Supplementary Online Content


eAppendix: A Complete Description of the Statistical Methods, Including Model Diagnostics and Covariate Definitions

eFigure: Example of coarsened exact matching on age.

This supplementary material has been provided by the authors to give readers additional information about their work.
eMethods

Three different techniques were employed to determine the independent impact of race on the main outcome measure of in-hospital mortality after trauma among a) younger (16-64 years of age) and b) older (≥ 65 years of age) patients. We first used the standard methods of univariable logistic regression and multivariable logistic regression [adjusting for age, gender, insurance status, type of injury (blunt vs. penetrating), intent of injury, injury severity (TMPM), head injury severity, and CCI] with and without clustering for hospital effects. Covariates were chosen based on the 5 minimum covariates that are considered to be essential when performing a risk-adjusted analysis of trauma mortality outcomes 1. Race, age, gender, insurance status, mechanism of injury (blunt vs. penetrating), and severe head injury (Abbreviated Injury Scale ≥3) 2 were coded as binary variables. Intent of injury was classified according to the CDC external cause of injury intent categorization (unintentional, self-inflicted, assault, undetermined and others) 3. Age was categorized into six groups: 16-25, 26-35, 36-45, 46-55, 56-64, 75-75, 76-85, and ≥86 years. ISS was divided into 4 groups: <9, 9-15, 16-24, 25-75. TMPM scores were treated as a continuous variable. The total scores derived from the STATA CCI module were divided into the following groups: 0, 1, 2 and ≥3 for descriptive purposes (Manuscript Table 1), but treated as a continuous variable for statistical analyses.

Regression diagnostics for the multivariable logistic regression model without clustering demonstrated areas under the curve and Homers-Lemeshow statistics of 0.93 and 84.3 for patients age < 65 years and 0.80 and 224.5 for patients age ≥ 65 years, respectively. Clustering patients by hospitals produces more reliable confidence intervals by taking into account the inter-facility correlation of patient outcomes (i.e. patient outcomes are more likely to be similar within rather than across hospitals) 4-5. Model performance was not affected by clustering as clustering mainly affects how standard errors and confidence intervals are handled between facilities.

We then performed Coarsened Exact Matching (CEM) to match Black patients to White patients on age, gender, insurance status, type of injury, intent of injury, overall injury severity, head injury severity, and co-morbid conditions (Figure S1). CEM is a statistical means of matching patients that aims to reduce the imbalance in covariates between two groups using monotonic imbalance bounding 6. We report the L1 distance between Black and White patients in each age group before and after CEM in order to demonstrate the change in-group differences following implementation of the CEM technique. The L1 statistic is a multivariate measure of imbalance ranging from 1 (complete separation) to 0 (perfect global match) that is calculated based on the differences of all model covariates for the case vs. control groups 7. Following CEM, conditional logistic regression was employed to generate the odds of death for Blacks versus Whites for younger (16-64 years of age) and older (≥ 65 years of age) patients.

eReferences


eFigure. Example of coarsened exact matching on age.

CEM is a statistical means of matching patients based on categorical bins that allows for a greater overall number of successfully matched patients compared to traditional matching while still bounding the degree of model dependence and the average treatment estimation error. The technique involves 4 main steps: 1) The variable of interest (e.g. age) is "coarsened", meaning that it is assigned categorical bins that are chosen on the reasonable assumption that patients within those bins will behave similarly; 2) Patients from the case (e.g. Black) and Control (e.g. White) groups are...
matched on the coarsened variable; 3) The patients are assigned back into their group (i.e. Case or Control); and 4) The patients are matched on the next variable.