

IDENTIFICATION AND ASSESSMENT OF THE RISKS INVOLVED IN OPERATIONS AND MAINTENANCE ACTIVITIES ON HIGHWAYS

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PURPOSE OF THE STUDY

There were over 55,000 crashes between 2001 and 2010 in Iowa involving intermittent work zones or work on the shoulders and medians, Figure 1. The purpose of this study is to identify and assess the risks involved in mobile operations and maintenance activities on highways using an Integrated Risk Management Model that looks at frequency and severity of accidents.

RESEARCH METHODOLOGY

1

- Conducted Technical Advisory Committee (TAC) Meeting to identify the probable hazards

2

- Analyzed the Iowa DOT Statewide Crash Data from 2001 to 2010 provided by the Office of Traffic and Safety, Iowa DOT

3

- Sent out surveys for **validation of results** to
 - Traffic & Safety' and 'Operations & Maintenance' divisions of Iowa DOT
 - American Traffic Safety Services Association (ATSSA)

Severity of the Hazards

- Dependent variable – “Severity of crashes”
- The dependent variable being discrete and ordered, the suitable model selected was **ORDERED PROBIT MODEL** [Assumption: Disturbance terms $(\epsilon) \sim N(0, 1^2)$]
- The statistical significance of the independent variables were estimated using one-tailed t-test and 90% confidence ($\alpha=0.10$)
- The critical cut-off value for the t-statistic was 1.28 ($n > 100$)

Frequency of the Hazards

- Frequency / likelihood of occurrence of the hazards is same as the frequency of crashes caused due to those hazards.
- Descriptive Statistics (DS) were used to analyze the frequency / likelihood of occurrence of the hazards.

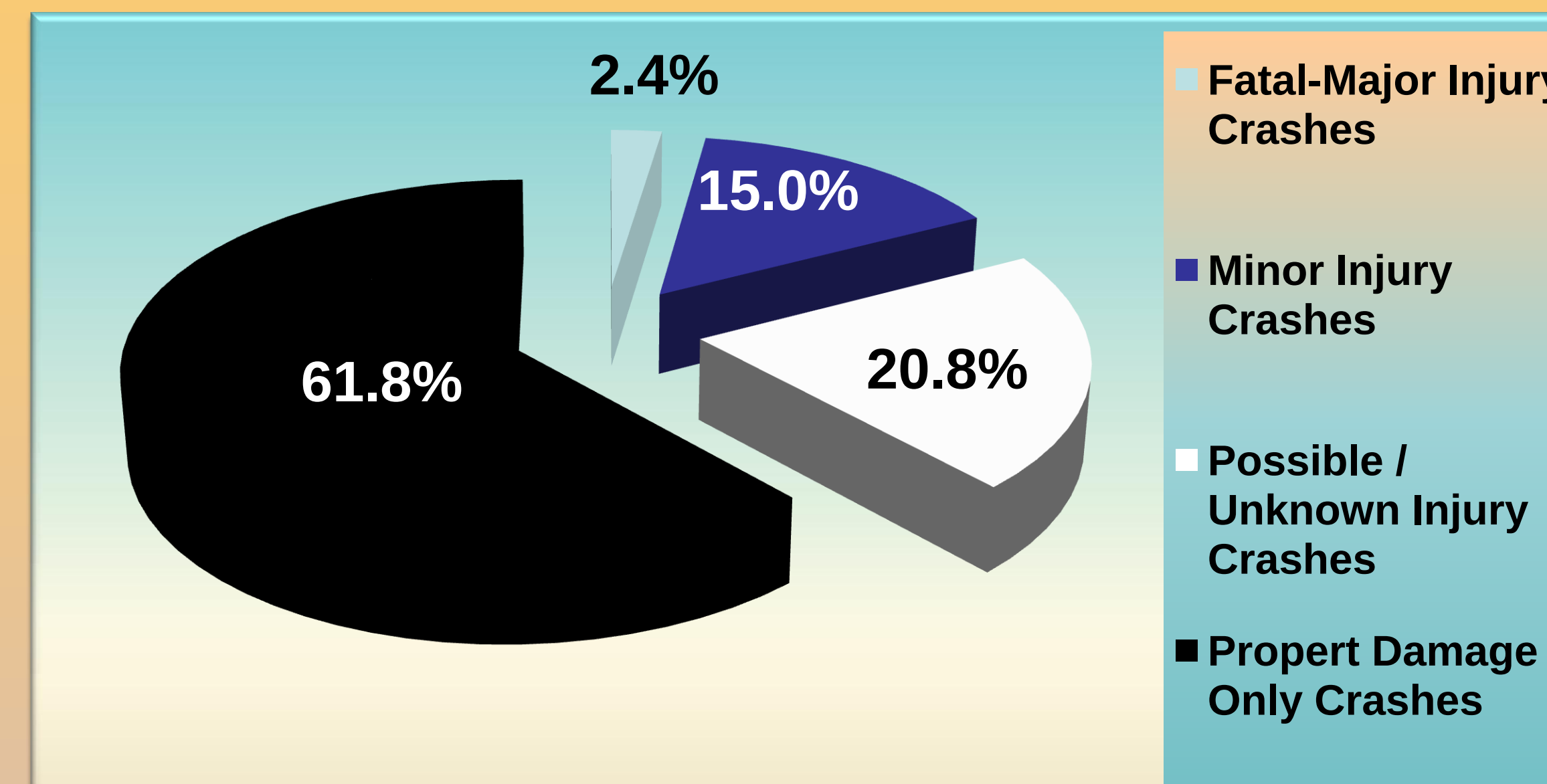


Figure 1 - Percentage Distribution of Mobile Work Zone Crashes from 2001 - 2010

Frequency Level of 5

- Vision not obscured
- Interstate Route
- Region located within or adjacent to work activity

Risk value greater than 9

- Interstate Route
- Passenger vehicle
- US Route
- Municipal Route
- Vision not obstructed
- Region located within or adjacent to work activity

FREQUENCY	5	5	10	15	20	25	1 to 3	Negligible Risk Potential
	4	4	8	12	16	20	4 to 5	Marginal Risk Potential
	3	3	6	9	12	15	6 to 9	Moderate Risk Potential
	2	2	4	6	8	10	10 to 12	Critical Risk Potential
	1	1	2	3	4	5	15 to 25	Catastrophic Risk Potential
		1	2	3	4	5		
		SEVERITY						

Figure 2 – Color coded Risk Assessment Matrix

Severity Level of 5

- US Route
- Secondary Route
- Municipal Route
- Iowa Route

ANALYSIS OF DATA

SEVERITY

- A variety of models were tested with the different variables and the best one was chosen according to the highest adjusted p^2 value, significant χ^2 value and containing meaningful variables.
- The distribution of the weighted **marginal effects** from the **Ordered Probit Model** was used to rank the hazards according to their severity.

FREQUENCY

- Percentage frequency distribution of the hazards was used to rank the factors according to their frequency.

INTEGRATED RISK MANAGEMENT MODEL

- The severity and the likelihood of occurrence of the hazards were ranked on a Likert scale of 1 through 5, 1 being the least and 5 being the most.
- The severity and frequency values were multiplied to create a **risk index value** which is measured with the **Integrated Risk Management Model** (values ranging from 1 through 25), Figure 2.

IMPLICATIONS OF THE RESULTS

- The results indicate that improper traffic control systems near the work zones and high speed limits on highways are the major reasons behind mobile work zone related crashes.
- These factors can be mitigated by
 - decreasing the speed limits at reasonable distances away from the mobile work zone,
 - imposing high speed limit fines near the work zones, and
 - by improving the mobile work zone signage systems

REFERENCES

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- Qin, X., D. Noyce, C. Lee, and J. Kinar. Snowstorm Event-Based Crash Analysis. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1948, Transportation Research Board of the National Academies, Washington D.C., 2006, pp. 135-141.