Relationship Between Quality of Care and Racial Disparities in Medicare Health Plans

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E l i m i n a t i n g d i s p a r i t i e s i n health care is a fundamental component of the agenda to improve quality.1 In a landmark 2001 report, the Institute of Medicine affirmed this principle by defining equity as 1 of 6 essential dimensions of quality of care.2 This report recommended that the nation strive for “care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.” The importance of equity is supported by numerous studies that have documented worse quality of care for black Americans relative to white Americans across a broad array of medical conditions.3-7

Several performance reporting systems now report publicly on aspects of quality such as surgical outcomes,8 adherence to evidence-based quality measures,9,10 and patients’ assessments of care,11 but few public reports about the quality of health care organizations have also assessed the equity of care provided by those organizations. Since 2003, the National Healthcare Disparities Report has provided information on the quality of care by race and ethnicity, but this report has not assessed racial disparities in the quality of clinical care within health plans or health care delivery organizations.12

The Medicare managed care program (Medicare Advantage) offers an opportunity to study whether and how equity in the delivery of clinical care is related to the quality of care provided by health plans. Since 1997, all health plans participating in Medicare have reported on the quality of care using Health Plan Employer and Data Information Set (HEDIS) performance measures developed by the National Committee for Quality Assurance.9 In a prior analysis of these data, we found both improvement in the quality of care and narrowing of racial disparities in adherence to HEDIS process-of-care indicators. For 2 outcome measures assessing control of glucose and cholesterol, however, racial disparities remained substantial and statistically unchanged from 1997 to 2003.13

**Context** Overall quality of care and racial disparities in quality are important and related problems in health care, but their relationship has not been well studied. In the Medicare managed care program, broad improvements in quality have been accompanied by reduced racial gaps in processes of care, but substantial disparities in outcomes have persisted.

**Objectives** To assess variations among Medicare health plans in overall quality and racial disparity in 4 Health Plan Employer and Data Information Set (HEDIS) outcome measures, to determine whether high-performing plans exhibit smaller racial disparities, and to identify plans with high quality and low disparity.

**Design, Setting, and Patients** We assessed the relationship between quality and racial disparity using multilevel multivariable regression models. The study sample included 431,573 individual-level observations in 151 Medicare health plans from 2002 to 2004.

**Main Outcome Measures** Hemoglobin A1c of less than 9.5% or less than 9.0% for enrollees with diabetes; low-density lipoprotein cholesterol level of less than 130 mg/dL for enrollees with diabetes or after a coronary event; and blood pressure of less than 140/90 mm Hg for enrollees with hypertension.

**Results** Clinical performance on HEDIS outcome measures was 6.8% to 14.4% lower for black enrollees than for white enrollees (P<.001 for all). For each measure, more than 70% of this disparity was due to different outcomes for black and white individuals enrolled in the same health plan rather than selection of black enrollees into lower-performing plans. Health plans varied substantially in both overall quality and racial disparity on each of the 4 outcome measures. Adjusted correlations between overall quality and racial disparity were small and not statistically significant, ranging from 0.01 (blood pressure control) to −0.21 (cholesterol control in diabetes). Only 1 health plan achieved both high quality and low disparity on more than 1 measure.

**Conclusions** In Medicare health plans, disparities vary widely and are only weakly correlated with the overall quality of care. Therefore, plan-specific performance reports of racial disparities on outcome measures would provide useful information not currently conveyed by standard HEDIS reports.
The current study addresses 3 new research questions related to persistent racial disparities in the HEDIS outcome measures. First, are the nationally observed disparities in outcomes among black and white enrollees due to different outcomes for white and black enrollees treated within the same plan or, instead, due to disproportionate enrollment of black enrollees in lower-performing plans? Second, do high-quality plans exhibit smaller racial disparities in outcome measures? Third, have any specific health plans achieved both high overall quality and low racial disparity on 1 or more HEDIS outcome measures?

METHODS
Data Sources and Study Population
We obtained HEDIS data for Medicare managed care plans from the Centers for Medicare & Medicaid Services (CMS) representing clinical care delivered from 2002 to 2004. These data contained 644 233 observations from 183 health plans for individuals eligible for at least 1 of 4 HEDIS outcome indicators assessing control of glucose (hemoglobin A1c) and low-density lipoprotein cholesterol (LDL-C) among enrollees with diabetes, blood pressure control among enrollees with hypertension, and LDL-C control among enrollees following an acute myocardial infarction or coronary revascularization procedure. Each observation included an individual’s Health Identification Code (HIC) number and health plan and variables indicating eligibility for and adherence to each HEDIS measure. Information about data collection, outcome measure specifications, and CMS-sponsored audits has been published previously.\(^\text{13,14}\)

Using the HIC number, we matched 98% of observations (n=629 281) in the HEDIS data set to the Medicare enrollment file for the corresponding year to obtain demographic information on enrollees’ race, age, sex, ZIP code of residence, and dual coverage by Medicaid. Information on race in the Medicare enrollment file is derived from Social Security Administration data obtained at the time of an individual’s application for a new or replacement Social Security card, updated for some with information collected during other administrative contacts.\(^\text{15}\) The sensitivity and positive predictive value of race data for black and white beneficiaries in the Medicare enrollment file exceed 95%.\(^\text{16}\) ZIP code–level data on poverty and education were obtained from the 2000 US Census.

We subsequently excluded enrollees who were younger than 65 years (n=79 559), enrollees who were not of black or white race (n=54 308; for whom race and ethnicity designations are often inaccurate),\(^\text{16}\) and enrollees who died during the year of measurement (n=9979). We further excluded observations from 24 plans (n=13 280) with only 1 year of participation during the study period and from 6 plans (n=48 575) with missing data for more than 10% of eligible enrollees or an adherence rate of less than 10% on 1 or more measures, suggesting incomplete reporting. These exclusions yielded an initial study sample of 433 617 observations from 153 health plans. We obtained health plan characteristics (region, model type, age, and tax status) from the Interstudy Competitive Edge data set.\(^\text{17}\) For 17 Medicare health plans that could not be matched to this data set, we ascertained these characteristics by contacting the health plans directly. We excluded 2 plans (n=2044) for which we were unable to obtain information from a plan representative. Therefore, the final study sample included 431 573 observations from 151 health plans for the 4 HEDIS performance measures.

Study Variables
Our dependent variables included the following 4 dichotomous HEDIS outcome measures: (1) hemoglobin A1c of less than 9.5% (in 2002) or less than 9.0% (in 2003 or 2004) for enrollees with diabetes; (2) LDL-C level of less than 130 mg/dL (3.37 mmol/L) for enrollees with diabetes; (3) blood pressure of less than 140/90 mm Hg for enrollees with hypertension; and (4) LDL-C level of less than 130 mg/dL for enrollees after a coronary event. Individual-level covariates included black or white race, age, sex, Medicaid eligibility, percentage of persons aged 65 years or older in an enrollee’s ZIP code with income less than the federal poverty level, percentage of persons aged 65 years or older in an enrollee’s ZIP code who attended college, and year of measurement. Plan-level covariates were US Census region (Northeast, South, Midwest, West), model type (group or staff, independent provider association, network, or mixed), average yearly Medicare enrollment, percentage of black enrollees, plan age in years, and for-profit or not-for-profit tax status.

Statistical Analysis
We assessed characteristics of health plans serving the population eligible for HEDIS measures stratified by race. For black and white enrollees, we determined the performance for each HEDIS measure as the percentage of eligible enrollees who were reported to achieve the desired outcome. For each health plan, we calculated the performance rates for each HEDIS outcome measure stratified by race and the corresponding absolute disparity for each measure, defined as the white rate minus the black rate.

To estimate the proportion of each racial disparity attributable to within-plan differences and to determine the correlation between the outcome measure results and racial disparities in the results, we fitted multilevel linear regression models predicting the result of each HEDIS indicator. Each model included plan-level random effects for the intercept (representing the average rate) and race (the black-white difference). From an unstructured covariance matrix for the intercept and race effects, their correlation coefficient was calculated as\(^\text{22}\)

\[
\rho = \frac{\sigma_{12}}{\sqrt{\sigma_{11} \sigma_{22}}}
\]

where \(\sigma_{12}\) equals the covariance of the intercept and race effects and \(\sigma_{11}\) and \(\sigma_{22}\) are the variances of the intercept and race effects, respectively. We used Bayesian estimation to derive 95% confidence intervals for these correlation coefficients. To further determine the impact of health plan and enrollee characteristics on achievement of HEDIS
outcomes, we subsequently included 6 health plan fixed effects (Census region, model type, size, percentage of black enrollment, age, and tax status) and 6 individual fixed effects (age, sex, ZIP code–level poverty and education, Medicaid enrollment, and year of measurement) in these multilevel models. To determine whether any plan characteristics were associated with racial disparities, we tested the significance of plan characteristic × race interaction terms. To evaluate the effect of enrollees who contributed multiple observations on the same indicator across years, we reestimated our models after collapsing such measurements into a single mean measurement for each enrollee. Results from these analyses were similar to those from observation-weighted analyses and, thus, not reported.

For each HEDIS outcome measure, we assigned ratings (above average, average, or below average) of quality and disparity for each health plan that had 20 or more observations for eligible black enrollees. Quality ratings were assigned by testing whether the plan’s performance rate for white enrollees, adjusted for age and sex, was statistically different (P < .05) from the performance rate for whites within all other plans (using the t test). Similarly, we compared each plan’s absolute white-black disparity, adjusted for age and sex, with all other plans for each performance measure. If a plan’s absolute disparity was significantly different from average (P < .05), the plan was classified as having above-average or below-average racial disparity, respectively. This method is similar to that used for the Consumer Assessment of Health Plans Study to assign Medicare health plan ratings for consumer assessments of care.

Bivariate analyses were performed using SAS statistical software, version 9.1 (SAS Institute Inc, Cary, NC), and multilevel models were estimated using MLwiN software, version 2.02 (Centre for Multilevel Modelling, University of Bristol, Bristol, England). We report 2-tailed P values for all analyses. The study protocol was approved by the Human Subjects Committee of Harvard Medical School, Boston, Mass, and the CMS Privacy Board.

RESULTS

The distributions of observations for white and black enrollees by sociodemographic and health plan characteristics are shown in the Table. In the study cohort, 12% of observations were for black enrollees, 52% for female enrollees, and 7% for enrollees dually eligible for Medicaid; the mean age was 71 years. The mean proportion of elderly persons in enrollees’ ZIP codes whose income was below the federal poverty level was 9% and who had attended at least some college was 34%. Compared with white enrollees, black enrollees were more likely to be from newer plans, plans located in the South and Northeast, smaller plans, and for-profit plans.

The mean performance on all 4 HEDIS outcome measures was significantly lower for black enrollees than white enrollees (P < .001 for all), with absolute percentage point differences ranging from 6.8% for blood pressure control to 10.0% for colorectal cancer screening.

Table. Sociodemographic and Health Plan Characteristics of White and Black Enrollees Eligible for Health Plan Employer and Data Information Set Outcome Measures, 2002-2004

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Plans (N = 151)</th>
<th>White Enrollees (n = 380,377)</th>
<th>Black Enrollees (n = 51,196)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>40</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>45</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>≥75</td>
<td>16</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>51</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>5</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Below poverty†</td>
<td>8</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Attended college‡</td>
<td>35</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>26</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>South</td>
<td>19</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Midwest</td>
<td>31</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>West</td>
<td>25</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Model type</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Group/staff</td>
<td>11</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>IPA</td>
<td>42</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>Network</td>
<td>18</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Mixed</td>
<td>30</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Plan size§</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-24.999</td>
<td>58</td>
<td>40</td>
<td>46</td>
</tr>
<tr>
<td>25,000-99,999</td>
<td>36</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>≥100,000</td>
<td>6</td>
<td>26</td>
<td>25</td>
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<tr>
<td>Black, %</td>
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<td></td>
</tr>
<tr>
<td>0-2.9</td>
<td>36</td>
<td>32</td>
<td>5</td>
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<tr>
<td>3.0-6.9</td>
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<td>7.0-9.9</td>
<td>12</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>≥10.0</td>
<td>30</td>
<td>19</td>
<td>59</td>
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<tr>
<td>Plan age, y</td>
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<tr>
<td>6-7.9</td>
<td>19</td>
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<td>≥25</td>
<td>20</td>
<td>35</td>
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<td>Profit status</td>
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<tr>
<td>Not for profit</td>
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<td>52</td>
<td>44</td>
</tr>
<tr>
<td>For profit</td>
<td>60</td>
<td>48</td>
<td>56</td>
</tr>
</tbody>
</table>

Abbreviation: IPA, independent practice association.

*All data are expressed as percentages. Sums of percentages may not equal 100% because of rounding. P < .001 for all white-black comparisons.
†Proportion of persons older than 65 years in enrollee’s ZIP code with income below the federal poverty level.
‡Proportion of persons older than 65 years in enrollee’s ZIP code who attended college.
§Average yearly Medicare enrollment.

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with high quality and low disparity on the hemoglobin A1c control measure, 4 plans each for the diabetes LDL-C and blood pressure control measures, and 2 plans for the measure assessing LDL-C control after a coronary event. Only 1 health plan achieved both significantly higher-than-average quality and lower-than-average disparity for 2 HEDIS outcome measures.

**Comment**

The quality of care for Medicare managed care enrollees as assessed by HEDIS outcome measures is less than optimal, variable across health plans, and unequal by race. We observed no consistent relationship between overall performance and racial disparity in these measures. High-quality health plans had racial disparities that were generally comparable in magnitude to low-quality plans, and only 1 plan demonstrated both high quality and low disparity for more than 1 outcome indicator. Furthermore, nationally observed racial disparities in outcomes were largely attributable to different outcomes for black and white enrollees within the same health plan rather than

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**Figure 1. Percentage of Medicare Managed Care Enrollees Achieving Health Plan Employer and Data Information Set Outcome Indicators by Race**

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>White Rate</th>
<th>Black Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin A1c, Control</td>
<td>80.2%</td>
<td>72.2%</td>
</tr>
<tr>
<td>LDL-C Control</td>
<td>72.2%</td>
<td>62.9%</td>
</tr>
<tr>
<td>Blood Pressure Control</td>
<td>60.2%</td>
<td>53.4%</td>
</tr>
<tr>
<td>LDL-C Control</td>
<td>71.6%</td>
<td>57.2%</td>
</tr>
</tbody>
</table>

P<.001 for all black-white comparisons using the χ² test. LDL-C indicates low-density lipoprotein cholesterol.

To convert LDL-C to mmol/L, multiply by 0.0259.

*Changed to 9.0% in 2003.

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**Figure 2. Within- and Between-Plan Racial Disparities in Health Plan Employer and Data Information Set Outcomes**

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Within-Plan Disparity</th>
<th>Between-Plan Disparity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin A1c, Control</td>
<td>5.8%</td>
<td>2.2%</td>
</tr>
<tr>
<td>LDL-C Control</td>
<td>7.5%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Blood Pressure Control</td>
<td>4.7%</td>
<td>2.1%</td>
</tr>
<tr>
<td>LDL-C Control</td>
<td>11.1%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Estimates derived from multilevel models. LDL-C indicates low-density lipoprotein cholesterol. To convert LDL-C to mmol/L, multiply by 0.0259.

*Changed to 9.0% in 2003.
QUALITY OF CARE AND RACIAL DISPARITIES IN MEDICARE

differences in the distribution of black and white enrollees across health plans.

Medicare health plans varied widely in both their overall performance and magnitude of racial disparity. For example, absolute differences between the top-ranked and bottom-ranked health plan on the 4 outcome measures ranged from 35% to 70%. Although some health plans did not exhibit significant disparities between white and black enrollees, other plans had absolute racial disparities exceeding 20% on these measures. Despite substantial evidence that controlling blood pressure, glucose, and cholesterol can improve survival by preventing cardiovascular, cerebrovascular, and renal complications,19-26 21% to 41% of enrollees did not achieve relatively liberal goals for blood pressure, glucose, and cholesterol control. Clinical performance on these measures was even worse for black enrollees, with absolute rates that were 6.8% to 14.4% lower than those of their white counterparts.

Prior studies have shown that racial disparities in many simple processes of care have been substantially reduced or eliminated in recent years.27,28 General efforts to improve quality may have contributed to the narrowing of disparities in processes of care, but the same effect has not been evident for measures of clinical outcomes.13,29,30 Achieving equity is more straightforward for measures of processes of care that require simpler actions, such as a single annual blood test, than for outcome measures, which may require sustained access and adherence to drug therapy, an ongoing relationship with a health care practitioner, lifestyle modifications, and attention to social determinants of health. In addition, while quality improvement interventions such as disease management and use of continuous quality improvement management strategies have been associated with improved performance on process indicators, these interventions have had more modest effects on clinical outcomes.31,32

Finally, many health plans do not collect data on the race or ethnicity of enrolled populations.33 Without such data, health care organizations will be unable to detect systematic racial or ethnic disparities among their patients or to develop and evaluate interventions to eliminate disparities.

To address racial disparities in the quality of care, it is critical to understand whether racial disparities occur predominantly within or between health care organizations.34 We found that most of the disparities in HEDIS outcome measures were attributable to different outcomes for black and white individuals enrolled within the same health plan. Moreover, the proportion of black enrollees within a plan was not an independent predictor of clinical performance. Our findings for HEDIS outcome measures in Medicare managed care plans contrast with other recent studies showing that between-hospital differences are the primary contributor to racial disparities observed nationally in treatments and outcomes of hospital care for cardiovascular disease.35,37 If racial differences in HEDIS outcome measures were similarly the result of black enrollees joining plans that have worse performance regardless of race, then policy solutions would include implementing broad quality improvement efforts within these plans or encouraging black enrollees to join higher-performing plans. Our findings suggest, however, that most Medicare health plans will need to develop specific programs to improve equity for at least 3 of the 4 clinical outcome measures we studied.

The correlation among performance results in the various domains of quality of care has not been extensively studied. Our study is consistent with other reports that have suggested performance in the various domains of quality measurement may show little or no correlation. For example, organizations that are highly rated by consumer assessments may perform well on some but not all measures of clinical care.11 Similarly, adherence to processes of care for one disease condition may not predict performance for other conditions.30 Our finding that equity is not highly correlated with overall performance therefore supports the need to monitor equity as well as average quality across multiple domains. To gauge the performance of health care organizations, measures of access to care, clinical processes, outcomes of care, and patients’ experiences will all be important.39

Profiling health plans based on achievement of specific goals for control of cholesterol, blood pressure, and glucose has been ongoing since 1999.40 These scores, however, have not been collected or reported for specific demographic groups. Reporting only aggregated adherence rates could create an incentive to avoid groups with worse outcomes rather than undertaking interventions to improve their care.41 Some health plans or clinicians may avoid enrolling minority patients, for whom performance rates are typically lower.42,43 Stratifying performance rates by race, ethnicity, or other demographic characteristics may mitigate such undesired effects by not penalizing organizations that disproportionately treat minority patients. Stratified reports could also raise awareness of racial disparities in care, provide a framework for feedback and accountability of health plans and clinicians, and ideally promote effective efforts to improve care for patients who experience worse outcomes, particularly black Americans with diabetes, hypertension, or heart disease.

Our study was strengthened by the large and geographically diverse sample, the use of validated and audited quality measures, and the availability of enrollee and health plan characteristics that may mediate the relationship among race, quality, and equity. We used a modeling strategy that decomposed disparities into between-organization and within-organization effects and accounted for clustering of observations and differential sample sizes within plans.

Study limitations included the lack of information on related process measures, such as whether appropriate therapy was initiated or increased in patients with suboptimal control,35 and on prescription drug coverage for enrollees. Access to lipid-lowering medication, for example, may be an impor-
tant mediator of racial disparities in cholesterol control. Black enrollees may also be less aware of their cholesterol levels or less able to adhere to expensive cholesterol-lowering medications. Although the HEDIS denominator criteria define eligible individuals, we also lacked additional detailed clinical and sociodemographic information to enable further risk adjustment of the performance results. While some studies have found substantial variation in plan-level prevalence of co-morbid conditions, the degree of variation in clinical severity among plans’ enrollees eligible for HEDIS measures is unknown. Studies of patient-level correlates of blood pressure control have identified age and sex as the 2 dominant predictors of uncontrolled hypertension, accounting for 44% of the population-attributable risk. These 2 covariates were included in our adjusted models for this measure and did not vary substantially by plan.

We lacked information on physician practices within these Medicare plans and were therefore unable to include medical groups or individual physicians in multilevel models predicting receipt of quality indicators. Finally, we were unable to analyze disparities for Hispanic, Asian, and Native American enrollees, for whom Medicare data on race and ethnicity are relatively inaccurate.

Effective measurement within health plans is one cornerstone of improving quality and reducing racial disparities in outcomes. Such an approach is especially salient because health plans have both the fiduciary responsibility to enrollees to ensure high-quality and equitable care and the management infrastructure to organize efforts to achieve these related goals. For the Medicare program, plan-specific

**Figure 3. Relationship Between Quality and Racial Disparity in Health Plan Employer and Data Information Set Outcome Measures Among Medicare Health Plans**

Each data point represents a health plan. Only health plans with 20 or more eligible black enrollees were included in scatter plots. All correlation coefficients are adjusted for age, sex, and year of measurement. The interquartile ranges for overall quality and racial disparity among health plans are shown on the x and y axes, respectively. To convert LDL-C to mmol/L, multiply by 0.0259.

*Rate for white enrollees in plan minus rate for black enrollees in plan.
†Average of rates for white and black enrollees.

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performance reports that include information on equity would capture a dimension of quality not currently assessed by the HEDIS reporting system.

**Author Contributions:** Dr Trivedi had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Trivedi, Zaslavsky, Ayanian. Acquisition of data: Trivedi, Ayanian. Analysis and interpretation of data: Trivedi, Zaslavsky, Schneider, Ayanian. Drafting of the manuscript: Trivedi, Zaslavsky. Critical revision of the manuscript for important intellectual content: Trivedi, Zaslavsky, Schneider, Ayanian. Statistical analysis: Trivedi, Zaslavsky, Ayanian. Obtained funding: Trivedi, Ayanian. Study supervision: Schneider, Ayanian.

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