higher for Black and Indigenous beneficiaries as compared to beneficiaries of other races or ethnicities. In both rural and urban counties, average risk scores are lowest for beneficiaries residing in the West census region. The difference between average risk scores in metropolitan versus non-core area counties is also greatest for beneficiaries residing in the West census region (0.91 – 0.78 = 0.13) followed by the Northeast (0.10), Midwest (0.08) and South (0.04) census regions.

Table 3. Average Risk Scores by Census Region, Rural Status and Race/Ethnicity among Community-Dwelling Beneficiaries, 2014

Mean **Census Region and Race**	Metropolitan	Micropolitan	Non-Core		Metropolitan	Micropolitan	Non-Core
Northeast	0.99	0.92	0.89	**South**	0.95	0.93	0.91
Asian	0.95	0.89	0.80	Asian	0.83	0.78	0.81
Black	1.01	0.94	0.97	Black	0.98	0.95	0.94
Hispanic	0.99	0.88	0.88	Hispanic	1.07	0.97	0.87
Indigenous[a]	1.03	0.92	1.04	Indigenous[a]	1.00	1.04	1.01
White	0.99	0.92	0.89	White	0.94	0.93	0.91
Other	0.90	0.82	0.84	Other	0.80	0.86	0.83
Midwest	0.95	0.91	0.87	**West**	0.91	0.83	0.78
Asian	0.85	0.80	0.72	Asian	0.95	0.81	0.76
Black	1.06	0.97	0.91	Black	0.99	0.91	0.83
Hispanic	0.91	0.82	0.81	Hispanic	0.95	0.88	0.85
Indigenous[a]	1.02	1.01	0.99	Indigenous[a]	0.97	0.91	0.90
White	0.95	0.91	0.87	White	0.91	0.83	0.78
Other	0.82	0.82	0.78	Other	0.82	0.76	0.74

[a] Source data uses the term "North American Native"

An analysis of average utilization by health care setting for community-dwelling beneficiaries in metropolitan, micropolitan, and non-core area counties in the year prior to the calculated risk score (Table 4) revealed only a few differences, primarily in outpatient settings. The average number of hospital outpatient visits per beneficiary is larger in more rural areas, while the average numbers of evaluation and management visits and Part B physician events are lower in rural areas as compared to urban. The mean number of emergency room visits leading to an inpatient admission is also lower for rural as compared to urban beneficiaries.

Table 4. Average Health Care Utilization among Community-Dwelling Beneficiaries by Rural Status, 2013

Mean (Standard Deviation)	Metropolitan	Micropolitan	Non-Core
Acute Inpatient Stays	0.20 (0.62)	0.20 (0.59)	0.20 (0.59)
Acute Inpatient Readmissions	0.03 (0.25)	0.02 (0.22)	0.02 (0.22)
Inpatient Emergency Room Visits	0.14 (0.53)	0.11 (0.44)	0.09 (0.39)
Other Inpatient Stays	0.02 (0.21)	0.02 (0.18)	0.02 (0.16)
Hospital Outpatient Visits	4.97 (9.33)	6.44 (9.94)	7.32 (10.56)
Outpatient Emergency Room Visits	0.41 (1.40)	0.50 (1.48)	0.50 (1.39)
Evaluation and Management Events[a]	4.81 (12.27)	3.48 (8.60)	3.13 (8.15)
Part B Physician Events[b]	8.26 (8.16)	6.93 (7.07)	5.74 (6.42)

Note: 7.15% of community-dwelling metropolitan beneficiaries, 6.69% of community-dwelling micropolitan beneficiaries, and 7.00% of community-dwelling non-core area beneficiaries had no utilization across all eight of the listed utilization categories

[a] Includes visits with multiple providers in the same encounter. Each visit is counted separately.

[b] Represents the count of events in the Medicare part B physician office services for a given year. An event is defined as each line item that contains the relevant service. Additional information on variable definitions can be found at https://www.resdac.org/cms-data/files/mbsf-cost-and-utilization/data-documentation.

DISCUSSION

Consistent with previous studies, we find that Medicare beneficiaries in rural counties have lower average CMS-HCC risk scores than their urban counterparts[9,14] despite previous research suggesting that rural populations are sicker than urban populations.[6,7,8] The CMS-HCC risk score differential holds across the majority of segment codes and across census regions. An examination of average utilization by setting and rurality shows some differences in numbers and types of encounters with the health care system across settings in rural versus urban areas. This suggests that differences in average CMS-HCC risk scores may be driven, in part, by differences in the intensity or types of health care interventions received by rural versus urban beneficiaries. However, this study cannot rule out differences in coding patterns and/or resources in rural versus urban areas as a potential additional factor. Further research is needed to understand the causal factors behind the observed differences in CMS-HCC risk scores. Still, as risk-adjustment becomes more prevalent across Medicare payment programs, it will be important to consider the implications for rural providers, including the possible financial implications of the observed risk score differences between rural and urban beneficiaries.

REFERENCES AND NOTES

1. Pope G, Kautter J, Ingber M, Sara F et al. Evaluation of the CMS-HCC Risk Adjustment Model. Research Triangle International, 2011. Available at: https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/downloads/Evaluation_Risk_Adj_Model_2011.pdf [Accessed April 10, 2018].
2. Pope G, Kautter J, Ellis R, Arlene A, et al. Risk Adjustment of Medicare Capitation Payments Using the CMS-HCC Model. *Health Care Finance Review*, 2004;25(4):119-141. Available at: https://www.rti.org/publication/risk-adjustment-medicare-capitation-payments-using-cms-hcc-model/fulltext.pdf.
3. Centers for Medicare & Medicaid Services (CMS). Detailed Methodology for the 2017 Value Modifier and the 2015 Resource Use Report. March 2017. Available at: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeedbackProgram/Downloads/Detailed-Methodology-for-the-2017-Value-Modifier-and-2015-Quality-and-Resource-Use-Report-.pdf [Accessed April 10, 2018].
4. Centers for Medicare & Medicaid Services. Hospital Value-Based Purchasing. Available at: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Hospital-Value-Based-Purchasing-.
5. Song Y, Skinner J, Bynum J, Sutherland J, Wennberg JE, Fisher ES. Regional Variations in Diagnostic Practices. *New England Journal of Medicine*, 2010;363(1):45-53. Available at: https://doi.org/10.1056/NEJMsa0910881.
6. Centers for Disease Control and Prevention. Leading Causes of Death in Nonmetropolitan and Metropolitan Areas - United States, 1999-2014. January 2017. Available at: https://www.cdc.gov/mmwr/volumes/66/ss/ss6601a1.htm [Accessed April 10, 2018].
7. Hoffman A, Holmes M. Regional Differences in Urban and Rural Mortality Trends. North Carolina Rural Health Research Program, UNC Sheps Center, 2017. Available at: https://www.ruralhealthresearch.org/publications/1127.
8. Meit M, Knudson A, Gilbert T, et al. The 2014 Update of the Rural-Urban Chartbook. NORC Walsh Center for Rural Health Analysis. October 2014. Available at: https://ruralhealth.und.edu/projects/health-reform-policy-research-center/pdf/2014-rural-urban-chartbook-update.pdf [Accessed April 10, 2018].
9. Stensland J, Akamigbo A, Glass D, Zabinski D. Rural and Urban Medicare Beneficiaries Use Remarkably Similar Amounts of Health Care Services. *Health Affairs*, 2013;32(11):2040-2046. Available at: https://doi.org/10.1377/hlthaff.2013.0693 [Accessed April 10, 2018].
10. Hoffman A, Reiter K, Randolph R. Average Beneficiary CMS Hierarchical Condition Category (HCC) Risk Scores for Rural and Urban Providers. North Carolina Rural Health Research Program, UNC Sheps Center, 2018. Available at: https://www.shepscenter.unc.edu/wp-content/uploads/dlm_uploads/2018/07/Average-Beneficiary-CMS-Hierarchical-Condition-Category-HCC-Risk-Scores-for-Rural-and-Urban-Providers.pdf.
11. Malone T, Kirk D, Randolph R, Reiter K. Association of CMS-HCC Risk Scores with Health Care Utilization among Rural and Urban Medicare Beneficiaries. North Carolina Rural Health Research Program, UNC Sheps Center, 2020. [findings brief in preparation].
12. ResDAC. Risk Score Files. 2014. Available at: https://www.resdac.org/cms-data/files/risk-score. Accessed in 2020.
13. ResDAC. Master Beneficiary Summary File (MBSF): Base Segment. 2013. Available at: resdac.org/cms-data/files/mbsf-base. Accessed 2020.
14. United States Department of Agriculture, Economic Research Service. What is Rural? 2019. Available at: https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html.
15. ResDAC. Master Beneficiary Summary File (MBSF): Cost and Utilization Segment. 2013. Available at: https://www.resdac.org/cms-data/files/mbsf-cost-and-utilization. Accessed 2020.

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