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# Racial differences in low value care among older adult Medicare patients in US health systems: retrospective cohort study

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## ABSTRACT OBJECTIVE

To characterize racial differences in receipt of low value care (services that provide little to no benefit yet have potential for harm) among older Medicare beneficiaries overall and within health systems in the United States.

## DESIGN

Retrospective cohort study

## SETTING

100% Medicare fee-for-service administrative data (2016–18).

## PARTICIPANTS

Black and White Medicare patients aged 65 or older as of 2016 and attributed to 595 health systems in the United States.

## MAIN OUTCOME MEASURES

Receipt of 40 low value services among Black and White patients, with and without adjustment for patient age, sex, and previous healthcare use. Additional models included health system fixed effects to assess racial differences within health systems and separately, racial composition of the health system's population to assess the relative contributions of individual patient race and health system racial composition to low value care receipt.

## RESULTS

The cohort included 9 833 304 patients (6.8% Black; 57.9% female). Of 40 low value services examined, Black patients had higher adjusted receipt of nine

services and lower receipt of 20 services than White patients. Specifically, Black patients were more likely to receive low value acute diagnostic tests, including imaging for uncomplicated headache (6.9% v 3.2%) and head computed tomography scans for dizziness (3.1% v 1.9%). White patients had higher rates of low value screening tests and treatments, including preoperative laboratory tests (10.3% v 6.5%), prostate specific antigen tests (31.0% v 25.7%), and antibiotics for upper respiratory infections (36.6% v 32.7%; all  $P<0.001$ ). Secondary analyses showed that these differences persisted within given health systems and were not explained by Black and White patients receiving care from different systems.

## CONCLUSIONS

Black patients were more likely to receive low value acute diagnostic tests and White patients were more likely to receive low value screening tests and treatments. Differences were generally small and were largely due to differential care within health systems. These patterns suggest potential individual, interpersonal, and structural factors that researchers, policy makers, and health system leaders might investigate and address to improve care quality and equity.

## Introduction

Many studies have shown that Black patients in the United States and elsewhere are less likely to receive high value healthcare than White patients,<sup>1–9</sup> but the evidence is less clear on racial differences in receipt of low value care<sup>10–13</sup>—services that provide little to no benefit in specific clinical scenarios yet have potential for harm.<sup>10–11</sup> Studies exploring a small set of low value services (eg, cervical cancer screening in older women) have found no differences or greater receipt among White patients compared with patients from racial and ethnic minority groups.<sup>10–13</sup> Given financial, physical, and other harms of low value care use,<sup>14</sup> which has decreased marginally or not at all in recent years despite substantial attention,<sup>15–16</sup> the limited evidence on racial differences in this care represents a barrier to addressing health and healthcare inequities faced by Black people in the United States and improving health outcomes overall.<sup>17–18</sup>

Racial differences in low value care receipt could be influenced by several factors. Firstly, health systems—where a growing share of Americans receive care—might shape low value care use through clinical policies, workflows, investments, hiring practices, and quality measurement.<sup>19–20</sup> As a result of such influences, researchers have noted differences in overall care quality both within and across health systems; that is, Black and White patients have been shown to receive

## WHAT IS ALREADY KNOWN ON THIS TOPIC

Black patients in the United States are less likely than White patients to receive high value health care

Evidence on racial differences in low value care—services which provide little to no benefit yet have potential for harm—is scant and mixed

Studies showed that among a limited number of low value services, Black patients had lower rates of some services than White patients and similar rates of other services

## WHAT THIS STUDY ADDS

Older Black Americans were more likely to receive low value acute diagnostic tests than older White Americans; older White Americans were more likely to receive low value screening tests and treatments

These differences were generally modest and were largely driven by differential treatment within health systems rather than by Black and White patients receiving care from different health systems

The results highlight the need for health systems to track internal data by race on low value care to identify, understand, and address the sources of racial differences

differential care due to bias within systems and because Black patients disproportionately receive care at lower quality systems.<sup>1-3 9 21-25</sup> Secondly, racial differences in low value care receipt might be influenced by broader differences in healthcare use; for example, differential access to primary and specialty care resulting, at least in part, from structural racism.<sup>26-28</sup> Understanding racial differences in low value care receipt overall and within systems is critical for developing interventions to reduce low value care use and promote equity.

To address this need among older adults who are at high risk of low value care,<sup>15 19 29</sup> we used 100% Medicare fee-for-service claims data to compare Black and White older adults attributed to 595 US health systems on receipt of 40 low value services. These services fell into four distinct categories: screening tests, acute diagnostic tests, monitoring tests, and treatments. We then built on these comparisons by investigating whether racial differences in low value care use persisted when comparing Black and White patients within the same systems, and by examining the relative contributions of individual patient race and health system racial composition to differences in low value care receipt. We hypothesized that racial differences would vary across the four categories of low value services studied, and that these patterns might generate causal hypotheses and inform future interventions.

## Methods

### Data and population

We used 2016-18 Medicare fee-for-service administrative data from the Master Beneficiary Summary file; Medicare Part A (hospital) and B (outpatient) 100% claims; Medicare Part D (prescription) claims for a random 40% sample of patients; the Long Term Care Minimum Data Set; and FirstDataBank.<sup>30</sup> Our study cohort included patients aged 65 and older as of 1 January 2016 and continuously enrolled in Medicare Parts A and

B through 2018 or until death. For measures using prescription information (for outcomes or for low value care algorithms or exclusions), we required continuous Part D enrollment through 2018 or until death. We excluded patients with any hospice use in 2017-18 (Master Beneficiary Summary File—MBSF) and those not attributable to a health system. We limited our analyses to non-Hispanic Black and non-Hispanic White patients, as defined by the Research Triangle Institute developed race variable (MBSF).<sup>31</sup> We did not assess patients in other racial groups to focus on the unique experience of Black Americans and because of limitations in identifying other groups using claims data.<sup>31</sup>

### Identifying health systems and attributing patients to systems

We identified health systems listed in the 2018 Agency for Healthcare Research and Quality Compendium.<sup>19 32</sup> We attributed each patient with at least one clinician encounter (ie, an evaluation and management (E&M) service, using Carrier and Outpatient files) to a single health system based on the plurality of primary care services received across 2017 and 2018 following Centers for Medicare and Medicaid Services (CMS) Medicare Shared Savings Program attribution methods.<sup>33</sup> We excluded systems that were predominantly pediatric (based on a compendium indicator for system hospitals primarily serving children). We further restricted our analysis to systems with ≥250 attributed patients.

### Low value care measures

We operationalized 40 claims based measures of low value care relevant to older adults from previous research<sup>19</sup> and from the Milliman MedInsight Health Waste Calculator version 8.0,<sup>34</sup> a standalone, proprietary, annually updated software program that identifies potentially low value services based on Choosing Wisely campaign recommendations

**Table 1 | Patient and system characteristics**

Characteristics	Black patients (n=671 890)	White patients (n=9 161 414)
<b>Patient characteristics</b>		
Female	420 254 (62.59)	5 272 326 (57.55)
Medicaid eligible*	116 849 (17.39)	437 678 (4.78)
Age (years), mean (SD)	73.73 (7.12)	74.52 (7.22)
HCC score,† mean (SD)	1.11 (1.07)	0.90 (0.84)
Total ambulatory care visits in 2016,‡ median (IQR)	8 (4-14)	8 (4-14)
Percentage of ambulatory visits in primary care in 2016,§ median (IQR)	55.56 (33.33-81.81)	50.00 (31.81-75.00)
Bice-Boxerman Continuity of Care Index, 2016,¶ median (IQR)	0.17 (0.10-0.30)	0.20 (0.09-0.26)
<b>System characteristics (n=595)</b>		
System with safety net status	204 (34.29)	
Percentage of Black patients attributed to system, mean (SD)	7.41 (10.37)	
Percentage of Black patients attributed to system, median (IQR)	3.66 (1.09-9.82)	

Data are numbers (%) unless indicated otherwise. All differences between Black and White patients significant at  $P < 0.001$ .

HCC=Hierarchical Condition Category; IQR=interquartile range; SD=standard deviation.

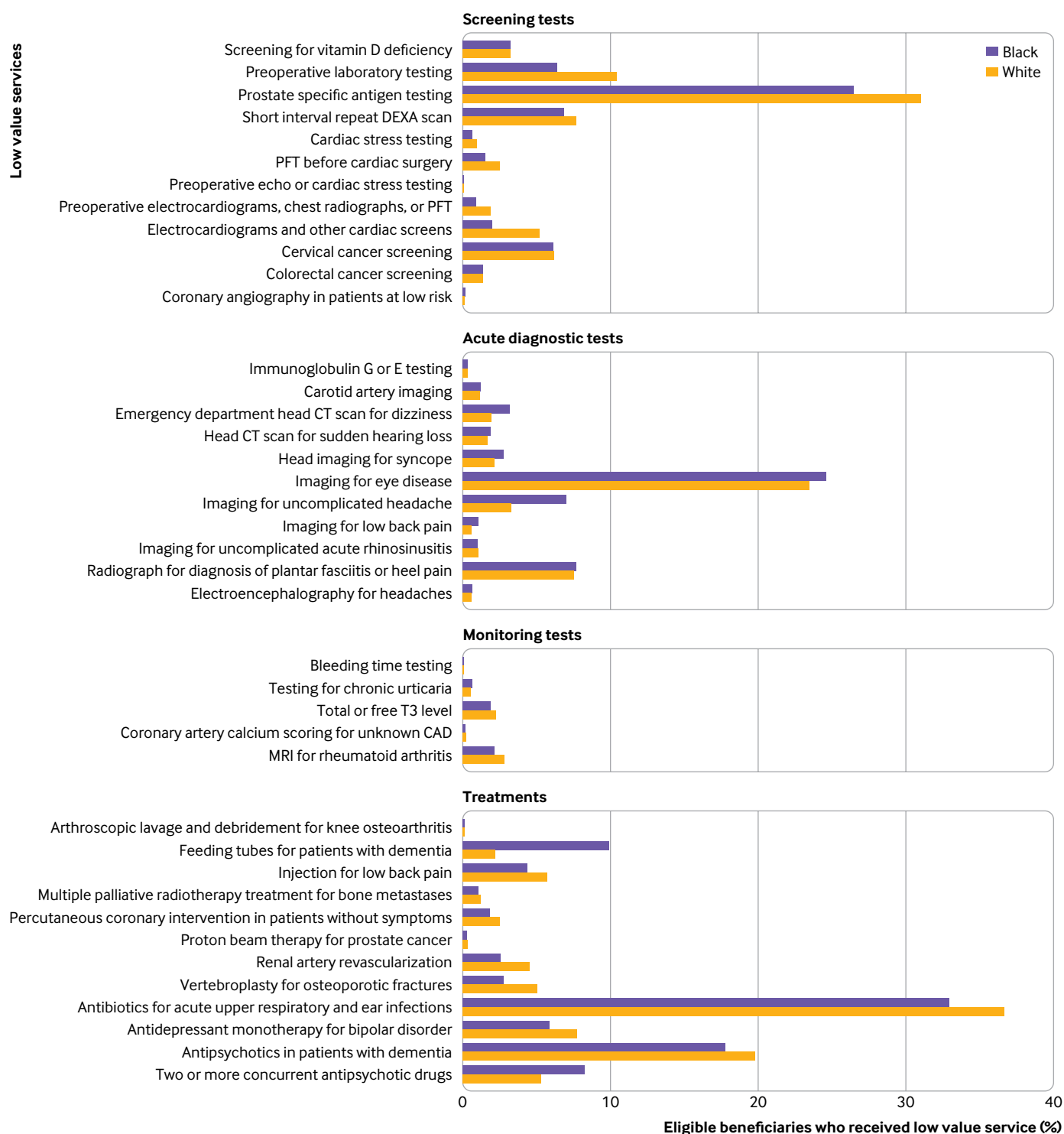
\*Patients were considered Medicaid eligible if they had any month with full Medicaid.

†HCC score missing for 85 patients.

‡Total ambulatory visits were calculated as sum of ambulatory visits from Part B and outpatient files.

§Primary care visits were defined as those with physicians specializing in general practice, family practice, internal medicine, pediatric medicine, or geriatric medicine, or with any nurse practitioner, certified clinical nurse specialist, or physician assistant because some have primary care roles.

¶Bice-Boxerman Continuity of Care Index was only measured among patients with more than four visits in 2016 to ensure stability of estimates<sup>41</sup> (78.8% of patients).



**Fig 1 | Unadjusted rates of low value service receipt among Black and White Medicare patients attributed to 595 health systems in the United States. CAD=coronary artery disease; CT=computed tomography; DEXA=dual energy x ray absorptiometry; echo=echocardiography; MRI=magnetic resonance imaging; PFT=pulmonary function testing; T3=triiodothyronine**

and other professional medical society guidelines (supplementary table S1).<sup>15–19</sup> Results from the Milliman MedInsight Health Waste Calculator have been used by a number of insurers, employers, and state governments to inform policies and have been published in peer reviewed journals.<sup>15–19 35–38</sup> Milliman algorithms use international classification of diseases,

ninth and tenth revision (ICD-9 and ICD-10) diagnosis codes; American Medical Association procedural codes; and National Drug Code entries to assign healthcare services provided within specific clinical scenarios to one of three categories: not wasteful, likely wasteful, or wasteful. In our analyses, we defined low value services conservatively by only including those

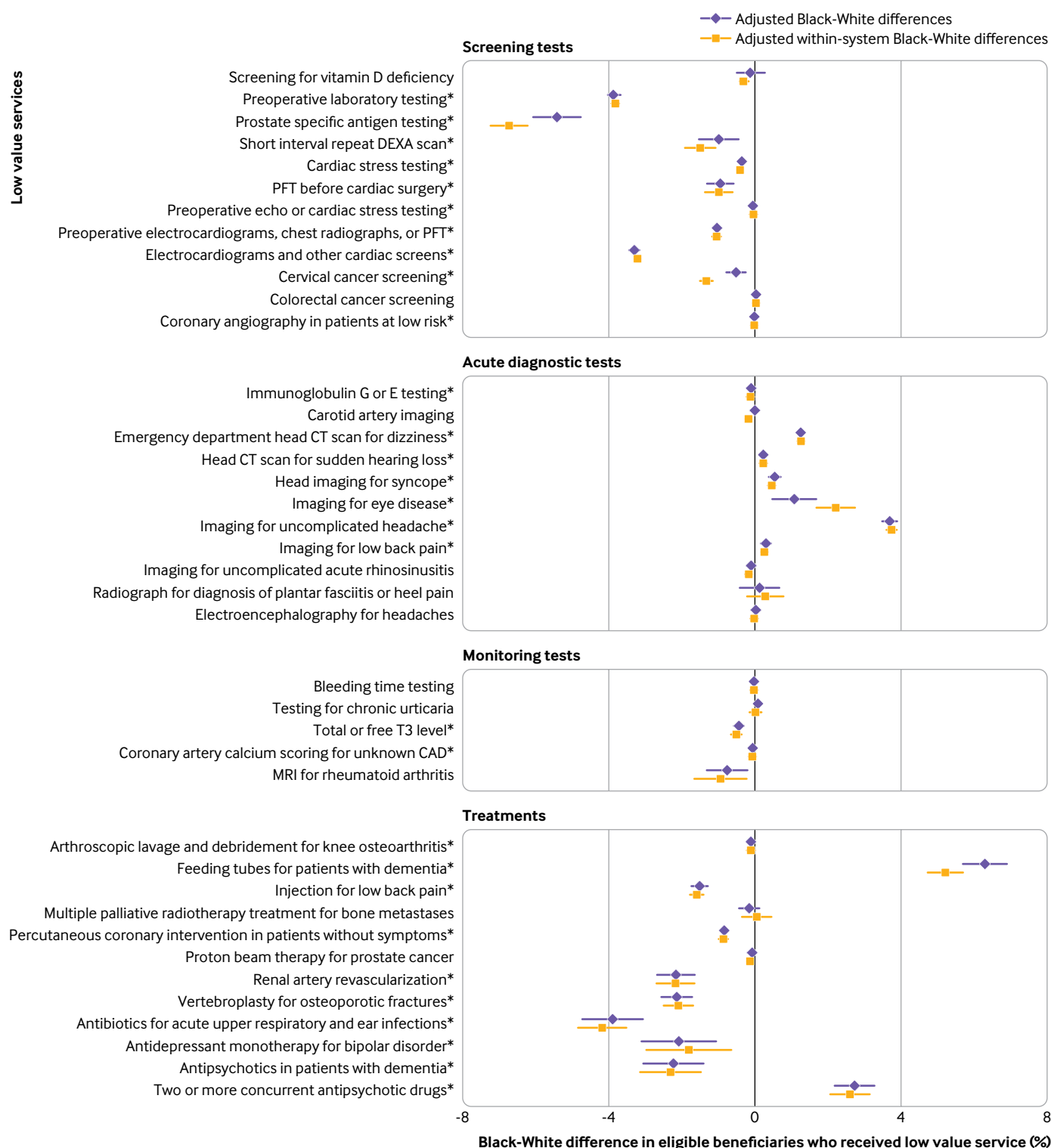


Fig 2 | Adjusted differences in low value service receipt between Black and White Medicare patients overall and within health systems. CAD=coronary artery disease; CT=computed tomography; DEXA=dual energy x ray absorptiometry; echo=echocardiography; MRI=magnetic resonance imaging; PFT=pulmonary function testing; T3=triiodothyronine. \*Indicates statistical significance of primary model (adjusted Black-White differences overall in study cohort) after correction for multiple testing. Values are presented in percentage points. All estimates are from logistic regression models adjusted for age, sex, and number of ambulatory care visits in 2016 that account for clustering by health system. Purple denotes adjusted Black-White differences (primary models); yellow denotes adjusted within-system Black-White differences in models that also included health system fixed effects. Dots represent estimates; the upper and lower ends of the bars are confidence intervals. Patients were attributed to health systems based on the plurality of primary care visits across 2017 and 2018. See supplementary table 1 for measure definitions

tagged as wasteful. For each measure, we used 2016-18 data to identify patients eligible (in other words, at

risk) for the low value service based on claims derived demographic and clinical characteristics including age,

**Table 2 | Differences in low value service receipt between Black and White Medicare patients when accounting for individual race and racial composition of attributed health systems**

Low value service	Models including individual race,* adjusted Black-White difference	Models including individual race and system racial composition†	
		Individual race, adjusted Black-White difference	System racial composition, adjusted difference per 10% additional Black patients
Screening tests			
Preoperative laboratory testing	−3.80 (−3.99 to −3.62)	−3.78 (−3.97 to −3.60)	−0.13 (−0.27 to 0.00)
Prostate specific antigen testing	−6.60 (−7.13 to −6.06)	−6.60 (−7.14 to −6.07)	1.18 (0.46 to 1.90)
Short interval repeat DEXA scan	−1.36 (−1.80 to −0.91)	−1.38 (−1.83 to −0.94)	0.74 (0.40 to 1.08)
Cardiac stress testing	−0.37 (−0.40 to −0.33)	−0.36 (−0.40 to −0.33)	0.06 (0.02 to 0.10)
PFT before cardiac surgery	−0.90 (−1.28 to −0.52)	−0.89 (−1.28 to −0.51)	−0.03 (−0.28 to 0.22)
Preoperative echo or cardiac stress testing	−0.02 (−0.02 to −0.02)	0.00 (0.00 to 0.00)	−0.02 (−0.02 to −0.02)
Preoperative electrocardiograms, chest radiographs, or PFT	−1.04 (−1.09 to −0.99)	−0.02 (−0.20 to 0.05)	−1.04 (−1.09 to −0.99)
Colorectal cancer screening	0.07 (0.00 to 0.14)	0.07 (0.00 to 0.14)	0.02 (−0.02 to 0.07)
Coronary angiography in patients at low risk	0.02 (0.01 to 0.03)	0.02 (0.01 to 0.03)	0.01 (0.00 to 0.01)
Acute diagnostic tests			
Immunoglobulin G or E testing	−0.08 (−0.10 to −0.06)	−0.08 (−0.10 to −0.06)	0.01 (0.00 to 0.03)
Carotid artery imaging	−0.04 (−0.17 to 0.09)	−0.21 (−0.31 to −0.10)	0.40 (0.25 to 0.56)
Emergency department head CT scan for dizziness	1.30 (1.17 to 1.44)	1.31 (1.18 to 1.45)	−0.04 (−0.11 to 0.04)
Head CT scan for sudden hearing loss	0.11 (−0.04 to 0.27)	0.26 (0.14 to 0.38)	0.02 (−0.05 to 0.10)
Head imaging for syncope	0.51 (0.35 to 0.68)	0.49 (0.33 to 0.65)	0.08 (0.00 to 0.16)
Imaging for uncomplicated headache	3.79 (3.57 to 4.01)	3.83 (3.61 to 4.05)	−0.07 (−0.20 to 0.05)
Imaging for low back pain	0.31 (0.24 to 0.38)	0.29 (0.22 to 0.36)	0.03 (0.00 to 0.06)
Imaging for uncomplicated acute rhinosinusitis	0.02 (−0.04 to 0.08)	−0.13 (−0.19 to −0.07)	0.05 (0.00 to 0.10)
Radiograph for diagnosis of plantar fasciitis or heel pain	0.25 (−0.26 to 0.75)	0.32 (−0.19 to 0.83)	−0.35 (−0.68 to −0.03)
Electroencephalography for headaches	0.02 (−0.04 to 0.08)	0.01 (−0.05 to 0.07)	0.07 (0.04 to 0.11)
Monitoring tests			
Bleeding time testing	0.00 (−0.01 to 0.00)	0.00 (−0.01 to 0.00)	0.00 (0.00 to 0.00)
Testing for chronic urticaria	0.11 (−0.04 to 0.27)	0.05 (−0.09 to 0.19)	0.08 (0.03 to 0.13)
Total or free T3 level	−0.45 (−0.57 to −0.34)	−0.46 (−0.57 to −0.35)	0.24 (0.13 to 0.35)
Coronary artery calcium scoring for known CAD	−0.04 (−0.06 to −0.02)	−0.04 (−0.06 to −0.02)	0.00 (−0.02 to 0.01)
MRI for rheumatoid arthritis	−0.72 (−1.27 to −0.17)	−0.69 (−1.29 to −0.10)	−0.06 (−0.36 to 0.24)
Treatments			
Arthroscopic lavage and debridement for knee osteoarthritis	−0.06 (−0.07 to −0.04)	−0.06 (−0.07 to −0.04)	0.00 (−0.01 to 0.01)
Feeding tubes for patients with dementia	5.29 (4.74 to 5.84)	5.06 (4.51 to 5.62)	0.49 (0.30 to 0.68)
Injection for low back pain	−1.53 (−1.71 to −1.34)	−1.52 (−1.71 to −1.33)	−0.18 (−0.40 to 0.04)
Multiple palliative radiotherapy treatments for bone metastases	−0.07 (−0.38 to 0.24)	0.06 (−0.29 to 0.41)	−0.28 (−0.46 to −0.10)
Percutaneous coronary intervention in patients without symptoms	−0.80 (−0.93 to −0.67)	−0.80 (−0.94 to −0.67)	0.02 (−0.09 to 0.13)
Proton beam therapy for prostate cancer	−0.06 (−0.10 to −0.01)	−0.06 (−0.10 to −0.02)	0.01 (−0.02 to 0.04)
Renal artery revascularization	−2.10 (−2.63 to −1.57)	−2.12 (−2.65 to −1.60)	0.11 (−0.26 to 0.47)
Vertebroplasty for osteoporotic fractures	−1.93 (−2.32 to −1.53)	−1.94 (−2.33 to −1.55)	0.20 (−0.05 to 0.45)
Antibiotics for acute upper respiratory and ear infections	−4.13 (−4.77 to −4.48)	−4.10 (−4.74 to −3.46)	−0.42 (−1.01 to 0.17)
Antidepressant monotherapy for bipolar disorder	−2.05 (−3.10 to −1.00)	−1.89 (−2.96 to −0.82)	−0.36 (−0.86 to 0.14)
Antipsychotics in patients with dementia	−2.17 (−2.99 to −1.36)	−2.29 (−3.12 to −1.46)	0.43 (−0.16 to 1.02)
Two or more concurrent antipsychotic drugs	2.67 (2.13 to 3.20)	2.63 (2.08 to 3.19)	0.08 (−0.23 to 0.39)

Data are percentage points (95% confidence intervals). Results from four measures for which logistic models failed to converge were excluded.

CAD=coronary artery disease; CT=computed tomography; DEXA=dual-energy x ray absorptiometry; echo=echocardiography; MRI=magnetic resonance imaging; PFT=pulmonary function testing; T3=triiodothyronine.

\*Estimated association between individual race and receipt of given low value service, with system random effects, adjusted for age, sex, and 2016 ambulatory care use.

†Estimated association between individual race, health system racial composition, and receipt of given low value service, with system random effects, adjusted for age, sex, and 2016 ambulatory care use.

sex, previous medical conditions, and previous service use. For instance, female patients older than 65 with adequate previous screening and not otherwise at high risk for cervical cancer would be considered eligible for low value cervical cancer screening. For each service, we then calculated the share of eligible patients who received the low value service at least once in 2017-18. For ease of interpretation, we assigned each service to one of four categories based on service type, indication, and clinical context<sup>39</sup>: screening tests, acute diagnostic tests, monitoring tests, and treatments.

#### Patient and system factors

To account for individual level factors that might confound racial differences in low value care use, we

obtained patient age (continuous, 2016 MBSF), sex (2016 MBSF), and number of ambulatory visits in 2016 (E&M codes 99201-5, 99211-5 in Carrier and Outpatient files). We also identified patients' Medicaid eligibility status, CMS Hierarchical Condition Category (HCC) score (a measure of medical complexity, continuous, 2016 Medicare administrative data<sup>40</sup>), share of patients' outpatient visits billed by a primary care clinician (doctors specializing in general practice, family practice, internal medicine, pediatric medicine, or geriatric medicine according to CMS methods; we also included nurse practitioners, certified clinical nurse specialists, and physician assistants because some have primary care roles—though Medicare data do not capture specialties for these clinicians), and



continuity of care (2016, Bice-Boxerman Continuity of Care Index<sup>41</sup>; range=0 (each visit with different clinician) to 1 (all visits with same clinician)). Finally, we examined the racial composition of health system populations (defined as the percentage of all patients attributed to the health system who were Black) and safety net status (generally meaning patients are cared for regardless of ability to pay; here defined by health system inclusion of at least one hospital with a high Disproportionate Share Hospital patient percentage<sup>42</sup>; AHRQ Compendium; supplementary table S2).

### Statistical analysis

We estimated unadjusted rates of each low value service among Black and White patients. To estimate differences by race in the receipt of each service, we then constructed our primary models: a series of patient level, multivariable, logistic regression models in which the key predictor was patient race and additional covariates were patient age, sex, and ambulatory care use, with standard errors clustered at the health system level using Huber-White correction. In these primary models, we did not adjust for factors such as HCC score (low value service measures already account for clinical factors) or Medicaid eligibility (an indicator of poverty) according to National Academy of Medicine guidelines to avoid masking racial differences.<sup>43 44</sup> Then, in secondary analyses, we repeated these models for each low value service, additionally including health system fixed effects to compare Black and White patients within the same systems. Comparing the results of models without and with system fixed effects allowed us to assess the extent to which racial differences in service receipt persisted within the given systems. If differences between Black and White patients were similar in both sets of models, this would suggest that differences were largely explained by differential care within systems; if differences diminished when adding system fixed effects, these differences might be better explained by Black and White patients receiving care from different health systems.

We performed two sets of exploratory analyses that were modifications of our primary models. Firstly, to determine if racial differences in low value care receipt diminish when comparing Black and White patients with similar socioeconomic status, we added Medicaid eligibility to these models. Second, to explore intersectional effects of race and sex,<sup>45</sup> we added race-sex interaction terms to the models for the 36 services that male and female patients could receive (eg, we excluded prostate specific antigen testing).

Then, to determine the relative roles in low value care receipt of the patient's race versus the racial composition of the patient's health system, we built three more sets of models. The first set included patient race, age, sex, ambulatory care use, and health system random effects (to account for unobserved differences between health systems while also allowing us to estimate the effects of the health system level factors we describe next). The second set also included

an indicator for racial composition of the patient's attributed health system. The third set of models included indicators for racial composition and safety net status of the health system because systems with this status might have greater experience with caring for underserved racial and ethnic minority groups.

Finally, to assess the extent to which differences by individual race varied across health systems after accounting for the racial composition of systems, we built a set of models that included individual race, system racial composition, the above covariates, health system random intercept effects, and health system random slopes for individual Black race. The variance of these random slopes quantifies the unexplained variation between systems in individual Black-White differences.

We used complete case analysis because there were no missing values for model covariates. We used postestimation counterfactual evaluations to translate logistic regression results to percentage point differences for ease of interpretation. We created claims measures and ran descriptive and regression analyses using SAS, version 9.4 (SAS Institute) and Stata, version 17.0 (StataCorp LLC). To create the figures, we used R in RStudio. Reported P values were two sided and P<0.05 represented statistical significance. For the primary models, we used Holm-Bonferroni correction to adjust for multiple comparisons.<sup>46</sup> This study followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting.

### Patient and public involvement

No members of the public were formally involved in the design or implementation of this study. However, clinician authors' lived experiences as members of racial and ethnic minority groups and their clinical experiences interacting with minoritized patients informed the research question and interpretation of results.

### Results

We analyzed data for 671 890 Black patients and 916 141 White patients attributed to 595 health systems (table 1). Black patients were more likely to be female (62.6% v 57.6%) and Medicaid eligible (17.4% v 4.8%) compared with White patients. On average, Black patients were younger, had higher HCC scores, had a higher proportion of ambulatory visits with primary care physicians or advanced practice clinicians (55.6% v 50.0%), and had lower Bice-Boxerman Continuity of Care scores (0.17 v 0.20). Of the 595 systems, 204 (34.3%) had safety net status. Systems varied widely in the proportion of attributed patients who were Black, ranging from 0.07% to 82.0% (median 3.7%).

### Racial differences in low value service use by service type

Unadjusted rates of low value service use varied by race across measures (fig 1; supplementary table S3). Supplementary table S4 shows numbers of Black and

White patients receiving each service. Adjusted results were similar to unadjusted results. In adjusted analyses, Black and White patients differed significantly in receipt of 29 low value services (fig 2; supplementary table S3). Black patients had higher rates of nine low value services: one screening test, six acute diagnostic tests, and two treatments. White patients had higher rates of 20 low value services: nine screening tests, one acute diagnostic test, two monitoring tests, and eight treatments. Specifically, Black patients were at greater risk than White patients of receiving acute low value diagnostic tests, including imaging for uncomplicated headache (6.9% v 3.2%), emergency department head computed tomography scans for dizziness (3.1% v 1.9%), and head imaging for syncope (2.6% v 2.1%). Black patients were also more likely to be prescribed two or more antipsychotic drugs (8.0% v 5.2%) and to receive a feeding tube in the setting of advanced dementia (8.5% v 2.2%).

In contrast, White patients were at higher risk of receiving low value screening services, including preoperative laboratory testing (10.3% v 6.5%); electrocardiograms and other cardiac screens (5.1% v 1.8%); and prostate specific antigen testing in men over age 75 (31.0% v 25.7%). White patients were also more likely to receive low value treatments, including antibiotics for acute upper respiratory and ear infections (36.6% v 32.7%), renal artery revascularization (4.5% v 2.3%), injections for low back pain (5.6% v 4.2%), and vertebroplasty for osteoporotic fractures (4.9% v 2.8%).

When we added Medicaid eligibility (a proxy for poverty) to the primary models, the results did not change appreciably for most services with a few exceptions: differences diminished for some services that White patients were more likely to receive than Black patients—for example, antibiotics for upper respiratory infection and prostate specific antigen testing (supplementary table S5). When examining race and sex interactions, 14 low value services showed statistically significant interactions (supplementary table S6). For example, Black female patients were more likely to receive imaging for uncomplicated headache (7.5% v 3.4% for White female patients, 5.5% for Black male patients, and 2.8% for White male patients); and White female patients were more likely to have electrocardiograms and other cardiac screens (6.1% v 3.9% for White male patients, 1.9% for Black female patients, and 1.8% for Black male patients) and antibiotics for upper respiratory infections (38.6% v 33.0% for White male patients, 36.0% for Black female patients, and 26.0% for Black male patients).

#### Racial differences in low value service use across versus within health systems

When we added system fixed effects to the primary models, the direction and magnitude of the differences were similar, meaning that racial differences in low value care receipt were largely due to differential care within systems rather than Black and White patients receiving care in different systems (fig 2). We noted a

few key exceptions. Firstly, Black patients were more likely to receive imaging for eye disease than White patients, and this difference widened when comparing Black and White patients within the same systems. Secondly, Black patients were less likely to receive low value prostate specific antigen testing and cervical cancer screening, and these differences also widened when comparing Black and White patients within the same systems.

In models including system random intercepts and slopes, the direction and magnitude of individual racial differences were largely unchanged when also accounting for racial composition of the patient's attributed system (table 2), consistent with system fixed effect model results reported above. However, even after accounting for individual race, patients attributed to systems serving a larger share of Black patients received more of certain services, including low value repeat bone density testing (0.74 percentage points for every 10% of Black patients served, 95% confidence interval 0.40 to 1.08) and prostate specific antigen testing (1.18 percentage points, 0.46 to 1.90), and less of other low value services, including radiation for bone metastases (−0.28 percentage points, −0.46 to −0.10). When we also included system safety net status in the models, our results were largely unchanged (supplementary table S7). Racial differences in low value care receipt varied widely across health systems (supplementary table S8).

## Discussion

### Principal findings

In this analysis of Medicare patients attributed to US health systems, a range of <1% to 37% of eligible patients received each of the 40 low value services examined. For most of these services, we found significant racial differences, ranging from modest (most differences) to more than fourfold, with notable patterns by service type. Black patients were more likely to receive some low value acute diagnostic tests such as imaging for uncomplicated headache, syncope, and low back pain, while White patients were more likely to receive most low value screening tests and treatments, including preoperative tests, cardiac and cancer screening, and surgical procedures. The observed racial differences were largely driven by differential care within systems rather than by Black and White patients receiving care from different systems.

### Strengths and weaknesses

This study examines racial differences in low value care use across a large number of low value services with a range of impacts on spending and patient harms,<sup>39</sup> and examines the role of health systems in these differences. These results build on previous research that found reduced risk of low value cervical cancer screening among Black US veterans<sup>13</sup> and Medicare patients.<sup>11</sup> Similar to the findings of Schpero and colleagues (2006-11 data),<sup>11</sup> we found Black patients with advanced dementia were at higher risk of receiving

feeding tubes. However, unlike Schpero, we found that Black patients experienced no significant difference in vitamin D screening, lower risk of antipsychotic use in dementia, and higher risk of imaging for low back pain.

The study has several limitations. The 40 services examined represent a fraction of all low value care, and claims data lack clinical details to confirm clinician intent.<sup>47</sup> Potential for bias exists if misclassification of low value care eligibility varies systematically by race. We also acknowledge important methodological debate in choice of model covariates.<sup>43 44</sup> Our data are from 2016 to 2018, and differences in low value care use might have changed since then. The study focuses on patients attributed to larger US health systems, therefore our results might not generalize to patients attributed to small systems or to those who are not attributed to health systems—who might receive low value care at slightly higher rates.<sup>48</sup> However, we note that Black and White patients had similar likelihood of being attributed to the included systems (when applying our cohort criteria to Medicare patients before and after system attribution, Black patients made up 6.9% of all patients and 6.4% of all attributed patients). Similarly, our results might not generalize to the growing share of older adults enrolled in Medicare Advantage or to other populations.<sup>29</sup>

Our intention in this study was to generate hypotheses; underlying mechanisms should be explored in future research. We did not involve the public in shaping study questions and interpretation, which will be critical for future studies. Future quantitative and qualitative work might also assess low value care receipt among other racial groups, examine the role of health system characteristics in inequities, explore the association between high value and low value care, and study positive outliers in net care value to identify best practices.

### Study meaning

Although the racial differences we found were heterogeneous and generally modest, they varied by low value service category in informative ways. These patterns suggest hypotheses about possible mechanisms at individual, interpersonal, and structural levels that can inform low value care reduction efforts more broadly.

Black patients were at slightly (one to twofold) greater risk of receiving several low value acute diagnostic tests. At the individual level, mistrust in the healthcare system because of historical and present day racism<sup>49 50</sup> might contribute to Black adults being more receptive to diagnostic testing when acutely ill—in this scenario, it is possible that a tangible test is more reassuring than a clinician's words and might serve to lessen valid concerns about undertreatment. Mistrust, and structural factors such as access barriers, might also result in care seeking delays, so that Black adults are sicker when they present with acute conditions, potentially leading clinicians to order more low value tests.

At an interpersonal level, clinicians' implicit or explicit biases<sup>51</sup> and patient-clinician racial discordance<sup>52 53</sup> might contribute to clinician misperceptions of patient needs, less effective communication, and in turn, greater clinical uncertainty<sup>54</sup> that prompts more testing.<sup>55-57</sup> In a similar vein, we found Black patients with advanced dementia were more likely to receive feeding tubes, mirroring evidence that patients from racial and ethnic minority groups were more likely to receive high cost, aggressive interventions at the end of life.<sup>25 58 59</sup> These findings may be due to patients in racial and ethnic minority groups having fewer treatment limitations in place (eg, do not resuscitate orders), more severe illness, or different end-of-life preferences.<sup>57 58</sup> At a structural level, these results might reflect decades of structural racism resulting in racially segregated neighborhoods and lower density of primary care clinics and high quality urgent care centers<sup>60</sup> in predominantly Black neighborhoods compared with White neighborhoods. Despite our finding that Black patients had a larger share of visits with primary care or advanced practice clinicians, they are less likely to have a regular primary care clinician<sup>28 61</sup> (who might appropriately triage them away from the emergency department) and might be more likely to receive acute care from urgent care or emergency medicine clinicians who do not know them well,<sup>27 62</sup> potentially contributing to more acute diagnostic testing.<sup>63</sup> This low value acute diagnostic testing affects recipients through direct harms (eg, radiation exposure, treatment burden, and out-of-pocket spending)<sup>64</sup> and through downstream care cascades that can often arise from imaging tests in particular.<sup>65 66</sup>

In contrast to our finding that Black patients received more low value acute services, White patients received one to threefold more of most low value screenings examined. At the individual level, it is possible that White patients are more likely to request or agree to screening services if relative privilege and the racial opportunity gap augment their perceived benefit of such services compared with Black patients.<sup>67</sup> At an interpersonal level, clinicians might be more likely to offer screening services to White patients because of implicit biases. Some racial differences could be explained by socioeconomic differences, as suggested by our finding that the greater risk of low value prostate specific antigen testing in White men compared with Black men was diminished when controlling for a poverty indicator. At a structural level, Black patients have less access to routine, timely primary care (despite our finding that Black patients had a larger share of visits with primary care doctors or advanced practice clinicians).<sup>22 28 61 68</sup> For instance, Black Medicare patients are less likely to receive annual wellness visits<sup>22 68</sup> and use disproportionately more emergency department and inpatient care relative to ambulatory care.<sup>27 69</sup> Unfortunately, lower rates of low value screening among Black patients parallels lower rates of high value screening, such as age appropriate colorectal cancer screening.<sup>70</sup> Most notably, higher rates of prostate cancer incidence and death among



Black men<sup>71</sup> could arguably justify higher rates of low value prostate cancer screening in this population, but Black men were instead less likely than White men to receive this service. Finally, White patients were at slightly (one to threefold) higher risk of receiving eight of 12 examined low value treatments, such as antibiotics for acute upper respiratory tract and ear infections. These findings might reflect White patients being more likely to request treatments, or clinicians being more inclined to offer them to White patients, partly because of implicit, historically rooted power differentials.<sup>72 73</sup>

Our exploratory examination of race and sex interactions revealed some substantial differences in low value care receipt across sex-race groups. Hypotheses that might explain these patterns would be speculative, but we believe these findings merit further examination in future studies.

Examining the role of health systems, we found racial differences in receipt of low value care were driven less by Black and White patients receiving care in different systems, and more by differential treatment within systems (eg, through services directly provided by in-system primary care and specialist clinicians, or through referrals<sup>19</sup>), consistent with previous evidence of stronger within-system racial inequalities in care quality measures.<sup>9</sup> The most notable exception to this was prostate specific antigen testing—health systems serving larger proportions of Black patients offered more low value prostate specific antigen tests to all of their patients, perhaps in response to higher rates of prostate cancer among Black men. However, within any given system, White patients were still more likely to get the service. Studies have revealed that hospitals or practices that predominantly serve patients from racial and ethnic minority groups provide lower care quality for all of their patients,<sup>21–23</sup> but we did not find clear evidence of this in our study.

## Conclusions

Low value care is problematic, not only because of direct and cascading harms to patients,<sup>14 39</sup> but also because it diverts limited resources, contributing to underuse of effective care especially among racial and ethnic minority populations. In general, we found Black patients were at modestly greater risk of receiving low value acute diagnostic tests commonly performed in acute care settings, while White patients were at modestly greater risk of receiving low value screening services and treatments. Even small differences might be clinically important because of the direct and indirect effects of low value care, while the patterns across service categories suggest hypotheses about underlying mechanisms. We also found that these differences result almost entirely from differential care delivered within systems. Taken together, these results invite further exploration of differential access by race to routine, high value primary care, patient-clinician concordance, and trust. Our findings also highlight the need to develop and test effective interventions

to reduce low value services, especially those with greatest potential impact (ie, based on numbers of people affected, direct and cascading costs, and likelihood of other harms).<sup>39</sup> Health systems invested in reducing low value care and promoting health equity could begin by measuring low value service use internally overall, and by race and sex, in line with a recent Joint Commission mandate to report care quality data stratified by demographic categories.<sup>74</sup> Such efforts might allow systems to identify and address underlying sources of racial differences; for example, clinician-patient interactions (bias, mistrust) or structural issues (access to high quality primary care or differential referral patterns). Granular, population stratified analyses within health systems are increasingly feasible with the use of electronic health record data, and will likely be essential to advancing equitable, high value care for all.

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**Data sharing:** Data presented in this study were obtained from US governmental agencies and vendors. We are not allowed to share these data due to existing data protection rules and licensing agreements.

The lead author (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

**Dissemination to participants and related patient communities:** The findings of this study will be shared publicly through lay press coverage, social media, press releases from the authors' affiliated organizations, and presentations at virtual and in-person conferences.

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## Web appendix: Supplementary materials