

Statistical Analysis of Risk Factors Affecting Severe Crashes Likelihood in Proximity to Hospitals in Alabama

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Overview

- Several studies have been conducted in safety to define the risk factors contributing to crash severity to reduce severe injuries and fatalities.
- Understanding the relationship between the distance from severe crash locations to hospitals is crucial.
- In this study, the response variable (crash severity) was categorized into three levels based on the distance to hospitals: non-severe, severe within 8 minutes to the nearest hospital, and severe with more than 8 minutes to the nearest hospital.
- Two different logit models developed and compared.
- The models are the multinomial logit (ML) and the Hierarchical multinomial logit (HML).
- The Kernel density method has been implemented for severe crash locations with low accessibility to hospitals to propose hospitals in their vicinity.

Model Results

Parameter	Phase 1				Phase 2			
	Esti mate	SE	P-value	OR	Esti mate	SE	P-value	OR
Intercept	-2.27	0.20	0.00	0.10	1.15 1	0.410	0.005	3.161
Weather condition (Ref: clear)								
cloudy	0.12	0.04	0.00	1.12	---	---	---	---
Snow, Fog, sever wind, sleet	-0.22	0.12	0.07	0.79	---	---	---	---
Day of week (Ref: week day)								
Weekend	0.30	0.04	0.00	1.35	0.23	0.09	0.00	1.26
Light condition (Ref: daylight)								
Dark	0.20	0.07	0.00	1.23	---	---	---	---
Traffic volume	-0.06	0.01	0.00	0.93	-0.31	0.04	0.00	0.73
Peak hour (Ref: morning off peak (10 am to 4 pm))								
Evening peak	-0.11	0.05	0.04	0.89	---	---	---	---
Evening off peak	0.49	0.08	0.00	1.63	0.21	0.09	0.02	1.24
Driver age (Ref: Young)								
Middle-aged	0.09	0.05	0.09	1.10	---	---	---	---
Elderly	0.17	0.08	0.03	1.19	---	---	---	---

Data Collection

- 28,282 vehicle crashes between 2010 and 2014.
- Seven hospitals located in Madison County.

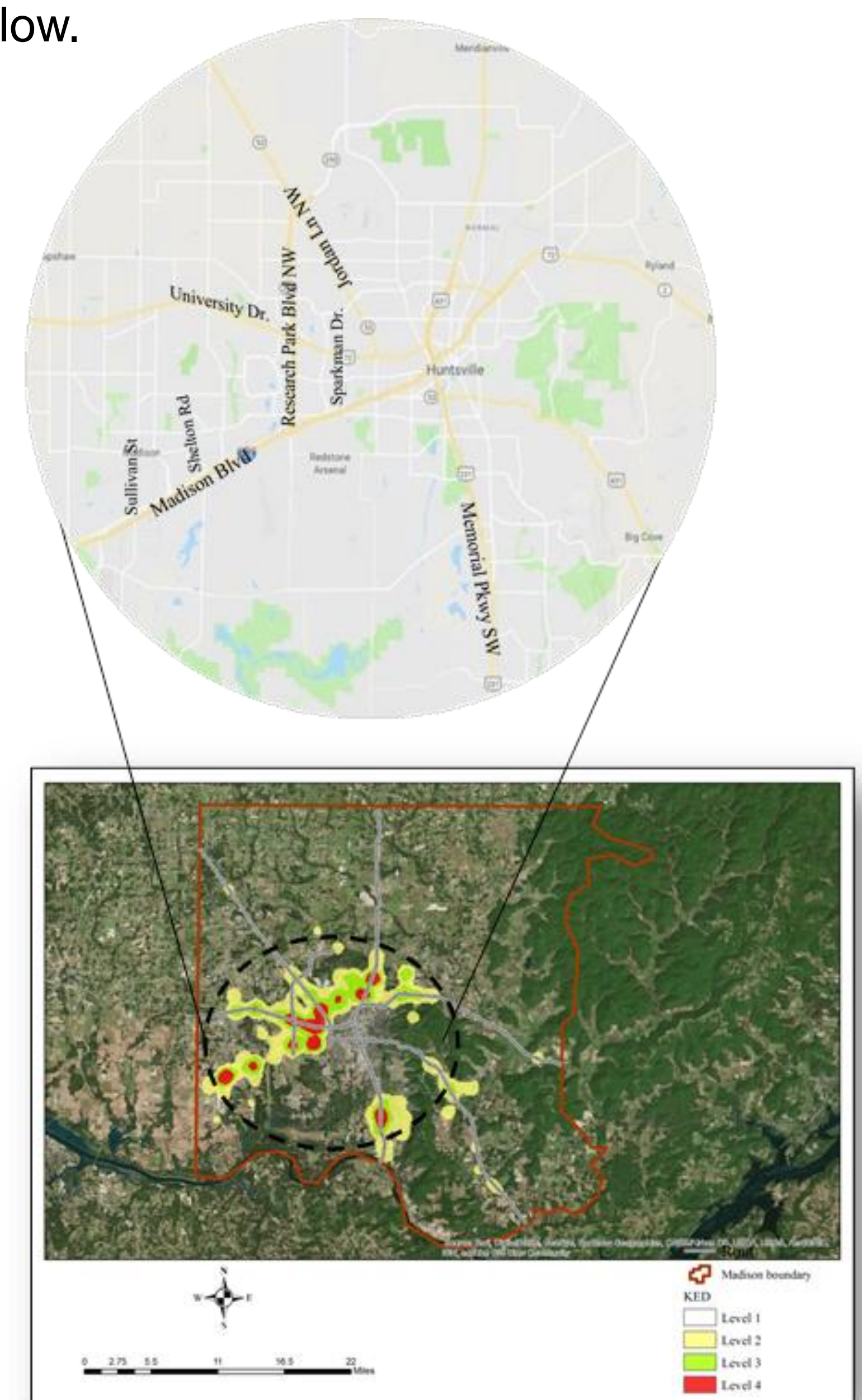
HML Model Fitting

The HML models included two phases:

- Phase 1: The base scenario was non-severe crashes " π_{i1} " compared to both severe crashes " $\pi_{i2} + \pi_{i3}$ ".
- Phase 2: Severe crashes with more accessibility to hospitals as base scenario, compared to severe crashes far from emergency services " π_{i2} ".

Conclusions/Applications

- The comparison of the two models has shown that the HML with lower Akaike Information Criterion "AIC" (22358.25) is a better model than the traditional ML.
- Roads with high risk of severe crashes and low accessibility to hospitals were identified, as shown below.



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