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Lower- Versus Higher-Income Populations In The Alternative Quality Contract: Improved Quality And Similar Spending

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Abstract

As population-based payment models become increasingly common, it is crucial to understand how such payment models affect health disparities. We evaluated health care quality and spending among enrollees in areas with lower versus higher socioeconomic status in Massachusetts before and after providers entered into the Alternative Quality Contract, a two-sided population-based payment model with substantial incentives tied to quality. We compared changes in process measures, outcome measures, and spending between enrollees in areas with lower and higher socioeconomic status from 2006 to 2012 (outcome measures were measured after the intervention only). Quality improved for all enrollees in the Alternative Quality Contract after their provider organizations entered the contract. Process measures improved 1.2 percentage points per year more among enrollees in areas with lower socioeconomic status than among those in areas with higher socioeconomic status. Outcome measure improvement was no different between the subgroups; neither were changes in spending. Larger or comparable improvements in quality among enrollees in areas with lower socioeconomic status suggest a potential narrowing of disparities. Strong pay-for-performance incentives within a population-based payment model could encourage providers to focus on improving quality for more disadvantaged populations.

Across the United States, public and private payers are increasingly entering population-based payment arrangements with accountable care organizations (ACOs). These payment arrangements reward providers for improving the quality of care for a defined population of patients and establish accountability for spending. They may also influence disparities in quality of care that exist along socioeconomic and demographic lines.^{1–4} On the one hand, population-based payment models that reward high quality care could motivate physician organizations to focus on improving quality for more disadvantaged patients who have a greater opportunity for improvement, given that populations in areas with lower socioeconomic status may have lower quality scores at baseline.^{5,6} On the other hand, these

payment models could fail to address—or could even exacerbate—disparities, because physicians who serve more disadvantaged populations could face greater social or health care system-level challenges in achieving higher quality performance. Provider groups that serve areas with lower socioeconomic status might also be less likely than provider groups in other areas to join population-based payment models. To date, evidence related to the impact of population-based payment models on disparities in quality is lacking. Evidence is also lacking on whether medical spending differs by socioeconomic status under such payment models.

We evaluated changes in quality of care and medical spending among populations in areas with lower and higher socioeconomic status before and after their physicians entered the Alternative Quality Contract (AQC) with Blue Cross Blue Shield of Massachusetts. The AQC, launched in 2009, is a multiyear, population-based global budget model that has two-sided incentives: It rewards physicians for savings below the risk-adjusted budget (shared savings) but also requires them to share in deficits with Blue Cross Blue Shield of Massachusetts for spending above the budget (shared risk). During the first four years of the AQC, the enrollee population comprised primarily those in health maintenance organization plans.

The Alternative Quality Contract rewards performance on sixty-four quality measures across ambulatory and inpatient settings and within both process and outcome domains. While the measures are similar to those in ACO contracts used by Medicare and other private insurers, rewards under the AQC tend to be substantially larger.^{7–10} The contract grew from seven provider organizations in 2009 to about 90 percent of Massachusetts physicians in the Blue Cross Blue Shield of Massachusetts network by 2012. Previous analyses have found decreases in medical spending on claims and improved quality performance associated with the contract relative to control, with net savings appearing in the fourth year.^{11,12}

Study Data And Methods

Principal Component Analysis

We assigned enrollees to subgroups by lower and higher socioeconomic status, using a principal component analysis of socioeconomic and demographic characteristics for each enrollee's area of residence. Characteristics were obtained at the census block group level using the 2010 census and 2011 five-year American Community Survey from the Census Bureau.^{13,14} Census block groups better represent individuals than ZIP codes or census tracts because they comprise smaller and more homogenous populations than ZIP codes or census tracts, both of which are substantially larger geographic units.¹⁵ Five-year estimates from the American Community Survey allow for greater precision than one- or three-year estimates and are preferable when analyzing smaller populations or geographies.¹⁶ The area characteristics included variables such as race, education, income, and employment, which have been linked to quality of care.^{1–6,17,18}

Principal component analysis is widely used in the biological and social sciences to collapse multidimensional data into fewer dimensions by generating variables that summarize the essential features of the original data.¹⁹ We performed a principal component analysis at the

census block group level, identifying three variables whose eigenvalues were above 1 (for details, see online Appendix Exhibit 1).²⁰ Using the first principal component, we grouped enrollees by lower or higher socioeconomic status using the median as the cutoff. In sensitivity analyses, we used alternative cutoffs of the twenty-fifth and seventy-fifth percentiles.

Data, Population, and Variables

We analyzed data on process measures, outcome measures, and medical spending at the enrollee level. For process measures, data were collected at the enrollee level from 2007 to 2012. For outcome measures, data at the enrollee level were available during the postintervention years (2009–12) only. For medical spending, enrollee-level claims data were available from 2006 to 2012.

We focused on comparisons between subgroups in areas with lower and higher socioeconomic status within the 2009 AQC cohort, which comprised enrollees whose primary care physicians belonged to organizations that joined the AQC in that year. This included 299,285 individuals in the lower-socioeconomic-status subgroup who were continuously enrolled for at least one year and 244,415 individuals in the higher-socioeconomic-status subgroup who were analogously enrolled.

In secondary analyses of process measures and spending, we included enrollees whose primary care physicians belonged to organizations not in the Alternative Quality Contract as a control group, to test whether trends by income group varied outside of the contract. This comparison population included 1,053,089 lower-socioeconomic-status and 650,041 higher-socioeconomic-status Blue Cross Blue Shield of Massachusetts enrollees who were also continuously enrolled for at least one year. In secondary analyses of outcome measures, we used national and New England Healthcare Effectiveness Data and Information Set (HEDIS) average performance scores as an unadjusted comparison benchmark.

Process measures included eighteen ambulatory measures across three domains: chronic disease management, adult preventive care, and pediatric care (for a complete list of the measures, see Appendix Exhibit 2).²⁰ Each measure was applied to enrollees eligible for the measure, and performance was measured as a binary outcome based on whether performance met criteria in a given year. For example, patients with diabetes would satisfy the eye exam measure if they received an eye exam in a given year. In the AQC, providers would receive a composite measure of quality performance annually, based on the weights assigned to each measure listed in Appendix Exhibit 2.²⁰ The composite performance was then converted into financial rewards based on five “gates” of performance thresholds defined by the percentage of eligible members for whom the measure was met. We analyzed process measures in aggregate as a weighted average and by domain.

The Alternative Quality Contract included five outcome measures: hemoglobin A1c level at or below 9 percent, low-density lipoprotein (LDL) cholesterol level below 100 mg per deciliter, and blood pressure below 140/80 mmHg for patients with diabetes; LDL cholesterol in patients with coronary artery disease; and blood pressure in patients with hypertension. Outcome measures were collected at the enrollee level during postintervention

years for AQC enrollees, which precluded difference-in-differences analysis but enabled adjusted comparisons of postintervention trends. In unadjusted comparisons, we provided average performance at the Blue Cross Blue Shield of Massachusetts network level for the preintervention years and used the national and New England HEDIS average performance for a rough comparison group. Given the confidential nature of outcomes data, these measures had different anonymous enrollee identifiers that prevented cross-linkages with other Blue Cross Blue Shield of Massachusetts claims or quality data. Enrollees were linked to specific provider organizations in the contract via their primary care physician's affiliation.

Spending was the combination of the insurer payment and enrollee cost sharing. This reflects utilization and negotiated prices between payers and physician organizations. We captured differences in plan benefit design by using plan-level fixed effects in our main analyses. Given that plan-level benefit design might change over time, we also used average enrollee cost sharing at the plan level in a sensitivity analysis.^{11,12} Similar to prior analyses, pharmaceutical spending was excluded from the main analysis because some enrollees had drug benefits carved out of their benefit package, so claims for these services were not available in Blue Cross Blue Shield of Massachusetts claims. Spending was inflation adjusted to 2012 dollars.

Statistical Analysis

We used a difference-in-differences framework to isolate changes in process measures and spending associated with the Alternative Quality Contract among the subgroup of lower socioeconomic status relative to changes in the subgroup of higher socioeconomic status.^{21,22} For outcome measures, we tested differences in postcontract trends between the subgroups of lower and higher socioeconomic status.

We used a linear multivariable model that regresses the dependent variable on an indicator of socioeconomic status interacted with postintervention years at the enrollee level. With a large sample size, linear models are often preferable to two-part models and other specifications in estimating the population average, which was the parameter of interest.^{23,24} The base model controlled for age categories, interactions between age and sex, concurrent risk score based on the diagnostic cost group system, secular trends, and plan fixed effects. Regressions with quality as the dependent variable also included fixed effects for each type of quality measure, to identify “within measure” changes associated with socioeconomic status. Standard errors were clustered at the plan level. Given the confidentiality of outcomes data, which did not include plan information, standard errors in outcomes models were clustered at the physician organization level. Results were reported with two-tailed p values.

A major threat to the validity of this design is differential preintervention trends between AQC enrollees in areas with lower and higher socioeconomic status. Thus, we tested for differences in preintervention trends between the two subgroups. We also complemented these analyses with a triple-difference approach that included non-AQC enrollees similarly assigned to subgroups of lower and higher socioeconomic status. Because more physicians in Massachusetts joined the AQC over time, a reliable control group of non-AQC Blue Cross

Blue Shield of Massachusetts enrollees became less available two years after the contract.¹² Thus, triple-difference analyses were limited to two postintervention years.

Limitations

This study had several limitations. Data for the principal component analysis were census variables at the census block group level, instead of characteristics of individual enrollees. Thus, assignment of enrollees to subgroups of lower and higher socioeconomic status using geographic data might involve assignment error. Nevertheless, we used the geography of residence in determining the census block group, consistent with other studies.^{25,26} Moreover, the census block group unit of geography is smaller and more homogenous than the ZIP code, county, or census tract, which improves the accuracy of socioeconomic status assignment.^{27,28}

In addition, because we lacked individual-level outcome measures prior to the Alternative Quality Contract and for non-AQC enrollees, we could not draw strong inferences about outcome measures. However, our aggregate unadjusted analyses suggest no differential trends in improvement by socioeconomic status postintervention, resulting in similarly large improvements relative to national and New England comparisons.

Findings from the AQC might not be representative of global payment models by other payers or similar contracts in other states, as the population, the providers, and the incentives for this payment model might be different from other ACO contexts in important ways.^{29–31} For example, the median household income for enrollees in the subgroup of lower socioeconomic status was higher than the median US household income, which is consistent with Massachusetts having one of the highest median incomes relative to other states. Thus, the subgroup of lower socioeconomic status in this study might not be representative of the degree of socioeconomic distress or vulnerability experienced by disadvantaged populations in other states. In sensitivity analyses, we examined comparisons using different cutoffs for defining subgroups of lower and higher socioeconomic status.

In addition, the average cost sharing in the study population was lower than in typical privately insured populations, which suggests that Blue Cross Blue Shield of Massachusetts plans were more generous, on average.

Our observational design also precludes strong causal inferences about AQC effects, given that entry into the contract was nonrandom and there could be unobserved factors that affected the results.

Lastly, the quality measures we studied do not capture all dimensions of quality that are important to physicians and patients. The process measures were largely primary care oriented, and the outcome measures touched on a small subset of intermediate outcomes of interest. Future developments in quality measures for specialties and in outcome measures would enrich such analyses of quality.

Study Results

Population

Enrollees in the 2009 Alternative Quality Contract cohort in areas with lower and higher socioeconomic status were similar in age, sex, diagnostic cost group risk score, and average cost sharing (for details, see Appendix Exhibit 3).²⁰ Enrollees of lower socioeconomic status lived in census block groups that had larger minority populations than did enrollees of higher socioeconomic status (12.6 percent black and 9.6 percent Hispanic, versus 1.6 percent black and 2.4 percent Hispanic), lower levels of education attainment (85.8 percent versus 95.9 percent with at least high school completion), lower median household income (\$58,967 with 9.7 percent of families in poverty, versus \$101,658 with 2.2 percent in poverty), and higher unemployment (9.6 percent versus 6.2 percent). Similar differences were evident among non-AQC enrollees (for details, see Appendix Exhibit 4).²⁰ For summary characteristics of census block groups served by each AQC organization in the 2009 cohort, see Appendix Exhibit 5.²⁰

Process Measures

Unadjusted aggregate process measures improved more among AQC enrollees in the subgroup of lower socioeconomic status than among enrollees in the higher socioeconomic status subgroup during the four years, narrowing the difference between these subgroups (Exhibit 1). In adjusted analysis, the lower-socioeconomic-status subgroup in the AQC had a greater improvement in aggregate performance relative to the higher-socioeconomic-status subgroup—on average, 1.2 percentage points per year during the four years ($p < 0.001$) (Exhibit 2). Preintervention trends were not significantly different between the two subgroups (0.1 percentage points per year, $p = 0.45$). Sensitivity analyses were consistent with our main results (for results of the sensitivity analyses, see Appendix Exhibit 6).²⁰

Analyses by domain showed that the differences in improvement were not statistically significant among chronic disease management measures (0.3 percentage points per year in favor of the subgroup of lower socioeconomic status, $p = 0.53$) but were statistically significant for the adult preventive care and pediatric care measures—on average, 1.2 and 1.8 percentage points per year in favor of the subgroup of lower socioeconomic status, respectively ($p < 0.001$) (Exhibit 2). In secondary analyses involving non-AQC enrollees, the triple-difference model demonstrated qualitatively similar results consistent with Exhibit 1, which suggests that differential trends by socioeconomic status were not driving our findings.

Outcome Measures

Aggregate unadjusted performance on outcome measures demonstrated continuous improvement after the intervention among AQC enrollees in areas with both lower and higher socioeconomic status (Exhibit 3). Unadjusted performance for lower-socioeconomic-status enrollees improved from 63.6 percent in 2009 to 73.8 percent in 2012 (a 10.2-percentage-point change), while that for higher-socioeconomic-status enrollees improved from 65.3 percent to 76.0 percent (a 10.7-percentage-point change). In adjusted analysis, average improvement in outcome measures was not statistically different between lower-

socioeconomic-status and higher-socioeconomic status subgroups across the four post-AQC years (-0.11 percentage point per year, $p = 0.82$). Sensitivity analyses supported our results (see Appendix Exhibit 7).²⁰

In secondary analyses, the slope of improvement in outcome measures was comparably greater for AQC enrollees of both lower and higher socioeconomic status compared to national and New England HEDIS averages (Exhibit 3). This comparison is limited because HEDIS performance was not disaggregated by socioeconomic status, but it offers a sense of AQC performance across socioeconomic status subgroups relative to HEDIS.

Spending

Average unadjusted medical spending on claims was higher among AQC enrollees of lower socioeconomic status than among those of higher socioeconomic status nearly throughout the study period, and both subgroups saw slower growth in spending after the intervention (Exhibit 4).

In adjusted analyses, AQC enrollees of lower socioeconomic status had similar changes in spending as did their higher-socioeconomic-status peers during the first four years of the contract, but the difference was not statistically significant ($-\$5.74$ per enrollee per quarter, $p = 0.43$) (Exhibit 2). Preintervention trends in spending between these two subgroups were also not significantly different ($-\$3.06$ difference, $p = 0.52$) (data not shown). Sensitivity analyses were broadly consistent with these findings, although a more restrictive definition of lower socioeconomic status produced a small but statistically significant difference in spending (see Appendix Exhibit 8).²⁰ The triple-difference model also demonstrated qualitatively similar results.

Discussion

Improvements in process measures were generally greater among Alternative Quality Contract enrollees in areas with lower socioeconomic status than among those in higher-socioeconomic status areas during the AQC's first four years. This finding was robust to secondary analyses and sensitivity analyses, including those that used Blue Cross Blue Shield of Massachusetts enrollees who were not in the AQC as controls. The lack of preintervention and control data for outcome measures at the individual level precluded as thorough of an analysis for outcomes. Nevertheless, our adjusted analysis of outcomes postintervention shows comparable trends between subgroups of lower and higher socioeconomic status, and both subgroups outperformed national and New England HEDIS averages. Meanwhile, spending trends were similar between the subgroups. Overall, these findings suggest a likely narrowing of disparities in process quality under the AQC without significant differences in spending along the socioeconomic status dimension.

The fact that disparities between enrollees in areas with lower and higher socioeconomic status narrowed among process measures but not for outcome measures, despite larger improvements for both subgroups in outcome measures, could reflect a weak relationship between process and outcome measures. For example, monitoring hemoglobin A1c for patients with diabetes (process measure) might not translate into lower hemoglobin A1c

levels (outcome measure). Moreover, most process measures, such as cancer screening, do not have a corollary in the outcome measure domain (for example, cancer-specific survival rates), and improvements in outcomes may take longer to manifest. In general, improvement in outcome measures is considered more complex and challenging because it requires patient adherence and changes in health behaviors, which are less under the direct influence of providers than process measures are. The fact that outcomes improved substantially for AQC enrollees of both lower and higher socioeconomic status is meaningful.

Furthermore, quality measures in the AQC exhibited different trends in improvement when compared to national and New England HEDIS averages. Process measures improved slowly across the postintervention years, potentially reflecting the increased difficulty of further improvement at higher baseline levels of performance. Meanwhile, outcome measures improved more quickly and in a sustained fashion. This difference could be explained by lower baseline performance for outcome measures as compared with process measures, rendering outcome measures less susceptible to a ceiling effect by which improvement is increasingly difficult from higher levels of performance. This ceiling effect may have analogously contributed to greater improvements in process quality attained by enrollees of lower socioeconomic status, who began with lower performance levels than those of their peers in higher-socioeconomic-status areas. The fact that outcome measures were triple-weighted toward determining incentive payments in the AQC, whereas process measures were largely single-weighted, might have also contributed to the difference. Gains in the intermediate outcomes of hemoglobin A1c, LDL, and blood pressure reflect improved control of major chronic illnesses including hypertension, diabetes, and risk factors for coronary artery disease and stroke—an encouraging sign relative to regional and national averages.

The sizable incentives for quality under the AQC might have played an important role in the greater gains among enrollees of lower socioeconomic status compared to their peers in higher-socioeconomic-status areas. In 2009–10, physician organizations could earn up to 10 percent of their risk-adjusted budgets in bonus payments for quality performance—an amount substantially larger than the 2.3 percent average bonus for quality performance in prior pay-for-performance contracts.¹⁰ Since 2011, rewards for quality were determined as a per member per month amount to equalize payments across physician organizations for a given level of performance, but they nevertheless remained substantial.³² For population-based payment models elsewhere in the country, the Alternative Quality Contract could provide an example of the potential of large quality incentives to improve quality without exacerbating disparities. Indeed, even in a relatively higher-average-income population overall, differences in quality still narrowed under the AQC.

Qualitative evidence suggests that AQC organizations tended to place an emphasis on quality improvement, partly because bonuses were large and could be allocated freely by the organization internally.³³ Additional discussions from Blue Cross Blue Shield of Massachusetts collaborations with AQC providers and best-practice sharing forums suggest that providers serving areas with lower socioeconomic status developed strategies for patient engagement, in many cases adopting new staffing models to enable more customized outreach to improve access and achieve quality goals for patients. For patients, receiving

more frequent communication regarding preventive care may help compliance with recommended services. Moreover, the size of the Blue Cross Blue Shield of Massachusetts enrollee population could help facilitate positive peer- or neighborhood-level effects on health, given that populations with similar socioeconomic and demographic characteristics tend to cluster geographically.^{34,35} Ultimately, social and environmental factors are recognized to play a larger role than health care in determining the health of populations. This suggests that efforts to reduce disparities in poverty, education, and related factors would be an important complement to interventions in the health care system.^{36,37}

Conclusion

During the first four years of the Alternative Quality Contract in Massachusetts, improvements in quality of care for enrollees in areas with lower socioeconomic status were comparable or greater than those in areas with higher socioeconomic status, without statistically significant differences in spending trends. These results suggest that in its early years, the AQC likely contributed to a narrowing of disparities in some dimensions of quality, notably as reflected by process measures in the contract. Moreover, our results suggest that in a population-based global budget model, sufficiently large quality incentives with an overall adequate budget could be important factors in giving physician organizations the financial resources necessary to intensify efforts toward improving quality of care for disadvantaged populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Notes

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Exhibit 1. Performance on Process Quality Measures, 2007-2012*

* Unadjusted aggregate process quality as a weighted average composite of 18 process measures across 3 domains: chronic disease management, adult preventive care, and pediatric care. Each measure was applied to enrollees eligible for the measure, such as hemoglobin A1c measurement for patients with diabetes. Performance was measured as a binary outcome based on whether the measure was satisfied in a given year.

	AQC enrollees (2009 cohort)						
	Lower socioeconomic status enrollees		Higher socioeconomic status enrollees		Difference-in-differences		
	Pre-AQC	Post-AQC	Pre-AQC	Post-AQC	Unadjusted	Adjusted	<i>p</i> value
Process quality ^a							
(aggregate)	75.1	79.7	78.2	82.0	0.8	1.2	<0.001
Chronic disease management	78.8	83.1	79.3	83.4	0.2	0.3	0.530
Adult preventive care	73.9	78.7	76.7	80.8	0.7	1.2	<0.001
Pediatric care	75.5	79.7	81.1	84.2	1.1	1.8	<0.001
Medical spending ^b							
(PMPQ)	\$813.32	\$926.74	\$776.91	\$904.81	-\$14.50	-\$5.74	0.430

Exhibit 2. Changes in quality of care and medical spending by socioeconomic status under the Alternative Quality Contract (AQC), 2006–12

SOURCE Authors' analysis of data from Blue Cross Blue Shield of Massachusetts.

NOTES ^aFor quality, preintervention refers to 2007–08 and postintervention refers to 2009–12. The difference-in-differences results represent the average changes in the percentage of eligible enrollees for a measure who met quality performance for the measure from before to after the AQC in the lower socioeconomic status subgroup as compared with the higher socioeconomic status subgroup. Quality measures are measured on an annual basis. ^bFor spending, preintervention refers to 2006–08 and postintervention refers to 2009–12. PMPQ represents per member per quarter. The difference-in-differences results represent the average change in medical spending on claims per enrollee per quarter from before to after the AQC in the lower socioeconomic status subgroup as compared with the higher socioeconomic status subgroup. Spending is inflation-adjusted to 2012 dollars.

Exhibit 3. Performance on Outcome Quality Measures, 2007-2012*

* Unadjusted aggregate outcome quality comprising 5 measures: hemoglobin A1c level

9%, low-density lipoprotein (LDL) cholesterol level <100 mg per deciliter, and blood-pressure <140/80 mmHg for patients with diabetes; LDL cholesterol in patients with coronary artery disease; blood-pressure <140/80 mmHg for patients with hypertension.

Given that 2007 and 2008 were pre-intervention years, data were collected at the BCBSMA network level and performance was not separable by SES for AQC enrollees.

Exhibit 4. Medical Spending, 2006-2012*

* Unadjusted aggregate medical spending per enrollee per quarter as obtained through medical claims, representing the sum of the amount paid by the payer and the amount paid through enrollee cost-sharing. Spending is inflation-adjusted to 2012 dollars.