Department of Surgery

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Abstract

A number of studies have linked disparities between patient care and outcomes to socioeconomic status (SES), as well as insurance status and other social factors in a variety of diseases. There have been few plausible explanations for this phenomenon. Recently, there has been information gathered about poor outcomes in trauma patients with these factors. The purpose of our study was to identify outcome differences between patients with and without insurance, specifically breaking down insurance types, and using geocoding technology along with census data to identify these differences. With this data, we hoped to identify tangible reasons for poorer outcomes in the uninsured.

Factors studied included SES, sex, age, race, location of trauma, location of home address, time from injury to arrival at trauma center, mechanism of injury, ISS, GCS, pre-existing medical conditions, LOS, ICULOS, mortality, and discharge. Although differences may exist, socioeconomic and insurance status do not independently affect outcomes in patients with traumatic injuries. Our primary outcome measurement was identification of outcome differences between patients with and without insurance, and our secondary outcome measurement was to identify outcome differences related to socioeconomic status.

Introduction

- There have been numerous studies published discussing the relationships between clinical outcomes and ecological social factors such as race, ethnicity, socioeconomic status (SES), and insurance status.
- Despite the growing base of research indicating that differences in outcomes exist, there have been few plausible explanations for this phenomenon.

Purpose/Hypothesis

- Identify if social determinants of health influenced outcomes in trauma patients at our institution.
- We hypothesized that by using US Census data and geocoding, we would identify specific ecological social factors that contributed to outcomes in patients following traumatic injuries.

Methodology

- Retrospective review of our trauma registry from 1 Jan. 2000 – 1 Jan. 2010
- Utilized individual outcomes from trauma cases and environmental data to test the primary outcome
- Patients' home addresses were taken from our trauma registry and were spatially merged with US Census data using Arc GIS 10.0 software with a 96% match.
- Environmental variables were defined as dimensions of social determinants of health, which included the following US Census variables:
  - % population at poverty
  - % population Hispanic, Black, or White
  - % population with < high school education (US Census 2000 definition: > 25 years old without HS degree)
  - % population in labor force that is unemployed (US Census 2000 definition: > 16 years old, in labor force, unemployed)
- ANOVA was used for comparison of continuous variables
- A logistic regression was used to test insurance status (primary independent variable), vs mortality, while adjusting for potential confounding variables.
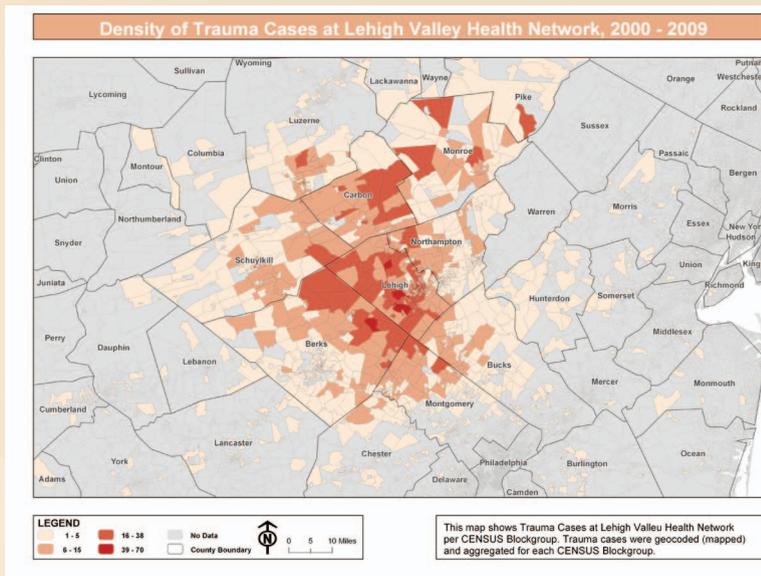

Density of Trauma Cases at Lehigh Valley Health Network, 2000 - 2009

LEGEND
1 - 5 | 16 - 38 | No Data
6 - 10 | 39 - 79 | County Boundary

This map shows Trauma Cases at Lehigh Valley Health Network per CENSUS Blockgroup. Trauma cases were geocoded (mapped) and aggregated for each CENSUS Blockgroup.

Figure 1

Exclusion Criteria

- Patients not admitted to ICU
- ISS < 10
- Major data endpoint missing (n=24)

Table 1: Patient Demographics

Variable	Mean/Median	SD	Range (min – max)
n = 8812			
GCS	12.28	4.95	
Age	53.64	23.451	
Length of Stay	7.73	10.424	
ICU Length of Stay	3.18	7.54	
Days on Ventilator	2.17	6.384	
ISS	17.00		10 – 75
% population at poverty	5.3109		0 – 77.84
% population Hispanic	1.5966		0 – 92
% population Black	0.6602		0 – 100
% population White	95.9843		0 – 100
% population with less than high school education	17.7905		0 – 80.25
% labor force unemployed	3.5330		0 – 49.60
Total comorbidities w/EtOH abuse	1.0000		0 – 9
Total comorbidities w/out EtOH abuse	0.0000		0 – 9
n (%)			
Female	3341 (37.9)		
Uninsured (self-pay)	687 (7.8)		
Medicaid	735 (8.3)		
Medicare	2368 (26.9)		
Private Insurance	4998 (56.7)		
Mortality = yes	768 (8.7)		
Mortality = no	8044 (91.3)		
> 2 major comorbidities	2394 (27.2)		
1 major comorbidity	1862 (21.1)		
Alcohol abuse	602 (6.8)		
Drug abuse	252 (2.9)		

Table 2: Analysis of Variables vs. Reference Group (mortality = yes)

Variable	P value	Odds Ratio
ISS	<0.001	1.113
Age	<0.001	1.024
Percent Poverty	0.014	1.011
> 2 major comorbidities	0.424	0.908
1 major comorbidity	0.001	0.662
No major comorbidities	Reference group	
Uninsured	<0.001	5.093
Medicaid	0.128	1.324
Medicare	<0.001	1.597
Private Insurance	Reference group	
Alcohol Abuse = YES	0.528	0.884
Alcohol Abuse = NO	Reference group	
Drug Abuse = YES	0.024	0.375
Drug Abuse = NO	Reference group	

Table 3: Analysis of Variables vs. Reference Group Minus Medicare (mortality = yes)

Mortality		P Value	Odds Ratio
	ISS	<0.001	1.109
	Age	<0.001	1.025
	Percent Poverty	0.032	1.011
	> 2 major comorbidities	0.256	0.825
	1 major comorbidity	0.006	0.658
	No major comorbidities	Reference Group	
Yes	Uninsured	<0.001	4.939
	Medicaid	0.113	1.341
	Private Insurance	Reference Group	
	Alcohol Abuse = YES	0.193	0.742
	Alcohol Abuse = NO	Reference Group	
	Drug Abuse = YES	0.022	0.341
	Drug Abuse = NO	Reference Group	

Table 4: Controlling for SES – Excluding Medicare and Private Insurance (mortality = yes)

Mortality		P value	Odds Ratio
	ISS	<0.001	1.114
	Age	0.255	1.007
	Percent Poverty	0.023	1.016
	>2 major comorbidities	0.520	1.261
	1 major comorbidity	0.130	0.639
	No major comorbidities	Reference Group	
Yes	Uninsured	<0.001	4.268
	Medicaid	Reference Group	
	Alcohol Abuse = YES	0.621	0.839
	Alcohol Abuse = NO	Reference Group	
	Drug Abuse = YES	0.230	0.513
	Drug Abuse = NO	Reference Group	

Discussion

It appears that socioeconomic status does not independently influence outcomes. When controlled for socioeconomic status, our data shows that individuals who are uninsured have poorer outcomes than insured individuals, regardless of their socioeconomic status. If you consider the data in table 2, it is clear that uninsured (represented by self pay) are 6 times more likely to have a mortality following trauma than patients of low SES but insured (represented by medicaid), and patients with private insurance. Medicaid carriers versus private insurance carriers did not significantly differ in outcomes. However, since ISS is controlled for, there is no data to support that uninsured patients are more severely injured than insured. While some may propose that this is due to a disparity in care, that argument is difficult to make with trauma patients specifically, as caregivers are almost never aware of the patient's insurance status when they present, and, at least in our network, physicians are rarely aware of a patient's insurance status. As one would expect, having greater than 2 comorbidities increases the chance of mortality following trauma by 2.5 times. It is clear that more research needs to be done to extract reasons why the uninsured patient population fares worse post-trauma than the insured.

Study Limitations

- Homogeneity of our study population and the fact that no obvious socioeconomic variable was identified linking why uninsured patients have higher mortality rate.
- We failed to identify any linking factors explaining why people without insurance have a higher mortality rate.

Conclusion

- In our single-institution study, insurance status is the most important predictor of mortality, conferring a 4-5 times higher risk of death for those who do not have insurance compared to those who do have insurance, regardless of socioeconomic status.
- Reasons for insurance status being such a large contributor to outcomes are unclear.
- Differences in outcomes do exist between those who are insured and uninsured. Being uninsured independently increases one's risk at least 4-fold for mortality following trauma for patients with ISS greater than 10.