NCHRP is a State-Driven Program

- Sponsored by individual state DOTs who
  - Suggest research of national interest
  - Serve on oversight panels that guide the research.

- Administered by TRB in cooperation with the Federal Highway Administration.
Practical, ready-to-use results

• Applied research aimed at state DOT practitioners
• Often become AASHTO standards, specifications, guides, syntheses
• Can be applied in planning, design, construction, operations, maintenance, safety, environment
Today’s Speakers

- John Gambatese, PhD, PE(CA)
  NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety

- David S. Hurwitz, PhD, Title of Presentation
  NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety

- Keith Robinson, PLA
NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety

Presented by:

John Gambatese, PhD, PE(CA) & David S. Hurwitz, PhD
School of Civil and Construction Engineering
Oregon State University
Introduction

- Problem Statement
- Scope and Purpose
- Key Terminology
Problem Statement

- Construction and maintenance of transportation infrastructure
  - Managed or conducted by state DOTs

- State DOT employees placed in high risk environments
  - Results in injuries and fatalities

- What are state DOTs doing to prevent injuries and fatalities?
  - How are state DOTs using historical data to develop their safety program elements?
Scope and Purpose

- Review state DOT health and safety practices
- Better understand state DOT diversity with respect to safety programs
- Explore the use of data in safety programs
Key Terminology

- **Highway worker** - An employee of a state DOT who is active in construction or maintenance work sites on state DOT right-of-way.

- **Incident** - Any disruption in the normal flow of work involving a highway worker employed by a state DOT in a construction or maintenance site that involves an injury, fatality, property loss, damaged equipment, work stoppage, or near miss.

- **Work site** - Any location where construction or maintenance work is being done on state DOT right-of-way.
Literature Review

- Prevalence and causality of highway worker incidents
- Legal standards and policy recommendations
- Availability of injury and fatality data
Prevalence and Causality of Incidents

- Types of work site incidents
  - Public vehicle
  - On-site vehicle
  - Other on-site hazard
Prevalence and Causality of Incidents

- Types of work site incidents
  - Public vehicle
  - On-site vehicle
  - Other on-site hazard

- Construction Chart Book (CPWR, 2013)
  - 2010 construction industry statistics
Legal Standards and Policy Recommendations

➢ Strategic Highway Safety Plans (SHSP)
  ➢ Federal requirement for state DOTs

➢ Sections related to work sites
  ➢ Enforcement of existing work zone speed laws
  ➢ Education of public, law enforcement, and first responders
  ➢ Higher visibility of workers and work zones
Availability of Safety Data

- Bureau of Labor Statistics (BLS)
- Occupational Safety and Health Administration (OSHA)
- National Institute for Occupational Safety and Health (NIOSH)
- Fatality Analysis Reporting System (FARS)
- Strategic Highway Research Program (SHRP2)
## Availability of Safety Data

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLS</td>
<td>Able to separate by state; numerically based data separated by categories</td>
<td>Illness and Injury data not well coded to isolate for highway work sites; little known about individual incidents</td>
</tr>
<tr>
<td>OSHA</td>
<td>Short written description regarding each incident</td>
<td>Difficult to search by state</td>
</tr>
<tr>
<td>NIOSH</td>
<td>Very detailed reports and specific recommendations</td>
<td>Poor geographic diversity and few recent reports for highway work zones</td>
</tr>
<tr>
<td>FARS</td>
<td>Detailed, comprehensive database</td>
<td>Cannot isolate highway workers</td>
</tr>
<tr>
<td>SHRP2</td>
<td>High volume of naturalistic driving information</td>
<td>Not as available to non-academic researchers at state DOTs</td>
</tr>
</tbody>
</table>
Research Questions

Research Question #1: How do state DOTs respond when an incident with a highway worker occurs on a work site?
Research Questions

Research Question #2: What is the current state of practice for using data to develop, implement, and evaluate state DOT worker safety programs?
Research Questions

Research Question #3: How does the size and scope of a state DOT influence the agency’s highway worker health and safety programs?
Methods

- Research Tasks
  - Survey of state DOTs
  - Case studies of selected safety programs
Survey Method

- Survey questions developed from research questions
- Questions coded into Qualtrics software
- Link to survey questions distributed to members of:
  - North American Association of Transportation Safety and Health Officials (NAATSHO)
Survey Results

- Demographics
- Incident Reporting
- Data Collection
- Data Utilization
Demographics

- Frequency of involvement with injury claims and prevention programs

- Percentage of DOT employees regularly on work sites
Incident Reporting: DOT response to an incident

- Prepare initial incident report
- Prepare worker injury claim
- Inform law enforcement
- Inform insurance policy provider
- Inform Federal OSHA office
- Inform State OSHA office
- Conduct incident review meeting
- Upload findings to 'lessons learned' database
- Communicate 'lessons learned' agency-wide
- Return to work initiatives
- Review of modify policies and procedures
- Post-incident investigation
- Other

Number of Responses

- On-Site Hazard
- On-Site Veh/Equip
- Public Auto
Incident Reporting: State DOT Incident Reports

**Location of Archive**

- Regional/District Human Resources
- Statewide Human Resources
- Regional/District Traffic Engineering
- Statewide Traffic Engineering
- Regional/District Maintenance Office
- Statewide Maintenance Office
- Regional/District Safety Office
- Statewide Safety Office
- Other

**Format of Archive**

- On-line database: 24 responses
- Electronic documentation: 27 responses
- Paper copy: 29 responses
- No specified format: 3 responses
- Other: 3 responses
Incident Reporting: Near Miss Reporting System

18 of 41 states do **not** have a “near miss” reporting system

Reason for not having Near Miss Reporting System

- Lack of resources: 3
- Fear of inconsistent reporting: 0
- Lack of clear definition of "near miss": 8
- No clear value of "near miss": 3
- No clear need in recording incidences: 1
- Other: 4
- Unsure: 4
State DOT Data Collection

<table>
<thead>
<tr>
<th>Data set</th>
<th>Average Completeness Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident report</td>
<td>4.0</td>
</tr>
<tr>
<td>Police citation report</td>
<td>3.9</td>
</tr>
<tr>
<td>Worker insurance claim</td>
<td>4.2</td>
</tr>
<tr>
<td>Worker annual performance review</td>
<td>3.7</td>
</tr>
<tr>
<td>Safety training records</td>
<td>3.6</td>
</tr>
<tr>
<td>Contractor safety records</td>
<td>2.9</td>
</tr>
<tr>
<td>Medical record</td>
<td>3.3</td>
</tr>
<tr>
<td>Fatality/injury data</td>
<td>4.1</td>
</tr>
<tr>
<td>Roadway design</td>
<td>3.9</td>
</tr>
<tr>
<td>Roadside design features</td>
<td>3.9</td>
</tr>
</tbody>
</table>
## Data Utilization: Data Driven Safety Programs

<table>
<thead>
<tr>
<th>Policy/Practice</th>
<th>Number of Responses</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional training for workers</td>
<td>37</td>
<td>90%</td>
</tr>
<tr>
<td>Additional Training for Supervisors</td>
<td>34</td>
<td>83%</td>
</tr>
<tr>
<td>New standards for work site traffic control plans</td>
<td>28</td>
<td>68%</td>
</tr>
<tr>
<td>Driver awareness programs</td>
<td>27</td>
<td>66%</td>
</tr>
<tr>
<td>Worker behavior assessment programs</td>
<td>13</td>
<td>32%</td>
</tr>
<tr>
<td>Safety incentive programs</td>
<td>10</td>
<td>24%</td>
</tr>
<tr>
<td>Drug/alcohol abuse programs</td>
<td>18</td>
<td>44%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
## Data Utilization: Sharing of Data

<table>
<thead>
<tr>
<th>Organization</th>
<th>Number of Responses</th>
<th>Percentage of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal agencies</td>
<td>19</td>
<td>46%</td>
</tr>
<tr>
<td>Other State DOTs</td>
<td>23</td>
<td>56%</td>
</tr>
<tr>
<td>County/Municipal governments</td>
<td>7</td>
<td>17%</td>
</tr>
<tr>
<td>Private Organizations</td>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>24%</td>
</tr>
<tr>
<td>None</td>
<td>9</td>
<td>22%</td>
</tr>
</tbody>
</table>
Conclusions

- Discussion
- Limitations
- Future Research
Discussion

Research Question #1: How do state DOTs respond when an incident with a highway worker occurs on a work site?

- Consistency of response across types of incidents
- Variability among which steps are used
Research Question #2: What is the current state of practice for using data to develop, implement, and evaluate state DOT worker safety programs?

- Data sources are often available, but not always used.
- Data sources are often incomplete, making them ineffective.
Discussion

Research Question #3: How does the size and scope of a state DOT influence the agency’s highway workers health and safety programs?

- Structural differences in DOTs might impact their ability to implement certain programs
  - Smaller DOTs were more likely to have the following characteristics
    - Faster access to data
    - A drug/alcohol abuse program
Limitations

- 41 of 50 states responded to the survey
- Only one information source (e.g., State Safety Officer) for each survey/case study
Future Needs

- Integration of nationally available data sources
- Establishment of a consistent “near miss” definition
- Exploration of a framework to allow quantitative evaluations of safety programs
Funded under NCHRP Topic 47-16 (Highway Worker Safety) for Project 20-05

Zach Barlow, PhD Student, Oregon State University
Questions?
NCHRP Synthesis 20-05/Topic 47-16: Highway Worker Safety

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Research Question: Are there examples of current or recent data driven worker safety programs that have been implemented by state DOTs?
Methods

➢ Research Tasks

➢ Survey of state DOTs

➢ Case studies of selected safety programs
Survey Results

- Demographics
- Incident Reporting
- Data Collection
- Data Utilization
Case Study Methods

- Follow-up from survey responses
- Target areas:
  - Potentially innovative safety program
  - Geographical diversity
  - Willingness to participate

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>California</td>
<td>39,144,818</td>
<td>1</td>
</tr>
<tr>
<td>Maine</td>
<td>1,329,328</td>
<td>42</td>
</tr>
<tr>
<td>North Dakota</td>
<td>756,927</td>
<td>47</td>
</tr>
<tr>
<td>Oregon</td>
<td>4,028,977</td>
<td>27</td>
</tr>
<tr>
<td>South Carolina</td>
<td>4,896,146</td>
<td>23</td>
</tr>
<tr>
<td>Washington</td>
<td>7,170,351</td>
<td>13</td>
</tr>
</tbody>
</table>
Case Study Methods

- Interview protocol drafted
- Phone interview with state DOT safety officer
- Interviewer information combined with survey data and publically accessible information
Case Studies

- 6 case studies conducted
  - CA, ME, ND, OR, SC, WA
- 4 to be highlighted
  - California
  - North Dakota
  - Oregon
  - Washington

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Methods</th>
<th>Survey Results</th>
<th>Case Studies</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
Case Studies

- Explore details of specific safety programs
- Actions and strategies
- Data sources

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Safety Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Design for Safety Initiative</td>
</tr>
<tr>
<td>Maine</td>
<td>Safety Idea Incentive Program</td>
</tr>
<tr>
<td>North Dakota</td>
<td>Leading Indicator Initiative</td>
</tr>
<tr>
<td>Oregon</td>
<td>Oregon Work Zone Executive Strategy Steering Committee</td>
</tr>
<tr>
<td>South Carolina</td>
<td>Work Zone Safety Enforcement Campaign</td>
</tr>
<tr>
<td>Washington</td>
<td>Near Miss Reporting Program</td>
</tr>
</tbody>
</table>
California

- **Design for Safety Initiative**
  - Data identified hazards
  - State fatality and injury records

- **Roadside Safety Program Guidance**
  - Provided to Caltrans Employees
  - Describes objectives of Design for Safety
  - Results in updated standard plans
    - Mitigate safety issues
    - Remove hazards
Caltrans Design for Safety – Guardrail Typical Section
North Dakota

- Leading Indicator Initiative
  - Leading vs. Lagging
  - NDDOT’s Job Hazard Analysis worksheet
    - Document risks associated with various tasks
  - Risk rating table
**RISK RATING TABLE**

This table is used to calculate whether the hazard you have identified is Extrem: 9-10 or High: 7-8, Medium: 5-6 or Low: 3-4.

The objective of rating the risk is to lower the risk by initiating risk control measures. The score is noted in the JSA risk score column on the next page — both before & after risk control measures have been nominated.

<table>
<thead>
<tr>
<th>Likelihood: How likely is it to be that bad?</th>
<th>Consequences: how severe an injury?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost Certain - Expected to Occur</td>
<td>Death</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Likely - could happen sometime</td>
<td>9</td>
</tr>
<tr>
<td>Moderate - could happen but not likely</td>
<td>8</td>
</tr>
<tr>
<td>Unlikely - could happen but very rare</td>
<td>7</td>
</tr>
<tr>
<td>Rare - could happen but probably never will</td>
<td>6</td>
</tr>
</tbody>
</table>
Oregon

- Oregon Work Zone Executive Strategy Steering Committee (OWZESSC)
  - Established in December of 2013
  - Partnership between ODOT; Oregon Trucking Association, Inc.; Associated General Contractors, Oregon Columbia Chapter; Oregon State University; American Automobile Association; and the Oregon State Police
  - 4 task forces: Separation and Mobility; Law Enforcement; Engineering Enhancements; Communications Resource Team
  - Group meets semi annual to discuss WZ safety solutions
Washington

- Near Miss Reporting Program
  - Submit short report of “near miss”
  - Creation of booklet
  - Implemented statewide
  - 35 reports submitted
  - Small lottery-style monetary incentive
Near Miss Booklet
- 3”x5” to fit in a pocket
- Instructions for submitting a report

“Near Miss” Definition
- Near misses describe incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.
Washington

Filling out a near miss report is as easy as 1-2-3.

1. Submit a near miss or a safety suggestion to supervisor.
2. The supervisor works with employee to identify solutions.
3. Solutions may be implemented locally, regionally or statewide.

INJURY FREE - WE’RE ALL IN

RATING YOUR NEAR MISS REPORT

- **HIGH FREQUENCY** - These near misses occur often and require immediate attention.
- **HIGH SEVERITY** - These near misses have serious impact and require immediate attention.
- **LOW FREQUENCY** - These near misses don’t occur very often but when associated with a High Severity classification should be reported.
- **LOW SEVERITY** - These near misses typically don’t have serious consequences but when associated with a High Frequency classification should be reported.
Conclusions

- Discussion
- Limitations
- Future Research
Discussion

Research Question: Are there examples of current or recent data driven worker safety programs that have been implemented by state DOTs?

- Survey highlighted existence of programs
- Case studies reviewed these programs (varied data use)
  - Leading Indicator Initiative
  - Worker’s Memorial
  - Near Miss Program
Limitations

- 41 of 50 states responded to the survey
- Only 7 willing participants for case studies
Acknowledgements

➢ Funded under NCHRP Topic 47-16 (Highway Worker Safety) for Project 20-05

➢ Zach Barlow, PhD Student, Oregon State University