The Effect of Insurance on Burn Patient Mortality Outcomes

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Burn Statistics

- 486,000 burns received treatment in 2016
- 3,275 Fire/Smoke deaths in 2016
- 40,000 hospitalizations (30,000) at designated burn care centers

Background

- Females and African American males, noted in previous studies to have increased mortality rates
  - African Americans /Blacks found in NIS study looking at burn inhalation injuries, to be 37% more likely to die of injuries[7]
  - African Americans found in NBR study to have 57% greater chance of death with injuries encountered while smoking on home O2[1]
  - Women with 50% increased risk of death due to thermal injury versus males, between ages of 10-70 [4]
  - Women also found to have increased burn mortality associated with increasing poverty levels [2]

Background

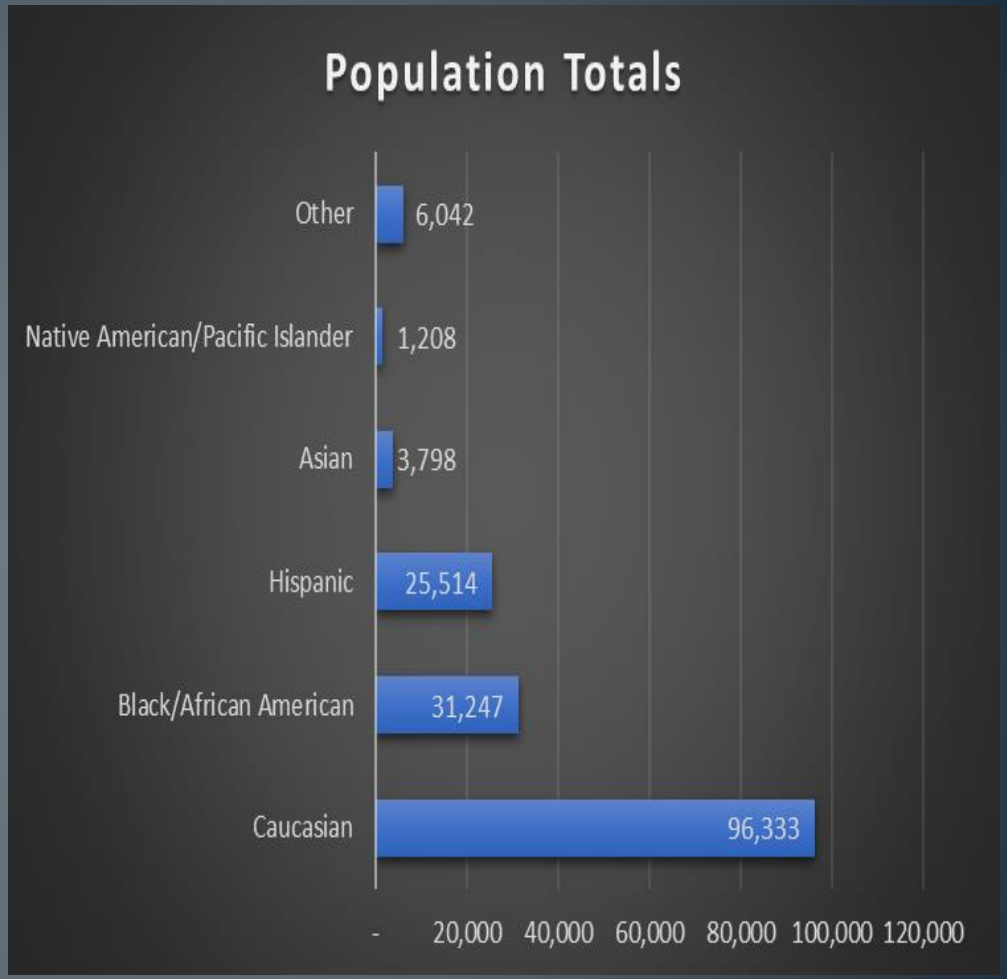
- Long seen in research that African Americans overall have higher mortality rates
  - In a study published in the Annals of Surgery in 2006, African American patients were noted to have higher operative mortality risk in 7out of 8 general surgery procedures selected for analysis; higher mortality rates were noted at hospitals African American/Black patients go to predominantly for care; also African Americans were found to likely to present emergently for surgery. [5]
- Some mitigation of mortality and morbidity with homogenous health care
  - Meta-analysis looking at outcomes in Emergency General Surgery of universally insured enlisted and ranking officers on Tricare the results of the study showed no difference in mortality among soldiers of different racial backgrounds, and only an increased morbidity in African Americans admitted with appendiceal disorders.[8]

Question

- Do racial disparities exist in burn mortality rates among patient groups with the same insurance type?
  - Using National Burn Repository data from 2002-2011
  - Multivariate analysis
    - Age
    - Gender
    - Race
    - TBSA
    - Presence of an inhalation injury
    - Insurance type

Methods

- Total of 172,640 patient encounters in NBR from 2002-2011
  - Native Americans and Asians omitted in our analysis due to small sample size
  - Total of 108, 722 encounters analyzed
- 63,918 encounters removed from our analysis due to missing information
  - TBSA, Age, Insurance status, or survival status missing
- Logistic regression models created for each insurance designation with $p<0.05$
  - Caucasian males with private insurance designated as the reference group



General Model

n=108,722

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.05	0.00	1.04 - 1.05
TBSA	1.06	0.00	1.05 - 1.07
Inhalation	3.18	0.00	2.48 - 4.07
Black	1.48	0.00	1.22 - 1.81
Hispanic	1.06	0.78	0.68 - 1.66
Female	1.09	0.18	0.95 - 1.25
Uninsured	1.66	0.07	0.94 -2.91
Workman's compensation	0.67	0.04	0. 45 - 0.98
Medicare	1.37	0.05	0.99 - 1.89
Medicaid	1.08	0.63	0.77 - 1.51

In the general model, Black/African American males had 1.49 increased odds of mortality from burn injuries than the reference group, Caucasian males.

Workman's Compensation

n=11,711

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.03	0.00	1.01 - 1.04
TBSA	1.07	0.00	1.05 - 1.08
Inhalation	2.02	0.01	1.33 - 3.07
Black	1.52	0.10	1.22 - 1.81
Hispanic	0.54	0.78	0.29 - 0.97
Female	0.68	0.18	0.38 - 1.20

Black/African American males noted to have 1.52 greater odds of increased mortality (52%) than Caucasian males with Workman's compensation.

Both Hispanic and Females were noted to have lower odds of mortality with burn injury with Workman's compensation as their primary insurance with the result being statistically significant among Hispanics.

Medicare

n= 9,632

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.05	0.00	1.04 - 1.06
TBSA	1.07	0.00	1.05 - 1.08
Inhalation	2.02	0.01	1.33 - 3.07
Black	1.54	0.00	1.26 - 1.88
Hispanic	0.54	0.64	0.446 - 1.64
Female	0.97	0.69	0.856 - 1.11

In the Medicare model, Black/African American males had 1.54 greater odds of increased mortality following burn injuries than Caucasian males.

Medicaid

n= 15,545

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.05	0.00	1.04 - 1.06
TBSA	1.04	0.00	1.05 - 1.07
Inhalation	3.31	0.00	2.28 - 4.81
Black	1.47	0.03	1.04 - 2.07
Hispanic	1.30	0.29	0.789 - 2.15
Female	1.45	0.02	0.789 - 2.15

In the cohort of patients with Medicaid as their insurance type, Black/African American males had 1.47 increased odds of mortality following burn injury in comparison to the reference group, Caucasian males.

Uninsured

n= 15,176

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.03	0.01	1.00 - 1.06
TBSA	1.06	0.00	1.04 - 1.07
Inhalation	2.61	0.00	1.55- 4.38
Black	1.59	0.08	0.94 - 2.69
Hispanic	0.56	0.03	0.34 - 0.94
Female	0.97	0.81	0.755- 1.24

Uninsured patients identified as Hispanic noted to have 0.56 lower odds (56%) of increased mortality following burn injuries versus the reference group, Caucasian males. Black/African American males, although with increased odds, with insignificant p value (0.08).

Private Insurance

n = 26,559

Category	Odds Ratio	p >|z|	95% Confidence Interval
Age	1.05	0.01	1.04 - 1.06
TBSA	1.06	0.00	1.05 - 1.07
Inhalation	3.94	0.00	2.64 - 5.88
Black	1.42	0.05	1.01 -2.02
Hispanic	1.01	0.46	1.00 - 2.02
Female	1.40	0.01	1.09 - 1.80

In patients with private insurance, Black/African American males noted to have 1.42 greater odds of increased mortality following burn injuries versus the reference group. Women also shown to have increased odds of mortality (1.4) following burn injuries in comparison to Caucasian males.

Conclusions

- African American/Black males noted to have elevated odds of mortality in all insurance groups, however statistically insignificant in the Uninsured group.
- Protective or non- significant outcomes noted for Hispanics with various insurance statuses.
- Female burn mortality outcomes odds varied dependent on insurance status.
- TBSA, Age, and Inhalation status remain significant factors in burn mortality odds determination.

Limitations

- NBR discrepancies
  - Non-uniform reporting of patient data
    - Different variables representation for hospitals
    - Single patients represented multiple times in the data
    - All information de-identified
    - Recently, TRAC system implemented to standardize coding information from all hospitals participating in the NBR
      - Awaiting 2016/2017 documentation

Evaluation of Racial Determinants of Mortality in Burn Patients Using HCUP National Inpatient Sample

Introduction

Multiple studies have shown race as a determinant of inpatient mortality, when accounting for age, burn surface area, inhalation injury, and insurance. However, several studies have shown minimal if any connection between race and mortality in patient groups with similar status, such as military officials with Tricare insurance. Previous research conducted using National Burn Repository (NBR) data showed increased mortality odds for Blacks when controlling for insurance status. We sought to see if in a snapshot of a region's population presented by NIS data, race was still a strong determinant of mortality when controlling for other confounders.

OBJECTIVES

- To determine if the same odds of inpatient mortality were found using the NIS database as seen in the NBR database when accounting for race, sex, and prevalence of inhalation injury.
- To determine if race is the prevalent factor explaining a greater odds of mortality in burn patients, seen both at facilities designated part of the National Burn registry and non-NBR participatory facilities

METHODS AND DATA

- Retrospective Cohort Study
- Used the HCUP National Inpatient Sample (NIS), 2002-2015
- Patients with any ICD-9-CM diagnosis code in the range 940.x – 946.x or 949.x, or 692.71, 692.76, or 692.77
- No interventions were performed
- Main outcome was inpatient mortality
- Stata-13 used to perform multivariate logistical regression based on race, age, BSA, Inhalation, Residence in a Low-Income ZIP code, Lack of private insurance, and admission to a large and/or teaching hospital.

RESULTS

After extraction of data from NIS Core and Hospital files, combination of multiple years, calculation of comorbidity scores, and multiple imputation of missing values for burned body surface area (BSA), we identified 136,345 cases (excluding transfers out), corresponding to a weighted population of 672,293 for the 14 years. Raw mortality varied by reported racial categories:

Raw Mortality Percentages

Race	Sample Size (n)	Mortality
White	68,292	2.65%
Black	18,360	2.66%
Hispanic	14,092	1.70%
Asian	2,323	2.32%
Unknown	32,374	2.97%

Weighted survey logistic regression demonstrated that mortality was significantly increased by age, burn surface area (BSA), inhalation, residence in a low-income ZIP code, lack of private insurance, and admission to a large and/or teaching hospital. After controlling for these factors, racial categories were still associated with somewhat different odds of mortality when compared to "White":

Race	OR	95% Confidence Interval
Black	1.16	0.99-1.34
Hispanic	0.87	0.72-1.05
Asian	1.01	0.73-1.40
Unknown	1.21	1.05-1.36

Conclusions

Compared to previous National Burn Repository studies showing an increase in adjusted mortality for black patients of 37% or more, the effect of race on mortality in the NIS is at least partially explained by economic factors and possibly by differences in data quality and completeness.

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