

Adjusting Medicare Advantage Star Ratings for Socioeconomic Status and Disability

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Policy makers use quality measurement, public accountability, and financial incentives to induce health plans and providers to improve performance. Frequently, the process-of-care and intermediate outcome measures on which plans and providers are evaluated are not adjusted for differences in patient socioeconomic status (SES) across plans and providers. Pay-for-performance programs that do not account for differences in patients across providers in their quality measurement risk reducing funding to providers that treat medically complex, disabled, and socioeconomically disadvantaged patients, potentially reinforcing or exacerbating existing SES disparities, as more resources may be required to achieve high quality for such patients.¹⁻³ Moreover, providers caring for disadvantaged patients tend to have fewer resources available to invest in quality improvement due to lower reimbursement rates compared with providers with predominantly commercially insured patients.^{1,4-7}

Low-SES individuals receive recommended care less often and experience worse health outcomes than those with higher SES,^{2,8,9} possibly because they have greater health burdens and barriers to care, including limited transportation and lower health literacy,¹⁰⁻¹³ which may discourage providers from treating disadvantaged patients. A recent examination of associations between social risk factors (dual eligibility [DE] for Medicare and Medicaid, black race, Hispanic ethnicity, disability, and rural residence) and performance on quality measures included in 9 Medicare value-based purchasing programs found that beneficiaries with social risk factors received recommended care less often.¹⁴ Providers disproportionately serving high-risk beneficiaries performed worse on average, even after controlling for beneficiary differences.

Policy makers have identified closing these quality gaps as a key policy priority.¹⁵ One approach to accomplish this is to adjust quality measures for socioeconomic factors. The National Quality Forum (NQF)¹⁶ and HHS¹⁴ have called on sponsors of value-based measurement and payment programs to determine whether quality measures should be adjusted for differences in providers' patient mix. The National Academies of Sciences, Engineering, and Medicine developed criteria for determining which social risk factors to address.^{8,9}

ABSTRACT

OBJECTIVES: Studies have identified potential unintended effects of not adjusting clinical performance measures in value-based purchasing programs for socioeconomic status (SES) factors. We examine the impact of SES and disability adjustments on Medicare Advantage (MA) plans' and prescription drug plans' (PDPs') contract star ratings. These analyses informed the development of the Categorical Adjustment Index (CAI), which CMS implemented with the 2017 star ratings.

STUDY DESIGN: Retrospective analyses of MA and PDP performance using 2012 Medicare beneficiary-level characteristics and performance data from the Star Rating Program.

METHODS: We modeled within-contract associations of beneficiary SES (Medicaid and Medicare dual eligibility [DE] or receipt of a low-income subsidy [LIS]) and disability with performance on 16 clinical measures. We estimated variability in contract-level DE/LIS and disability disparities using mixed-effects regression models. We simulated the impact of applying the CAI to adjust star ratings for DE/LIS and disability to construct the 2017 star ratings.

RESULTS: DE/LIS was negatively associated with performance for 12 of 16 measures and positively associated for 2 of 16 measures. Disability was negatively associated with performance for 11 of 15 measures and positively associated for 3 of 15 measures. Adjusting star ratings using the CAI resulted in half-star rating increases for 8.5% of MA and 33.3% of PDP contracts that exceeded 50% DE/LIS beneficiaries.

CONCLUSIONS: Increases in star ratings following adjustment of clinical performance for SES and disability using the CAI focused on contracts with higher percentages of DE/LIS beneficiaries. Adjustment for enrollee characteristics may improve the accuracy of quality measurement and remove incentives for providers to avoid caring for more challenging patient populations.

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TAKEAWAY POINTS

CMS implemented the Categorical Adjustment Index (CAI) as part of the Medicare Advantage and Part D Star Rating Program in 2017. These analyses informed its development.

- ▶ Low socioeconomic status and disability are negatively associated with performance for most measures included in the Medicare Advantage Star Rating Program, controlling for between-contract effects.
- ▶ The CAI most benefits contracts with at least 50% of enrollees who are dually eligible for Medicare and Medicaid or receive a Part D low-income subsidy.
- ▶ Adjusting the star ratings using the recently implemented CAI changes the star ratings for a modest number of contracts by half a star.

Although adjustment of process-of-care and intermediate outcome measures for socioeconomic factors is rare, the use of SES-adjusted patient experience measures in the Medicare Advantage (MA), prescription drug plan (PDP), and Hospital Consumer Assessment of Healthcare Providers and Systems surveys are examples of nationwide implementation of such adjustment.¹⁷ Clinical measures in the Medicare Star Ratings Program are not currently adjusted for SES.

Annually, Medicare computes star ratings based on MA and PDP contract performance on clinical, patient experience, customer service, and complaint measures. The star ratings are reported on Medicare Plan Finder,¹⁸ determine MA quality-based bonus payments, and affect MA rebates and enrollment (see [eAppendix](#) [available at ajmc.com] for star ratings description). To address concerns that the star ratings disadvantage contracts serving low-SES and disabled beneficiaries, CMS implemented a Categorical Adjustment Index (CAI)¹⁹ beginning with the 2017 star ratings as an interim policy until measure developers evaluate which clinical measures should be adjusted. The CAI approximates the effect of case mix on star ratings, adjusting the underlying clinical measures for SES characteristics available in CMS administrative data (DE/low-income subsidy [LIS]) and disabled status.

We present analyses that informed the development of the CAI. Our analyses addressed 3 questions: (1) Do within-contract SES and disability performance disparities exist for clinical measures used in the Medicare Star Ratings Program?, (2) How consistent are within-contract disparities across contracts?, and (3) How does adjusting for SES differences affect the overall star rating of MA and PDP contracts, particularly for contracts serving a large portion of beneficiaries who are dually eligible for Medicare and Medicaid, receive a Part D LIS, or are disabled?

STUDY DATA AND METHODS

Study Population

We used patient-level data from the 2014 star ratings (measurement year 2012) to assess the relationship of contract performance with SES (ie, DE/LIS) and disability and to develop the CAI. The 2014 star ratings used 48 Part D (prescription drug) and Part C (health plan) measures to rate MA prescription drug contracts, 36 Part C measures to rate MA-only contracts, and 15 Part D measures to rate PDPs. Analyses

included all MA and PDP contracts eligible for star ratings. We excluded Puerto Rico contracts from analyses due to program differences.

Study Variables

Performance measures. We examined the effect of SES and disability adjustment for 16 (13 Part C and 3 Part D) clinical measures ([Table 1](#); see [eAppendix](#) for description). We excluded from evaluation those measures that were already adjusted for SES (n = 10 measures), being retired or revised (n = 6), used only for

Special Needs Plans (SNPs; n = 3), addressing plan-level customer service (n = 12), or under direct provider or plan control (n = 1; high-risk medication). Measures were coded to indicate whether the beneficiary received the recommended care or achieved the measured outcome (0 = no; 1 = yes).

Low SES. Beneficiaries were classified as low SES if they were partially or fully dually eligible for Medicare and Medicaid as of December 2012 or if they applied and were approved for an LIS.

Disability. Beneficiaries were classified as disabled based on their original reason for Medicare eligibility.

Regression Analysis

NQF recommends considering adjustment for within-provider disparities (the extent to which low-SES patients receive lower-quality care than high-SES patients within the same provider) while preserving between-provider differences in performance (the extent to which all patients of a given provider receive lower-quality care than others). Consistent with this recommendation, we assessed average within-contract DE/LIS disparities for each of the 16 measures by fitting logistic regressions predicting performance from the DE/LIS indicator, using fixed effects for MA and PDP contracts to control for between-contract performance differences (see [eAppendix](#) for additional detail). A sensitivity test examined the effect on DE/LIS and disabled effects after adjusting for Census-based SES characteristics (block group-level education and income/poverty; see [eAppendix](#) for additional detail). We performed similar analyses for the disability indicator.

Contract-level variation in disparity in performance for DE/LIS versus non-DE/LIS beneficiaries was estimated in percentage points using a linear mixed effects model that included DE/LIS as a predictor, mean-centered at the contract level, and random effects for contract and the contract-by-DE/LIS interaction, using empirical best linear unbiased predictions (BLUPs) to account for sampling error in contract-level disparity estimates. As expected from the sample sizes,²⁰ results were insensitive to normality assumptions (not shown). We performed similar analyses for the disability indicator.

Categorical Adjustment Index

The CAI adjustment factor is applied to groups of contracts. Each contract is assigned to an adjustment group based on the

percentage of its beneficiaries who are DE or LIS or disabled. The measure subset selected by CMS for the 2017 star ratings CAI is limited to measures with large and/or consistent within-contract disparities, as determined by measures for which the within-contract DE/LIS disparities based on BLUPs were large (median absolute difference in performance of 5 or more percentage points between DE/LIS and non-DE/LIS enrollees) or consistent (DE/LIS performed worse/better than non-DE/LIS enrollees in all contracts) in the 2012 measurement year data. Adjusted scores for the CAI measure subset were derived from logistic regression with contract fixed effects, DE/LIS, and disabled status as righthand-side variables. An adjusted overall star rating for each contract was simulated based on these adjusted measure scores plus all other star rating measure scores. The value of the CAI adjustment factor was computed as the average difference between contract-level adjusted and unadjusted overall star ratings within each CAI adjustment group. To simulate the effect of DE/LIS and disability adjustment on star ratings, we applied the CAI to the star ratings separately for MA and PDP contracts using the 2015 measurement year data (2017 star ratings). The results are summarized for contracts overall and stratified by contract percentage of DE/LIS beneficiaries (<50% DE/LIS and ≥50% DE/LIS).

The study was approved by RAND Corporation's Human Subjects Protection Committee.

RESULTS

The analyses using the 2012 data included 620 MA and 76 PDP contracts. The number of MA contracts that met the denominator criteria for individual measures varied from 341 to 613 (Table 1). All PDP contracts met the denominator criteria for each of the included prescription drug event (PDE) measures. The average contract-level percentage of DE/LIS beneficiaries was 40.5% (SD = 38.7%), ranging from 0.4% to 100%, for MA contracts. PDP contracts averaged 22.1% DE/LIS (SD = 27.7%), ranging from 0.0% to 86.2%. Contracts with at least 1 SNP, which focus on specific subpopulations of Medicare beneficiaries, including those who are dual-eligible, have chronic conditions, or reside in institutions, had more DE/LIS beneficiaries than contracts without an SNP (59.0% vs 27.8%; *P* < .0001). Roughly one-third (34.4%) of MA contracts and one-fifth (21.1%) of PDP contracts had at least 50% beneficiaries who were DE/LIS. MA contracts averaged 19.8% (SD = 16.2%) disabled beneficiaries (ranging from 0.0% to 97.1%), whereas PDPs averaged 17.9% (SD = 15.2%) disabled beneficiaries

TABLE 1. Summary of Measures, 2012

	Contracts (n)	Beneficiaries (n)	Overall Pass Rate (%)
HEDIS measures (MA contracts)			
Adult BMI assessment	442	509,393	91.1
Rheumatoid arthritis management	372	131,771	77.9
Breast cancer screening	440	1,492,766	73.6
Controlling high blood pressure	437	170,639	62.3
Diabetes care: blood sugar controlled	445	258,711	79.4
Diabetes care: eye exam	445	321,777	66.6
Diabetes care: kidney disease monitoring	445	289,618	91.7
Colorectal cancer screening	444	626,637	74.4
Osteoporosis management in women who had a fracture	341	129,361	28.1
Plan all-cause readmissions ^{a,b}	434	1,291,182	87.4
CAHPS/HEDIS measures (MA contracts)			
Annual flu vaccination	451	187,706	72.5
HOS/HEDIS measures (MA contracts)			
Monitoring physical activity	485	312,795	49.4
Reducing the risk of falling	466	123,696	59.5
PDE/Part D measures (MA contracts and PDPs)			
Part D medication adherence for diabetes medications	563 MA	1,636,258 MA	75.8 MA
	77 PDP	2,564,528 PDP	75.7 PDP
Part D medication adherence for hypertension	613 MA	5,066,387 MA	77.7 MA
	77 PDP	8,416,679 PDP	76.8 PDP
Part D medication adherence for cholesterol	611 MA	5,114,962 MA	72.8 MA
	77 PDP	8,392,722 PDP	73.0 PDP

BMI indicates body mass index; CAHPS, Consumer Assessment of Healthcare Providers and Systems; HEDIS, Healthcare Effectiveness Data and Information Set; HOS, Health Outcomes Survey; MA, Medicare Advantage; PDE, prescription drug event; PDP, prescription drug plan.

^aMeasure has been reverse-coded.

^b1,587,493 total admissions; pass rate at the admission level is 86.5%.

(ranging from 0.0% to 54.7%). Contracts with SNPs enrolled more disabled beneficiaries than contracts without an SNP (29.4% vs 14.6%; *P* < .0001). Approximately one-fourth (23.2%) of MA contracts and one-third (31.6%) of PDP contracts had at least 25% disabled beneficiaries.

Within-Contract SES and Disability Performance Disparities

Controlling for between-contract differences, DE/LIS beneficiaries received significantly worse care for 12 of 16 MA measures (Figure 1), with odds ratios (ORs) ranging from 0.68 (95% CI, 0.66-0.70) to 0.94 (95% CI, 0.93-0.95). DE/LIS beneficiaries were more likely to have an adult body mass index assessment (OR, 1.10; 95% CI, 1.06-1.14) and have better performance on the measure reducing risk of falling (OR, 1.67; 95% CI, 1.60-1.74) than non-DE/LIS beneficiaries; there were not significant overall differences between DE/LIS and other beneficiaries for 2 measures (controlling high blood pressure and monitoring physical activity). Within PDPs, DE/LIS beneficiaries received significantly lower-quality care than other beneficiaries on all 3 PDE measures, with ORs ranging from 0.67 (95% CI, 0.66-0.67) to 0.81 (95% CI, 0.81-0.81). These results were not sensitive

to further adjustment for Census-based SES characteristics (block group-level education and income/poverty) (eAppendix).

Controlling for contract, disabled beneficiaries received significantly less care for 11 of 15 MA measures (Figure 1), with ORs ranging from 0.56 (95% CI, 0.51-0.62) to 0.93 (95% CI, 0.91-0.96). Disabled beneficiaries were more likely to receive rheumatoid arthritis management (OR, 1.13; 95% CI, 1.10-1.17) and have better performance on the measures reducing risk of falling (OR, 1.32; 95% CI, 1.22-1.42) and monitoring physical activity (OR, 1.33; 95% CI, 1.26-1.40) than other beneficiaries; there were not significant overall differences between disabled and other beneficiaries for 1 measure (controlling high blood pressure). Within PDPs, disabled beneficiaries received significantly lower-quality care than other beneficiaries on all 3 PDE measures, with ORs ranging from 0.61 (95% CI, 0.61-0.61) to 0.74 (95% CI, 0.74-0.75).

Consistency of Within-Contract Disparities Across Contracts

Figure 2 illustrates the heterogeneity of the within-contract difference in care received by DE/LIS beneficiaries relative to non-DE/LIS beneficiaries for each measure; Figure 3 provides analogous information for disability. DE/LIS beneficiaries receive, on average, lower-quality care than non-DE/LIS beneficiaries in contracts.

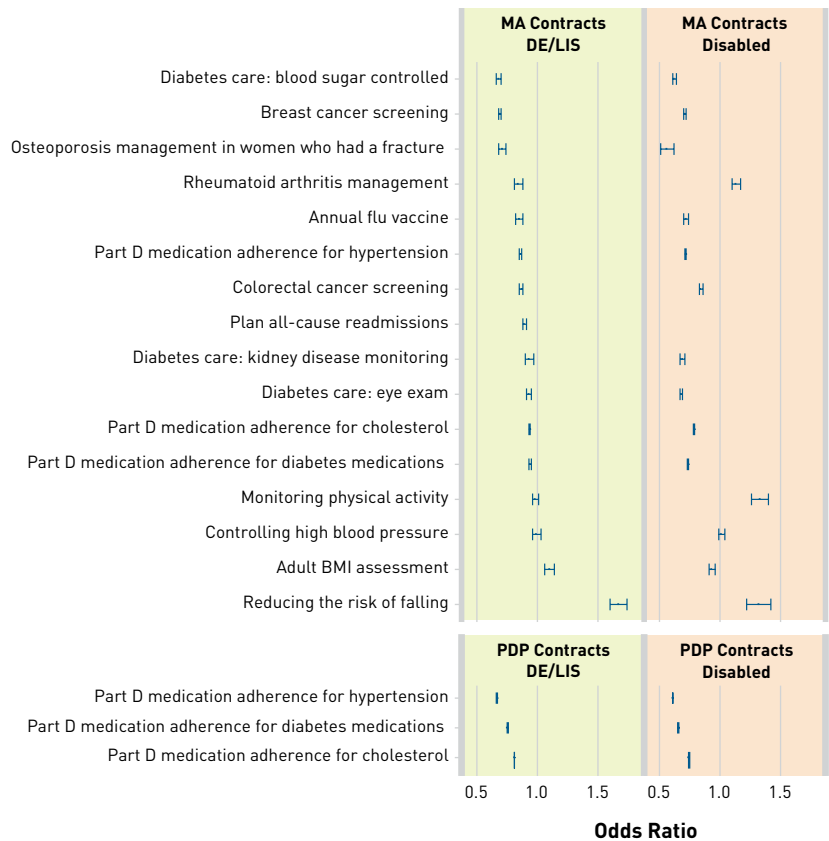
For 3 measures, DE/LIS beneficiaries received lower-quality care than non-DE/LIS beneficiaries in all MA contracts. DE/LIS beneficiaries received lower-quality care in at least 90% of contracts for an additional 3 measures, but higher-quality care in all contracts for 1 measure. For PDPs, DE/LIS beneficiaries received lower-quality care in all contracts for 1 PDE measure and lower-quality care in 90% or more of PDPs for the remaining 2 Part D measures.

Disabled beneficiaries received lower-quality care than nondisabled beneficiaries in all MA contracts for 6 measures and received lower-quality care in at least 90% of contracts for 3 additional measures. They received higher-quality care in at least 90% of MA contracts for 2 measures. For PDPs, disabled beneficiaries received lower-quality care in all contracts for the 3 PDE measures.

Contract Star Ratings Following Adjustment for SES Differences Using CAI

There are 7 measures (6 MA and 1 PDP) for which the contract-level median absolute DE/LIS disparity is at least 5 percentage points or there are no contracts with DE/LIS scores equal to or higher than

FIGURE 1. DE/LIS Beneficiary Odds of Receiving Care, Relative to Other Beneficiaries, by Measure, 2012^{a,b}



BMI indicates body mass index; DE, dual eligibility; LIS, low-income subsidy; MA, Medicare Advantage; OR, odds ratio; PDP, prescription drug plan.

^aThe plan all-cause readmission measure was excluded from the disability analyses due to the high correlation between disability and case-mix adjustment for the measure.

^bWithin each contract type, measures are ordered from lowest to highest OR for DE/LIS. See Table 1 for number of contracts and beneficiaries in each measure. Dots represent OR estimates and horizontal bars denote 95% CI estimates for ORs.

their non-DE/LIS scores. Table 2 shows the simulation of the overall star ratings when applying the CAI based on these 7 measures, with large and consistent DE/LIS disparities across contracts. Adjustment with the CAI changed the overall star ratings for 8.5% of contracts with 50% or more DE/LIS beneficiaries (Table 2). Gains in overall star ratings were concentrated in the high-DE/LIS group; 9 of 10 contracts that had higher overall star ratings following CAI had 50% or more DE/LIS. One contract that had less than 50% DE/LIS lost one-half star, while no contracts with 50% or more DE/LIS lost stars. No contract gained or lost more than one-half star.

Adjustment with the CAI changed the Part D ratings for 20.3% of PDPs (16.3% of contracts with <50% DE/LIS and 33.3% with ≥50% DE/LIS; Table 2). No contract gained or lost more than one-half star. Gains only occurred among contracts with 50% or more DE/LIS beneficiaries (n = 5; 33.3%), while losses only occurred among contracts with less than 50% DE/LIS (n = 8; 16.3%).

FIGURE 2. Contract-Level Variation of the Within-Contract Difference in Care Received by DE/LIS Beneficiaries Relative to Non-DE/LIS Beneficiaries, 2012^a

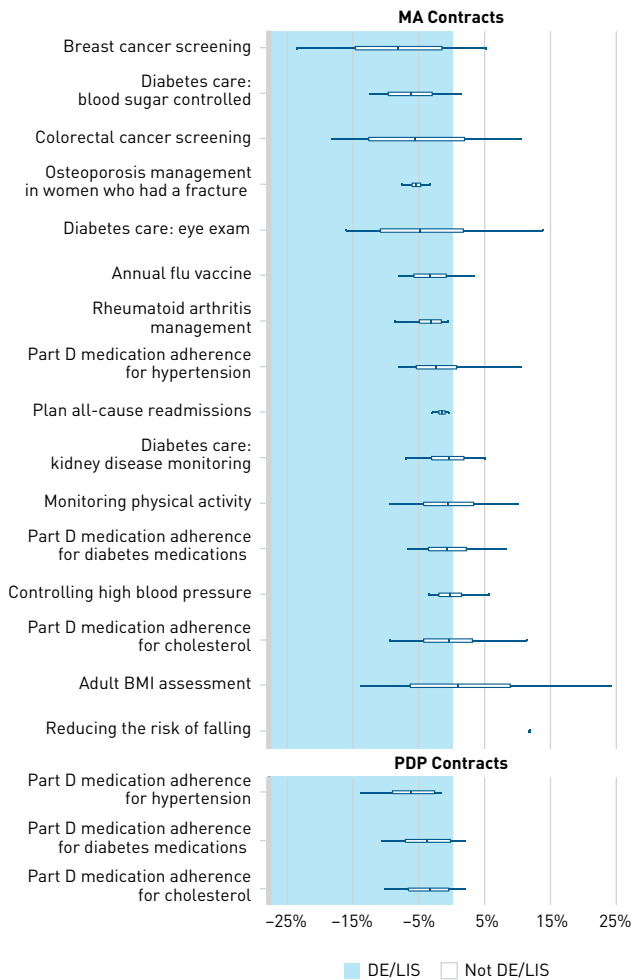
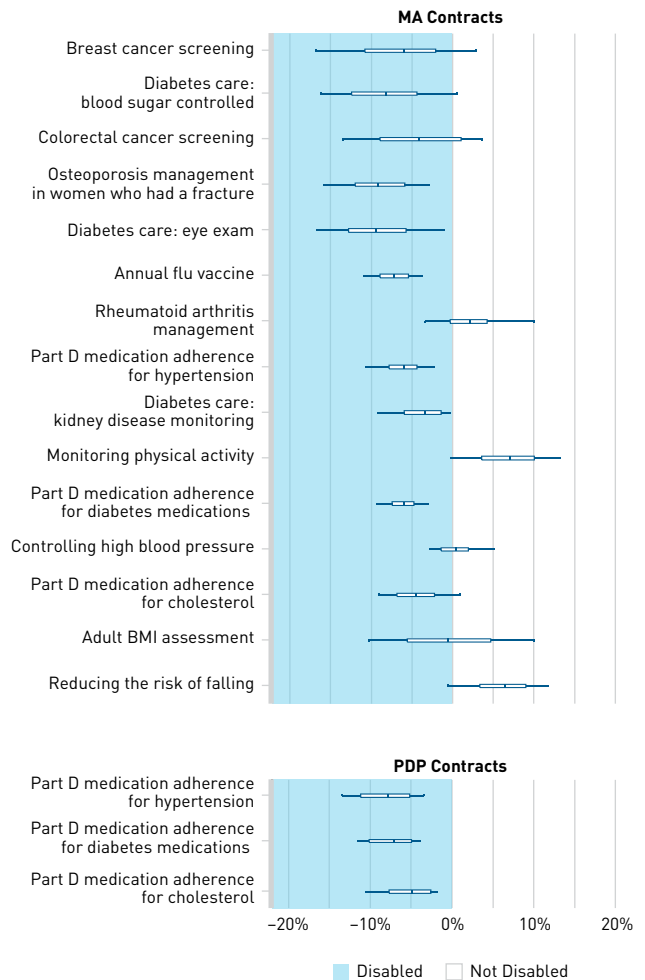


FIGURE 3. Contract-Level Variation of the Within-Contract Difference in Care Received by Disabled Beneficiaries Relative to Nondisabled Beneficiaries, 2012^a



BMI indicates body mass index; DC, District of Columbia; DE, dual eligibility; LIS, low-income subsidy; MA, Medicare Advantage; PDP, prescription drug plan.

^aWithin each contract type, measures are ordered from greatest to smallest disparity for DE/LIS beneficiaries. Overall ratings were simulated for 421 MA contracts in the 50 states and DC meeting the minimum number of measures required, and Part D ratings were simulated for 64 PDP contracts meeting the minimum number of measures required. The central dot represents the median difference between DE/LIS and other beneficiaries within the contract, the white bar contains the within-contract differences for the middle 90% of contracts, and the dark blue lines represent the full range of within-contract differences. The light blue region reflects contract performance that is worse for DE/LIS beneficiaries.

BMI indicates body mass index; DC, District of Columbia; DE, dual eligibility; LIS, low-income subsidy; MA, Medicare Advantage; PDP, prescription drug plan.

^aWithin each contract type, measures are ordered from greatest to smallest disparity for DE/LIS beneficiaries. Overall ratings were simulated for 421 MA contracts in the 50 states and DC meeting the minimum number of measures required, and Part D ratings were simulated for 64 PDP contracts meeting the minimum number of measures required. The central dot represents the median difference between disabled and other beneficiaries within the contract, the white bar contains the within-contract differences for the middle 90% of contracts, and the dark blue lines represent the full range of within-contract differences. The light blue region reflects contract performance that is worse for disabled beneficiaries.

DISCUSSION

To address gaps in care, public and private payers have undertaken a variety of actions, including performance measurement, public reporting, and performance-based payments. Concerns have been raised that some program designs may create incentives for providers and plans to avoid more challenging patient populations.¹ Adjusting performance for differences in the patient populations that plans and providers serve, to level the playing field, is one approach that has been suggested to address potential mismeasurement problems.^{6,16}

Providers caring for low-SES patients may face communication challenges associated with lower education, English proficiency, and health literacy, as well as reduced patient access to care and compliance with medical regimes associated with limited transportation, residential instability, and other barriers.¹⁶ Accounting for these differences may reduce the likelihood that providers will avoid lower-SES patients in response to pay-for-performance programs.

We found within-contract disparities in performance on the clinical measures used to assess MA contract and PDP performance,

TABLE 2. Changes in Star Ratings After Adjustment With CAI, Stratified by Percent DE/LIS Beneficiaries in Contract^a

Contracts With <50% DE/LIS Beneficiaries										Contracts With ≥50% DE/LIS Beneficiaries								
MA Contracts, Overall Star Rating																		
Adjusted	1.5	2	2.5	3	3.5	4	4.5	5		1.5	2	2.5	3	3.5	4	4.5	5	
Unadjusted	TOTAL									TOTAL								
1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2.5	0	0	3	0	0	0	0	0	3	0	0	6	1	0	0	0	0	7
3	0	0	0	39	0	0	0	0	39	0	0	0	28	5	0	0	0	33
3.5	0	0	0	0	89	1	0	0	90	0	0	0	0	44	2	0	0	46
4	0	0	0	0	1	102	0	0	103	0	0	0	0	0	19	2	0	21
4.5	0	0	0	0	0	0	56	0	56	0	0	0	0	0	0	10	0	10
5	0	0	0	0	0	0	0	12	12	0	0	0	0	0	0	0	0	0
Total	0	0	3	39	90	103	56	12	303	0	1	6	29	49	21	12	0	118
PDP Contracts, Part D Rating																		
Adjusted	1.5	2	2.5	3	3.5	4	4.5	5		1.5	2	2.5	3	3.5	4	4.5	5	
Unadjusted	TOTAL									TOTAL								
1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
2.5	0	0	3	0	0	0	0	0	3	0	0	2	1	0	0	0	0	3
3	0	0	0	9	0	0	0	0	9	0	0	0	4	3	0	0	0	7
3.5	0	0	0	2	10	0	0	0	12	0	0	0	0	2	0	0	0	2
4	0	0	0	0	3	9	0	0	12	0	0	0	0	0	1	0	0	1
4.5	0	0	0	0	0	2	9	0	11	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0
Total	0	0	3	11	13	11	10	1	49	0	1	3	5	5	1	0	0	15

CAI indicates Categorical Adjustment Index; DE, dual eligibility; LIS, low-income subsidy; MA, Medicare Advantage; PDP, prescription drug plan.

^aRows are unadjusted stars; columns are stars adjusted for DE/LIS.

^bBolded values indicate the number of contracts with no difference between adjusted and unadjusted star ratings.

predominantly reflecting lower odds of receiving recommended care for low-SES patients; the magnitude of within-contract disparities varied across measures and contracts. These findings are consistent with those of prior studies demonstrating associations among patient sociodemographic characteristics, including SES, for selected Healthcare Effectiveness Data and Information Set measures in commercially insured populations,^{21,22} for outcomes measures among the general population with cardiovascular disease or diabetes,²³ and for medication adherence measures in the MA population.²⁴

Based on these analyses, CMS implemented the CAI with the 2017 star ratings. Adjustment of star ratings through CAI resulted in increased star ratings for some contracts with higher percentages of DE/LIS beneficiaries; 8.5% of MA contracts with 50% or more DE/LIS received half-star increases and none decreased, and 33.3% of PDPs with 50% or more DE/LIS received half-star increases and none decreased. Of contracts with less than 50% DE/LIS, less than 0.1% of MA contracts and 0% of PDPs had higher star ratings and less than 0.1% of MA and 16.3% of PDP contracts had lower star ratings.

Our study is the first to estimate the effects of adjusting the full set of clinical measures used in the Medicare Star Rating Program for SES factors and to simulate the effect of CAI adjustments for

DE/LIS and disability on the star ratings used for quality bonus payments and public reporting. These results should inform future decisions about adjustment for SES.

Strengths and Limitations

Our study has several strengths. First, our analyses used patient-level measures of SES, in contrast to other studies that have used area-level estimates of SES from Census data as proxies for patient-level measures; these estimates measure a combination of the separate effects of the neighborhood in which a person resides and are a less accurate measure of person-level SES. Second, we measured the effect of SES adjustment for the universe of MA and PDP contracts. Third, we measured the effect of adjustment on all clinical measures contained in the Star Rating Program, rather than only a small subset of measures as has previously been reported.^{21,22,24} Fourth, inclusion of the contract fixed effects in our models allowed for adjustment for within-contract differences in quality for DE/LIS and disability, preserving quality differences between contracts and their affiliated providers that should be the target of improvement efforts.¹⁶ Fifth, we translate into policy-relevant terms the effect of risk adjustment at the measure level by examining its effect on the

overall star rating used for quality bonus payment determination in MA contracts.

Our study also has several limitations. This study examined the effects of DE and/or receipt of LIS; although Medicaid eligibility varies by state, it is an important and widely available measure of low income and assets and has been recognized as the best proxy for income linkable to the Medicare beneficiary level.⁹ Furthermore, other measures of SES, such as housing stability, may be important markers of disparity; however, CMS and other payers would face challenges in collecting this measure of disadvantage. We believe that DE/LIS is a partial proxy for housing instability, as it measures the resources available to a beneficiary. This study was not designed to determine what factors allow some contracts to have small or zero disparities in care while others have sizeable disparities. Our findings are limited to beneficiaries in MA and PDP contracts, although other studies have found disparities in care in fee-for-service.^{25,26}

CONCLUSIONS

Policy makers, plans, and providers need to understand the effects of case mix on performance scores and to consider whether it is appropriate to adjust for differences. The overall impact of adjustment and the feasibility of adjustment are important considerations.²² In addition, even when risk adjustment does not lead to changes in performance scores for most providers, it provides face validity to the overall measurement effort in signaling to providers that their treatment of more challenging patients will be accounted for in performance assessment. It is important to design performance measures to influence plan and provider behavior in desired ways, and case-mix adjustment could guard against undesired behaviors, improve the accuracy of quality measurement, and increase the incentive for high-performing contracts to enroll low-income and disabled beneficiaries, which, in turn, might help reduce disparities in quality of care. Decisions about whether to adjust and the effects of adjustment will be a function of the existence of within-contract or within-provider disparity, the magnitude of disparity, and the structure of the scoring algorithm used to rate providers.

In addition to adjustment for SES, which primarily addresses issues of quality measurement, policy makers may consider other options to reduce disparities in health and healthcare, including enhancing data collection to better support reporting quality, specifically for patients with social risk factors; developing and including in value-based purchasing programs measures of health equity paired with incentives to improve performance on these measures; changing the payment structure of incentive programs to reward high performance and improvement among beneficiaries with social risk factors; providing support and technical assistance to providers that serve beneficiaries with social risk factors; developing demonstrations that focus on care innovations intended to achieve better outcomes for beneficiaries with social risk factors; and requiring the coordination of benefits between Medicare and Medicaid by contracts that serve dually enrolled beneficiaries.⁶ ■

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eAppendix

Star Ratings Overview

Star Ratings are used for multiple purposes. They are publicly reported on the Medicare Plan Finder to inform Medicare beneficiaries' plan selections.¹ They determine MA Quality Bonus Payments and affect MA rebates. Finally, they may directly affect enrollment, as beneficiaries may switch to a five-star plan at any point in the year, and plans receiving less than three stars are unable to enroll beneficiaries online.

The 2017 Star Rating program included 47 Part C and Part D measures. Each contract receives one (worst performance) to five stars (best performance) for each measure for which it meets measure requirements. The set of measures considered for inclusion in the CAI adjustment are provided in the table below. For most measures, a clustering algorithm determines the Star Rating based on the scores for all contracts.² Each measure is assigned a weight that ranges from one for process measures to five for an improvement measure.¹ Contracts receive an Overall Star Rating that is a weighted average of both Part C and D individual measure stars, a Summary Part C Star Rating and a Summary Part D Star Rating. PDPs only receive a Summary Part D Star Rating. Ratings are round to the nearest half star.

The included measures, measure specifications, weights and other components of the Star Ratings program are reviewed by CMS annually. Proposed changes to the program are published in annual call letters and are available for public comments. Changes are finalized in published regulations.

¹ Each MA contract includes one or more plans. Performance for the Star Ratings program is measured at the contract level.

² The Beneficiary Access and Performance Problems measure uses fixed cut point to assign stars, while stars for CAHPS measures are assigned using a combination of percentile rank, reliability, and significance testing.

eAppendix Table 1. Measures included in 2017 Star Ratings

	Description
HEDIS Measures (MA contracts)	
Adult BMI Assessment	Percent of plan members with an outpatient visit who had their “Body Mass Index” (BMI) calculated from their height and weight and recorded in their medical records.
Rheumatoid Arthritis Management	Percent of plan members with Rheumatoid Arthritis who got one or more prescription(s) for an anti-rheumatic drug.
Breast Cancer Screening	Percent of female plan members aged 52-74 who had a mammogram during the past 2 years.
Controlling High Blood Pressure	Percent of plan members with high blood pressure who got treatment and were able to maintain a healthy pressure.
Diabetes Care – Blood Sugar Controlled	Percent of plan members with diabetes who had an A-1-C lab test during the year that showed their average blood sugar is under control.
Diabetes Care – Eye Exam	Percent of plan members with diabetes who had an eye exam to check for damage from diabetes during the year.
Diabetes Care – Kidney Disease Monitoring	Percent of plan members with diabetes who had a kidney function test during the year.
Colorectal Cancer Screening	Percent of plan members aged 50-75 who had appropriate screening for colon cancer
Osteoporosis Management in Women who had a Fracture	Percent of female plan members who broke a bone and got screening or treatment for osteoporosis within 6 months.
Plan All-Cause Readmissions	Percent of senior plan members discharged from a hospital stay who were readmitted to a hospital within 30 days, either for the same condition as their recent hospital stay or for a different reason. (Patients may have been readmitted back to the same hospital or to a different one. Rates of readmission take into account how sick patients were when they went into the hospital the first time. This “risk-adjustment” helps make the comparisons between plans fair and meaningful.)
CAHPS/HEDIS Measures (MA contracts)	
Annual Flu Vaccination	Percent of plan members who got a vaccine (flu shot) prior to flu season.
HOS/HEDIS Measures (MA contracts)	
Monitoring Physical Activity	Percent of senior plan members who discussed exercise with their doctor and were advised to start,

	increase or maintain their physical activity during the year.
Reducing the Risk of Falling	Percent of plan members with a problem falling, walking or balancing who discussed it with their doctor and got treatment for it during the year.
PDE/Part D Measures (MA contracts and PDPs)	
Part D Medication Adherence for Diabetes Medications	Percent of plan members with a prescription for diabetes medication who fill their prescription often enough to cover 80% or more of the time they are supposed to be taking the medication. (“Diabetes medication” means a <i>biguanide drug</i> , a <i>sulfonylurea drug</i> , a <i>thiazolidinedione drug</i> , a <i>DPP-IV inhibitor</i> , an <i>incretin mimetic drug</i> , a <i>meglitinide drug</i> or a <i>SGLT2 inhibitor</i> . Plan members who take insulin are not included.)
Part D Medication Adherence for Hypertension	Percent of plan members with a prescription for a blood pressure medication who fill their prescription often enough to cover 80% or more of the time they are supposed to be taking the medication. (“Blood pressure medication” means an <i>ACE (angiotensin converting enzyme) inhibitor</i> , an <i>ARB (angiotensin receptor blocker)</i> , or a <i>direct renin inhibitor drug</i> .)
Part D Medication Adherence for Cholesterol	Percent of plan members with a prescription for a cholesterol medication (a <i>statin drug</i>) who fill their prescription often enough to cover 80% or more of the time they are supposed to be taking the medication.

Additional Information for Analysis

Logistic regressions were performed using patient-level data for each of the measures considered for inclusion in the CAI. Thirteen measures were considered for MA contracts and three were considered for PDP contracts. The three measures considered for PDP contracts were also considered for MA contracts. Analysis included all MA and PDP contracts that were eligible for Star Ratings. Separate regressions were performed for PDP and MA contracts for the three measures that were relevant for both types of contracts. The number of contracts contributing data to the analyses varied by measure. Each regression included contract fixed effects and indicator variables for LIS/DE and disability.

The focus of this work was to use beneficiary characteristics available in CMS administrative data to adjust for SES. With the recognition of the large body of work showing

the relationship between Census-based SES characteristics and quality of care, we performed a sensitivity analysis that examined the changes in the odds ratios for LIS/DE and disability when Census-based characteristics were also included in the model. The Census-based measures included at the block-group level focused on the highest level of education attainment (proportion with less than high school, high school or some college, four-year degree or higher) and income/poverty (proportion with less than 100% of federal poverty level (FPL), 100% to less than 200% of FPL, income less than \$100,000 and FPL 200% or more, income more than \$100,000). Inclusion of the Census-based measures changed the odds ratios for LIS/DE and disability minimally, with changes ranging from 0.00 to 0.03.

CAI Adjustment Factor Calculation

The CAI categories and adjustment factors are calculated annually for the Star Rating program. All contracts that received Star Ratings in the prior year are used in the determination of the CAI adjustment factor. Contracts are placed into equal-sized groups based on their percentage of beneficiaries who are LIS/DE and separately based on the percentage of beneficiaries who are disabled, which are the initial CAI categories. The original version of the CAI used deciles for LIS/DE and quintiles for disability. Some of the cells that result from this combination may have no contracts. For example, we typically do not observe any contracts in the category that combines the lowest percentage of LIS/DE beneficiaries with the highest percentage of disabled beneficiaries. For each contract, the adjusted Overall and Summary Star Ratings are calculated using the adjusted measure-level stars for the subset of measures selected for adjustment in the CAI and operational run measure-level stars for all other measures. The difference between the adjusted Overall and Summary Star Ratings and the unadjusted Overall and Summary Star Ratings are calculated for each contract. Within each of the initial categories, the mean difference between the adjusted Star Rating and the unadjusted Star Rating is calculated for the Overall and Summary Star Ratings. The initial CAI categories are then combined to achieve: 1) monotonicity in at least one dimension (percentage LIS/DE or percentage disabled), 2) at least a .01 difference between categories in the adjustment factor, and 3) a minimum number of contracts (i.e. 30 contracts for MA-PD and 10 for PDPs) in each of the final adjustment categories. The adjustment factors are then recalculated for each of the final CAI adjustment categories (shown below for 2017 Star Ratings).

Final Adjustment Categories and CAI Adjustment Factors for the 2017 Overall Rating

Final Adjustment Category	%LIS/DE Decile	%Disability Quintile	% LIS/DE	% Disability	CAI Adjustment Factor
1	1	1	less than 8.94%	less than 9.00%	-0.015566
2	2-9	1	8.94% to less than 99.00%	less than 9.00%	-0.006181
	1-6	2	less than 30.37%	9.00% to less than 13.10%	
3	1-5	3-5	less than 23.90%	13.10% to 100.00%	0.002408
	6	3	23.90% to less than 30.37%	13.10% to less than 18.86%	
4	7-8	2-3	30.37% to less than 73.90%	9.00% to less than 18.86%	0.013514
5	10	1-4	99.00% to 100.00%	less than 26.50%	0.024680
	9	2-4	73.90% to less than 99.00%	9.00% to less than 26.50%	
	6-8	4	23.90% to less than 73.90%	18.86% to less than 26.50%	
6	6-8	5	23.90% to less than 73.90%	26.50% to 100.00%	0.028531
7	9	5	73.90% to less than 99.00%	26.50% to 100.00%	0.054610
8	10	5	99.00% to 100.00%	26.50% to 100.00%	0.081245

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- Centers for Medicare & Medicaid Services. Medicare 2017 Part C & D star rating technical notes: First plan preview. 2016; https://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/Downloads/2017_Technical_Notes_preview_1_2016_08_03.pdf. Accessed November 9, 2016.