



# Comparing Social Determinants of Health after Trauma in Rural and Urban Settings in Pennsylvania

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## Background

- The impact of social determinants of health (SDOH) on outcomes is an important facet of healthcare.
- The effects of SDOH is understudied in traumatic injury.
- Prior work has focused on socioeconomic factors in urban violence settings
- It is unclear how SDOH impact outcomes of injuries across urban and rural areas.

## Hypothesis

We hypothesized that SDOH factors would be associated with differences in mortality between urban and rural communities and would improve mortality prediction at the patient level.

## Methods

- Variables from the Agency for Healthcare Research and Quality's Social Determinants of Health Dataset were merged at the zip code level to patient level data in the 2000-2017 Pennsylvania Trauma Outcomes Study (PTOS).
- Logistic regression was applied to determine if SDOH were significant risk or protective factors for mortality after injury.
- SDOH variables were then added to a PTOS base mortality model and compared using Bayesian information criterion (BIC; lower is better fit) and area under the curve (AUC; higher is better discrimination) to determine change in model fit and discrimination.
- These analyses were performed separately in rural, suburban, and urban patients based on the USDA Rural-Urban Commuting Area codes (urban 1-3, suburban 4-6, rural 7-10).

## Results

- We included 266,580 urban, 27,234 suburban, and 14,761 rural patients.
- 89 SDOH variables demonstrated significant association with increased or decreased risk of mortality.
- There were 28 (31%) risk factors unique to urban settings, 7 (8%) risk factors unique to rural settings, and only 1 (1%) risk factor unique to suburban setting.
- Unique urban risk factors included poverty, income, and public assistance programs and insurance while unique rural risk factors included low education, crowded living conditions, and no health insurance.
- The sole unique suburban risk factor was proportion of population in mobile homes (aOR 1.01; 95%CI 1.01-1.02 per %, p=0.04) which also which also improved model fit (BIC 50167 vs 42418) and slightly improved discrimination (AUC 0.936 vs 937). (Table 3)

Table 1. Examples of Urban Risk and Protective factors by category

	Risk	Protective
Living conditions	Percentage of households w/ out PC	Median home value
Income	% using food stamps	Per capita income
Insurance	% on public health insurance	% on private health insurance
Demographics	% Black	% Caucasian

Table 2. Examples of Rural Risk and Protective factors by category

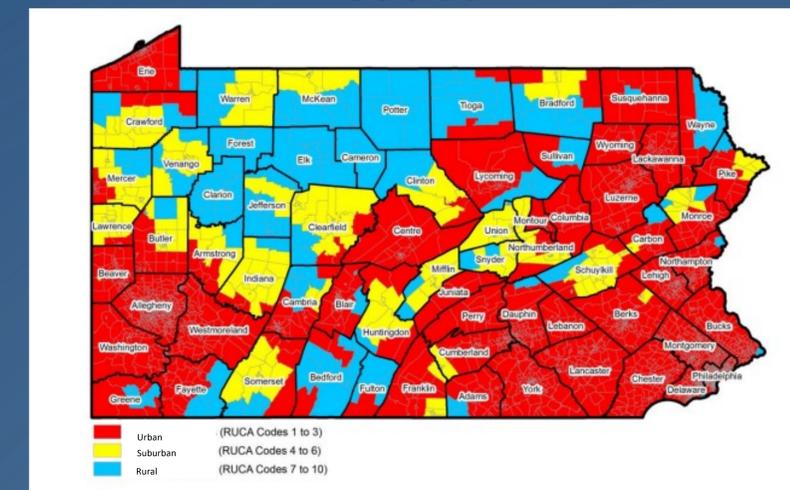
	Risk	Protective
Education	% < high school diploma	
Housing	% > 1 occupant per household room	
Insurance	% uninsured	% private insurance

Table 3. Examples of Suburban Risk and Protective factors by category

	Risk	Protective
Living Conditions	% Living in mobile home	-
Transportation	% taking taxi to work	% taking public transportation to work

- The strongest urban risk factor was public health insurance (aOR 1.18; 95%CI 1.10-1.27 per %, p<0.01) which also improved model fit (BIC 49943 vs 42407) and discrimination (AUC 0.935 vs 937). (Table 1)
- The strongest rural risk factor was more than 1 occupant per household room (aOR 1.10; 95%CI 1.03-1.13 per %, p<0.01) which also improved model fit (BIC 49925 vs 42419) and discrimination (AUC 0.935 vs 937). (Table 2)

## Pennsylvania map of RUCA codes



Source: Rural Pennsylvania: Where Is It Anyway? A Compendium of the Definitions of Rural and Rationale for Their Use

## Conclusions

We identified differing SDOH that were associated with mortality after injury among rural, suburban, and urban patients. These are key novel findings, as future work to address SDOH among injured patients will need to take a tailored approach based on the geography the patient comes from.