RESEARCH ARTICLE

Do racial and ethnic disparities in health care use vary with health?

Adam I. Biener PhD¹ | Samuel H. Zuvekas PhD²

¹Department of Economics, Lafayette College, Easton, Pennsylvania

²Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality, Rockville, Maryland

Correspondence

Adam I. Biener, PhD, Department of Economics, Lafayette College, Easton, PA 18042.

Email: bienera@lafayette.edu

Objective: To determine the relationship between health status and the magnitude of black-white and Hispanic-white disparities in the likelihood of having any office-based or hospital outpatient department visits, as well as number of visits.

Data Source: 2010-2014 Medical Expenditure Panel Survey.

Study Design: The probability of having a visit is modeled using a Probit model, and the number of visits using a negative binomial model. We use a nonlinear rank-and-replace method to adjust minority health status to be comparable to that of whites, and predict utilization at different levels of health by fixing an indicator of health status. We compare estimated differences in predicted utilization across racial/ethnic groups for each level of health status to map out the relationship between the racial/ethnic disparity and health status, also stratifying by health insurance coverage.

Extraction Methods: We subset to nonelderly adults.

Principal Findings: We find that Hispanic-white differences in the probability of having an office-based or hospital outpatient department were widest among adults in excellent health (27 percentage points, 95% CI: [23, 31]) and narrowest when reporting poor or fair health (15 p.p. [13, 17]). Black-white and Hispanic-white differences in the number of visits were wider for adults who report poor or fair health (5.3 visits [4.0, 6.6] and 5.7 [4.3, 7.0], respectively) compared to excellent health (1.7 [1.2, 2.1] and 1.5 [1.1, 2.0], respectively) among adults who are full-year privately insured.

Conclusions: The magnitudes of racial/ethnic disparities vary with level of health.

KEYWORDS

health care utilization, perceived health, racial and ethnic disparities

1 | INTRODUCTION

A long line of studies documents substantial racial and ethnic disparities in access and use of health care services. The 2014 National Healthcare Quality and Disparities Report found that, despite improving access through higher rates of insurance among blacks and Hispanics, many of these racial and ethnic disparities still persist.¹ In aggregate, blacks and, especially, Hispanics, are less likely to use any type of office-based or outpatient medical care and have lower average expenditures compared to whites.¹⁻⁴ Substantial disparities

are found in all age groups ranging from children and adolescents⁵ to the elderly.⁶ Disparities are similarly found for many specific types of services including, for example, cardiac care,⁷ cancer screening,^{1,8-10} mental health and substance abuse treatment,¹¹⁻¹⁵ and renal transplantation.¹⁶

The literature suggests many factors that contribute to racial and ethnic disparities. These factors range from differences in underlying health and treatment needs, health insurance coverage, and socioeconomic status (SES) to cultural factors and attitudes to discrimination.^{17,18} We focus on two key factors, in particular:

health status and health insurance coverage. Health status clearly differs across racial and ethnic groups. For example, Hispanics, and especially certain Hispanic subgroups, are younger and thus healthier on average than other groups. As a result, simple comparisons of utilization rates could understate actual disparities. Thus, the Institute of Medicine (IOM) in its landmark *Unequal Treatment* report defined racial and ethnic disparities as all differences in health care use except for the differences in clinical need, clinical appropriateness, and patient preferences.¹⁸ However, long before the 2003 IOM report, disparities studies using the Andersen-Aday¹⁹ behavioral model or similar frameworks standardly included controls for health status.

Simply controlling for health status, though, may mask important differences in the magnitudes of disparities at different levels of health. For example, smaller disparities when health is poor may signal improved access for minorities most in need of health care, but conversely raise concerns of underuse of preventive care among minorities in better health (or overuse by whites in better health). If disparities were larger when health is poor, we might instead deduce that the overall disparity understates the magnitude of the racial/ethnic differences in medical care use among those with the highest health needs.

Similar to health status, rates of health insurance coverage also differ across racial and ethnic groups^{1,2} and are a key driver of disparities.^{4,17,20,21} Hispanics, in particular, but also blacks, are much more likely to be uninsured, and if insured, more likely to have Medicaid than whites. Many disparities diminish or disappear altogether with coverage. For example, Fiscella and Sanders¹⁷ note that “differences in cancer screening by race or ethnicity among persons with similar types of insurance are relatively small.” On other measures of health care use, substantial disparities remain among even insured populations.^{4,20}

In this paper, we extend the previous literature by estimating differences in utilization across racial/ethnic groups at different levels of health. Because of its special importance, we further stratify the analyses by health insurance coverage to illustrate how the magnitudes of disparities may change with level of health even within similarly insured populations. We use as a point of departure the series of empirical studies explicitly adopting the IOM framework,^{13,14} but our methods apply more generally.

Methods to estimate IOM concordant disparities start with similar regression models as much of the rest of the disparities literature with controls for race and ethnicity, health status, and key SES characteristics including income, education, and health insurance coverage. Institute of Medicine disparity studies fundamentally differ, though, in how the results of the regression models are then used to estimate the magnitude of disparities. Instead of measuring the independent effect of race and ethnicity on health care use once health status and SES and all other characteristics are controlled for, IOM disparity methods adjust only for health status in predicting differences in use between racial and ethnic groups. This reflects the IOM's view that differences in health care provided attributable to SES factors such as health insurance,

income, and education are, in fact, still disparities. For example, Cook, McGuire, and Zuvekas³ find that the IOM definition yields estimates significantly larger than the independent effect of race and ethnicity alone, as socioeconomic (SES) factors mediate some racial/ethnic differences in medical care use.

We first formally describe our extensions to the IOM disparities methods by explicitly incorporating changes in disparities with level of health and stratifying by insurance coverage and then empirically estimate the model. We consider multiple measures of health status to test the sensitivity of our findings to our choice of health measures, and we test the robustness of our findings to alternative model specifications.

2 | METHODS

2.1 | Extending the IOM definition of disparity

We illustrate how the relationship between changes in health and the IOM disparity arises using the linear Oaxaca-Blinder decomposition of a mean difference for convenience. In practice, we estimate this relationship using nonlinear models. We express mean utilization for whites and a minority group as a linear combination of nonhealth characteristics such as socioeconomic factors (**S**) and health characteristics (**H**),

$$\begin{aligned}\bar{Y}_w &= \bar{H}'_w \hat{\beta}_w + \bar{S}'_w \hat{\gamma}_w \\ \bar{Y}_m &= \bar{H}'_m \hat{\beta}_m + \bar{S}'_m \hat{\gamma}_m,\end{aligned}\quad (1)$$

where $\hat{\beta}$ is a vector of estimated coefficients for each health characteristic and $\hat{\gamma}$ is a vector of estimated coefficients for each socioeconomic factor as well as the model constant term. Thus, the total mean difference in utilization between whites and the minority group is,

$$\bar{Y}_w - \bar{Y}_m = (\bar{H}'_w \hat{\beta}_w + \bar{S}'_w \hat{\gamma}_w) - (\bar{H}'_m \hat{\beta}_m + \bar{S}'_m \hat{\gamma}_m) \quad (2)$$

We use the Oaxaca-Blinder decomposition to decompose the total mean difference into components that are explained by differences in observed characteristics, and the components that cannot be explained by observed characteristics:

$$\bar{Y}_w - \bar{Y}_m = (\bar{H}'_w - \bar{H}'_m) \hat{\beta}_m + (\bar{S}'_w - \bar{S}'_m) \hat{\gamma}_m + \bar{H}'_w (\hat{\beta}_w - \hat{\beta}_m) + \bar{S}'_w (\hat{\gamma}_w - \hat{\gamma}_m) \quad (3)$$

The first term in Equation 3 is the portion of the total mean difference due to observed differences in health. The second term is the portion of the total mean difference due to observed differences in SES and other nonhealth observables such as income or education. The last two terms are the unexplained structural component of the total mean difference. This component is due to different “returns” to personal characteristics evaluated at whites’ mean characteristics.²²

The IOM definition of a racial and ethnic disparity does not consider differences in use due to different clinical need or need-based patient preferences as part of the disparity. In Equation 4, we implement this definition in the Oaxaca-Blinder framework by setting,

$\bar{H}_m = \bar{H}_w$, effectively assigning the minority group the same distribution of health status as whites.

$$(\bar{Y}_w - \bar{Y}_m)_{IOM} = \bar{H}'_w(\hat{\beta}_w - \hat{\beta}_m) + \bar{S}'_w(\hat{\gamma}_w - \hat{\gamma}_m) + (\bar{S}'_w - \bar{S}'_m)\hat{\gamma}_m \quad (4)$$

Although the IOM disparity removes the contribution due to differences in health, it nevertheless depends partly on the differing return to health by race/ethnicity, scaled by the mean level of health: $\bar{H}'_w(\hat{\beta}_w - \hat{\beta}_m)$. Thus, for any given level of health, the magnitude of the disparity is partly driven by the difference in the minority response to health and the utilization response of whites.

We identify the racial/ethnic difference in utilization for a given level of health by evaluating Equation 4 for fixed values of $\mathbf{H}$ that correspond with a particular level of health. For example, the mean difference in utilization among adults with excellent health can be expressed as,

$$(\bar{Y}_w - \bar{Y}_m)_{H=EX} = (\mathbf{H} = \mathbf{EX})'_w(\hat{\beta}_w - \hat{\beta}_m) + \bar{S}'_w(\hat{\gamma}_w - \hat{\gamma}_m) + (\bar{S}'_w - \bar{S}'_m)\hat{\gamma}_m \quad (5a)$$

and similarly among adults in poor health,

$$(\bar{Y}_w - \bar{Y}_m)_{H=PR} = (\mathbf{H} = \mathbf{PR})'_w(\hat{\beta}_w - \hat{\beta}_m) + \bar{S}'_w(\hat{\gamma}_w - \hat{\gamma}_m) + (\bar{S}'_w - \bar{S}'_m)\hat{\gamma}_m \quad (5b)$$

As Oaxaca and Ransom²³ showed, the health components in either 5a or 5b are not invariant to choice of reference group in the specification of the health measures. However, the total “structural” differences in 5a and 5b are invariant to choice of reference group due to the constant term in the model,²³ and thus, we can isolate the contribution of differences in response to health to the IOM disparity as a difference-in-differences estimate. For example, we identify the difference-in-differences when moving from excellent to poor health as,

$$(\bar{Y}_w - \bar{Y}_m)_{H=PR} - (\bar{Y}_w - \bar{Y}_m)_{H=EX} = (\mathbf{H} = \mathbf{PR})'_w(\hat{\beta}_w - \hat{\beta}_m) - (\mathbf{H} = \mathbf{EX})'_w(\hat{\beta}_w - \hat{\beta}_m) \quad (6)$$

In the linear setting, this is simply the health difference, $(\mathbf{H} = \mathbf{PR}) - (\mathbf{H} = \mathbf{EX})$, weighted by the differences in the two groups’ health coefficients (an estimate that is invariant to choice of reference group).

Earlier studies have used a similar difference-in-differences approach to determine changes in disparities over time. Smith and Welch²⁴ compared changes in blacks-white disparities in wages between 1940 and 1990 (see also Heckman, et al²⁵). Barr and Lin²⁶ extend the Oaxaca-Blinder decomposition of the difference-in-differences using the nonlinear decomposition approach of Fairlie.²⁷ We follow Barr and Lin²⁶ in identifying Equation (6) with nonlinear models of health care utilization.

2.2 | Estimation

We implement the IOM definition by estimating nonlinear regression models of utilization controlling for both socioeconomic ($\mathbf{S}$) and health ($\mathbf{H}$) characteristics but then adjusting only for health ($\mathbf{H}$) in predicting differences in utilization across groups. We use a

nonlinear rank-and-replace method to adjust minority health status variables to reflect the white’s distribution.^{13,28} Specifically, we follow the procedure used in Cook, et al³ to adjust dichotomous and ordinal health covariates. Once all health covariates are adjusted, we calculate the predicted utilization for each racial and ethnic group for fixed levels of a health status indicator, which is both a member of the set of health covariates and a single index of overall health. To account for correlation between the health status indicator and other health covariates such as age and gender, we include interactions between the health status indicator and all other health variables to allow for all health covariates to contribute to different utilization responses at each level of health. To account for differing response at different levels of health across insurance groups, we also interact health status with insurance status.

We specify the conditional mean $E(y|X)_g$ for racial/ethnic group g as the appropriate link function μ with argument equal to the linear predictor for a given level of health, using a single metric of health as a health status indicator, η ,

$$E(y|X)_g = \mu[\alpha_g + \beta_{1g}\eta + \beta_{2g}(\text{insurance}) + \beta_{3g}\eta(\text{insurance}) + \eta\mathbf{H}'\beta_{4g} + \mathbf{H}'\gamma_g + \mathbf{S}'\delta_g] \quad (7)$$

Covariate matrix $\mathbf{H}$ contains controls for gender, age, and disability. The socioeconomic covariates are contained in $\mathbf{S}$ and include controls for SES, region, and year fixed effects. We consider insurance status an SES variable in our analysis. In order to predict the level of use for a given racial/ethnic group with a particular source of insurance coverage, we predict use while fixing insurance status in Equation 7, which restricts β_{2g} and β_{3g} to the racial/ethnic group response only among adults in that particular insurance group.

We build our estimates of racial/ethnic differences and changes in these differences from individual predictions in the level of utilization for a given racial/ethnic group at fixed levels of health indicated by the health status indicator, η . We use Probit regression to predict the probability of having an office-based or outpatient visit. We use negative binomial regression to predict the number of office-based or outpatient visit conditional on having any visits, as tests of overdispersion rejected the Poisson model.²⁹

3 | DATA

Our data come from the 2010-2014 Medical Expenditure Panel Survey (MEPS), a nationally representative household survey of the US civilian noninstitutionalized population conducted annually since 1996. The MEPS collects detailed information on health care use, health status, health insurance, and other characteristics over a 2-year period for each household through five in-person interviews. One respondent generally reports for each household. Survey interviewers ask that this be the person most knowledgeable about health and health care use of the family.

The MEPS utilizes an overlapping panel design with a new panel starting each year. Estimates for calendar year 2014, for example, combine data from panels 18 (old, initiated in 2013) and 19 (new, initiated in 2014). The sample frame for each new panel is a subsample of the previous year's responders to the National Health Interview Survey (NHIS). Cumulative response rates (NHIS plus MEPS rounds) were 53.5, 54.9, 56.3, 52.8, and 48.5 percent, respectively, for 2010 through 2014. Response rates were higher among blacks and Hispanics compared to other groups. For example, the 2014 Round 1 response rates were 79.5 percent for blacks, 73.7 percent for Hispanics, 70.3 percent for whites/others, and 67.6 percent for Asians.³⁰

We compare outcomes by insurance and health status among three racial/ethnic categories: non-Hispanic white, Hispanic, and non-Hispanic black. Other categories were omitted due to small sample sizes.

3.1 | Health status

The MEPS contains a number of measures of health status. We use two: the standard single-item perceived health status (excellent, very good, good, fair, and poor) reported in every round of the MEPS and the broader SF-12 health status index contained in a separate paper-based Adult Self-Administered Questionnaire for each adult every year in MEPS. Both are widely used as controls for health in the disparities literature. Methodological studies provide mixed evidence as to whether different racial and ethnic groups respond differently in reporting their health on each of these scales with many studies finding either no differences or relatively small differences.³¹⁻⁴³

We choose to present analyses based on the single-item perceived health status measure as the main results primarily because of its arguably more natural interpretation (e.g. poor vs excellent health) than SF-12 composite scores. Specifically, we define three mutually exclusive and exhaustive categories: excellent reported health in all survey rounds corresponding to that calendar year, good or very good reported health but no worse in at least one round, and at least one round of poor or fair health.

We test the sensitivity of our results to the choice of health status indicator by alternatively using the broader SF-12 Physical Component Summary Score. The SF-12 is a composite score from 12 questions regarding physical and mental health, including single-item perceived health status. The SF-12 score ranges from 0 to 100 with 0 indicating the poorest level of health, and 100 being the best. We categorize the SF-12 into quintiles and compare poorest health (1st) to the two best health quintiles (4th and 5th). Complete results using the SF-12 are available in the Appendix S2.

3.2 | Insurance

To capture differences among distinct insurance populations, we generate indicators for mutually exclusive subsamples of adults with any public coverage during the year, full-year privately insured, and full-year uninsured from the monthly insurance indicators on the

MEPS public use files.⁴⁴ We do not separately analyze part-year insured with no public coverage due to low sample size, but include them in the pooled sample.

3.3 | Outcomes

We estimate racial and ethnic disparities in the probability of any ambulatory medical care use and the number of visits conditional on use during the year. Ambulatory use is defined as office-based and hospital outpatient department visits as reported by MEPS household respondents. Medical Expenditure Panel Survey respondents are asked to enumerate each ambulatory visit (including dates, reasons for visit, and type of provider) made in the household through detailed probing that includes use of calendars, explanation of benefit forms, provider billing statements, and show cards with different types of office- and clinic-based providers and settings.⁴⁴

3.4 | Covariates

Covariates are divided into two broad categories: those that are associated with health status and SES variables. Additional health status variables include gender, age (18-24, 25-34, 35-44, 45-54, 55-64), and any activity limitation ("Is anyone in the family limited in any way in the ability to work at a job, do housework, or go to school because of an impairment or a physical or mental health problem? Who is that?"). Socioeconomic status variables include the level of education (less than high school, high school graduate, any college, college graduate, master's degree or higher, education missing), family income (below federal poverty level [FPL], near poverty [100-125 percent FPL], low income [125-200 percent FPL], middle income [200-400 percent FPL], and high income [≥ 400 percent FPL]), household composition (number of household members aged 0-5, 6-17, 18-64, 65+), marital status, whether interviews were conducted in a language other than English, whether the individual self-reported their survey response, year and state fixed effects. We note that while the regression models control for these SES variables, in many cases reducing the magnitudes of the direct effects of the black and Hispanic coefficients, these differences due to SES that are correlated with race/ethnicity are not differenced out of the estimates of disparities in IOM-consistent methods such as ours.

3.5 | Sample

We restrict our analysis to the full sample of adults aged 18-64. The initial sample size was 97 329 person-year observations, with each person contributing up to 2 observations. 1707 person-year observations were excluded because perceived health status was missing in one or more rounds, resulting in a final sample of 95 622 person-year observations and 59 555 unique persons. We further adjusted the MEPS public use file weights for this small amount of item nonresponse on health status using propensity-score methods.

All analyses were conducted using STATA/MP 14.1 and corrected for the complex multistage clustered and stratified design

of the MEPS, which also accounts for the repeated observations in the sample.^{45,46} All differences between minority groups and whites noted in the text are statistically significant at the 5 percent level unless otherwise noted.

3.6 | Sensitivity analyses

We perform two sets of sensitivity analyses in addition to the tests of alternative health status measures. We test the sensitivity of our nonlinear model specification by using ordinary least squares instead of the nonlinear probit and negative binomial models, finding similar results (see Appendix S2).

We do not know a priori what the appropriate level of use is for any individual, and thus cannot distinguish whether racial/ethnic groups are over- or underutilizing services for each level of health. We investigate this further by repeating our analysis on subsamples for which higher levels of utilization are more appropriate. First, we restrict the sample to adults with at least one reported “priority” medical condition in MEPS. Priority conditions are a list of common, high cost, and/or policy-relevant chronic conditions developed by AHRQ in consultation with the IOM, CMS, and other stakeholders.⁴⁴ Second, we also estimate racial/ethnic differences in the number of visits for adults with at least two office-based or outpatient visits, as well as the smaller sample of adults with at least four visits.

4 | RESULTS

Table 1 presents descriptive statistics for our estimation sample. Compared to whites, blacks and Hispanics were significantly less likely to have any ambulatory (office-based or hospital outpatient department) visits and had fewer visits per person conditional on positive use. Blacks and Hispanics were also less likely to report excellent health in all interview rounds and were more likely to report poor/fair health in at least one round. Whites were more likely to be privately insured, and Hispanics were more likely to be full-year uninsured relative to whites and blacks. The distribution of ages for whites skews older than for blacks and Hispanics, although other health characteristics are similar across groups.

Table 2 contains the estimated disparities in the probability of having any ambulatory visits. We find that, in the pooled sample, whites were 13 (95% CI: [12, 15]) percentage points more likely to have an ambulatory visit than blacks and 21 (20, 23) percentage points more likely to have an ambulatory visit than Hispanics. Using the IOM definition, whites were similarly more likely than blacks or Hispanics to have any ambulatory visit within each insurance group.

Figure 1 contains predicted means of each racial/ethnic group's probability of having any ambulatory visit for each category of perceived health, where perceived health is fixed to the same relevant category for all racial/ethnic groups and all other minority health characteristics are adjusted to reflect the white population's distribution when predicting medical care use. Thus, comparisons between groups represent estimates of differences in medical care use

due to racial/ethnic differences, as well as differences due to mediating socioeconomic factors but not differences in health status. We observe that moving from excellent perceived health to poor/fair perceived health, the probability of use increases for all groups but at a faster rate for blacks and Hispanics compared to whites. As a result, the magnitude of racial/ethnic differences in the probability of office-based or outpatient medical care use narrows at lower health levels use in the overall sample, as well as in each insurance group.

Columns 2-4 of Table 2 report the differences in predicted mean probability of having any ambulatory visit between whites and blacks and Hispanics, respectively, found in Figure 1. In the pooled sample, whites in excellent health were 16 (13, 20) percentage points more likely to have any ambulatory care visit than blacks in excellent health and have a 27 (23, 31) percentage point higher likelihood than Hispanics in excellent health. Yet, whites in poor/fair health only had a 9 (7, 11) percentage point higher likelihood of having any ambulatory care than blacks in similar health and a 15 (13, 17) percentage point higher likelihood than Hispanics in similar health. Thus, we find that in the pooled sample, moving from excellent to poor/fair levels of health was associated with a 7 (3, 12) percentage point narrowing in the magnitude of the black-white disparity and a 12 (7, 16) percentage point narrowing in the Hispanic-white disparity.

In each insurance subgroup, moving from excellent to poor/fair levels of health was associated with a significant narrowing in the magnitude of the Hispanic-white difference. Additionally, moving from excellent to poor/fair levels of health is associated with a significant narrowing in the magnitude of the black-white difference among the full-year privately insured. The magnitudes of these *differences-in-differences* are roughly half the size to nearly as large as the overall disparity.

Figure 2 contains predicted means of each racial/ethnic group's number of office-based and outpatient medical care visits for each category of perceived health, conditional on having positive use. Like probability of use, the number of visits conditional on any use increases as the level of health moves from excellent to poor/fair. However, in contrast to probability of use, the number of visits increases more steeply for whites compared to blacks and Hispanics with the result that the magnitude of the racial/ethnic disparities tends to be wider at lower levels of health.

Table 3 contains the estimated disparities in the number of office-based and outpatient medical care visits conditional on having positive use. In the pooled sample, the overall black-white disparity according to the IOM definition is 2.1 (1.8, 2.3) visits, and the overall Hispanic-white disparity is 2.7 (2.5, 2.9) visits. Whites in excellent health had 1.7 (1.2, 2.3) more visits than blacks in excellent health, and 4.5 (3.5, 5.4) more visits than blacks in poor/fair health, resulting in a 2.8 (1.6, 3.9) visit widening in the black-white disparity moving from excellent to poor/fair levels of health. We find an even larger widening of 3.4 (2.2, 4.6) visits in the Hispanic-white difference.

We do not find any evidence of widening in either the black-white or Hispanic-white differences as health status changes among publicly insured adults or full-year uninsured adults. However, among adults with full-year private insurance, the black-white difference in number of office-based and outpatient medical care visits widens by

TABLE 1 Weighted population characteristics for non-hispanic whites, blacks, and hispanics age 18-64

	white		black		Hispanic	
	Mean	SD	Mean	SD	Mean	SD
Any ambulatory care visits during year	0.76	0.33	0.64	0.60	0.55	0.65
Number of ambulatory care visits ^a	8.11	9.17	6.80	16.74	6.14	14.66
Perceived health (all rounds in year)						
Excellent health all rounds	0.18	0.29	0.15	0.45	0.15	0.47
At least good or very good	0.67	0.36	0.65	0.60	0.64	0.63
Poor/fair some rounds	0.15	0.27	0.20	0.51	0.21	0.53
Insurance status						
Any public	0.10	0.23	0.24	0.53	0.18	0.50
Full-year private	0.70	0.35	0.47	0.63	0.38	0.63
Full-year uninsured	0.12	0.25	0.20	0.50	0.37	0.63
Health characteristics						
Female	0.51	0.38	0.54	0.62	0.49	0.65
Age 18-24	0.14	0.26	0.18	0.48	0.20	0.52
Age 25-34	0.20	0.30	0.22	0.52	0.26	0.57
Age 35-44	0.19	0.30	0.20	0.50	0.24	0.55
Age 45-54	0.24	0.33	0.22	0.52	0.18	0.51
Age 55-64	0.23	0.32	0.18	0.48	0.12	0.42
Any activity limitation	0.04	0.14	0.05	0.27	0.02	0.19
Socioeconomic characteristics						
Married	0.56	0.38	0.32	0.58	0.46	0.65
Education missing	0.00	0.04	0.01	0.09	0.01	0.14
Less than HS diploma	0.08	0.21	0.15	0.45	0.33	0.61
High school diploma	0.26	0.34	0.33	0.59	0.28	0.59
Some college	0.31	0.35	0.33	0.59	0.24	0.56
Bachelor's degree	0.22	0.32	0.13	0.42	0.09	0.38
Master's degree or higher	0.12	0.25	0.06	0.29	0.04	0.24
Family income < 100% FPL	0.10	0.23	0.24	0.53	0.20	0.52
100%-125% FPL	0.03	0.13	0.06	0.30	0.07	0.33
125%-200% FPL	0.10	0.23	0.15	0.45	0.21	0.53
200%-400% FPL	0.30	0.35	0.29	0.57	0.32	0.61
Family Income > 400% FPL	0.47	0.38	0.25	0.54	0.20	0.53
Number of HH members aged 0-5	0.21	0.40	0.25	0.72	0.37	0.88
Number of HH members aged 6-17	0.48	0.65	0.51	1.11	0.74	1.30

(Continues)

TABLE 1 (Continued)

	white		black		Hispanic	
	Mean	SD	Mean	SD	Mean	SD
Number of HH members aged 18-64	2.03	0.66	2.00	1.28	2.39	1.48
Number of HH members aged 65+	0.07	0.21	0.08	0.39	0.07	0.38
Interview language not english	0.00	0.05	0.00	0.07	0.47	0.65
Person-year observations	42 009		21 773		31 840	

Notes: Data are from 2010 to 2014 MEPS. SD = standard deviation. All means and standard deviations are adjusted for MEPS complex survey design. FPL, federal poverty level; MEPS, Medical Expenditure Panel Survey.

^aThe mean level of use is conditional on having positive service use.

	IOM disparity	Excellent all rounds in year	At least good or very good	Poor/fair some rounds
Pooled sample				
White-black	0.13 (0.12, 0.15)	0.16 (0.13, 0.20)	0.13 (0.12, 0.15)	0.09 (0.07, 0.11)
White-hispanic	0.21 (0.20, 0.23)	0.27 (0.23, 0.31)	0.22 (0.20, 0.24)	0.15 (0.13, 0.17)
Any public				
White-black	0.09 (0.04, 0.14)	0.10 (0.02, 0.18)	0.08 (0.05, 0.11)	0.04 (0.01, 0.06)
White-hispanic	0.13 (0.11, 0.16)	0.18 (0.10, 0.26)	0.15 (0.12, 0.18)	0.05 (0.02, 0.07)
Full-year private				
White-black	0.13 (0.09, 0.17)	0.14 (0.10, 0.18)	0.12 (0.09, 0.14)	0.08 (0.05, 0.11)
White-hispanic	0.13 (0.11, 0.15)	0.19 (0.15, 0.23)	0.13 (0.11, 0.15)	0.10 (0.07, 0.14)
Full-year uninsured				
White-black	0.15 (0.10, 0.20)	0.16 (0.09, 0.23)	0.13 (0.09, 0.16)	0.10 (0.05, 0.14)
White-hispanic	0.18 (0.15, 0.21)	0.21 (0.14, 0.27)	0.17 (0.14, 0.21)	0.14 (0.10, 0.18)

Notes: Data are from 2010 to 2014 MEPS. 95% confidence intervals in parentheses from statistical tests of differences in means of white and estimates of racial/ethnic minority group utilization given white's distribution of health characteristics. All means and standard errors are adjusted for MEPS complex survey design.

IOM, Institute of Medicine; MEPS, Medical Expenditure Panel Survey.

TABLE 2 Racial/ethnic differences in probability of having any office-based or outpatient care visits during a year by perceived health and insurance coverage

3.6 (2.3, 5.0) visits moving from excellent health to poor/fair levels of health and the Hispanic-white difference widens by 4.1 (2.7, 5.6) visits. The magnitude of widening is larger than the overall IOM disparity for both blacks and Hispanics.

Using the SF-12 in place of the single-item perceived health status does not significantly alter our findings and preserves the pattern of narrowing in racial/ethnic differences in probability of having any ambulatory care, and widening in the number of visits (see online appendix). Similarly, when we restrict the sample to groups where higher utilization might be more appropriate—one or more chronic conditions, two or more visits, and four or more visits, respectively—the difference-in-difference estimates are similar in magnitude to those from the full sample.

5 | DISCUSSION

We extend the previous literature on racial and ethnic disparities in health care use by developing methods within the IOM framework to control for differences in health while also allowing the magnitude of disparities to vary with health status. We show empirically that there are different responses at different levels of health across racial and ethnic groups in the use of ambulatory health care services, even when stratified by health insurance coverage. Our findings contribute to a more complete understanding of racial and ethnic disparities in health care use, raising important questions and pointing to potential avenues to mitigate racial and ethnic disparities in health care use.

FIGURE 1 Predicted mean probability of office-based or outpatient care during year among nonelderly adults by perceived health and insurance status [Color figure can be viewed at wileyonlinelibrary.com]

Notes. Data are from 2010 to 2014 Medical Expenditure Panel Survey (MEPS). Predicted means for blacks and Hispanics are estimates of the counterfactual in which each minority group has the same distribution of health characteristics as whites. Error bars represent the 95% confidence interval around each estimate. All means and standard errors are adjusted for MEPS complex survey design.

Specifically, we find that, with regard to initial access to ambulatory care, the largest racial and ethnic differences in the probability of having an ambulatory care visit occur among adults in excellent health, and that the differences are significantly smaller when health is poor/fair. Consistent with the previous literature, we find that insurance coverage matters.^{4,17,20,21,47} Disparities across all levels of health were smaller among those with either private or public coverage compared to the uninsured. However, the wide disparities among those in better health still persist among insured populations, especially for Hispanics.

These wide disparities among healthy populations raise concerns of either overuse of medical care by healthy whites or that Hispanics in particular may have inadequate access to preventive care services even if covered by insurance, or both. Health plan benefit design, clinical information systems, and culturally competent care are among the potential mechanisms that have been identified for improving preventive care use for all Americans but especially minorities.

We also find evidence that racial and ethnic disparities in the number of ambulatory visits vary with health. Although

FIGURE 2 Predicted mean annual number of office-based and outpatient visits among nonelderly adults by perceived health and insurance status [Color figure can be viewed at wileyonlinelibrary.com]

Notes. Data are from 2010-2014 Medical Expenditure Panel Survey (MEPS). Predicted means are conditional on having any positive number of ambulatory visits. Predicted means for blacks and Hispanics are estimates of the counterfactual in which each minority group has the same distribution of health characteristics as whites. Error bars represent the 95% confidence interval around each estimate. All means and standard errors are adjusted for MEPS complex survey design.

we cannot determine the clinically appropriate level of care for any group or individual, it is troubling that, among the privately insured, increased services associated with higher clinical need accrue disproportionately to whites. Wider disparities in the level of ambulatory care use at poorer levels of health may be a function of unaffordability of more intensive health care or increased financial burden that disproportionately affects blacks and Hispanics with private insurance relative to privately insured whites. Average income is lower even among blacks

and Hispanics with private insurance compared to whites contributing to this disparity. Differences in plan generosity, benefit design, and out-of-pocket premiums may also contribute to disparities among those with private insurance, but we do not control for these. In addition, it is possible that wide disparities among privately insured adults in poor health may reflect different perceived payoffs to more intensive medical care. Insofar as our measures of health reflect racial and ethnic differences in preferences for clinical services, whites may have greater

TABLE 3 Racial/ethnic differences in annual number of office-based and outpatient care visits by perceived health and insurance coverage

	IOM disparity	Excellent all rounds in year	At least good or very good	Poor/fair some rounds
Pooled sample				
White-black	2.05 (1.77, 2.33)	1.72 (1.17, 2.26)	1.96 (1.64, 2.28)	4.47 (3.53, 5.41)
White-hispanic	2.69 (2.45, 2.93)	2.04 (1.56, 2.52)	2.63 (2.34, 2.93)	5.44 (4.42, 6.46)
Any public				
White-black	3.72 (2.05, 5.39)	2.47 (−0.12, 5.07)	2.26 (0.95, 3.58)	2.96 (1.15, 4.76)
White-hispanic	3.36 (2.23, 4.48)	3.54 (0.99, 6.09)	3.17 (1.89, 4.45)	3.92 (1.90, 5.94)
Full-year private				
White-black	3.35 (2.50, 4.20)	1.65 (1.18, 2.12)	2.31 (1.92, 2.69)	5.30 (4.01, 6.58)
White-hispanic	2.53 (2.23, 2.82)	1.53 (1.06, 2.01)	2.45 (2.13, 2.78)	5.68 (4.30, 7.05)
Full-year uninsured				
White-black	2.74 (1.78, 3.71)	2.68 (0.76, 4.61)	1.69 (0.80, 2.57)	3.02 (1.91, 4.12)
White-hispanic	2.27 (1.46, 3.08)	2.81 (0.92, 4.70)	2.03 (1.18, 2.89)	2.90 (1.74, 4.07)

Notes: Data are from 2010 to 2014 MEPS. Means are conditional on having any positive use. 95% confidence intervals in parentheses from statistical tests of differences in means of whites and estimates of racial/ethnic minority group utilization given white's distribution of health characteristics. All means and standard errors are adjusted for MEPS complex survey design.

IOM, Institute of Medicine; MEPS, Medical Expenditure Panel Survey.

preference for additional ambulatory care visits relative to blacks and Hispanics conditional on being in poor health.

There are limitations to our analysis. First, the single-item perceived health status measure may not be fully representative of true health, and reporting may differ by racial and ethnic group. Although we find similar results using a more comprehensive measure of health, both perceived health and the SF-12 are drawn from survey responses. If minority groups are more likely than whites to not report their poor health, we may overstate the IOM disparity among adults in better health. Second, we do not address potential endogeneity of the health status measures. If our indicators of health are correlated with unobservable characteristics that also affect utilization, then our estimated coefficients on health status may be biased. Third, our sample sizes are smaller for the insurance subgroups, especially the uninsured, limiting the inferences that can be made in some cases. Lastly, like much of the previous literature implementing the IOM disparity definition, we do not directly control for preferences for health care. Instead, we rely on measures of age, gender, and disability to capture differences in needs and preferences that may affect health care decisions.

Despite these limitations, which also apply to much of the literature, our study demonstrates the importance of examining disparities at all levels of health. Our methods are straightforward to apply, either within the full IOM disparity framework or more simply by including interaction terms between racial and ethnic groups, health status, and insurance coverage in any regression-based model. Future applications might explore in more detail the extent to which disparities at different levels of health are driven by differences in clinically appropriate care vs differences in less appropriate or lower value care.

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ORCID

Adam I. Biener <http://orcid.org/0000-0001-5510-7284>

REFERENCES

1. Agency for Healthcare Research and Quality. 2014 National healthcare quality and disparities report. Technical report. Rockville, MD: U.S. Department of Health And Human Services, Agency for Healthcare Research and Quality. AHRQ Publication No. 15-0007; 2015.
2. National Center for Health Statistics (US). Health, United States, 2015: With Special Feature on Racial and Ethnic Health Disparities. Hyattsville, MD: National Center for Health Statistics (US); 2016. Report No.: 2016-1232; 2016.
3. Cook BL, McGuire TG, Zuvekas SH. Measuring trends in racial/ethnic health care disparities. *Med Care Res Rev*. 2009;66(1):23-48.
4. Kirby JB, Taliaferro G, Zuvekas SH. Explaining racial and ethnic disparities in health care. *Med Care*. 2006;44(5):64-72.
5. Flores G, Committee on Pediatric Research. Technical Report—Racial and ethnic disparities in the health and health care of children. *Pediatrics*. 2010;125(4):e979-e1020.
6. CMS Office of Minority Health in collaboration with the RAND Corporation. Racial and Ethnic Disparities by Gender in Medicare Advantage, April 2017.

7. Dong L, Fakeye OA, Graham G, Gaskin DJ. Racial/Ethnic disparities in quality of care for cardiovascular disease in ambulatory settings: a review. *Med Care Res Rev*. 2017;75(3):263-291.
8. Jackson CS, Oman M, Patel AM, Vega KJ. Health disparities in colorectal cancer among racial and ethnic minorities in the United States. *J Gastrointest Oncol*. 2016;7(Suppl 1):S32-S43.
9. Musselwhite LW, Oliveira CM, Kwaramba T, et al. Racial/ethnic disparities in cervical cancer screening and outcomes. *Acta Cytol*. 2016;60(6):518-526.
10. Bromley EG, May FP, Federer L, Spiegel BM, van Oijen MG. Explaining persistent under-use of colonoscopic cancer screening in African Americans: a systematic review. *Prev Med*. 2015;71:40-48.
11. Alegria M, Alvarez K, Ishikawa RZ, DiMarzio K, McPeck S. Removing obstacles to eliminating racial and ethnic disparities in behavioral health care. *Health Aff (Millwood)*. 2016;35(6):991-999.
12. Guerrero EG, Marsh JC, Khachikian T, Amaro H, Vega WA. Disparities in Latino substance use, service use, and treatment: implications for culturally and evidence-based interventions under health care reform. *Drug Alcohol Depend*. 2013;133(3):805-813.
13. Cook BL, McGuire TG, Zaslavsky AM. Measuring racial/ethnic disparities in health care: methods and practical issues. *Health Serv Res*. 2012;47(3pt2):1232-1254.
14. McGuire TG, Alegria M, Cook BL, Wells KB, Zaslavsky AM. Implementing the institute of medicine definition of disparities: an application to mental health care. *Health Serv Res*. 2006;41(5):1979-2005.
15. Cook BL, Zuvekas SH, Carson N, Wayne GF, Vesper A, McGuire TG. Assessing racial/ethnic disparities in treatment across episodes of mental health care. *Health Serv Res*. 2014;49(1):206-229.
16. Joshi S, Gaynor J, Ciancio G. Review of ethnic disparities in access to renal transplantation. *Clin Transplant*. 2012;26(4):E337-E343.
17. Fiscella K, Sanders MR. Racial and ethnic disparities in the quality of health care. *Annu Rev Public Health*. 2016;37:375-394.
18. Institute of Medicine. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Technical report. Washington, DC: National Academies Press; 2003.
19. Aday LA, Andersen R. A framework for the study of access to medical care. *Health Serv Res*. 1974;9(3):208-220.
20. Sommers BD, McMurtry CL, Blendon RJ, Benson JM, Sayde JM. Beyond health insurance: remaining disparities in US health care in the post-ACA era. *Milbank Q*. 2017;95(1):43-69.
21. Lillie-Blanton M, Hoffman C. The role of health insurance coverage in reducing racial/ethnic disparities in health care. *Health Aff*. 2005;24(2):398-408.
22. Hargraves LJ, Hadley J. The contribution of insurance coverage and community resources to reducing racial/ethnic disparities in access to care. *Health Serv Res*. 2003;38(3):809-829.
23. Oaxaca RL, Ransom MR. Identification in detailed wage decompositions. *Rev Econ Stat*. 1999;81(1):154-157.
24. Smith JP, Welch FR. Black economic progress after Myrdal. *J Econ Lit*. 1989;27(2):519-564.
25. Heckman JJ, Lyons TM, Todd PE. Understanding black-white wage differentials, 1960-1990. *Am Econ Rev*. 2000;90(2):344-349.
26. Barr T, Lin C. A detailed decomposition of synthetic cohort analysis. *Econ Lett*. 2015;127:76-80.
27. Fairlie RW. An Extension of The Blinder-Oaxaca decomposition technique to logit and probit models. *J Econ Soc Meas*. 2005;30:305-316.
28. Cook BL, McGuire TG, Meara E, Zaslavsky AM. Adjusting for health status in non-linear models of health care disparities. *Health Serv Outcomes Res Methodol*. 2009;9(1):1-21.
29. Cameron AC, Trivedi PK. Regression-based tests for overdispersion in the Poisson model. *J Econom*. 1990;46(3):347-364.
30. Westat, Inc. *MEPS Annual Methodology Report* 2014. Rockville, MD: WESTAT Inc; 2015.
31. Garbarski D, Dykema J, Croes KD, Edwards DF. How participants report their health status: cognitive interviews of self-rated health across race/ethnicity, gender, age, and educational attainment. *BMC Public Health*. 2017;17(1):771.
32. Allen CD, McNeely CA, Orme JG. Self-rated health across race, ethnicity, and immigration status for US adolescents and young adults. *J Adolesc Health*. 2016;58(1):47-56.
33. Sanchez GR, Vargas ED. Language bias and self-rated health status among the latino population: evidence of the influence of translation in a wording experiment. *Qual Life Res*. 2016;25(5):1131-1136.
34. Burgard SA, Chen PV. Challenges of health measurement in studies of health disparities. *Soc Sci Med*. 2014;106:143-150.
35. Desouky TF, Mora PA, Howell EA. Measurement invariance of the SF-12 across European-American, Latina, and African-American postpartum women. *Qual Life Res*. 2013;22(5):1135-1144.
36. Larson CO, Schlundt D, Patel K, Beard K, Hargreaves M. Validity of the SF-12 for use in a low-income African American community-based research initiative (REACH 2010). *Prev Chronic Dis*. 2008;5(2):A44.
37. Teresi JA, Ramirez M, Lai JS, Silver S. Occurrences and sources of differential item functioning (Dif) in patient-reported outcome measures: description of dif methods, and review of measures of depression, quality of life and general health. *Psychol Sci Q*. 2008;4:538.
38. Bzostek S, Goldman N, Pebley A. Why do Hispanics in the USA report poor health? *Soc Sci Med*. 2007;65(5):990-1003.
39. Franks P, Lubetkin E, Gold MR, Tancredi DJ. Mapping the SF-12 to preference-based instruments: convergent validity in a low-income, minority population. *Med Care*. 2003;41(11):1277-1283.
40. Fleishman JA, Lawrence WF. Demographic variation in SF-12 scores: true differences or differential item functioning? *Med Care*. 2003;7(Suppl):III75-III86.
41. Finch BK, Hummer RA, Reindl M, Vega WA. Validity of self-rated health among Latino(a)s. *Am J Epidemiol*. 2002;155(8):755-759.
42. Chandola T, Jenkinson C. Validating self-rated health in different ethnic groups. *Ethn Health*. 2000;5(2):151-159.
43. Johnson RJ, Wolinsky FD. Gender, race, and health: the structure of health status among older adults. *Gerontologist*. 1994;34(1):24-35.
44. Agency for Healthcare Research and Quality. MEPS HC-171 2014 Full Year Consolidated Data File, Public Use File Documentation, September 2016.
45. Williams RL. A note on robust variance estimation for cluster-correlated data. *Biometrics*. 2000;56(2):645-646.
46. Agency for Healthcare Research and Quality. Accounting for Clustering in the Analysis of MEPS Data: Frequently Asked Questions (FAQ). https://meps.ahrq.gov/survey_comp/hc_clustering_faq.pdf. Accessed October 18, 2017.
47. Zuvekas SH, Taliaferro G. Pathways to access: health insurance, the health care delivery system, and racial/ethnic disparities, 1996-1999. *Health Aff*. 2003;22(2):139-153.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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