4-15-2019

Association of Stratification by Dual Enrollment Status With Financial Penalties in the Hospital Readmissions Reduction Program

Karen E. Joynt Maddox

Mat Reidhead

Andrew C. Qi

David R. Nerenz
Henry Ford Health, dnerenz1@hfhs.org

Recommended Citation

Joynt Maddox KE, Reidhead M, Qi AC, and Nerenz DR. Association of Stratification by Dual Enrollment Status With Financial Penalties in the Hospital Readmissions Reduction Program. JAMA Intern Med 2019; Epub ahead of print.

JAMA Internal Medicine | Original Investigation

Association of Stratification by Dual Enrollment Status With Financial Penalties in the Hospital Readmissions Reduction Program

Karen E. Joynt Maddox, MD, MPH; Mat Reidhead, MA; Andrew C. Qi, BS; David R. Nerenz, PhD

IMPORTANCE Beginning in fiscal year 2019, Medicare's Hospital Readmissions Reduction Program (HRRP) stratifies hospitals into 5 peer groups based on the proportion of each hospital's patient population that is dually enrolled in Medicare and Medicaid. The effect of this policy change is largely unknown.

OBJECTIVE To identify hospital and state characteristics associated with changes in HRRP-related performance and penalties after stratification.

DESIGN, SETTING, AND PARTICIPANTS A cross-sectional analysis was performed of all 3049 hospitals participating in the HRRP in fiscal years 2018 and 2019, using publicly available data on hospital penalties, merged with information on hospital characteristics and state Medicaid eligibility cutoffs.

EXPOSURES The HRRP, under the 2018 traditional method and the 2019 stratification method.

MAIN OUTCOMES AND MEASURES Performance on readmissions, as measured by the excess readmissions ratio, and penalties under the HRRP both in relative percentage change and in absolute dollars.

RESULTS The study sample included 3049 hospitals. The mean proportion of dually enrolled beneficiaries ranged from 9.5% in the lowest quintile to 44.7% in the highest quintile. At the hospital level, changes in penalties ranged from an increase of $225 000 to a decrease of more than $436 000 after stratification. In total, hospitals in the lowest quintile of dual enrollment saw an increase of $12 330 157 in penalties, while those in the highest quintile of dual enrollment saw a decrease of $22 445 644. Teaching hospitals (odds ratio [OR], 2.13; 95% CI, 1.76-2.57; $P < .001$) and large hospitals (OR, 1.51; 95% CI, 1.22-1.86; $P < .001$) had higher odds of receiving a reduced penalty. Not-for-profit hospitals (OR, 0.64; 95% CI, 0.52-0.80; $P < .001$) were less likely to have a penalty reduction than for-profit hospitals, and hospitals in the Midwest (OR, 0.44; 95% CI, 0.34-0.57; $P < .001$) and South (OR, 0.42; 95% CI, 0.30-0.57; $P < .001$) were less likely to do so than hospitals in the Northeast. Hospitals with patients from the most disadvantaged neighborhoods (OR, 2.62; 95% CI, 2.03-3.38; $P < .001$) and those with the highest proportion of beneficiaries with disabilities (OR, 3.12; 95% CI, 2.50-3.90; $P < .001$) were markedly more likely to see a reduction in penalties, as were hospitals in states with the highest Medicaid eligibility cutoffs (OR, 1.79; 95% CI, 1.50-2.14; $P < .001$).

CONCLUSIONS AND RELEVANCE Stratification of the hospitals under the HRRP was associated with a significant shift in penalties for excess readmissions. Policymakers should monitor the association of this change with readmission rates as well as hospital financial performance as the policy is fully implemented.

JAMA Intern Med. 2019;179(6):769-776. doi:10.1001/jamainternmed.2019.0117
Published online April 15, 2019.

Supplemental content

Author Affiliations: Cardiovascular Division, Department of Medicine, Washington University School of Medicine, St Louis, Missouri (Joynt Maddox, Qi); Missouri Hospital Association, Hospital Industry Data Institute, Jefferson City (Reidhead); Henry Ford Health System, Center for Health Policy and Health Services Research, Detroit, Michigan (Nerenz).

Corresponding Author: Karen E. Joynt Maddox, MD, MPH, Cardiovascular Division, Department of Medicine, Washington University School of Medicine, 660 S Euclid Ave, St Louis, MO 63130 (kjoyntmaddox@wustl.edu).

Medicare's Hospital Readmissions Reduction Program (HRRP) is a mandatory pay-for-performance program that evaluates hospitals on their 30-day readmission rates for specified conditions and procedures.[1] Hospitals with higher than expected readmission rates are assessed a financial penalty of up to 3% of Medicare payments; in 2018, more than 80% of hospitals were penalized for their readmission rates.[2] Since the initial announcement of the HRRP in 2012, readmission rates have fallen both for targeted conditions and overall, although most of the decline happened prior to the program's actual implementation and readmission rates have leveled off since 2014.[3]

There has been significant controversy surrounding the HRRP, particularly with respect to whether readmission performance, which is adjusted for medical risk factors, should also be adjusted for social risk factors. The association between readmission rates and social risk factors, including race and ethnicity, income, and educational level, is well established,[4-10] and prior studies have shown that hospitals serving a greater proportion of patients with these risk factors are penalized at a higher rate.[11-14] Consequently, many stakeholders have argued that social risk should be taken into account in the HRRP. In response, Congress passed the 21st Century Cures Act in 2016,[15] which included a directive to Medicare to account for differences in the prevalence of poverty (as measured by dual enrollment in Medicare and Medicaid) between hospitals when assessing hospital performance in the HRRP.

Thus, beginning in fiscal year 2019, hospital performance in the HRRP has been stratified into peer group quintiles by the proportion of patients dually enrolled in Medicare and Medicaid, such that hospitals are evaluated relative to others with similar poverty levels in their Medicare patient populations. Although the overall program must remain budget neutral by statute, there is the potential for significant redistribution of penalty dollars as a result. This change has been anticipated by stakeholders across the academic, hospital, and policy communities, but its actual effect is largely unknown. Therefore, we set out to investigate the association of stratification under the updated rule with hospital performance and penalty assessment. We had 2 main research questions: first, how did hospital structural characteristics, patient mix characteristics, and geographical characteristics vary across strata, and second, what were the hospital characteristics associated with changes in HRRP performance and penalties after stratification, including the characteristics listed above as well as state-level variations in Medicaid eligibility?

Key Points

Question What was the association of Medicare's recent change to the Hospital Readmissions Reduction Program, in which hospitals are judged within 5 peer groups based on the proportion of their patients who are dually enrolled in Medicare and Medicaid, with changes in performance and penalties after stratification?

Findings In this cross-sectional study, hospitals in the lowest quintile of dual enrollment saw an increase of $12.3 million in penalties, while those in the highest quintile of dual enrollment saw a decrease of $22.4 million. Large hospitals, teaching hospitals, hospitals in the most disadvantaged neighborhoods, and those with the highest proportion of beneficiaries with disabilities were markedly more likely to see a reduction in penalties, as were hospitals in states with higher Medicaid eligibility cutoffs.

Meaning Stratification of hospitals by the Hospital Readmissions Reduction Program was associated with a significant shift in hospital penalties for excess readmissions.

Methods

Data

We used several sources of publicly available data on hospital characteristics, readmission rates, patient neighborhood characteristics, and state Medicaid eligibility to estimate HRRP penalties before and after stratification. We compiled hospital characteristics, readmission rates, and base operating diagnosis-related group (DRG) payments using the Centers for Medicare & Medicaid Services (CMS) Impact Files and Readmissions Supplemental Files for the final and proposed Inpatient Prospective Payment System rules for fiscal years 2018 and 2019. The performance periods contained in the Readmissions Supplemental Files are July 1, 2013, through June 30, 2016, for payment adjustments in fiscal year 2018, and July 1, 2014, through June 30, 2017, for payment adjustments in fiscal year 2019. We used the Hospital Compare General Information File for the performance period ending June 30, 2016, to identify state and profit status (not for profit, for profit, and public). This study was approved by the Henry Ford Hospital Institutional Review Board (IRB 11064). Informed consent was waived because of the deidentified nature of the data.

We measured patient neighborhood characteristics by joining Area Deprivation Indices for 9-digit zip codes[16] with CMS 2015 100% Inpatient Research Identifiable Files. Each hospital's proportion of Medicare patients with disability was calculated by joining 2015 Research Identifiable File data with CMS Master Beneficiary Summary File data on the original reason for Medicare eligibility. We obtained information on state Medicaid eligibility for the aged, blind, and disabled and Medicaid expansion status using 2017 State Health Facts data from the Henry J. Kaiser Family Foundation.

Covariates

We evaluated the outcome of HRRP stratification by hospital structural characteristics, geographical characteristics, patient mix characteristics, and state Medicaid eligibility characteristics. Structural characteristics included teaching status, size, and ownership. We evaluated geographical characteristics using CMS regions and rural vs urban location. Patient characteristics included quintiles of Area Deprivation Index (calculated using the mean of patients' neighborhood disadvantage for Medicare fee-for-service inpatient discharges during 2015), case mix index (mean DRG weight of inpatient discharges), proportion of patients originally eligible for Medicare because of disability, and proportion of patients dually eligible for Medicare and Medicaid, which is used to create the comparative peer groupings under the stratified

Table 1. Hospital Characteristics and Performance by Strata Under the Hospital Readmissions Reduction Program

Characteristic	Peer Group (Dual Enrollment, %)[a]					Total
	Quintile 1 (0.2%-13.7%)	Quintile 2 (13.7%-18.4%)	Quintile 3 (18.4%-23.2%)	Quintile 4 (23.2%-31.0%)	Quintile 5 (31.0%-93.8%)	
No. (%) of hospitals	577 (18.9)	618 (20.3)	621 (20.4)	629 (20.6)	604 (19.8)	3049
Proportion of patients with dual enrollment, mean	9.5	16.1	20.7	26.7	44.7	23.6
Mean excess readmission ratio	0.981	0.996	0.998	1.007	1.024	1.001
Structural characteristics, %						
Nonteaching	435 (21.8)	400 (20.1)	378 (19.0)	408 (20.5)	371 (18.6)	1992
Teaching	142 (13.4)	218 (20.6)	243 (23.0)	221 (20.9)	233 (22.0)	1057
Small	245 (25.1)	173 (17.7)	182 (18.6)	179 (18.3)	199 (20.3)	978
Medium	178 (18.2)	196 (20.0)	199 (20.3)	206 (21.0)	201 (20.5)	980
Large	154 (14.1)	249 (22.8)	240 (22.0)	244 (22.4)	204 (18.7)	1091
For profit	197 (28.8)	125 (18.2)	90 (13.1)	111 (16.2)	162 (23.6)	685
Public	55 (11.2)	72 (14.7)	110 (22.5)	116 (23.7)	136 (27.8)	489
Not for profit	325 (17.3)	421 (22.5)	421 (22.5)	402 (21.4)	306 (16.3)	1875
Geographical characteristics, %						
Northeast	49 (10.2)	85 (17.7)	98 (20.4)	122 (25.4)	126 (26.3)	480
Midwest	134 (18.5)	169 (23.3)	193 (26.6)	145 (20.0)	85 (11.7)	726
South	284 (22.4)	262 (20.7)	250 (19.7)	270 (21.3)	202 (15.9)	1268
West	110 (19.1)	102 (17.7)	80 (13.9)	92 (16.0)	191 (33.2)	575
Urban	528 (23.1)	518 (22.7)	429 (18.8)	378 (16.5)	432 (18.9)	2285
Rural	49 (6.4)	100 (13.1)	192 (25.1)	251 (32.9)	172 (22.5)	764
Patient characteristics, %						
ADI quintile 5	10 (1.6)	34 (5.6)	127 (20.8)	218 (35.7)	221 (36.2)	610
CMI quintile 5	222 (36.4)	110 (18.0)	115 (18.9)	89 (14.6)	74 (12.1)	610
Disability quintile 5	8 (1.3)	42 (6.9)	97 (15.9)	203 (33.3)	260 (42.6)	610
State Medicaid eligibility cutoffs, %						
Aged, blind, and disabled eligible at 52%-74% FPL	298 (22.9)	323 (24.8)	288 (22.1)	251 (19.2)	144 (11.0)	1304
Aged, blind, and disabled eligible at 80%-88% FPL	106 (20.5)	107 (20.7)	96 (18.6)	112 (21.7)	95 (18.4)	516
Aged, blind, and disabled eligible at 100% FPL	173 (14.1)	188 (15.3)	237 (19.3)	266 (21.6)	365 (29.7)	1229
Nonexpansion state	317 (25.5)	272 (21.9)	239 (19.2)	237 (19.1)	178 (14.3)	1243
Expansion state	260 (14.4)	346 (19.2)	382 (21.2)	392 (21.7)	426 (23.6)	1806

Abbreviations: ADI, Area Deprivation Index; CMI, case mix index; FPL, federal poverty level.

[a] Quintiles are not even because the Centers for Medicare & Medicaid Services assigns quintiles across all hospitals with any readmissions, regardless of whether the hospital is eligible for a Hospital Readmissions Reduction Program assessment.

HRRP method. We evaluated state Medicaid eligibility characteristics using 3 levels of relative eligibility cutoffs for beneficiaries aged 65 years or older in addition to state decisions on Medicaid expansion.

Outcomes

Our primary outcome was the difference in penalties between the traditional and stratified assessments of HRRP penalties in fiscal years 2018 and 2019, in relative (percentage change) and absolute (dollars) terms, at the hospital level. We also examined these outcomes at the stratum level (aggregating within each quintile of dual enrollment), state level, and across hospital characteristics.

Statistical Analysis

We described hospital structural characteristics, geographical characteristics, and patient characteristics as well as state Medicaid eligibility cutoffs by strata of dual enrollment. We then examined changes in penalties at the hospital level, aggregated to the stratum, characteristic, and state levels, both in relative and absolute terms. We used logistic regression to calculate the odds of receiving a lower penalty under stratification associated with each of the characteristics listed.

We analyzed the outcome of stratification by calculating penalty amounts under the traditional and stratified HRRP formulas using base operating DRG payments from the 2019 Inpatient Prospective Payment System proposed rule applied to the payment adjustment factors, peer group assignments, DRG weights, and budget neutrality modifier published in the 2019 final rule. This approach allowed us to draw comparisons between the expected penalty assessments during the first year of stratification and the simulated penalty assessments that would have been realized without stratification. As a robust-

Table 2. Mean Change in Penalties Under Stratification by Hospital Characteristics

Characteristic	Hospital Readmissions Reduction Program, $		Change, %	P Value
	Traditional	Stratified		
Overall	176 417	176 419	0.00	>.99
Structural characteristics				
Nonteaching	117 598	119 619	1.72	.02
Teaching	287 268	283 461	−1.33	.07
Small	95 594	95 602	0.01	.99
Medium	151 794	153 387	1.05	.15
Large	270 988	269 553	−0.53	.46
For profit	166 075	164 711	−0.82	.26
Public	108 757	108 559	−0.18	.80
Not for profit	197 842	198 394	0.28	.70
Geographical characteristics				
Northeast	319 079	306 996	−3.79	<.001
Midwest	133 168	136 784	2.72	.001
South	169 812	176 237	3.78	<.001
West	126 499	117 858	−6.83	<.001
Urban	216 924	217 473	0.25	.72
Rural	55 268	53 633	−2.96	<.001
Patient characteristics				
ADI quintile 5	99 635	94 530	−5.12	<.001
CMI quintile 5	227 802	230 368	1.13	.13
Disability quintile 5	135 693	126 217	−6.98	<.001
State Medicaid eligibility cutoffs				
Aged, blind, and disabled eligible at 52%-74% FPL	128 703	135 891	5.58	<.001
Aged, blind, and disabled eligible at 80%-88% FPL	271 609	271 271	−0.12	.86
Aged, blind, and disabled eligible at 100% FPL	187 077	179 596	−4.00	<.001
Nonexpansion state	152 086	157 680	3.68	<.001
Expansion state	193 164	189 316	−1.99	.01

Abbreviations: ADI, Area Deprivation Index; CMI, case mix index; FPL, federal poverty level.

ness check, we also compared fiscal year 2018 penalties under the prior policy specifications with simulated 2018 penalties under stratified policy specifications extrapolated from final and proposed rule data from fiscal years 2018 and 2019 (results of the simulated analysis for 2018 are included in eTables 1, 3, and 4 and the eFigure in the Supplement). In both analyses, only the benchmarks to which hospitals' performance were compared changed from one scenario to the next, while the actual underlying excess readmission ratios, base operating payments, and DRG weights were held constant during each year.

All analyses were conducted using SAS, version 9.4 (SAS Institute Inc). We considered a 2-tailed $P < .05$ to be statistically significant.

Results

Hospital Characteristics

There were 3049 hospitals in our sample (**Table 1**). The mean proportion of dually enrolled beneficiaries ranged from 9.5% in the lowest quintile to 44.7% in the highest quintile. The mean excess readmission ratio across all 6 measures included in the HRRP was lowest in the lowest quintile of dual enrollment (0.981, representing readmission rates 1.9% lower than expected based on current risk-standardization methods) and was highest in the highest quintile of dual enrollment (1.024, representing readmission rates 2.4% higher than expected). Structural characteristics, geographical characteristics, and patient characteristics differed across strata, as did state Medicaid eligibility cutoffs. For example, 233 of 1057 teaching hospitals (22.0%) were in the highest quintile of dual enrollment, compared with 371 of 1992 nonteaching hospitals (18.6%). Public hospitals (136 of 489 [27.8%] in the highest quintile), hospitals in the Northeast (126 of 480 [26.3%] in the highest quintile) and West (191 of 575 [33.2%] in the highest quintile), and rural hospitals (172 of 764 [22.5%] in the highest quintile) were also more likely to be in the group with the highest dual enrollment.

Hospitals in the highest quintile of mean neighborhood disadvantage and those in the highest quintile of proportion of patients qualified for Medicare on the basis of disability were also much more often in the group with the highest dual enrollment (Table 1). Hospitals with the highest (most complex) case mix index, however, were underrepresented in the group with the highest dual enrollment, with only 74 of 610 hospitals (12.1%) falling into the stratum with the highest dual enrollment. Hospitals located in states with the highest Medicaid eligibility cutoffs were also much more likely to be in the highest quintile of dual enrollment, as were hospitals located in Medicaid expansion states. These patterns were similar when we compared 2018 results with simulated stratified 2018 results (eTable 1 in the Supplement).

Change in Penalties by Stratum

We estimated the mean penalties in 2019 to be $176 400 per hospital under both stratification and traditional policy specifications, given the overall budget neutrality of the program (a modest discrepancy in **Table 2** is due to rounding). However, changes in penalties for individual hospitals ranged from an increase of just above $225 000 to a decrease of more than $436 000, and varied significantly by stratum as per program design (**Figure 1**A). In total, hospitals in the lowest quintile of dual enrollment saw an increase of $12 330 157 in penalties; quintile 2, an increase of $9 637 593; quintile 3, an increase of $5 850 547; and quintile 4, a decrease of $5 369 230, while those in the highest quintile of dual enrollment saw a decrease of $22 445 644 (Figure 1B). These patterns were similar when we compared 2018 results with simulated stratified 2018 results (eFigure in the Supplement).

Change in Penalties by Hospital Characteristics and Geography

Hospital teaching status, size, and ownership were not significantly associated with changes in mean penalty amount (Table 2). Hospitals in the Northeast and West saw their penalties reduced significantly (Northeast, −3.79%; and West, −6.83%), while those in the Midwest and South saw them rise (Midwest, 2.72%; and South, 3.78%). Significant reductions in penalties were also seen for hospitals with the most patients living in highly disadvantaged neighborhoods (−5.12%) and those with the highest proportion of disabled beneficiaries (−6.98%).

States with higher Medicaid eligibility cutoffs, compared with those with lower eligibility cutoffs, had significant reductions in penalties (hospitals in states with eligibility starting at 100% of the federal poverty level, −4.00%; hospitals in states with eligibility starting at 52% to 74% of the federal poverty level, 5.58%) (Table 2 and **Figure 2**). On a relative basis, California saw the greatest reduction in penalties (−14.2%) and South Dakota saw the greatest increase (37.3%). On an absolute basis, California saw the greatest monetary reduction (−$6 587 964), while Florida saw the greatest increase ($2 524 904) (Figure 2; eTable 2 in the Supplement). These patterns were similar when we compared traditional results with simulated stratified results for fiscal year 2018 (eTable 3 in the Supplement).

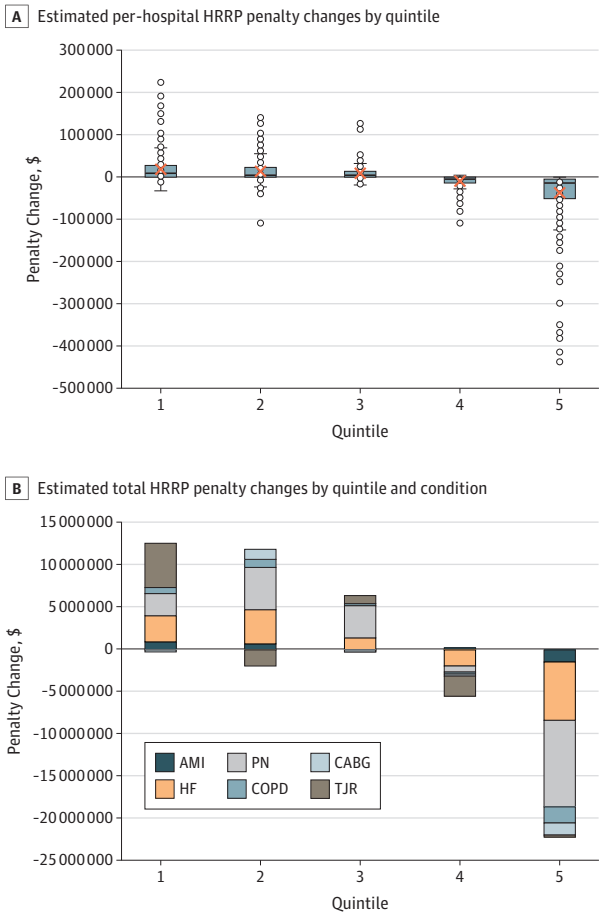
Odds of Receiving Reduced Penalties by Hospital Characteristics

When we modeled the odds of receiving a reduced penalty by hospital characteristics (**Table 3**), we found that teaching hospitals (odds ratio [OR], 2.13; 95% CI, 1.76-2.57; $P < .001$) and large hospitals (OR, 1.51; 95% CI, 1.22-1.86; $P < .001$) had higher odds of reduction. Not-for-profit hospitals (OR, 0.64; 95% CI, 0.52-0.80; $P < .001$) were less likely to have a penalty reduction than were for-profit hospitals, and hospitals in the Midwest (OR, 0.44; 95% CI, 0.34-0.57; $P < .001$) and South (OR, 0.42; 95% CI, 0.30-0.57; $P < .001$) were less likely to do so than hospitals in the Northeast. Hospitals with patients from the most disadvantaged neighborhoods (OR, 2.62; 95% CI, 2.03-3.38; $P < .001$) and those with the highest proportion of beneficiaries with disabilities (OR, 3.12; 95% CI, 2.50-3.90; $P < .001$) were markedly more likely to see a reduction in penalties, as were hospitals in states with the highest Medicaid eligibility cutoffs (OR, 1.79; 95% CI, 1.50-2.14; $P < .001$). These patterns were similar when we compared 2018 results with simulated stratified 2018 results (eTable 4 in the Supplement).

Discussion

We found that stratification of the HRRP as mandated by the 21st Century Cures Act was associated with a significant shift in penalties, ranging from an increase of just above $225 000 to a decrease of more than $436 000 at the hospital level. These outcomes varied by hospital characteristics and, notably, by state Medicaid eligibility cutoffs.

Figure 1. Change in Hospital Readmissions Reduction Program (HRRP) Penalties Under Stratification by Stratum

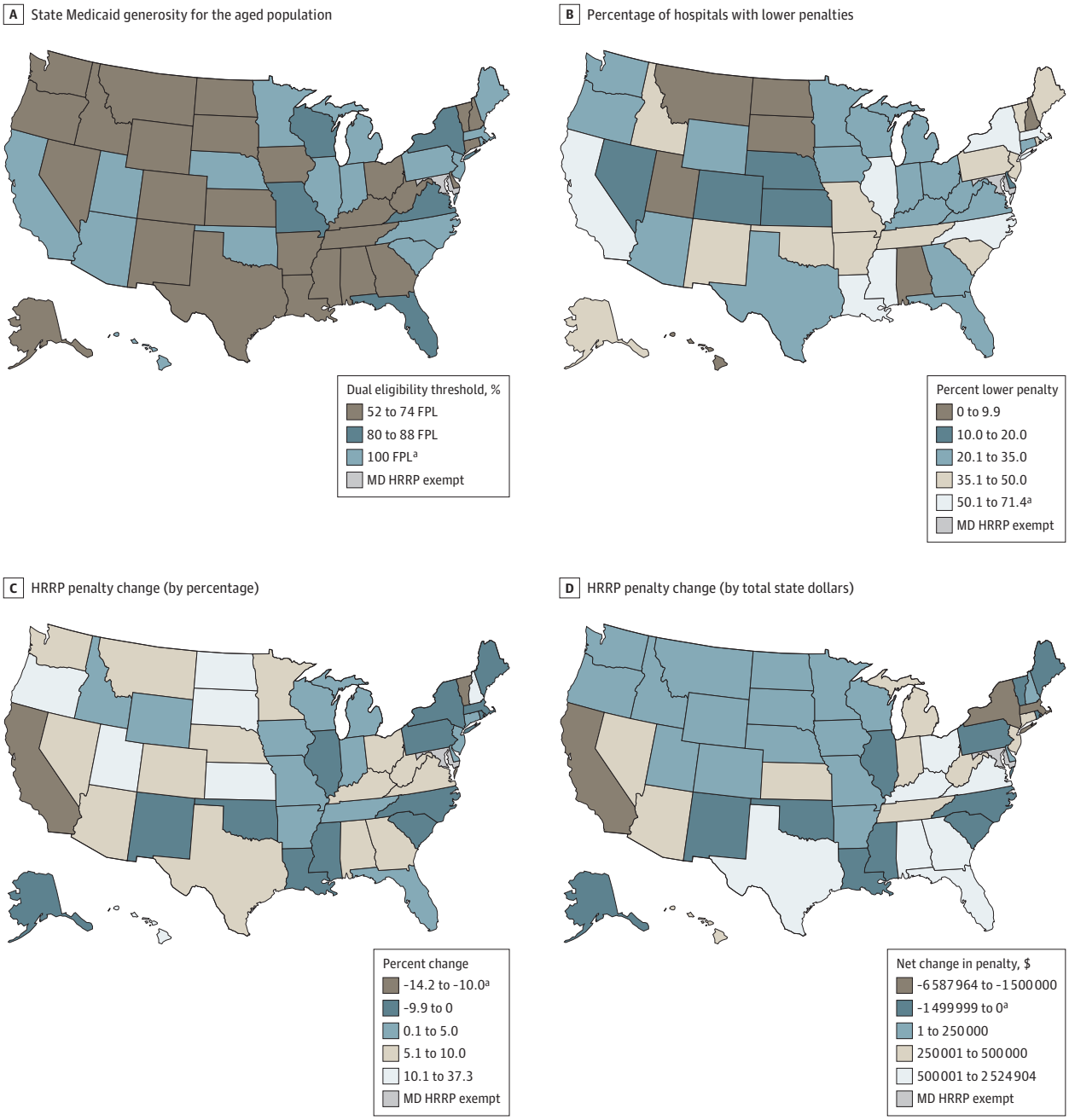


A, Estimated per-hospital HRRP penalty changes with stratification by dually eligible quintile peer groups (n = 3049). The orange crosses indicate the mean value, the horizontal lines outside the boxes are the 25th and 75th percentiles, and the horizontal lines inside the boxes are the median. B, Total estimated HRRP penalty changes with stratification by dually eligible quintile peer groups and condition. AMI indicates acute myocardial infarction; CABG, coronary artery bypass grafting; COPD, chronic obstructive pulmonary disease; HF, heart failure; PN, pneumonia; and TJR, total joint replacement.

Stratification of the HRRP led to significant changes in penalties, particularly for hospitals in the highest quintile of dual enrollment, in which the benchmark shifted the most under this approach. Although for many hospitals the absolute dollar change was quite small, there were hospitals for which the change was large and likely financially meaningful. This finding is in contrast to 1 prior report suggesting that accounting for social risk in the HRRP would have little association with hospital performance or penalties, although that report did not examine absolute changes in penalty dollar amounts.[17]

At the state level, the monetary shift was even more striking, with California hospitals receiving more than $6.5 million less in penalties and Florida hospitals receiving $2.5 million more in penalties. These state-level shifts were correlated with state Medicaid eligibility cutoffs, with states with higher cutoffs having a greater reduction in penalties than those with lower cutoffs. Although Medicaid eligibility for individuals

Figure 2. Geographical Distribution of Penalty Changes



A, State Medicaid eligibility cutoffs for the aged population. B, Percentage of hospitals with lower penalties. C, Hospital Readmissions Reduction Program (HRRP) penalty change by percentage. D, HRRP penalty change by total state dollars. FPL indicates federal poverty level; MD, Maryland.

[a] Also includes Washington, DC.

older than 65 years is set based on the federal standard for receipt of Supplemental Security Income for many states, there are 9 states with 209b waivers that have stricter eligibility standards than Supplemental Security Income, and 7 additional states that use Supplemental Security Income as the eligibility criteria but make their own determinations rather than using the federal government's determinations.[18] Because hospitals are assigned to peer group strata based on their proportion of patients who are Medicaid beneficiaries, states that enroll individuals in Medicaid at a higher income threshold would be categorized in a higher stratum even with the same underlying patient population in terms of poverty.

Although the decision to stratify the HRRP was met with approval from many stakeholders, including clinicians and hospital organizations, there are pros and cons to this approach. As is evident from the data in Table 1, because hospi-

Table 3. Odds of Receiving a Reduced Penalty Under Stratification

Characteristic	Hospitals With Lower Penalty, %	OR (95% CI)	*P* Value
Overall	1126 (36.9)	NA	NA
Structural characteristics			
Nonteaching	660 (33.1)	1 [Reference]	
Teaching	466 (44.1)	2.13 (1.76-2.57)	<.001
Small	330 (33.7)	1 [Reference]	
Medium	363 (37.0)	1.29 (1.05-1.58)	.02
Large	433 (39.7)	1.51 (1.22-1.86)	<.001
For profit	267 (39.0)	1 [Reference]	
Public	199 (40.7)	0.76 (0.59-1.00)	.047
Not for profit	660 (35.2)	0.64 (0.52-0.80)	<.001
Geographical characteristics			
Northeast	234 (48.8)	1 [Reference]	
Midwest	224 (30.9)	0.44 (0.34-0.57)	<.001
South	427 (33.7)	0.42 (0.30-0.57)	<.001
West	241 (41.9)	0.81 (0.62-1.06)	.12
Urban	792 (34.7)	1 [Reference]	
Rural	334 (43.7)	1.01 (0.80-1.27)	.96
Patient characteristics			
ADI quintiles 1-4	784 (32.1)	1 [Reference]	
ADI quintile 5	342 (56.1)	2.62 (2.03-3.38)	<.001
CMI quintiles 1-4	950 (39.0)	1 [Reference]	
CMI quintile 5	176 (28.9)	0.60 (0.48-0.75)	<.001
Disability quintiles 1-4	746 (30.6)	1 [Reference]	
Disability quintile 5	380 (62.3)	3.12 (2.50-3.90)	<.001
State Medicaid eligibility cutoffs			
Aged, blind, and disabled eligible at 52%-74% FPL	375 (28.8)	1 [Reference]	
Aged, blind, and disabled eligible at 80%-88% FPL	194 (37.6)	1 [Reference]	
Aged, blind, and disabled eligible at 100% FPL	557 (45.3)	1.79 (1.50-2.14)	<.001
Nonexpansion state	381 (30.7)	1 [Reference]	
Expansion state	745 (41.3)	1.13 (0.90-1.41)	.30

Abbreviations: ADI, Area Deprivation Index; CMI, case mix index; FPL, federal poverty level; NA, not applicable; OR, odds ratio.

tals are judged against the median performance in their own peer group, hospitals in the highest stratum of dual enrollment are held to a different benchmark than are hospitals in lower strata. Given the strength of evidence demonstrating that social risk factors are associated with readmission rates,[4-6,11,19,20] taking these factors into account in some manner is certainly appropriate. However, some have argued that direct adjustment, which would account for only the within-hospital component of the effect of a social risk factor, would have been a better approach than stratification. The latter approach gives hospitals credit for both the within-hospital and between-hospital differences in performance and, thus, has a greater effect than direct adjustment on performance assessment.[6]

Prior studies have shown that racial disparities in readmissions have begun to decrease under the HRRP.[21] Opponents of accounting for social risk in readmission policy have argued that doing so may reduce hospitals' incentive to improve and ultimately lead to another increase in disparities.[22] On the other hand, high penalties may have impeded hospitals' efforts to reduce readmissions by reducing resources in already constrained environments, so accounting for social risk and consequently reducing penalties could also plausibly lead to further improvements at safety-net hospitals. The association of this modification with the HRRP should be tracked closely, going forward.

To our knowledge, this is the first analysis examining the outcome of HRRP stratification under the 21st Century Cures Act. However, prior reports, including those from the Office of the Assistant Secretary for Planning and Evaluation within the US Department of Health and Human Services[6] and from the Medicare Payment Advisory Commission, have shown similar results in simulation work that preceded and informed this policy change.

Limitations

There are some limitations to our study. First, our findings represent the first year of the new policy approach. As hospitals are improving and worsening from year to year, the true outcome of the policy may change over time. Second, we relied on publicly released data from CMS and did not recalculate hospital performance directly. Finally, our estimates for 2019 penalties were based on hospitals' historical base DRG payments rather than future ones; as the program only started on October 1, 2018, actual penalty amounts in dollars will depend on the total billing to CMS in fiscal year 2019.

Conclusions

Stratification of the HRRP was associated with a significant shift in hospital penalties for excess readmissions. Policymakers should monitor the association of this change with trends in readmission rates as well as hospital financial performance as the policy is fully implemented.

Accepted for Publication: January 13, 2019.

Published Online: April 15, 2019. doi:10.1001/jamainternmed.2019.0117

Author Contributions: Mr Reidhead had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the analysis.
Concept and design: Joynt Maddox, Qi, Nerenz.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Joynt Maddox, Qi.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Reidhead.
Administrative, technical, or material support: Nerenz.
Supervision: Nerenz.

Conflict of Interest Disclosures: Dr Joynt Maddox reported performing intermittent contract work for the US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Dr Nerenz reported receiving personal fees from the Henry Ford Health System and from the Medicare Payment Advisory Commission outside the submitted work. No other disclosures were reported.

Funding/Support: Mr Qi was supported by the Washington University School of Medicine Office of Medical Student Research Dean's Fellowship.

Role of the Funder/Sponsor: The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: We thank DataGen, a national health care policy and analytic firm, for their contributions to the financial impact modeling used in this report. Amy Kind, MD, PhD, University of Wisconsin, provided consultation on use of the Area Deprivation Index that we used as a measure of social disadvantage at the neighborhood level. Dr Kind and the production of the Area Deprivation Index are supported by the National Institute on Minority Health and Health Disparities of the National Institutes of Health under Award R01MD010243 and the National Institute on Aging of the National Institutes of Health under Award RF1AG057784.

REFERENCES

1. Centers for Medicare & Medicaid Services. *FY 2013 IPPS Final Rule: Hospital Readmissions Reduction Program*. Baltimore, MD: Centers for Medicare & Medicaid Services; 2012.

2. Advisory Board. 2,573 hospitals will face readmission penalties this year: is yours one of them? https://www.advisory.com/daily-briefing/2017/08/07/hospital-penalties. Published August 7, 2017. Accessed October 4, 2018.

3. Zuckerman RB, Sheingold SH, Orav EJ, Ruhter J, Epstein AM. Readmissions, observation, and the Hospital Readmissions Reduction Program. *N Engl J Med*. 2016;374(16):1543-1551. doi:10.1056/NEJMsa1513024

4. Joynt KE, Orav EJ, Jha AK. Thirty-day readmission rates for Medicare beneficiaries by race and site of care. *JAMA*. 2011;305(7):675-681. doi:10.1001/jama.2011.123

5. Tsai TC, Orav EJ, Joynt KE. Disparities in surgical 30-day readmission rates for Medicare beneficiaries by race and site of care. *Ann Surg*. 2014;259(6):1086-1090. doi:10.1097/SLA.0000000000000326

6. US Department of Health & Human Services, Office of the Assistant Secretary for Planning and Evaluation. Report to Congress: social risk factors and performance under Medicare's value-based purchasing programs. https://aspe.hhs.gov/pdf-report/report-congress-social-risk-factors-and-performance-under-medicares-value-based-purchasing-programs. Published December 21, 2016. Accessed March 6, 2019.

7. Nagasako EM, Reidhead M, Waterman B, Dunagan WC. Adding socioeconomic data to hospital readmissions calculations may produce more useful results. *Health Aff (Millwood)*. 2014;33(5):786-791. doi:10.1377/hlthaff.2013.1148

8. Hu J, Gonsahn MD, Nerenz DR. Socioeconomic status and readmissions: evidence from an urban teaching hospital. *Health Aff (Millwood)*. 2014;33(5):778-785. doi:10.1377/hlthaff.2013.0816

9. Hu J, Kind AJH, Nerenz D. Area Deprivation Index predicts readmission risk at an urban teaching hospital. *Am J Med Qual*. 2018;33(5):493-501. doi:10.1177/1062860617753063

10. Calvillo-King L, Arnold D, Eubank KJ, et al. Impact of social factors on risk of readmission or mortality in pneumonia and heart failure: systematic review. *J Gen Intern Med*. 2013;28(2):269-282. doi:10.1007/s11606-012-2235-x

11. Joynt KE, Jha AK. Characteristics of hospitals receiving penalties under the Hospital Readmissions Reduction Program. *JAMA*. 2013;309(4):342-343. doi:10.1001/jama.2012.94856

12. Gilman M, Adams EK, Hockenberry JM, Wilson IB, Milstein AS, Becker ER. California safety-net hospitals likely to be penalized by ACA value, readmission, and meaningful-use programs. *Health Aff (Millwood)*. 2014;33(8):1314-1322. doi:10.1377/hlthaff.2014.0138

13. Gilman M, Hockenberry JM, Adams EK, Milstein AS, Wilson IB, Becker ER. The financial effect of value-based purchasing and the Hospital Readmissions Reduction Program on safety-net hospitals in 2014: a cohort study. *Ann Intern Med*. 2015;163(6):427-436. doi:10.7326/M14-2813

14. Joynt KE, Jha AK. Who has higher readmission rates for heart failure, and why? implications for efforts to improve care using financial incentives. *Circ Cardiovasc Qual Outcomes*. 2011;4(1):53-59. doi:10.1161/CIRCOUTCOMES.110.950964

15. 21st Century Cures Act, HR 34, 114th Cong, (2015-2016).

16. Kind AJH, Buckingham WR. Making neighborhood-disadvantage metrics accessible—the neighborhood atlas. *N Engl J Med*. 2018;378(26):2456-2458. doi:10.1056/NEJMp1802313

17. Bernheim SM, Parzynski CS, Horwitz L, et al. Accounting for patients' socioeconomic status does not change hospital readmission rates. *Health Aff (Millwood)*. 2016;35(8):1461-1470. doi:10.1377/hlthaff.2015.0394

18. Program Operations Manual System (POMS), Social Security Administration. SI 01715.010 Medicaid and the Supplemental Security Income (SSI) Program. https://secure.ssa.gov/poms.nsf/lnx/0501715010. Accessed October 4, 2018.

19. Zuckerman RB, Joynt Maddox KE, Sheingold SH, Chen LM, Epstein AM. Effect of a hospital-wide measure on the Readmissions Reduction Program. *N Engl J Med*. 2017;377(16):1551-1558. doi:10.1056/NEJMsa1701791

20. Kind AJ, Jencks S, Brock J, et al. Neighborhood socioeconomic disadvantage and 30-day rehospitalization: a retrospective cohort study. *Ann Intern Med*. 2014;161(11):765-774. doi:10.7326/M13-2946

21. Figueroa JF, Zheng J, Orav EJ, Epstein AM, Jha AK. Medicare program associated with narrowing hospital readmission disparities between black and white patients. *Health Aff (Millwood)*. 2018;37(4):654-661. doi:10.1377/hlthaff.2017.1034

22. Krumholz HM, Bernheim SM. Considering the role of socioeconomic status in hospital outcomes measures. *Ann Intern Med*. 2014;161(11):833-834. doi:10.7326/M14-2308