

Racial Disparity in Mortality After Injury

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Background

- There are well-documented, persistent racial disparities in life expectancy in the United States
 - Williams and Collins. *Annual Review of Sociology* 1995; 21:349-386.
 - Howard et al. *Annals of Epidemiology* 2000; 10(4):214-223.
- Attributed to a variety of factors
 - Differential exposure to health risks
 - Differential access to healthcare services

Injury

- Recent research has suggested that injury is the third leading contributor to racial disparities in life expectancy
 - Wong et al. *New England Journal of Medicine* 2002; 347(20): 1585-1592
- Could result from differential exposure to injury or
- Differences in quality of care received after injury

Limited previous research

- Two studies of care in emergency departments for minor head injuries found
 - African American patients more likely to receive care from a resident than staff physician
 - Less likely to be admitted to the hospital
 - Less likely to be referred for followup care
- Bazarian et al. *Academic Emergency Medicine* 2003; 10(11):1209-1217.
- Selassie et al. *American Journal of Emergency Medicine* 2004; 22(6):465-473.

My research

- Examines outcomes of hospitalized injured patients as an indicator of quality of care
 - Outcome=in-hospital mortality

Conceptually

- Donabedian's model of healthcare quality suggests three aspects
 - Structure
 - Availability and characteristics of healthcare facilities, providers and resources
 - Process
 - Delivery and timing of diagnostic and therapeutic interventions
 - Outcome
 - Illness, impairment, death

Data Source

- Healthcare Cost and Utilization Project
Nationwide Inpatient Sample
 - 20% stratified random sample of community hospitals in the United States, selected from 36 states
 - Released annually, used data from 1998-2002
 - Standard administrative data

Patient sample

- Primary diagnosis of injury
- Age 18-64
- Excluding patients transferred to another hospital (2.5% of admissions)

Measurement: race

- Reported by hospitals as recorded at hospital arrival or admission
 - Accuracy, when compared to self-report, is highest for African-American patients
 - Hispanic ethnicity is inconsistently coded
 - Native American ancestry is known to be unreliably coded
 - 11 participating states do not report race (excluded)

Measurement: injury severity

- Use ICD-9-CM codes to calculate an ICSS score
- Each injury diagnosis is assigned a survival probability
- ICSS of 10= minor injury with virtual certainty of survival
- ICSS of 0=extremely severe injury with no chance of survival

Measurement: comorbidity

- Also using ICD-9-CM codes
- Identify 5 conditions known to affect trauma outcomes
 - Chronic obstructive pulmonary disease
 - Congenital coagulopathy
 - Diabetes
 - Liver disease
 - Coronary heart disease

Measurement: mechanism of injury

- Indicated by ICD-9 E-codes
 - Categorized to indicate
 - Motor vehicle crashes
 - Falls
 - Intentional injuries
 - Other mechanisms
 - Unspecified

Measurement: Income

- Ecological measure: median income of zip code of residence

Other variables

- Gender
- Age
- Primary payer (insurance status)
- Hospital type
- In-hospital mortality

Table 1: Demographic and hospital characteristics of patients

	White	Black	Hispanic	Asian	Native American	Other	Missing
N	328696	74336	59448	7903	2689	15953	33485
Mean age	41±13	37±12	35±12	39±14	36±12	36±13	39±13
% female	36.2%	28.5%	23.6%	37.1%	32.0%	25.8%	32.2%
Payer							
Private insurance	57.1%	33.1%	29.8%	53.3%	33.7%	40.4%	58.0%
Medicare	6.6%	6.0%	3.1%	2.6%	4.4%	2.8%	4.2%
Medicaid	8.7%	20.7%	16.5%	11.5%	27.1%	11.4%	10.1%
Selfpay	12.9%	25.0%	27.1%	17.6%	15.5%	26.8%	14.4%
No charge	0.8%	1.9%	1.5%	0.5%	0.2%	1.2%	0.2%
Other	13.9%	13.4%	22.1%	14.5%	19.2%	17.5%	13.1%
Zip income							
<=\$25000	3.9%	21.2%	13.8%	3.4%	27.6%	8.2%	6.3%
\$25000-\$34999	26.3%	32.9%	27.3%	12.2%	32.9%	23.6%	24.3%
\$35000-\$44999	28.3%	23.3%	26.1%	22.6%	17.9%	26.7%	26.8%
>=\$45000	37.5%	18.9%	27.8%	57.9%	15.9%	36.9%	38.0%
Missing	4.1%	3.7%	5.1%	3.8%	5.7%	4.6%	4.5%
Hospital type							
Urban teaching	48.2%	71.7%	59.8%	60.1%	58.9%	63.2%	71.6%
Urban nonteaching	37.5%	22.6%	36.2%	32.0%	19.8%	30.3%	18.1%
Rural	14.3%	5.8%	4.0%	7.9%	21.4%	6.5%	10.2%

Table 2: Injury, health and mortality of patients

	White	Black	Hispanic	Asian	Native American	Other	Missing
N	328696	74336	59448	7903	2689	15953	33485
ICISS*10	9.4±1.1	9.3±1.2	9.4±1.1	9.4±1.1	9.3±1.2	9.3±1.2	9.3±1.3
Index injury (selected high risk injuries)	24.5%	26.4%	25.5%	26.7%	25.5%	26.2%	30.3%
Morris comorbidity	13.9%	12.1%	9.2%	8.9%	14.5%	9.0%	11.1%
COPD	6.0%	4.4%	2.3%	2.1%	3.0%	2.8%	4.3%
Coagulopathy	1.0%	0.9%	0.9%	0.9%	1.1%	0.8%	1.1%
Diabetes	6.0%	6.3%	5.6%	5.4%	9.2%	5.0%	4.7%
Liver disease	0.8%	0.5%	0.8%	0.4%	1.6%	0.5%	0.6%
Coronary heart disease	2.7%	1.5%	1.1%	1.4%	2.2%	1.3%	1.9%
Mechanism							
Motor vehicle crash	32.6%	25.1%	29.5%	37.3%	33.9%	32.3%	36.4%
Fall from height	12.9%	6.9%	10.3%	9.7%	9.6%	10.1%	12.2%
Low fall	17.3%	10.4%	10.5%	14.9%	11.8%	11.6%	15.0%
Intentional injury	6.4%	26.9%	16.4%	10.7%	19.6%	16.2%	10.1%
Other unintentional inj	15.6%	14.4%	18.0%	16.2%	13.5%	15.8%	16.6%
Other mechanism	4.0%	4.1%	2.9%	3.2%	5.3%	3.4%	4.1%
Unspecified	11.4%	12.2%	12.5%	8.1%	6.4%	10.8%	5.7%
Died in hospital	1.5%	2.1%	1.7%	2.0%	1.8%	2.0%	2.5%

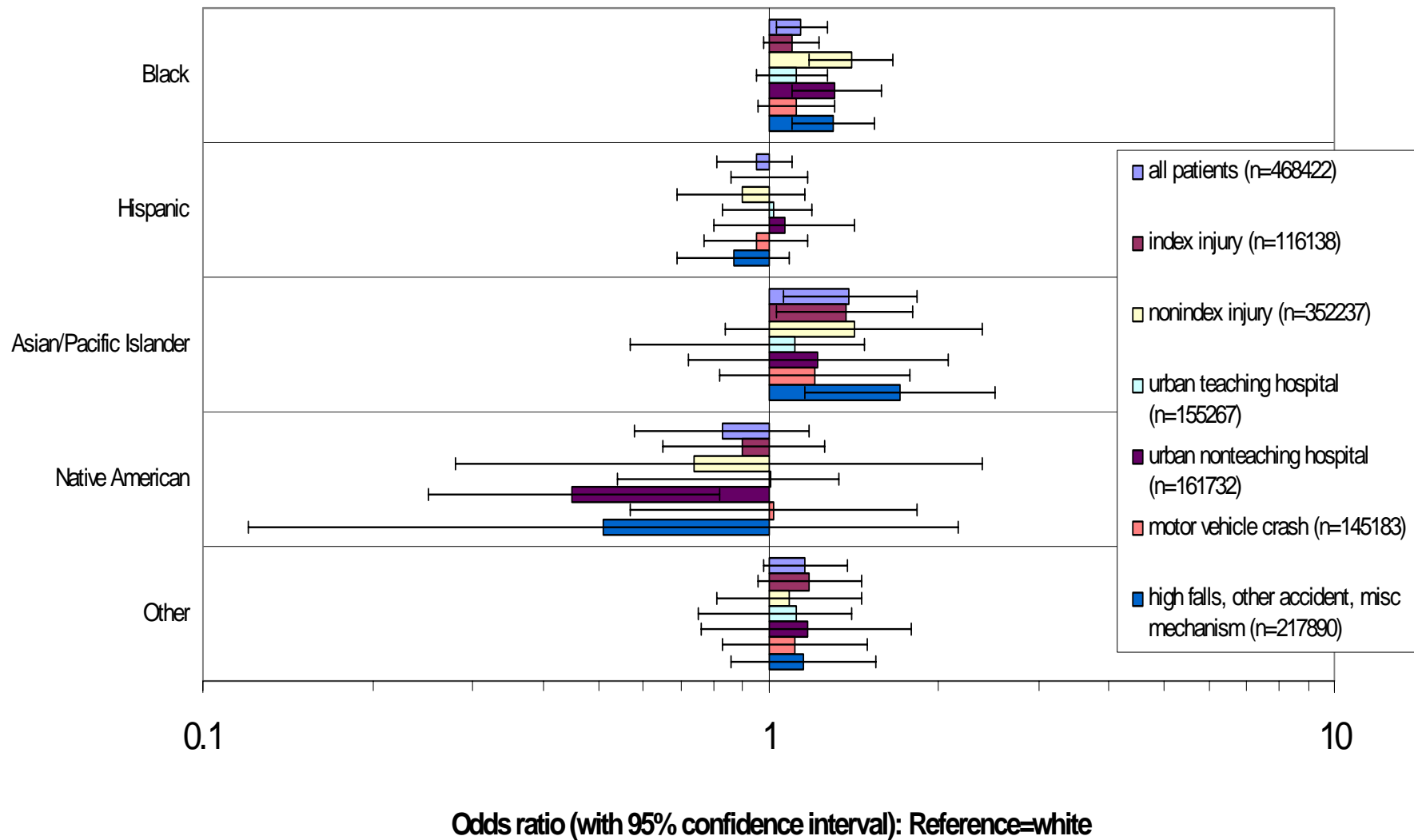
Multivariate models

- Use generalized estimating equations to control for clustering of patients within hospitals
- Output comparable to logistic regression
- Coefficients expressed as odds ratios:
 - >1=increased odds of death
 - <1=decreased odds of death

Multivariate models (see handout)

Variable	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Race			
White	Reference	Reference	Reference
Black	1.37 (1.23-1.52)***	1.21 (1.09-1.34)***	1.14 (1.03-1.27)*
Hispanic	1.11 (0.96-1.29)	0.97 (0.83-1.13)	0.95 (0.81-1.10)
Asian/Pacific Islander	1.35 (1.12-1.64)**	1.33 (1.01-1.75)*	1.39 (1.06-1.83)*
Native American	1.21 (0.86-1.72)	0.92 (0.67-1.28)	0.83 (0.58-1.18)
Other race	1.32 (1.09-1.60)**	1.18 (0.99-1.40)	1.16 (0.98-1.38)
Other variables	RACE ONLY	All other covariates except income	All covariates
N	489025	488971	468422

Figure 1: Stratified multivariate models of injury mortality*



Conclusions

- Suggests increased risk of mortality for African American and Asian patients compared to whites
- Among African American patients, the increased risk of death is most apparent for mild to moderate injuries and those treated outside of trauma centers
- Among Asian patients, the increased risk is concentrated among more severe injuries

Limitations

- Lack of physiologic data limits ability to assess injury severity
- Inadequate measures of socioeconomic status
- In-hospital mortality is a gross measure of outcome

Implications

- These data do not definitively demonstrate racial disparities in quality of care
- They suggest that further research should be undertaken to delineate the cause of racial disparities in mortality
 - Differences in availability of resources
 - Differences in processes of care
 - Differential patterns of injury

Arthur Handout: Multivariate models of mortality

Variable	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Race			
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Native American	1.21 (0.86-1.72)	0.92 (0.67-1.28)	0.83 (0.58-1.18)
Other race	1.32 (1.09-1.60)**	1.18 (0.99-1.40)	1.16 (0.98-1.38)
Age		1.02 (1.02-1.03)***	1.02 (1.02-1.03)***
Female		0.78 (0.73-0.83)***	0.78 (0.73-0.83)***
ICISS10		0.42 (0.41-0.43)***	0.42 (0.41-0.43)***
Hospital type			
Urban teaching		Reference	Reference
Urban non-teaching		0.73 (0.37-0.82)***	0.75 (0.66-0.84)***
Rural		0.39 (0.33-0.48)***	0.39 (0.32-0.48)***
Morris comorbidity		2.45 (2.25-2.67)***	2.46 (2.26-2.69)***
Payer			
Private insurance		Reference	Reference
Medicare		1.99 (1.74-2.27)***	1.96 (1.71-2.24)***
Medicaid		1.18 (1.03-1.35)*	1.14 (1.01-1.29)*
Selfpay		1.75 (1.54-1.98)***	1.71 (1.50-1.96)***
No charge		0.89 (0.49-1.61)	0.87 (0.51-1.46)
Other		No estimate	1.16 (0.98-1.38)
Zip income			
<=\$25000			1.32 (1.14-1.53)***
\$25000-\$34999			1.16 (1.06-1.28)**
\$35000-\$44999			1.15 (1.05-1.26)**
>=\$45000			Reference
N	489025	488971	468422

* p<.05

**p<.01

***p<.001