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Project Title: Crash Analysis and Decision Support for Truck Safety and Weight Compliance through Strategic Enforcement and Education, Phase II

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Research Needs: Trucks are critical in rural-economy market connectivity in where natural resource based goods are delivered to processors and consumer markets. The prominent role of trucks in oil development is evident in the rapidly expanding fleet that operates within and serves North Dakota, especially in the west. A fixed capacity public road system has greatly increased large truck-passenger vehicle interaction in the region. The associated increasing crash risk is evident in recent trends (Figures 1 & 2). Seventy percent of fatal and serious injury crashes occur on rural non-interstate roads. In addition, the prevalence of hazardous material loads in the truck and rail traffic have created a heightened awareness of planning, training and resources related to incident preparedness and the transportation aspects (North Dakota Highway Patrol 2014, Battelle Memorial Institute 2011).

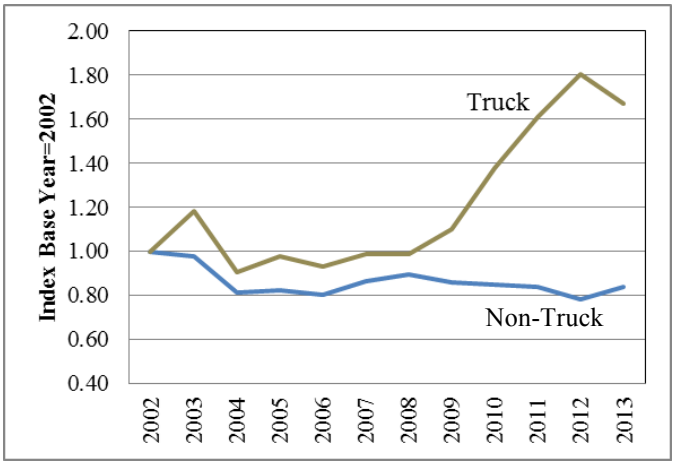

Figure 1. Injury Crash Index for All State Highways, Crashes per 10,000 DVMT by Truck Involvement

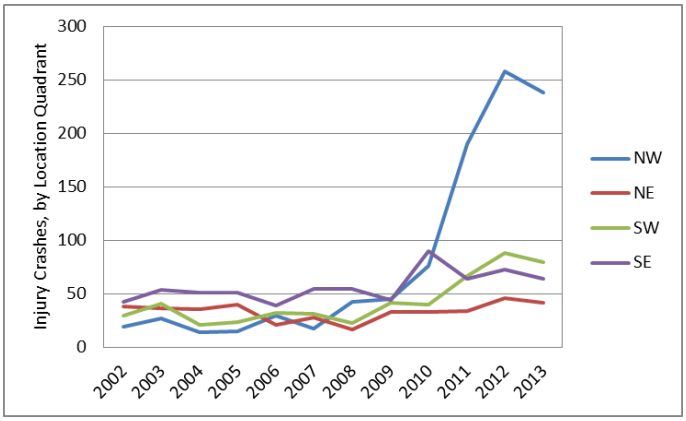

Figure 2. ND Regional Truck Crash Trends

Truck crash research has a well-established foundation when considering national datasets and federal enforcement/carrier safety monitoring (Federal Motor Carrier Safety Administration 2007; Mitchell, Friswell, and Mooren 2012; John A. Volpe National Transportation Systems Center, 2013). The understanding of crashes in a more rural driving environment and driver-related factors are more recent (Cantor et al., 2010;

Chen and Chen, 2011; Islam, Jones, and Dye 2014; Graham et al. 2015). These studies generally take one of two paths in the method applied in considering an event count/incidence or injury/severity outcome. Findings from continuing work related to large truck crashes is important in a crash reduction.

Research will elucidate factors in truck-involved crashes, in North Dakota, to contribute to a more effective resource allocation in the education and enforcement efforts. Interventions based on findings can be carried out through various methods, including administrative procedure or policy change, education and enforcement. Education can be offered through industry events, public information releases and media campaigns. These campaigns can be used to create greater awareness of the risks and needs for defensive driving. Coupling this education with enforcement is essential in providing sustainable traffic safety programs (Shults et. al 2004, Houston and Richardson 2006, Hedlund et. al 2008, and Nichols et. al 2008). Education efforts can be broad in nature such as encouraging drivers to respect right-of-way rules, stay out of the "no-zone" and promoting seat belt use by all occupants or specific such as making carriers aware of common driver errors. Enforcement is more complex given that the influence is determined level of activities and perception in law enforcements' ability to appear ubiquitous given a fixed level of resources. While data is always used in law enforcement planning, the ability to fully utilize multiple datasets and geospatial information may strengthen processes for shorter-term programs and longer-term strategies used to promote safety and responsibility in a dynamic truck market. In addition, enforcement has multiple potential faucets, including safety audits, traffic enforcement and roadside inspections. These activities have been shown to have varying degrees of effectiveness. The citation or violation outcomes from these activities have a range of effectiveness related to safety impacts.

Greater insight into the North Dakota's truck industry and safety outcomes would be beneficial for efficient and effective resource decisions related to policy decisions and resource allocations to reduce truck-involved crash risk.

Research Objectives:
Provide quantitative and geospatial decision support material and tools for the NDHP Motor Carrier Division to use in allocating limited resources for traffic safety and weight enforcement, especially in an active oil development region.

Research Methods:
Explore existing data sets and present analysis/tools to support enforcement and education efforts by optimizing resource allocation to increase truck traffic safety. Use descriptive statistics, means testing, regression modeling and geospatial mapping of traffic safety, traffic density, and truck weight in tools for planning, operating and allocating enforcement and education activities.

Expected Outcomes:
The research will provide knowledge to industry and regulators for increasing traffic safety related to large truck operations. A localized, baseline understanding of activities and existing resources for large truck hazardous material transport will also be improved. Additional knowledge may be used to further leverage current traffic safety efforts for targeting issues in safe car-truck interaction and safe truck operation. It should also contribute to increased local productivity through improved mobility and rural community health.

Relevance to Strategic Goals:

1. Safety
2. Human Factors
3. Heavy Vehicles & Commercial Trucks
4. Infrastructure Longevity
5. Traffic Operations & Management

Educational Benefits: Public/Industry Education for Truck Safety and Weight Compliance

Work Plan (Revised):

1. Meet with local subject matter experts, including NDHP, FMCSA, industry, and local officials. (Ongoing)
2. Identify potential data sets to be utilized in the research. (Ongoing/Expanded)
3. Conduct (large) truck crash literature review. (Underway/Expanded)
4. Explore crash and safety datasets and potential for periodic and ongoing analysis for enforcement planning and program metrics. (Underway)
    a. NDDOT Crash Data
    b. NDDOT Driver Records
5. Identify and collect commercial vehicle safety datasets for localized analysis. (NEW)
    a. NDHP/FMCSA Crash Data
    b. NDHP/FMCSA SafetyNet Data
6. Collect and describe HazMat related activities; data reported and safety trends related to large truck traffic in North Dakota. (NEW)
    a. US DOT/PHMSA, NDHP, NDDES, FMCSA
    b. Local Responders/TIM
    c. TRANSCAER/Other
    d. Statewide survey to understand capabilities, constraints, and priorities as envisioned in a collaboration with NDDES and first responder organizations.
7. Conduct statistical analysis to identify trends, norms, high-risk, etc. based on localized (North Dakota) truck crash patterns considering factors such as driver characteristics, truck configuration/load factors, and driving environment elements (Underway/Expanded)
8. Exploratory geospatial prediction analysis will be conducted based on the findings from the broader statistical analysis and logistic regression modeling
    a. Hotspot/Cluster Analysis (Ongoing/Expanded)
    b. Geographically Weighted Regression Analysis (NEW)
9. Supplemental data collection and statistical analysis of WIM and ATR traffic data in cooperation with the NDDOT and DOTSC. (NEW)
    a. Collect WIM & ATR data
    b. Conduct 85th percentile analysis of truck weight & speed data

c. Investigate the traffic ratio/safety relations

10. Identify potential for systemic activities related to program assessment such as longer-term planning and shorter-term saturation or sustained patrols or other enforcement programs. (To Be Completed).
11. Create geospatial platform for truck safety planning data visualization in cooperation with the NDHP CMD (NEW)
12. Establish a sustained platform for truck enforcement and education planning and performance monitoring that is complimentary to other programmatic activities such as the HazMat Transport Enforcement/Education, CVSP, BEP and New Entrant along with the traditional enforcement planning and education activities. (Expanded)
13. Draft report for North Dakota truck crash regression analysis. (To Be Completed)
14. Journal articles and conference papers. (To Be Completed)
15. Finalize report and publish. (To Be Completed)

Project Cost, Phase II:
Total Project Costs: $220,000
MPC Funds: $143,550
Matching Funds: $76,450
Source of Matching Funds:
Waived indirect costs: $64,840
In-kind NDDOT Truck Crash Records or General Fund Truck Safety Travel & Conference Expenses: $11,610

TRB Keywords:
Motor Carrier Safety, Commercial Vehicle Safety, Commercial Vehicle Operations, Enforcement, Longer Combination Vehicles, Combination Unit Trucks, Single Unit Trucks.

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