Understanding the Role of Faster Emergency Medical Service Response in Survival Time of Pedestrians in Fatal Crashes

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Introduction

Are all Pedestrian fatal crashes the same in terms of severity?

- Fatality of vulnerable road users has been rising
- Pedestrians have been recognized as the most at-risk road users
- Instant death is substantially more severe than death caused by a crash several days afterward

In this research:

- Instead of homogenizing all fatal pedestrian crashes as the same
- Considering pedestrians time-to-death as a timeline
- Ranging from instant death to death within 30 days of the crash
- Data: Fatality Analysis Reporting System dataset (FARS) from 2015-2018
- Spaciotemporal association of EMS response time with pedestrian survival time

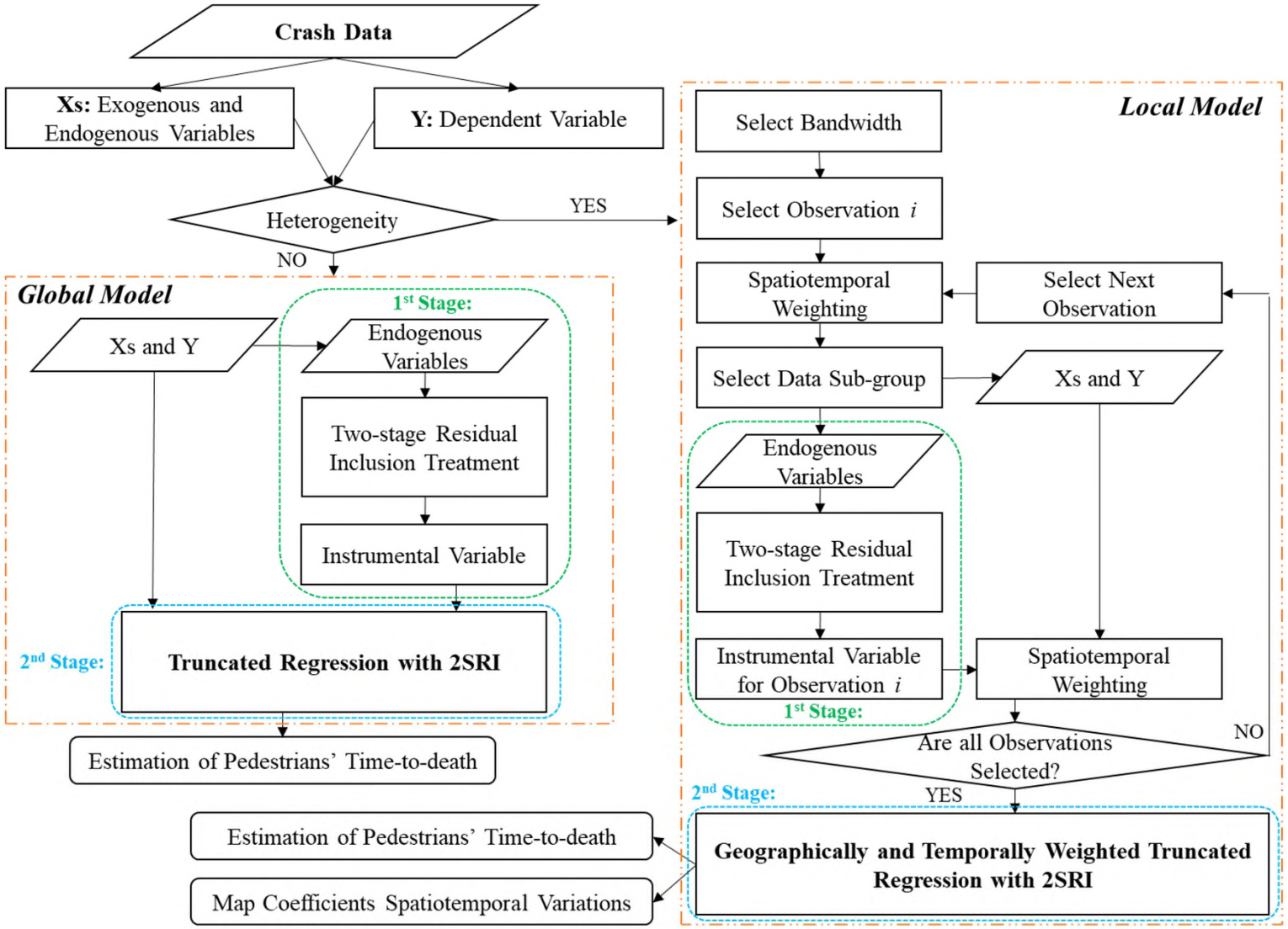
Crash Time

Arrival time of EMS personnel

- EMS response time is defined as the difference between crash time and the arrival time of EMS personnel

Framework

In depth analysis of factors affecting pedestrians time-to-death involved in fatal-injury crashes using a sophisticated methodology.

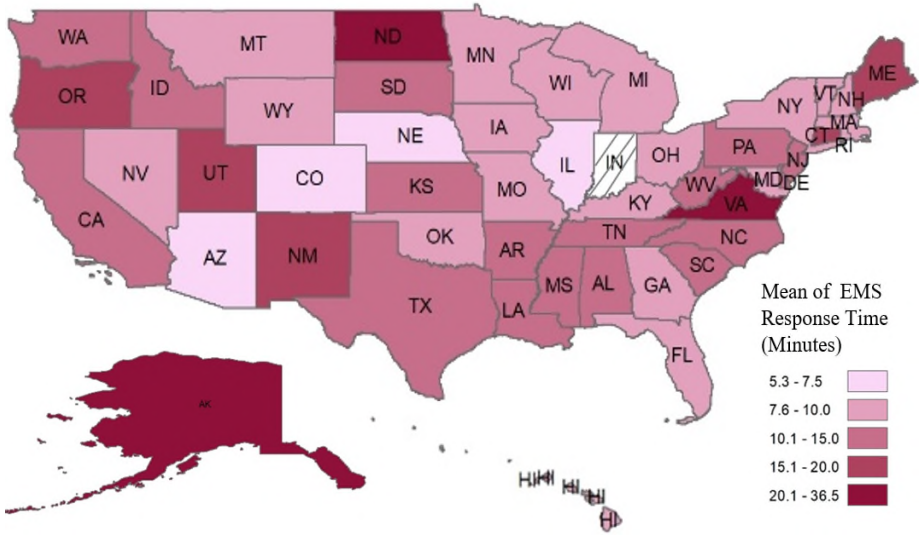


Findings

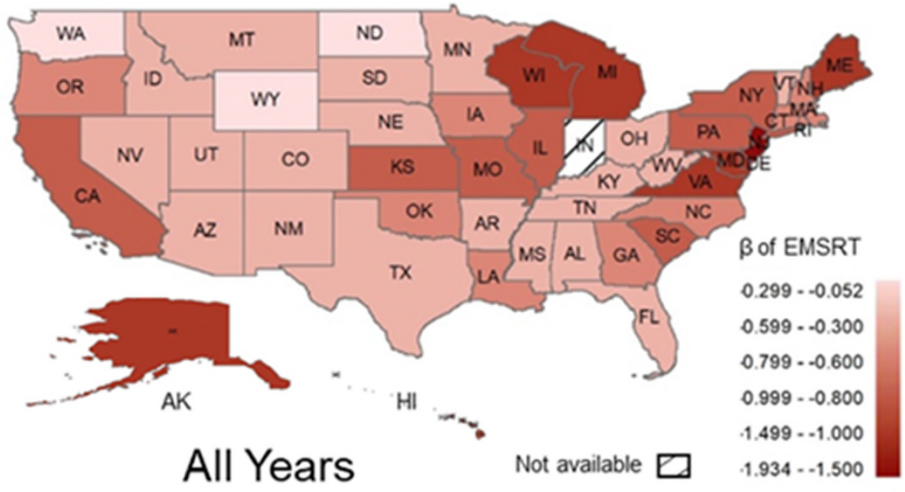
Y: Pedestrian survival time involved in a fatal crash

Variables (N = 4983)	β	Meanβ	P-value	Exp(β)
Constant	9.400	8.605	0.000	12088.38
Logarithm of EMS	**-0.858**	**-0.711**	0.013	0.424
Residual	1.151	0.962	0.001	3.161
Pedestrian Characteristics				
Age (base: <30)				
30-60	-0.404	-0.204	0.000	0.668
>60	-0.287	-0.224	0.022	0.751
Gender (base: Male) Female	-0.390	-0.320	0.000	0.677
Intoxication (base: No)				
Yes	-0.391	-0.272	0.002	0.676
Unknown	-0.111	-0.256	0.266	0.895
Behavior (base: Crossing, vehicle turning)				
Working or playing in roadway	-1.633	-0.909	0.000	0.195
Walking/running along roadway	-1.322	-0.976	0.000	0.267
Dash/dart-out	-0.992	-0.743	0.000	0.371
Crossing, vehicle not turning	-1.319	-1.045	0.000	0.267
Crossing expressway	-1.329	-1.218	0.000	0.265
Waiting to cross	-1.694	-1.278	0.000	0.184
Others	-1.395	-0.124	0.000	0.248
Roadway Characteristics				
Speed limit (base: <=30 mph)				
35-40	-0.420	-0.451	0.001	0.657
>=45	-1.115	-1.299	0.000	0.328
Crash Locations (base: At intersections)				
Not at intersections	-0.215	-0.270	0.038	0.807
Unknown	-0.414	-0.201	0.560	0.661
Functional Classification (base: Local and collector)				
Interstate	-0.592	-0.382	0.018	0.553
Arterial	-0.441	-0.224	0.688	0.643
Driver Characteristics				
Hit and Run (base: No) Yes	-0.417	-0.270	0.000	0.659
Driver Intoxication (base No) Yes	-0.342	-0.290	0.048	0.710
Environmental Characteristics				
Visibility (base: Good) Poor	-0.346	-0.349	0.004	0.708
Crash Time (base: off-peak midday) Other	-0.265	-0.326	0.021	0.767
Sigma	2.631	4.108	0.000	13.888
Log-Likelihood	-10991.36	-10939.4		
AIC	22034.73	21928.8		
R-squared	0.067	0.114		
Adjusted R-squared	0.063	0.110		
Pseudo R-squared	0.035	0.040		

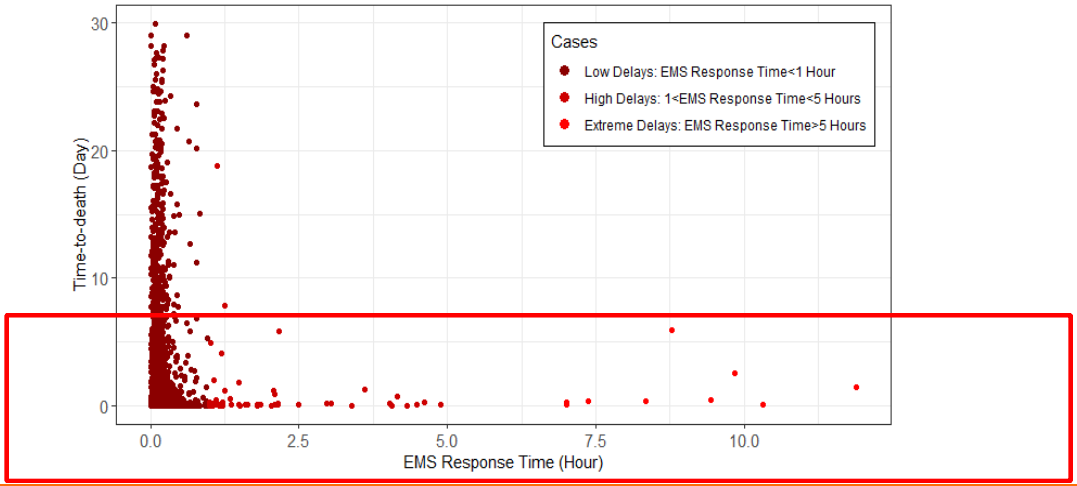
Findings



Mean of EMS Response Time in each state



Spatiotemporal variation of the coefficient of EMS response time



Scatterplot of pedestrian time-to-death vs. EMS response time

Conclusion

- **EMS response time**, **speeding**, and **pedestrian crossing behaviors** are the most important factors affecting pedestrian survival time in fatal crashes
- A delay in EMS response time significantly decreases pedestrian survival time in fatal injury crashes
- **Crossing expressways, waiting to cross along roadways, and working or playing in roadways** are relatively more detrimental and lethal pedestrian behaviors

- Associations of variables with pedestrian survival time substantially vary across space and over time, due to the unobserved heterogeneity
- The findings of this study can provide **traffic safety practitioners** with key factors that have the potential to save pedestrian lives, specifically through **faster pedestrian crash detection and emergency response**. Importantly, results from the proposed model deliver valuable information about **which areas and at what time interventions** that may be needed regarding the role of EMS response time or other studied factors.

Thank you!

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