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HIGHLIGHTS

- Although patient race significantly impacts hospitals' 30-day mortality and readmission rates, these effects are not taken into account in CMS's Hospital Compare data.
- This inequity could soon become a real financial problem for hospitals: starting in 2013, the healthcare reform law will allow CMS to penalize hospitals for excess readmission rates.
- Investigating discharge data can provide value to hospitals that are looking to better understand the implications of 30-day mortality and readmission rate data.

Risk-Standardized Rates for 30-Day Mortality and Readmissions Vary Significantly by Race

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Summary

The objective of this study was to evaluate the impact of race on risk-standardized, 30-day mortality and readmission rates used in the Centers for Medicare & Medicaid Services (CMS) Hospital Compare reporting.

The data in this study demonstrate that unless race is taken into account, bias may occur in comparing 30-day readmission for acute myocardial infarction (AMI), heart failure, and pneumonia patients and 30-day mortality rates for heart failure patients. And because CMS does not currently consider race when producing its risk-standardized rates, differing race populations across hospitals may cause unfair hospital comparisons.

Methodology

We performed a cross-sectional, correlation, and rate-comparison analysis of race (black, white, or other) with 30-day, risk-standardized mortality and readmission rates. Standard logistic regression models were used and specified as closely as possible to the CMS Hospital Compare models by Krumholz.[1,2]

For validity and a more detailed profile, we performed this analysis by Hospital Compare hospital-level data and discharge-level data. The data sources for each were:

- 30-day mortality and 30-day readmissions for hospital-level results: Hospital Compare data for Medicare patients with AMI, heart failure, or pneumonia from the third calendar quarter of 2007 through the second calendar quarter of 2010 (hospitalcompare.hhs.gov/staticpages/for-professionals/poc/data-collection.aspx)
- 30-day mortality for discharge-level results: CMS Medicare Provider Analysis and Review (MedPAR) data for Medicare patients with AMI, heart failure, or pneumonia from the third calendar quarter of 2007 through the second calendar quarter of 2010
- 30-day readmissions for discharge-level results: Calendar year 2010 CMS Standard Analytical Files (SAF) — the only available SAF data with dates included

Results

We found that rates of 30-day mortality and readmissions were significantly and substantively correlated with hospital proportional distribution of race (black, white, or other) — suggesting that race is an uncontrolled confounder in the CMS methodologies.

This analysis uses Pearson correlations, the most common measure of correlation used in statistics, to define the relationships between race and rates. A Pearson correlation shows the degree of correlation, or linear dependence, between two variables using a value between +1 and -1. A correlation of +1 means that there is a perfect positive linear relationship between variables, -1 means that there is a perfect negative linear relationship, and 0 means there is no linear relationship. We found:

- Increased hospital-specific proportion of white patients with heart failure was associated with significantly higher rates of 30-day mortality compared with patients who had race coded as black or other (Figure 1).
- Increased hospital-specific proportion of whites was significantly associated with decreased rates of 30-day readmissions among patients with AMI, heart failure, and pneumonia (Figure 2).
- There is a statistically significant correlation between average, 30-day, risk-standardized rates and the proportion of white race (Figure 3).

Figure 1: As Proportion of White Patients Increases Relative to Black or Other Patients, the Risk of 30-Day Mortality for Heart Failure Increases

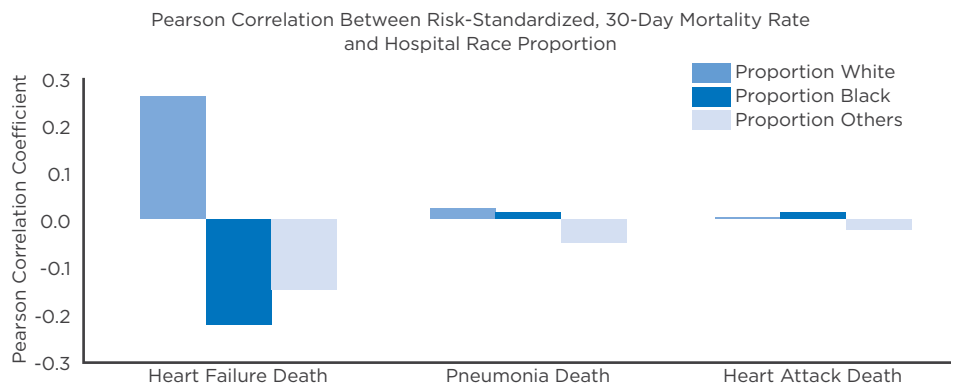Pearson Correlation Between Risk-Standardized, 30-Day Mortality Rate and Hospital Race Proportion

Figure 2: As Proportion of White Patients Increases Relative to Black or Other Patients, the Risk of 30-Day Readmissions is Decreased for all Three Patient Groups

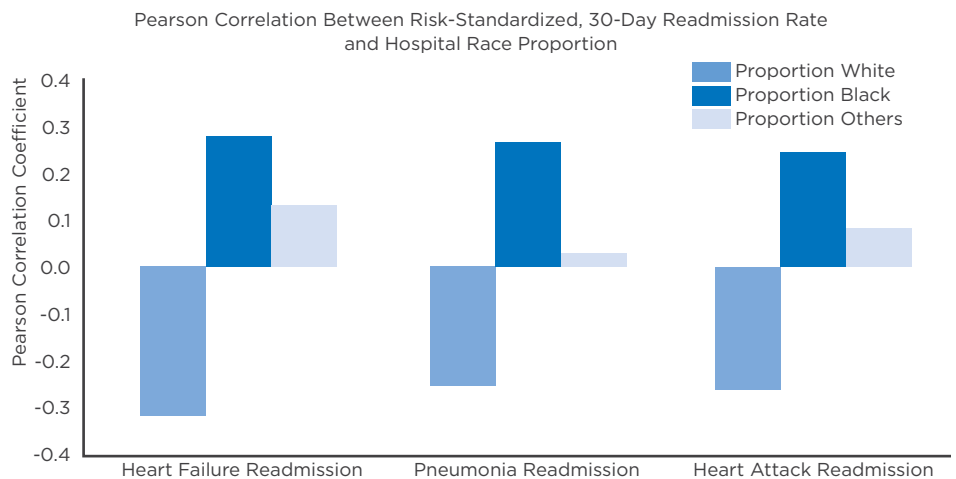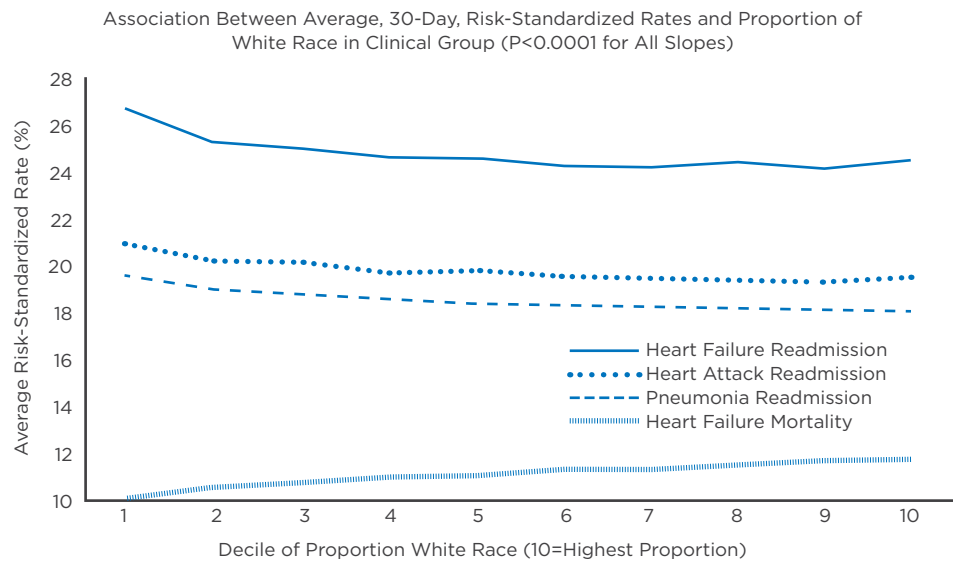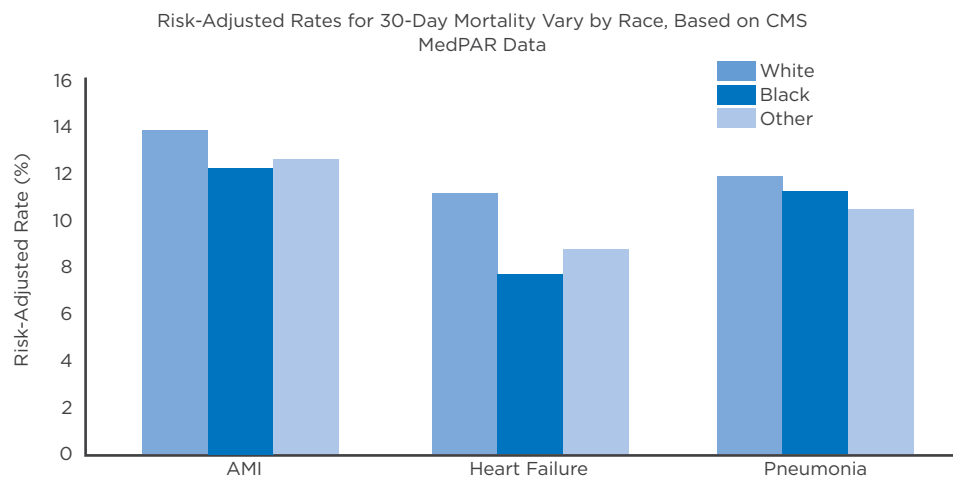Pearson Correlation Between Risk-Standardized, 30-Day Readmission Rate and Hospital Race Proportion

Figure 3: The Proportion of White Patients Relative to Black and Other is Associated With Risk of 30-Day Mortality and/or Readmissions for Some Patient Groups

Association Between Average, 30-Day, Risk-Standardized Rates and Proportion of White Race in Clinical Group (P<0.0001 for All Slopes)

Y-axis: Average Risk-Standardized Rate (%)

X-axis: Decile of Proportion White Race (10=Highest Proportion)

Legend:
— Heart Failure Readmission
••••• Heart Attack Readmission
- - - Pneumonia Readmission
▪▪▪▪▪ Heart Failure Mortality

The above results are gleaned from CMS Hospital Compare data, but similar results are also found when reviewing discharge-level CMS MedPAR data. Figure 4 also shows that white patients have higher 30-day mortality rates than blacks and others.

Figure 4: White Patients Have Higher Risk-Adjusted Rates Than Blacks and Other Patients on 30-Day Mortality, Based on Discharge-Level CMS MedPAR Data

Risk-Adjusted Rates for 30-Day Mortality Vary by Race, Based on CMS MedPAR Data

Legend:
- White
- Black
- Other

Y-axis: Risk-Adjusted Rate (%)

X-axis categories: AMI, Heart Failure, Pneumonia

A crude death rate analysis (without risk adjustment) supports the hypothesis that competing causes of death are responsible for higher 30-day mortality among whites (Figure 5).

Crude Death Rates per 100,000 by Race, 2008
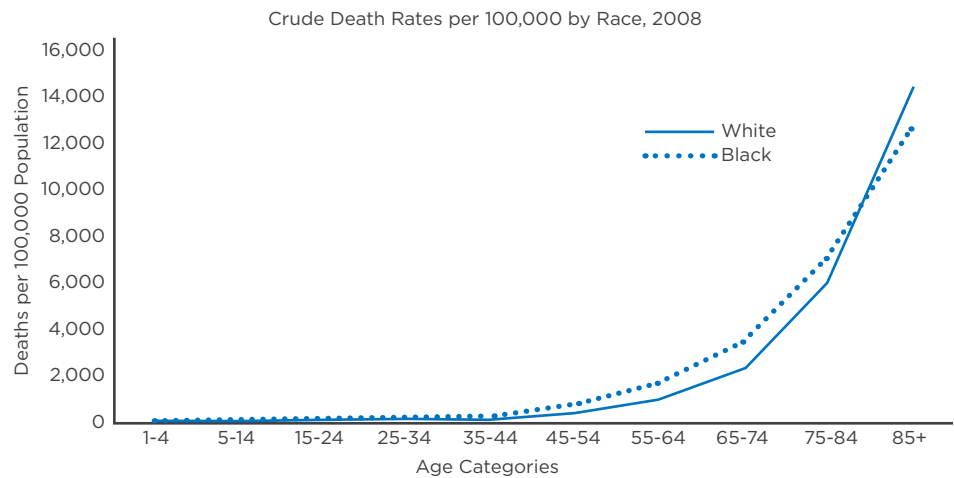
Model Performance for Discharge-Level Results

We used standard logistic regression models specified as closely as possible to the CMS Hospital Compare models by Krumholz.[1,2]

The Pearson correlations for the 30-day mortality models were 0.82, 0.75, and 0.83 for pneumonia, AMI, and heart failure, respectively. The Pearson correlations for the 30-day readmission models were 0.50, 0.31, and 0.59 for pneumonia, AMI, and heart failure, respectively. All correlations were statistically significant ($p < 0.0001$).

Limitations

Because only administrative data (Uniform Billing, UB) were used for this study, differences across hospitals in coding practices, limitations in risk-standardization, and other factors should be taken into consideration.

The models built to estimate the discharge-level results represented by the CMS Hospital Compare hospital-level results, while as close as possible, were necessarily imperfect due to our inability to use exactly the same data and patient population used by CMS.

Conclusions

These results support the hypothesis that competing causes of death at earlier ages lead to lower 30-day mortality among blacks for heart failure. They also maintain the premise that socioeconomic status, support, and access factors are associated with higher 30-day readmission rates for non-whites.

Consequently, unless race is taken into account, confounding (bias) may occur in comparing risk-standardized, 30-day readmission for patients with AMI, heart failure, and pneumonia and mortality rates for patients with heart failure.

Implications for Policy, Delivery, or Practice

The CMS Value-Based Purchasing (VBP) program bases reimbursement, in part, on risk-standardized, 30-day mortality rates. The 30-day, risk-standardized readmission rates, while not formally part of VBP, will impact hospital reimbursement.

Our study indicates that race, which currently is not taken into account in producing the CMS risk-standardized rates, is a significant confounder that may result in unfair hospital comparisons due to differential race distributions across hospitals.

This inequity could become a real financial problem for hospitals in the near future. With the passage of the healthcare reform law (PPACA) in March 2010, Congress gave CMS the authority to penalize hospitals for excess readmission rates starting federal fiscal year (FFY) 2013. Initial efforts will focus on heart failure, AMI, and pneumonia. Beginning FFY 2015, CMS may also begin withholding payments for excessive readmissions related to chronic obstructive pulmonary disease, coronary artery bypass grafts, percutaneous coronary interventions, and some vascular surgery procedures.

Finally, this study also demonstrates the value that investigating discharge data can provide to hospitals that are looking to better understand the implications of 30-day mortality and readmission rate data. These data allow for more detailed comparisons.

1 Krumholz, HM, et al. "An Administrative Claims Model Suitable for Profiling Hospital Performance Based on 30-Day Mortality Rates Among Patients with an Acute Myocardial Infarction." *Circulation*. 2006; 113; 1683-1692.
2 Krumholz HM, et al. "An Administrative Claims Model Suitable for Profiling Hospital Performance Based on 30-Day Mortality Rates Among Patients With Heart Failure." *Circulation*. 2006; 113: 1693-1701.

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