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Racial and ethnic disparities in care for health system-affiliated physician organizations and non-affiliated physician organizations

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Abstract

Objective: To assess racial and ethnic disparities in care for Medicare fee-for-service (FFS) beneficiaries and whether disparities differ between health system-affiliated physician organizations (POs) and nonaffiliated POs.

Data Sources: We used Medicare Data on Provider Practice and Specialty (MD-PPAS), Medicare Provider Enrollment, Chain, and Ownership System (PECOS), IRS Form 990, 100% Medicare FFS claims, and race/ethnicity estimated using the Medicare Bayesian Improved Surname Geocoding 2.0 algorithm.

Study Design: Using a sample of 16 007 POs providing primary care in 2015, we assessed racial/ethnic disparities on 12 measures derived from claims (2 cancer screenings; diabetic eye examinations; continuity of care; two medication adherence measures; three measures of follow-up visits after acute care; all-cause emergency department (ED) visits, all-cause readmissions, and ambulatory care-sensitive admissions). We decomposed these "total" disparities into within-PO and between-PO components using models with PO random effects. We then pair-matched 1853 of these POs that were affiliated with health systems to similar nonaffiliated POs. We examined differences in within-PO disparities by affiliation status by interacting each nonwhite race/ethnicity with an affiliation indicator.

Data Collection/Extraction methods: Medicare Data on Provider Practice and Specialty identified POs billing Medicare; PECOS and IRS Form 990 identified health system affiliations. Beneficiaries age 18 and older were attributed to POs using a plurality visit rule.

Principal Findings: We observed total disparities in 12 of 36 comparisons between white and nonwhite beneficiaries; nonwhites received worse care in 10. Within-PO disparities exceeded between-PO disparities and were substantively important (>=5 percentage points or>=0.2 standardized differences) in nine of the 12 comparisons. Among these 12, nonaffiliated POs had smaller disparities than affiliated POs in two comparisons ($P < .05$): 1.6 percentage points smaller black-white disparities in

follow-up after ED visits and 0.6 percentage points smaller Hispanic-white disparities in breast cancer screening.

Conclusions: We find no evidence that system-affiliated POs have smaller racial and ethnic disparities than nonaffiliated POs. Where differences existed, disparities were slightly larger in affiliated POs.

KEYWORDS

delivery of health care, health care disparities, primary health care, quality of health care, race factors

1 | INTRODUCTION

Racial and ethnic disparities in health care have persisted over the nearly two decades following the Institute of Medicine's landmark report, Unequal Treatment, which brought renewed attention to the problem.[1] In its 2018 national assessment, the Agency for Healthcare Research and Quality found that black and Hispanic Americans received worse care than whites on 40% and 35% of quality measures, respectively, including measures of clinical quality, care coordination, and patient experience.[2] Although access to health insurance explains at least some of these disparities,[3] even within the Medicare program that provides universal coverage to Americans aged 65 and older, black and Hispanic beneficiaries are three times more likely to receive worse care than better care compared to white beneficiaries.[4] Nonwhite patients tend to receive care from providers who have more limited resources, poorer quality, and worse access to specialty care.[5,6]

Meanwhile, vertical integration is reshaping health care delivery across the United States with health system ownership of physician practices increasing from 14% to 31% between 2012 and 2018, which represents an increase from 26% to 44% of all physicians.[7] While prior research has assessed disparities in more highly integrated care delivery systems such as the Veterans Affairs health system,[8] these studies use comparison groups that may combine health care organizations that are independent, "virtually" integrated within networks, and owned by health systems.[9,10] To our knowledge, prior studies have not examined the extent to which health system affiliation might reduce or widen racial and ethnic disparities in ambulatory care.

Empirical evidence and expert opinion suggest several factors that are critical for reducing disparities. These include the following: (a) robust quality measurement systems to detect disparities and guide quality improvement efforts,[11] (b) cultural adaptation of services to be more responsive to patient needs,[12-14] and (c) quality improvement strategies that simultaneously target multiple levers of change along care pathways.[14] We hypothesize that physician organizations (POs) that are owned or managed by health systems (hereafter referred to as "affiliated POs") might be better able to adopt these systems and strategies than nonaffiliated POs for several reasons. First, health systems often seek to use enterprise-wide EHR platforms, which can support quality measurement and accountability.[15] Larger POs, including health system-affiliated POs, have also been shown to use more advanced care management infrastructure, such as providing feedback to physicians on their quality of care.[16,17] Second, these same studies show that larger POs are more likely to use nonphysician staff such as patient educators. These staff could play vital roles in both culturally adapting services and providing other supportive services to vulnerable populations. Third, because health systems bring together primary care physicians, specialists, and hospital staff under common ownership or management, health systems

What is Known on This Topic

- Prior studies have shown limited benefit of health system affiliation on the quality of care in ambulatory settings.
- Health system-affiliated POs have more advanced care management infrastructure and greater access to specialty care, which might reduce disparities.
- Some anecdotal or empirical evidence suggests that physicians practicing in affiliated POs have less autonomy, shift their referral patterns, and face financial incentives that could worsen disparities.

What This Study Adds

- To our knowledge, this study is the first to compare racial and ethnic disparities in POs that are affiliated with health systems and those that are not.
- The study adds to growing evidence of the lack of a significant benefit of health system affiliation on quality of care in ambulatory settings.
- The study's decomposition analysis highlights the fact that within-PO disparities (gaps in care provided by a PO to members of different racial and ethnic groups) are often much larger than between-PO disparities (greater use of lower quality providers by certain racial and ethnic groups).

may be more effective than other organizations in implementing quality improvement strategies that address entire care pathways. Health systems' efforts to implement common care protocols[15,18] and minimize out-of-system referrals[19,20] may reflect, at least in part, a desire to standardize care and promote greater care coordination. Finally, physicians in affiliated POs are 18 to 20 percentage points more likely to participate in both Medicare and Medicaid accountable care organizations (ACO) than physician-owned POs,[21] which suggests that financial incentives could provide greater motivation to affiliated POs to identify and address gaps in care.

At the same time, health system affiliation could have limited impact on disparities or could even worsen them. Anecdotal evidence suggests that health system ownership might reduce physician autonomy, which could constrain a physician's ability to tailor care or provide additional supportive services such as health education that might not be reimbursable.[22] Physicians working in complex health care organizations might also have to navigate large bureaucracies to influence staffing and infrastructure decisions, such as hiring staff that are skilled in serving minority populations.[23] Compensation for health system-employed physicians, which is often tied to productivity, might make it more difficult for physicians to spend adequate time with patients who might need more tailored services. In addition, PO conversions to health system ownership have been associated with shifts in referral patterns[20] that might disrupt existing relationships and lead to additional travel distance or travel costs, which already tend to be higher for minority populations.[24] Finally, recent studies have documented declines in patient experience in health systems,[25,26] which raises concerns because nonwhite beneficiaries already tend to have worse care experiences than white beneficiaries.[4,27]

Given the uncertainty about how affiliation may impact disparities and the lack of evidence on this topic, this study sought to assess racial and ethnic disparities in care for Medicare fee-for-service beneficiaries and to examine whether these disparities differed between health system-affiliated POs and nonaffiliated POs. We first estimated disparities for black, Hispanic, and Asian/Pacific Islander (API) beneficiaries, relative to white beneficiaries, using 12 measures covering multiple domains of performance in ambulatory settings. We then decomposed these disparities, which we refer to as "total" disparities, into within-PO and between-PO components to understand the extent to which disparities were driven by variation in care within POs or by the disproportionate use of low-performing POs by nonwhite beneficiaries. Finally, we compared the magnitude of the within-PO disparities for affiliated POs and nonaffiliated POs.

2 | METHODS

2.1 | Study design and data

We conducted a cross-sectional analysis of POs that provided primary care to Medicare beneficiaries in 2015. We used the 2015 Medicare Data on Provider Practice and Specialty (MD-PPAS) database to link physicians to POs and to identify POs that provided primary care to Medicare beneficiaries. We used data from the 2015 Medicare Provider Enrollment, Chain, and Ownership System (PECOS) and Internal Revenue Service (IRS) Form 990 Schedule R to identify PO health system affiliations. We used Medicare claims and enrollment data to attribute beneficiaries to POs and to assess quality of care and utilization.

2.2 | PO sample and beneficiary sample

We used the MD-PPAS to identify all POs (using Taxpayer Identification Numbers, or TINs) and their associated physicians and advanced practice clinicians (using National Provider Identifiers, or NPIs). TINs were combined into a single PO if they had the same organization name and were located in the same state, were from the same academic PO, or shared a large proportion of their physicians. For example, we combined pairs of TINs using an iterative procedure if: (a) all NPIs were in common, (b) at least half of NPIs associated with each TIN billed under multiple TINs and at least half of these NPIs billed using both TINs in the pair; (c) at least a quarter of NPIs associated with each TIN billed under multiple TINs and at least quarter of these NPIs billed using both TINs in the pair; or (d) at least 10 NPIs were shared.

Physician organizations were identified as being "affiliated" with health systems if they were either owned or managed by a health system. Using PECOS, POs were identified as affiliated with health systems if the system had: (a) a 5% or greater direct or indirect ownership interest in the PO or (b) operational or managerial control over the PO whether or not there is an ownership interest by the system. From IRS Form 990, we linked POs with hospitals based on their joint appearance on the same form. POs are listed on Form 990 when the filing organization operates the entity. Affiliated POs were eligible for the analysis if the health system to which they were affiliated comprised at least one primary care physician and at least five total physicians across all of the system's POs. Primary care specialties included general internal medicine, family medicine, or geriatrics. Hospital-based physicians were excluded from the count of total physicians.

Medicare beneficiaries age 18 and older were attributed to POs based on the plurality of their ambulatory evaluation and management (E&M) visits to primary care physicians, or, for those beneficiaries who did not have visits to primary care physicians, the plurality of visits with internal medicine subspecialists (ie, cardiology, endocrinology, gastroenterology, hematology/oncology, infectious disease, nephrology, pulmonology/critical care, rheumatology/immunology, and physical medicine/rehabilitation). Among 73 349 POs with primary care physicians or internal medicine subspecialists that billed Medicare in 2015, we excluded POs that (a) represented solo practitioners or (b) were affiliated with health systems that did not meet our size thresholds. This sample comprised 16 007 POs and was used to estimate within-PO disparities and between-PO disparities for each measure as well as "total" disparities, which represent the magnitude of disparities prior

to their decomposition into within-PO and between-PO components and is equal to the sum of the two components. Appendix Table A1 displays the derivation of this sample.

2.3 | Matching approach

For the analysis that compared disparities between health system-affiliated and nonaffiliated POs, we matched affiliated POs to nonaffiliated POs by estimating propensity scores and using nearest-neighbor matching without replacement. Propensity scores were derived using a logistic regression model that estimated the probability of PO affiliation with a health system as a function of 13 beneficiary characteristics aggregated to the PO level (mean age, percent female, percent disabled, percent dually eligible, percent eligible for the Part D low-income subsidy, percent with HCC scores above the sample median, % white, % black, % Hispanic, % Asian or Pacific Islander, neighborhood socioeconomic status index, % living in metropolitan areas, and % living in nonmetropolitan urban areas) and three PO characteristics (number of attributed beneficiaries, number of physicians, and percentage of physicians that have primary care specialties) (additional details for the beneficiary characteristics are provided below). Each PO was assigned to a single hospital referral region (HRR) in which a plurality of the PO's beneficiaries lived. Within strata defined by the plurality HRR, we matched each affiliated PO to a single, nonaffiliated PO within a caliper of 0.20 standard deviations of the propensity score (logit) distribution.[28] The matched sample, comprising 1853 affiliated POs and 1853 nonaffiliated POs, was used to estimate the association between health system affiliation and within-PO disparities.

2.4 | Dependent variables

We examined twelve quality measures, including nine process, medication adherence, continuity, and care coordination measures, and three utilization measures. Appendix Table A2 provides detailed specifications for all measures. Process measures included breast cancer screening, colorectal cancer screening, and diabetes eye examinations—all of which followed HEDIS® 2016 specifications. Diabetes medication adherence was a binary measure indicating whether beneficiaries with Part D coverage who were prescribed diabetes medications filled their prescription often enough to cover 80% or more of the time they were supposed to be taking the medication.[29] Antidepressant medication adherence followed HEDIS 2016® Antidepressant Medication Management specifications and measured the percentage of members who were prescribed an antidepressant medication and continued taking it for at least 180 days. Continuity of care was assessed for beneficiaries with three or more primary care visits and was defined as the proportion of primary care visits made to the beneficiary's usual source of care, which was the clinician associated with a plurality of primary care visits.[30] Care coordination measures included three binary measures of the receipt of timely follow-up care within 14 days of an Emergency Department (ED) visit, within 30 days of discharge following any hospitalization and within 30 days of discharge following a hospitalization for mental illness. The first two measures of follow-up care were developed by the authors, whereas the latter used HEDIS® 2016 specifications. Utilization measures included all-cause ED visit rates, rates of all-cause readmissions within 30 days of hospital discharge (based on HEDIS® 2016 specifications), and a binary measure of whether beneficiaries with diabetes, hypertension, asthma, or COPD had any hospitalizations for ambulatory care-sensitive chronic conditions during 2015.[31] We consider higher risk-adjusted rates of ED visits, readmissions, and hospitalizations for ambulatory care-sensitive conditions to reflect poorer quality care under the assumption that at least some proportion of this utilization could be prevented with better ambulatory care.[2,32,33]

2.5 | Explanatory variables

Beneficiary race and ethnicity were estimated using the Medicare Bayesian Improved Surname Geocoding (MBISG 2.0) methodology, which combines Medicare administrative data and US census data to derive probabilities of membership in each of six mutually exclusive racial and ethnic groups (white, black, Hispanic, API, American Indian/Alaska Native (AIAN), and multiracial).[34] For the racial and ethnic groups included in the current analysis, correlations between the MBISG algorithm's estimated race/ethnicity and self-reported race/ethnicity range from 0.88 to 0.95. The algorithm is currently used to publicly report HEDIS and CAHPS measures by race and ethnicity in the Medicare Advantage program.[35]

Other beneficiary characteristics were derived from Medicare enrollment files, including age and indicators for female gender, disability, dual eligibility, and eligibility for the Medicare Part D subsidy for low-income enrollees. Medicare Hierarchical Condition Category scores, which measure predicted spending in the next calendar year, were used as a proxy for comorbidity. Urbanization was measured using Rural-Urban Continuum Codes and trichotomized as metropolitan (codes 1-3), nonmetropolitan urban (codes 4-6) and nonmetropolitan rural (codes 7-9). Each beneficiary's neighborhood socioeconomic status (SES) was measured using an index constructed at the ZIP code level using six items from the 2011-2015 pooled American Community Survey[36]: percent graduating high school, percent male unemployment, percent of households living below poverty, percent of female-headed households with children, percent of households receiving public assistance, and median annual household income. The index is calculated by standardizing each item to have a standard normal distribution, averaging the six standardized items, and then standardizing the index.[37]

2.6 | Statistical analysis

To address the research questions, we generated four types of estimates: (a) total disparities, (b) within-PO disparities, (c) between-PO

disparities, and (d) differences in within-PO disparities between affiliated POs and nonaffiliated POs. The total disparity is equal to the sum of the mean within-PO disparity and the between-PO disparity.

To estimate total disparities, we used generalized linear models to regress each quality and utilization measure on five beneficiary-level racial and ethnic probabilities (black, Hispanic, API, AI/AN, and multiracial) with white as the omitted probability. We report estimates for all groups but AI/AN and multiracial due to their low precision.[34] Standard errors were clustered on PO. We used "recycled predictions" to estimate group means on the scale of percent (binary and binomial outcomes) or rates (count outcomes).[38] Predicted means for black, Hispanic, and API groups were compared to predicted means for whites. The magnitude of each disparity was expressed as an effect size using Cohen's *d* (continuous measures) or Cohen's *h* (binary measures), and effect sizes that exceeded 0.2 standard deviations were considered meaningful. For binary measures only, we also considered disparities exceeding 5 percentage points to be substantively important, which is consistent with prior assessments of disparities in Medicare.[33,39]

To estimate the mean within-PO disparity, we used generalized linear mixed models to regress each quality/utilization measure on the five beneficiary-level racial and ethnic probabilities (black, Hispanic, API, AIAN, multiracial) that were mean-centered using each PO's mean probability for each racial and ethnic group. The mean-centered white beneficiary-level probability was the omitted (reference) probability. Each model included PO random effects. As above, we used recycled predictions to estimate group means and derived *P*-values from Wald tests for the coefficients on each centered beneficiary-level racial and ethnic probability.

To estimate the mean between-PO disparity, we subtracted the within-PO disparity from the overall disparity following an existing convention.[40] *P*-values were derived by fitting additional generalized linear mixed models that regressed each quality/utilization measure on the five mean-centered beneficiary-level racial and ethnic probabilities (excluding white) and five PO-level mean racial and ethnic probabilities (excluding white). *P*-values were derived from Wald tests for the coefficients on each PO-level mean racial and ethnic probability.

To estimate differences in disparities between affiliated POs and nonaffiliated POs, we used the matched sample and estimated models that included an indicator for PO affiliation with a health system and interactions between each of the five mean-centered beneficiary-level racial and ethnic probabilities and the health system affiliation indicator. Each model included PO random effects, HRR fixed effects, and the aggregated beneficiary characteristics and PO organizational characteristics listed above. These adjustment variables sought to control for any differences in beneficiary case mix, geographic, and PO differences following matching, which allowed "doubly robust" estimation of the association between affiliation status and racial and ethnic disparities.[41] We used Puhani's method[42] to estimate the interaction term on the untransformed scale. *P*-values were derived from Wald tests for the coefficients of each interaction term.

2.7 | Multiple comparisons

We used the Benjamini-Hochberg method to account for the potentially large number of race/ethnicity by measure comparisons in each analysis.[43]

2.8 | Sensitivity analyses

We explored the generalizability of the matched PO sample to the full sample and examined within-PO disparities for subgroups of POs where we had sufficient power, including large POs and POs affiliated with large health systems (and their matched pairs). We also examined within-PO disparities using a modified, matched PO sample in which we omitted the three PO characteristics as matching variables.

3 | RESULTS

A total of 16 007 POs representing nearly 19.8 million beneficiaries were used to measure racial and ethnic disparities, while 3706 POs (1853 matched pairs) were used to compare differences in disparities between affiliated and nonaffiliated POs. Affiliated POs differed slightly from nonaffiliated POs in the matched sample in terms of their size and specialty mix (Table 1). Affiliated POs were slightly more likely to be larger, with an average of 1541 attributed beneficiaries and 31 physicians per PO as compared with 1129 attributed beneficiaries and 24 physicians per PO for nonaffiliated POs. Affiliated POs were also more likely to be multispecialty organizations (66% vs 51%). Appendix Table B1 displays the results of a formal balance assessment, which indicates no meaningful differences in any organizational or beneficiary characteristic.

Beneficiaries included in the full sample were on average 70 years old, just over a quarter were dually eligible for Medicare and Medicaid, and had slightly higher HCC scores than the Medicare average (Table 1). Three-quarters of the sample was white; 11% was black, 8% was Hispanic, and 3% was API. Beneficiary characteristics for the matched sample were similar; however, beneficiaries attributed to affiliated POs were roughly 7 percentage points more likely to live in metropolitan areas, whereas beneficiaries attributed to nonaffiliated POs were about 4 percentage points more likely to live in rural areas. Beneficiaries who were not attributed to a primary care practice in 2015 and thus excluded from all analyses were more likely to be younger, male, healthier, and living in rural areas (Appendix Tables B2 and B3).

Comparing PO performance for black, Hispanic, and API beneficiaries relative to white beneficiaries across 12 measures, we identified disparities in one-third of comparisons (12 of 36 comparisons; Table 2). In 10 of the 12 comparisons, white beneficiaries received better care than nonwhite beneficiaries, including all five black-white disparities and all five Hispanic-white disparities. By contrast, API beneficiaries received better care than white beneficiaries on

TABLE 1 Characteristics of physician organizations and their attributed Medicare beneficiaries

	All physician organizations		Matched sample of physician organizations			
			Affiliated with health systems		Not affiliated with health systems	
	N = 16 007 POs N = 19 770 556 beneficiaries		N = 1853 POs N = 2 855 419 beneficiaries		N = 1853 POs N = 2 091 563 beneficiaries	
	Mean	SD	Mean	SD	Mean	SD
Characteristics of Physician Organizations						
Number of attributed beneficiaries	1235	3616.5	1541	3012.8	1129	2817.8
Number of physicians						
Primary care	10.0	42.7	13.4	26.3	10.0	87.4
Specialty care	9.0	54.0	11.5	41.2	8.7	63.1
Total	23.9	121.9	30.7	88.9	23.8	189.5
Percentage of primary care physicians	71.7	31.8	58.2	29.3	58.0	34.8
Organization specialty, %						
Primary care only	59.6		34.1		48.9	
Primary and specialty care	40.4		65.9		51.1	
Region, %						
Northeast	19.2		19.2		24.9	
Midwest	25.4		25.4		22.1	
South	38.7		38.1		37.6	
West	16.7		17.2		15.4	
Characteristics of Medicare Beneficiaries						
Age, mean	70.1	5.9	69.6	5.8	69.5	6.0
Female, %	56.4	11.4	56.4	11.7	56.3	12.6
Disabled, %	29.3	19.2	31.6	17.6	31.5	20.3
Dually eligible, %	27.1	23.6	27.4	20.2	26.6	21.2
Part D low-income subsidy eligible, %	2.8	3.5	3.1	4.5	3.1	4.5
Mean HCC score	1.2	0.4	1.2	0.4	1.2	0.4
Race and ethnicity: White, %	73.9	25.1	77.7	21.8	79.1	20.9
Black	10.7	15.7	10.6	15.7	10.2	15.8
Hispanic	8.5	15.7	5.7	10.2	5.1	9.3
Asian/Pacific Islander	3.4	9.1	2.1	6.6	1.8	4.9
Neighborhood SES index, mean	0.09	0.6	0.05	0.5	0.07	0.5
Urbanization: Metropolitan area, %	79.0	32.9	69.5	37.0	67.0	38.2
Nonmetropolitan urban area	14.0	28.9	20.7	32.8	21.3	32.2
Nonmetropolitan rural area	7.0	25.5	9.8	27.6	11.8	29.6

Note: Matching variables included 13 PO-level measures of aggregated beneficiary characteristics (mean age, percent female, percent disabled, percent dual eligible, percent low-income subsidy eligible, percent with above-median Hierarchical Condition Category score, mean neighborhood socioeconomic status index, percent living in metropolitan areas, percent living in nonmetropolitan urban areas, percent white, percent black, percent Hispanic, percent Asian/Pacific Islander) and three PO characteristics (number of attributed beneficiaries, total number of physicians, and percentage of physicians who provide primary care). Matching was conducted within hospital referral regions (defined as the plurality HRR for each PO based on beneficiary residence). HCC = Hierarchical Condition Category; SES = Socioeconomic Status. The median number of attributed beneficiaries per PO was 517 (affiliated POs) and 338 (nonaffiliated POs), and the median number of physicians per PO was 12 (affiliated POs) and 5 (nonaffiliated POs).

two measures (diabetes eye examinations and ED visit rate) and worse care on one measure (adherence to antidepressant medications). Black-white overall disparities were largest for medication adherence measures and care coordination measures, whereas Hispanic-white overall disparities were more common for process measures and medication adherence measures. Appendix Table B4 contains the standardized effect size estimates associated with these disparities.

TABLE 2 Racial and ethnic disparities on quality and utilization measures

	Black-White total disparity		Hispanic-White total disparity		API-White total disparity	
	Absolute difference	Better care ($P < .05$)	Absolute difference	Better care ($P < .05$)	Absolute difference	Better care ($P < .05$)
Process						
Breast cancer screening, %	3.6	Black	**8.3**	**White**	4.9	White
Colorectal cancer screening, %	2.1	Black	4.2	White	1.2	White
Diabetes eye examination, %	1.0	Black	**8.7**	**White**	**5.2**	**API**
Medication adherence						
Diabetes medications, %	**10.5**	**White**	**11.3**	**White**	0.7	Neither
Antidepressant medications, %	**17.6**	**White**	**26.2**	**White**	**15.1**	**White**
Continuity and coordination						
Continuity of care, %	1.1	Black	2.5	Hispanic	3.9	API
Follow-up after ED visit, %	**7.7**	**White**	3.2	White	0.6	Neither
Follow-up after hospitalization, %	2.9	White	0.1	Neither	0.8	Neither
Follow-up after hospitalization for mental illness, %	**12.4**	**White**	**7.4**	**White**	2.8	Neither
Utilization						
Emergency department visits, per 100 beneficiaries	5.3	White	4.5	White	**14.2**	**API**
All-cause readmissions, %	0.1	Black	1.7	White	1.5	White
One or more ACSC hospitalizations, %	0.5	White	0.2	Hispanic	0.7	API

Note: The absolute value of the racial or ethnic difference in quality of care is reported. All results are statistically significant at $P < .05$ after adjustment for multiple comparisons except when indicated by the word "Neither." Bold results reflect an effect size exceeding 0.2 standard deviations (for binary or continuous measures) or a disparity exceeding 5 percentage points (for binary measures).

Abbreviations: ACSC, Ambulatory care-sensitive condition; ED, Emergency Department.

TABLE 3 Within- and between-physician organization racial and ethnic disparities among measures associated with a total disparity

	Within-PO disparity		Between-PO disparity	
Comparison and measure	Absolute difference	Better care ($P < .05$)	Absolute difference	Better care ($P < .05$)
Black-White				
Diabetes medication adherence, %	**8.9**	**White**	1.6	White
Antidepressant medication adherence, %	**15.7**	**White**	2.0	White
Follow-up after ED visit, %	**5.6**	**White**	2.1	White
Follow-up after hospitalization for mental illness, %	**10.6**	**White**	1.7	White
Hispanic-White				
Breast cancer screening, %	4.4	White	3.9	White
Diabetes eye examination, %	**5.7**	**White**	3.0	White
Diabetes medication adherence, %	**9.9**	**White**	1.5	White
Antidepressant medication adherence, %	**23.9**	**White**	2.2	White
Follow-up after hospitalization for mental illness, %	3.7	White	3.7	White
API-White				
Diabetes eye examination, %	4.8	API	0.5	API
Antidepressant medication adherence, %	**12.9**	**White**	2.2	White
Emergency department visits per 100 beneficiaries	**4.8**	**API**	0.5	API

Note: The rows in the table correspond to racial or ethnic comparisons associated with substantively important overall disparities reported in Table 2. The absolute value of the racial or ethnic difference in quality of care is reported. All results are statistically significant at $P < .05$ after adjusting for multiple comparisons. Bold results reflect an effect size exceeding 0.2 standard deviations (for binary or continuous measures) or a disparity exceeding 5 percentage points (for binary measures).

Abbreviation: ED, Emergency Department.

Notable patterns in disparities were observed across racial and ethnic groups for certain measures. In particular, large disparities in medication adherence measures were observed in five of six comparisons between white and nonwhite beneficiaries. Adherence to diabetes medications was approximately 11 percentage points lower for both black and Hispanic beneficiaries, and adherence to antidepressant medications was 15 to 26 percentage points lower across all three nonwhite groups, with the largest disparity for Hispanic beneficiaries. Although rates of follow-up after any hospitalization were no different for each group relative to white beneficiaries, rates of follow-up after hospitalization for mental illness were 7.4 percentage points lower for Hispanics relative to white beneficiaries and 12.4 percentage points lower for black beneficiaries.

When decomposing these "total" disparities into within-PO and between-PO components, we found that most of the total disparity is driven by within-PO disparities (Table 3). Within-PO disparities remained substantively large for nine of 12 comparisons for which we observed a total disparity. For eight of the nine comparisons, white beneficiaries received better care.

Within-PO disparities differed only slightly between health system-affiliated POs and nonaffiliated POs for most measures (Table 4). Nonaffiliated POs had smaller disparities on one care coordination measure and one process measure, and the differences were small: 1.6 percentage points smaller black-white disparities in rates of follow-up after ED visits and 0.6 percentage points smaller Hispanic-white disparities in breast cancer screening. In analyses that limited the sample to large POs and POs affiliated with large health systems (and their matched pairs), we found results that were broadly consistent with the main analyses (Appendix Tables B5 and B6).

Our sensitivity analysis that excluded PO characteristics from matching to avoid potentially matching on mediators of performance that might favor affiliated POs, used a sample of 4666 POs that were well balanced on beneficiary characteristics but, as expected, not on organizational characteristics (Appendix Table C1). In these comparisons, we found even more statistically significant differences in disparities (4 comparisons vs two comparisons in the main analysis). In each instance, the direction of the difference favored nonaffiliated POs and the magnitude of the difference in disparities were generally larger (ranging from 1.0 percentage points to 2.6 percentage points) (Appendix Table C2).

4 | DISCUSSION

In a nationwide sample of just over 16 000 physician organizations, we found over a dozen cases of racial and ethnic disparities in care provided to Medicare FFS beneficiaries across a range of quality and utilization measures. White beneficiaries received better care than nonwhite beneficiaries across nearly all of these comparisons, and

TABLE 4 Within-physician organization racial and ethnic disparities, by health system affiliation status among measures associated with a total disparity

	Within-PO disparity			
Comparison and measure	**Affiliated POs**	**Nonaffiliated POs**	**Absolute Difference**	**Smaller disparity ($P < .05$)**
Black-White				
Diabetes medication adherence, %	9.3	7.8	1.4	Neither
Antidepressant medication adherence, %	14.1	13.3	0.8	Neither
Follow-up after ED visit, %	5.9	4.3	1.6	Nonaffiliated POs
Follow-up after hospitalization for mental illness, %	9.8	9.1	0.3	Neither
Hispanic-White				
Breast cancer screening, %	5.9	5.3	0.6	Nonaffiliated POs
Diabetes eye examination, %	5.9	7.0	1.1	Neither
Diabetes medication adherence, %	10.1	10.9	0.9	Neither
Antidepressant medication adherence, %	22.4	25.0	2.6	Neither
Follow-up after hospitalization for mental illness, %	3.2	2.1	0.7	Neither
API-White				
Diabetes eye examination, %	4.3	6.0	1.7	Neither
Antidepressant medication adherence, %	13.5	17.0	3.6	Neither
Emergency department visits per 100 beneficiaries	4.3	6.0	1.7	Neither

Note: The rows in the table correspond to racial or ethnic comparisons associated with substantively important overall disparities reported in Table 2. The absolute value of the difference in within-PO disparities between POs affiliated with health systems and nonaffiliated POs is estimated using an interaction term. All results are statistically significant at $P < .05$ after adjusting for multiple comparisons with the exception of those indicated by the word "Neither" in the far right column. A weighted average of the stratified differences reported in this table might differ from the mean within-PO absolute difference reported in Table 3 because the stratified differences are estimated using recycled predictions based on a model containing an interaction term.

disparities were largest for medication adherence measures and selected care coordination measures. These disparities were primarily due to within-PO differences in care between white and nonwhite beneficiaries rather than the disproportionate use of low-performing providers by nonwhite beneficiaries.

Health system-affiliated POs did not achieve smaller disparities than nonaffiliated POs. Rather, in the few cases where disparities differed between the two groups, nonaffiliated POs more often had smaller disparities although the magnitude of these differences was small.

The lack of differences between affiliated and nonaffiliated POs on most measures might indicate that any infrastructure advantages POs receive through affiliation might be insufficient to achieve improved processes of care.[44] The lack of a benefit of health system affiliation is also consistent with the growing literature that finds that affiliated POs have only modestly higher performance, at best, compared with nonaffiliated POs.[45-47] The findings from our analysis do not preclude the possibility that a subset of affiliated POs might be highly effective in reducing disparities. However, the lack of detailed information on the characteristics of POs and health systems with which they affiliate limits our ability to explore the mechanisms underlying any variation in performance. Notably, when we restricted the sample to a subset of the largest POs or the POs affiliated with the largest systems, we found no evidence of a stronger effect of affiliation.

The magnitude of the overall disparities across multiple measures is also notable. The large overall disparities in medication adherence might be related to differences in beneficiary demographics, health status, or the use of mail order.[48] The larger disparities in antidepressant medication adherence suggest that additional factors might be at play, such as lower acceptance of these medications by beneficiaries,[49] less access to psychotherapy,[50] or limited use of culturally tailored interventions[51] for black and Hispanic beneficiaries. Similarly, lower rates of follow-up after hospitalization for mental illness for black and Hispanic beneficiaries indicate that POs might be failing to identify patients who have barriers accessing follow-up care[24,52] and provide adequate assistance during these transitions.[53] Finally, the disparities in process measures for Hispanic beneficiaries we observed contrasts with prior research involving Medicare Advantage enrollees, which found that Hispanic beneficiaries received better care than whites.[4] These differences might reflect beneficiary selection or differences in the effectiveness of population health management between Medicare Advantage and Medicare fee-for-service.

The large within-PO disparities relative to between-PO disparities highlight the importance of decomposing these effects. Whereas racial and ethnic disparities in inpatient care tend to be primarily between hospitals rather than within hospitals,[54] the pattern may differ in the ambulatory setting or may be unique to Medicare FFS or POs. For example, large between-plan differences have been documented in Medicare Advantage.[40] The large within-PO disparities in our study indicate that much of these disparities may be under the control of each PO and could be reduced if POs deploy evidence-based interventions that target disparities, which might involve interventions directed toward providers, patients, and communities.[14]

Limitations of the analysis include its cross-sectional design, which limits our ability to infer the causal effect of health system affiliation if beneficiaries and providers select into different types of POs in ways that are not accounted for by our matching algorithm. Although the analysis used a diverse set of claims-based measures, key domains of quality such as access and patient experience were either unavailable or lacked the sample size required to estimate within-PO disparities. Further, the limited number of available PO-level characteristics or attributes of health systems prevented us from testing specific mechanisms or providing richer context to our findings. For example, achieving reductions in disparities requires leadership, workforce investments, and cultural change within organizations that cannot be measured in administrative data. While we considered conducting analyses within additional subgroups, such as smaller POs, POs affiliated with smaller systems, and POs that are health centers, these analyses lacked power because of both limited sample sizes for selected racial and ethnic groups and our rigorous matching approach which limited the number of POs in the analysis.

Although we used conventional approaches to identify POs, we lacked information about practice sites, which might be a more meaningful unit of analysis for assessing disparities. Lacking gold-standard data sources or approaches for identifying POs that use multiple TINs, we developed grouping rules based on organization name, location, and empirical estimates of physician overlap; however, these methods require further validation. Our analysis omitted racial and ethnic groups that lacked sufficient precision (AIAN and multiracial), and the API and Hispanic categories combined multiple racial and ethnic identities that might mask variation in care. Finally, although our analysis focused on Medicare fee-for-service beneficiaries, Medicare Advantage enrollment continues to grow annually, which may affect the composition of the fee-for-service population and, as a result, the sample used in our analyses. Supplementing the current analyses with those examining disparities in Medicare Advantage would provide a more complete assessment of the relationship between disparities and different types of health care organizations.

Given the lack of prior research assessing the role of health systems in reducing disparities in ambulatory care, additional studies using different measures, populations, and methods should be conducted to confirm these results. For example, a mixed methods study could test mediators of high and low performance in affiliated and nonaffiliated POs. In addition, conducting longitudinal studies that examine ownership conversions might provide stronger inferences regarding the effect of health systems on racial and ethnic disparities. Improvements in the systematic tracking of POs and their affiliations with health systems along with mixed methods study designs are critical to improving research on disparities in health systems. Moreover, the large within-PO disparities in care we observed highlight the urgency with which providers must identify and address disparities

within their own health care organizations using evidence-based interventions. Public reporting of health equity composite measures[55] at the level of POs or health systems could provide greater accountability for providers to take action to reduce these disparities.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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