Hospital Allocation and Racial Disparities in Health Care

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Background and motivation

Overall age-adjusted death rate 20% higher for non-Hispanic Black individuals compared to non-Hispanic Whites

Premature mortality rates (deaths before age 65) in the United States between 1960-2002 for White (dashed lines) and Black (solid lines) individuals by income (county-level)
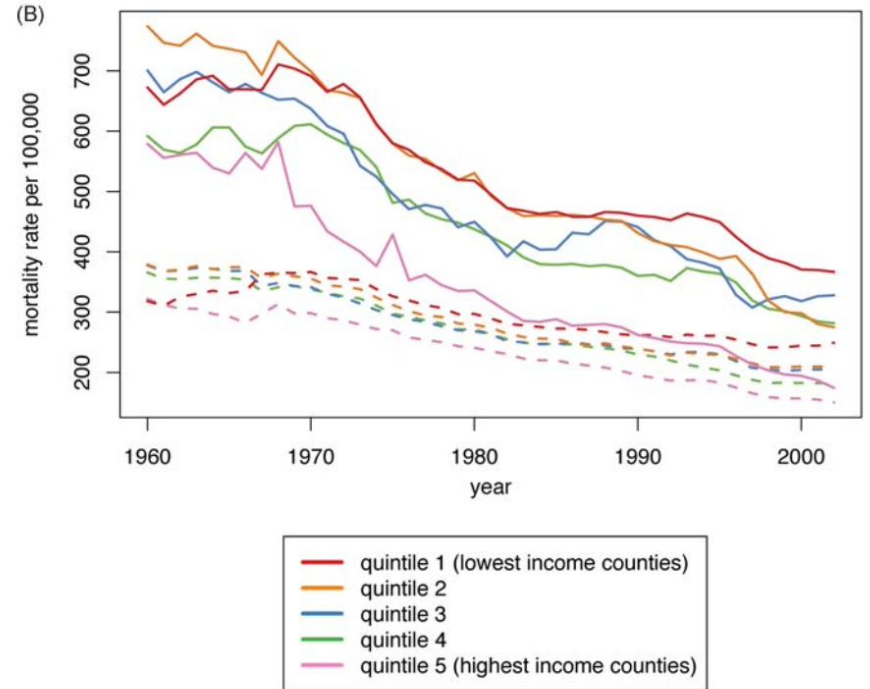

Figure source: Krieger, N., Rehkopf, D. H., Chen, J. T., Waterman, P. D., Marcelli, E., & Kennedy, M. (2008). The fall and rise of US inequities in premature mortality: 1960–2002. *PLoS medicine*, *5*(2), e46.

Background and motivation

Causes of disparities in health are vast and interconnected

- Wealth, income
- Education
- Geography/where one lives
- Housing and living conditions
- Health insurance coverage
- Difference in quality of care from the same provider (e.g., differential treatment, bias)
- Segregation of care (*de jure* and *de facto*) and difference in the providers that patients use
- Others?

Background and motivation

Allocation

- Receipt of care from different providers
- Black patients receive care from lower-quality providers (Back and Schrag, 2004; Barnato et al., 2005; Skinner et al., 2005; Jha et al., 2007)
- Allocative differences are derived from historical and persisting inequities in segregation, access to resources, patient trust
- The allocation literature suggest that patients reallocate to higher-quality hospitals over time (Chandra et al., 2016)

Setting

- Medicare beneficiaries
  - Holds constant insurance coverage
- Acute myocardial infarction (heart attack) patients
  - Acute health event that most everyone receives care for (mitigates selection)
  - Validated quality measures
  - Observable utilization of technology (i.e., beta-blockers, cardiac catheterization)
- Timeline
  - Baseline period (1995-1999)
  - Intermediate periods (2000-2004) and (2005-2009)
  - Endline period (2010-2014)

Data

- Medicare Part A claims and enrollment data
  - 100% sample of Medicare benes 1995-2014
- Dartmouth Atlas
  - Defines hospital markets by Hospital Referral Regions (HRRs)
- Cooperative Cardiovascular Project (CCP)
  - American College of Cardiology quality-improvement initiative
  - AMI quality measures

Methods

Performance measurement

- 30-day survival rate of AMI patients, adjusted for patient comorbidities and demographics
- Expected 30-day survival for the *average* Black and White patient in a given time period, at a given hospital
  - This approach specifically addresses the between-hospital differences
  - Because 20% of hospitals do not treat any Black patients and other hospitals treat few Black patients, posing challenges to estimating a precise race-specific hospital effect

Allocation measurement

- National market share of Black or White patients at a given hospital in a given time period

Methods

- Decomposition framework
  - Static decomposition
  - Dynamic decomposition
- Productivity literature → changes in sector-level productivity comprised of allocation (market shares) across firms and productivity within firms
- Analogous approach here: between-race differences in AMI outcomes can be separated out into
  - Differences in allocation of patients across hospitals
  - Differences in performance within hospitals

Methods

Static decomposition

- In a given time period (baseline and endline) how does the use of certain hospitals (higher or lower performing) change the average 30-day survival rate of Black AMI patients compared to White AMI patients
  - *Within-hospital:* differences in Black-White survival rate resulting from differential treatment within a given hospital
  - *Between-hospital:* differences in survival from allocation; Black patients using hospitals of higher/lower quality than White patients

- Decomposing the between-race gap by three levels of geography
  - Re-weight geographic distribution of White patients to match the distribution of Black patients in a given time period, at the hospital market and ZIP code level
    - hospital market differences
    - ZIP code differences that measure differences in neighborhoods within markets
    - within ZIP code differences in the hospitals Black and White patients use

Methods

Dynamic decomposition

- Objective: split the decline in survival disparity into component parts
- Two main contributors to evolving gap:
  - Reallocation of Black patients to higher performing hospitals
  - Changes in the quality of care provided at hospitals Black patients attend
- Mechanics
  - Differential performance improvement → change in between-race gap explained by performance improvements, holding fixed patient allocations at baseline levels
  - Differential reallocation → difference-in-difference of Black patients vs White patients market shares over time, holding fixed performance at baseline levels

Results - static

- Figure 1, panel A plots the distribution of hospital performance among Black and White patients at baseline (vertical bars indicate distribution means)
- Black patients used hospitals with 1 percentage point lower expected survival rates than White patients on average
- How can we explain this disparity in terms of geographic distribution?

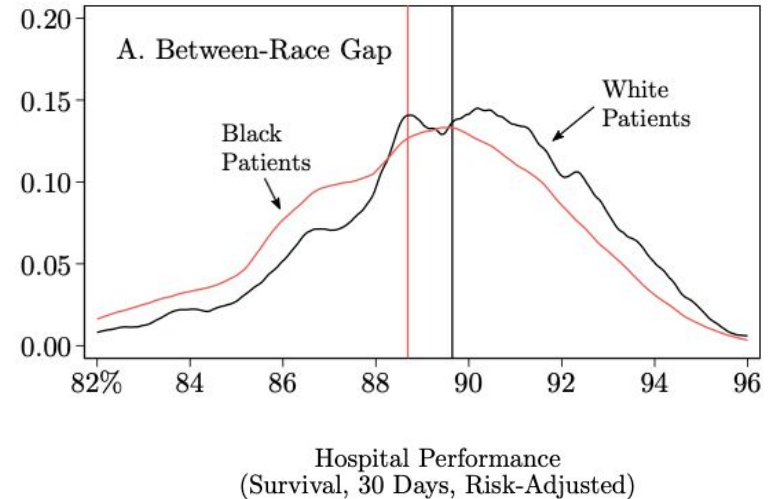Figure 1: Decomposition of Between-Race Gap in Hospital Performance at Baseline


Hospital Performance
(Survival, 30 Days, Risk-Adjusted)

Results - static

- 44% of the disparity can be attributed to differences in hospital markets

- 25% can be explained by neighborhood differences within markets

- 32% can be explained by differences in hospital choice between Black and White patients in the same neighborhoods

Figure 1: Decomposition of Between-Race Gap in Hospital Performance at Baseline
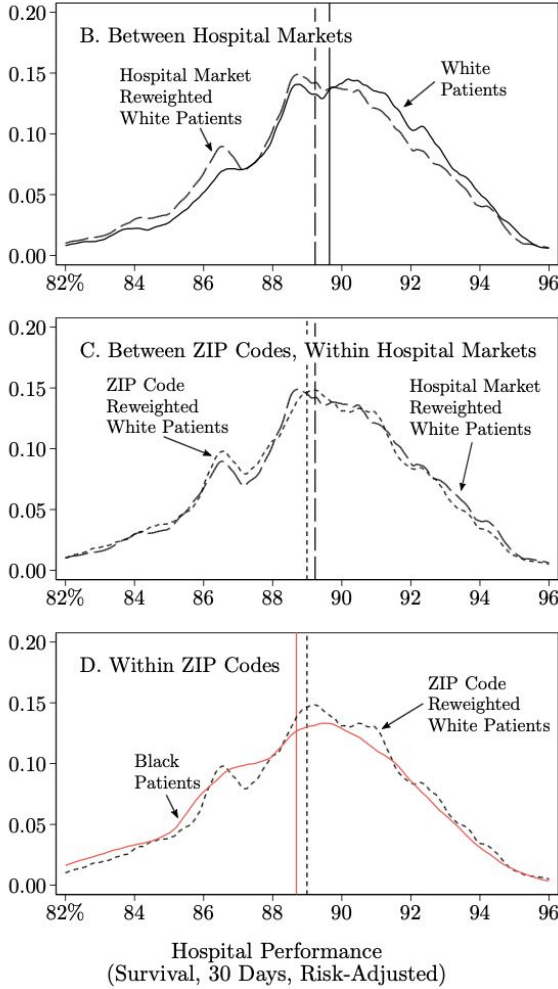
Results - static

Endline results

- Black patients used hospitals with 0.3 percentage point lower expected survival rates than White patients on average
  - 5% explained by differences in markets
  - 46% explained by differences in neighborhoods within markets
  - 49% explained by within ZIP code differences
- Declining market-level differences contributes most to the closing of the gap

- What are the roles of reallocation and performance improvement in this closing of the gap?

Figure 2: Between-Race Gap in Hospital Performance at Baseline and Endline
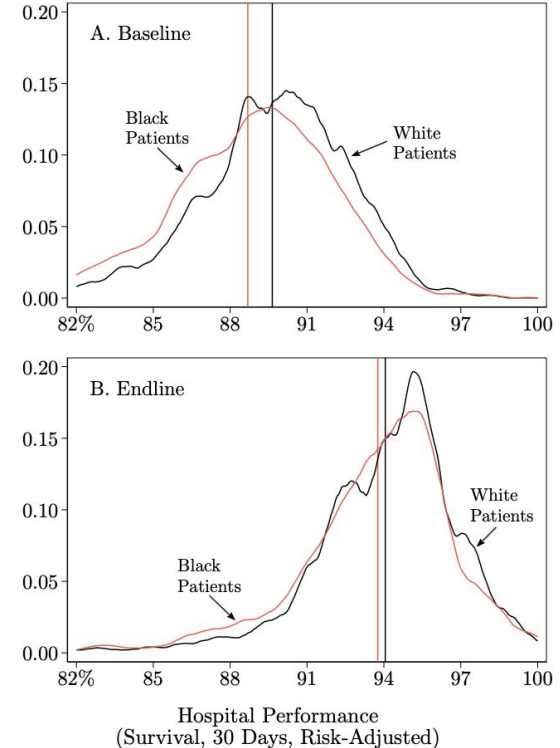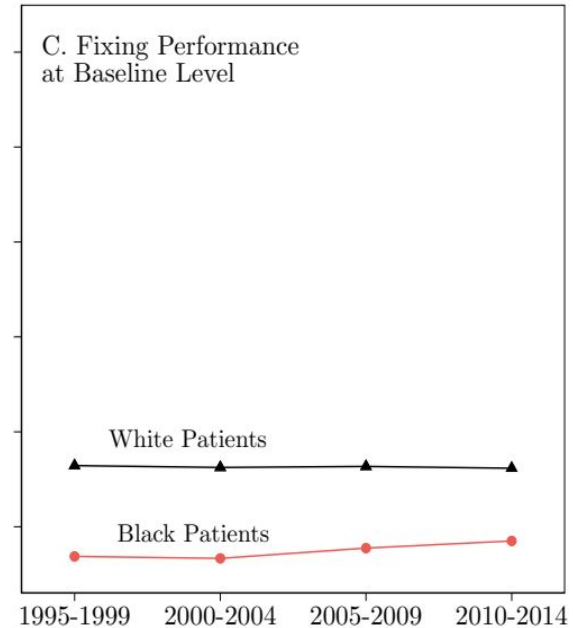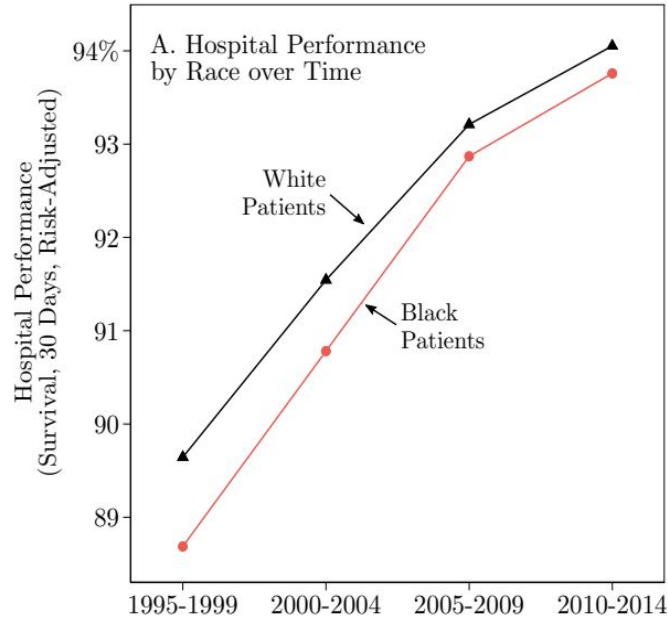
Results - dynamic

- Differential performance improvement among hospitals treating Black patients explains the *entire* change in the between-race disparity
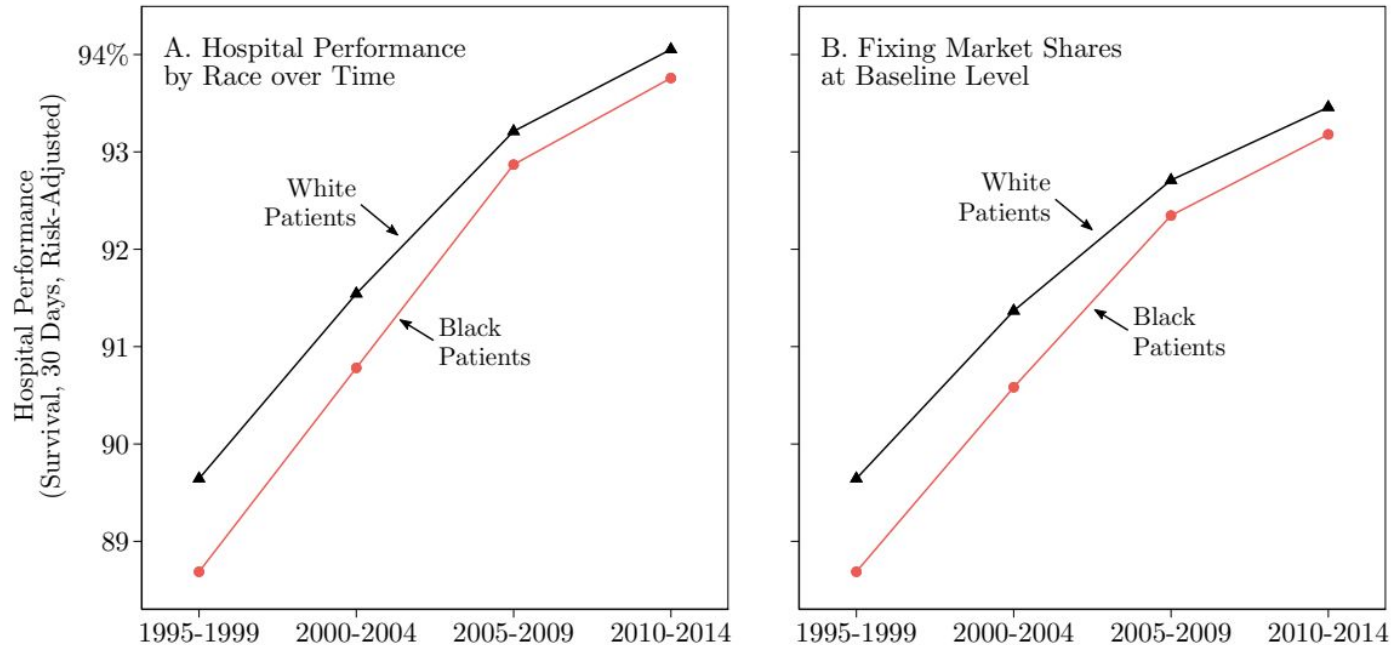
Results - dynamic

- Differential reallocation - Black patients reallocating to higher quality hospitals more quickly than White patients - explains very little of the change in disparity

What drives performance improvement?

- A natural question given these findings: what mechanism explains differential performance improvement?
  - A candidate explanation is technology adoption
- Repeat dynamic decomposition with two measures of adoption
- Beta blockers (low cost technology)
  - Gap in use shrinks from 1.7 pp at baseline to 0.2 pp at endline
  - Explained almost entirely by differential performance improvement
- Cardiac catheterization (high cost technology)
  - Gap flips over time from higher rates in hospitals treating Black patients to hospitals treating White patients

Discussion

- Important connections between racial and ethnic disparities, productivity, and medical innovation/diffusion
- Between 1995-2014, the Black-White gap narrowed by over two-third
  - This statistic represents *between* hospital differences and not disparities in outcomes within hospitals
- Place-based vs. person-based quality improvement
  - Use of beta-blockers and performance-improvement strategies may have been significant contributors to the differential performance improvement and narrowing of the Black-White gap (beta-blockers may be an observable proxy for other performance-improvement strategies as well)
- While reallocation was not a significant driver of the gap closing, about half of the within market endline disparities are explained by within ZIP code differences
  - Referral patterns, provider networks, hospital closure and entry

Discussion

- Addressing structural racism through place-based quality improvement
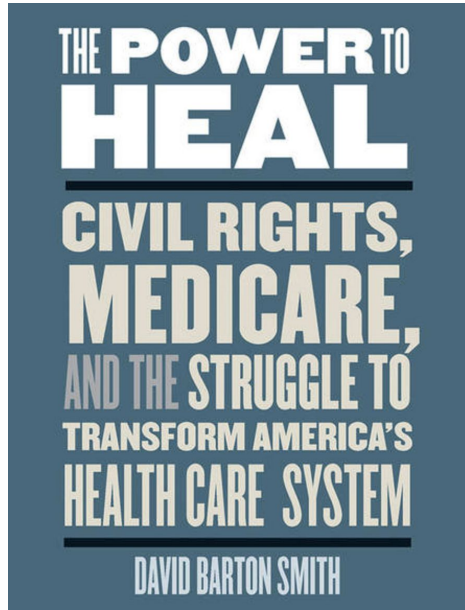
Racial Disparities in Health Status and Access to Healthcare: The Continuation of Inequality in the United States Due to Structural Racism

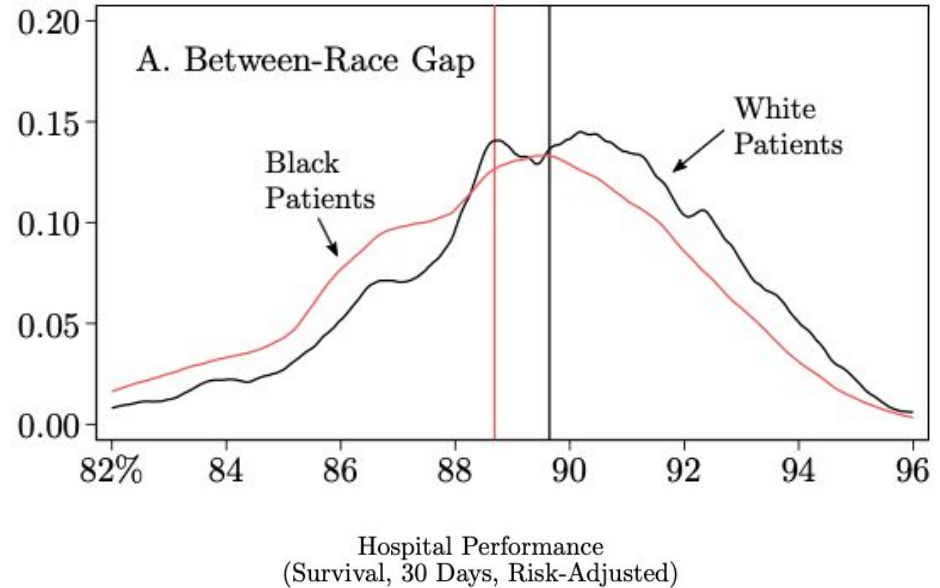By RUQAIIJAH YEARBY*

The NEW ENGLAND JOURNAL of MEDICINE

How Structural Racism Works — Racist Policies as a Root Cause of U.S. Racial Health Inequities

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Discussion

- Depicting disparities in terms of distributions in addition to differences in means
- Other illustrative mechanisms for visualizing disparities seen elsewhere?

A. Between-Race Gap

Black Patients

White Patients

Hospital Performance
(Survival, 30 Days, Risk-Adjusted)

Discussion

- What other health care settings could this framework be applied to?
- What questions might you want to investigate based on the finding that even within ZIP codes, Black and White patients go to different hospitals?
- How should be think about the role of technological diffusion in this setting? Why might some hospitals adopt technologies or process improvements before others?
- What are the policy conclusions we should take from these results?
  - Is there scope for allocative policies?
  - What levers seem best suited for further reducing disparities?