Safety Implementation Assistance Program Update

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2016 TRB Safety Data Oversight Committee
May 10-11, 2016, Woods Hole, MA
SHRP2 at a Glance

- **SHRP2 Solutions** – 63 products

- **Solution Development** – processes, software, testing procedures, and specifications

- **Field Testing** – refined in the field

- **Program Implementation** – 350 transportation projects; adopt as standard practice

- **SHRP2 Education Connection** – connecting next generation professionals with next-generation innovations
SHRP2 Implementation: Moving Us Forward

$122 million

FUNDING ASSISTANCE

63

SHRP2 SOLUTIONS

350

PROJECTS IMPLEMENTED

- DOT: 52 Recipients
- MPO/LOCAL: 29 Recipients
- UNIVERSITY: 10 Recipients
- FEDERAL/TRIBAL: 7 Recipients

- RENEWAL: 179
- CAPACITY: 95
- RELIABILITY: 65
- SAFETY: 11
SHRP2 Implementation: Moving Us Forward

- Participants Engaged: 145,831
- Outreach Activities: 5,713
- Hours of Technical Assistance: 6,155

- Training: 5,474
- Workshops: 152
- Peer Exchanges: 40
- Demos: 29
- Showcases: 18
Consists of Two Large Databases:
- Naturalistic driving study (NDS) database; and
- Roadway Information Database (RID)

Naturalistic Driving Study (NDS):
- Crash, pre-crash, near-crash, and “normal” driving data
- 3,500+ drivers, 6 sites, all ages

Roadway Information Database (RID):
- NDS trip data can be linked to roadway data from the RID, such as the roadway location, curvature, grade, lane widths, and intersection characteristics.
- These two databases will support innovative research leading to new insights into crash causation.
SHRP2 Safety Program

NDS
RID

TRB Research Phase

Phase 1
Proof of Concept

Phase 2
In-Depth Research

Phase 3
Deployment

FHWA/AASHTO Implementation Phase

Seattle, WA
Buffalo, NY
Bloomington, IN
State College, PA
Durham, NC
Tampa, FL
Main Objectives

• Utilize IAP to demonstrate the use of the NDS Safety Data
• Increase states’ understanding of the potential uses of the data
• Identify safety countermeasures based on research projects
• Reduce crashes and save lives!
IAP Safety Process

Phase I – Proof of concept with a sample reduced data set

Phase II – full data set and in-depth research analysis with countermeasure identification

Phase III – deployment to adopt, champion or implement countermeasure nationally
Role of Safety Task Force (STF)

- Collaborate with FHWA, TRB, and research teams
- Oversee Safety Implementation Assistance Program for AASHTO
- Review research proposals and research findings
- Promote opportunities for State DOTs and their research partners to use the NDS/RID
- Provide a customer/user perspective to SDOC

Activities

- Monthly conference calls
- Monitoring progress of teams through series of two interviews – focus on program support, not team evaluation
- Reporting findings to STF, FHWA, and TRB
Phase 1 – Proof of Concept

- 9 months
- Reduced set of NDS and RID data
- 10 states/11 projects
- Teams presented to STF – October 19th and 20th
- FHWA to selected Phase 2 projects with input from STF
Phase 1 Results - Summary

• All teams excited with potential research findings
• No fatal flaws in research or ability to use NDS data
• Sample of potential outcomes through POC:
  o New data processing tools
  o New highway lighting standards
  o New crash modification factors
  o New methods for establishing speed limits and advisory speeds
  o New understanding about effectiveness of work zone devices/messaging/campaigns
• 2-year, in-depth research proposals
• Lower-than-expected Phase 2 cost proposals
Phase 2 – In-Depth Analysis

- Selections were announced in December 2015
- Phase 2 began January 2016
- Conduct in-depth research and analysis
- Countermeasure identification and refinement
Please see the new Safety Brochure for additional information.

### Phase 2 In-Depth Research and Analysis Projects

<table>
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<tr>
<th>Project</th>
<th>DOT</th>
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<tbody>
<tr>
<td>Pedestrian Safety</td>
<td>Florida DOT</td>
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<tr>
<td>Roadway Departures</td>
<td>Iowa DOT</td>
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<td>Speeding</td>
<td>Michigan DOT</td>
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<td>Washington State DOT</td>
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<td>Work Zones</td>
<td>Minnesota DOT</td>
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<td>Horizontal and Vertical Curves</td>
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<td>Interchange Ramps</td>
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<td>Adverse Conditions</td>
<td>Wyoming DOT</td>
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Phase 2 – IAP Status Updates

- All IAP teams under contract with the FHWA
- Most teams are not fully contracted with their subs yet
- Two teams are entering data collection process and will be in contact with VTTI shortly.
- Importance of getting under contract ASAP:
  - **September 30, 2017** - deadline to obligate funding for Phase 3.
  - Most teams’ schedules for Phase 2 are 18-24 months (starting in January 2016)
  - **May 2017** – reports due from teams on early findings.
  - Phase 3 funding decisions – May to September 30, 2017 (last day to obligate funds under SHRP2)
Safety IAP Schedule

Phase 2 – 18 to 24 Months

IAP Teams Report Early Findings

FHWA Select and Obligate Funding for Phase 3 Projects

Deadline to obligate SHRP2 funds

Today

May 2016

May 2017

Sept. 30

May 2017

Sept 2017
Phase 3 - Implementation

- Adopt, champion, and implement countermeasures
- Integrate findings into Manuals, Guidelines, Policies
- Conduct pilot testing
Minnesota IAP

Evaluation of Work Zone Safety Using the SHRP2 Naturalistic Driving Study Data

Iowa State University and the Minnesota DOT
Rationale

- > 1,000 fatalities and 40,000 injuries
- Difficult to understand underlying causes of work zone crashes (driver behavior)
- Difficult to isolate work zone related crashes
- SHRP2 data offers unique opportunity:
  - study 1st hand account of activities leading to safety critical events and normal driving
  - identify whether safety critical events were work zone related
Objective

- Investigate the role of driver behavior (speeding and distraction) and work zone configuration (roadway characteristics) in crash risk.
Modeling Safety Risk
Phase 1 analysis

- Focused on rural multi-lane
- Conducted logistic regression using 110 crash/near-crash and 89 baseline events
- Preliminary results indicated
  - 10 mph over speed limit 11.7 times more likely to be involved in a safety critical work zone event than baseline
  - 3.3 times higher if distracted
  - 3.4 times more likely to be female
  - Higher when speed deviation is higher
  - Model showed relationship between driver & work zone characteristics and safety risk can be developed
  - Baseline not well correlated to crashes
Modeling Safety Risk
Phase 2 proposed task

- **Methodology**
  - Expand to include all roadway types
  - Logistic regression which provides odds ratios
    - dependent variable: \( P(\text{probability of safety critical event}) \)
    - co-variates: driver, roadway, work zone characteristics

- **Data Needs**
  - Have location of work zone for near-crash, obtain location for crashes (need to work with VTTI)
  - Request time series data for 10 – 15 normal driving events for each safety critical work zone location
  - Reduce roadway/work zone configuration from RID, aerial imagery, forward view, 511 data
  - Reduce driver speed from time series data
  - Reduce glance location and duration at secure data enclave
  - Coordinate data needs across tasks
**Objective:** develop relationship between speed and driver/work zone characteristics

**Data:** utilized baseline time series data for rural multilane work zones

- 87 baseline events included driving within work zone
- Full trace through work zone not available
- Sampled speed (\(\sum\) over 1.5 sec) at various points within work zone — dependent variable
- 226 observations over 87 work zones
- Extracted work zone configuration from forward video
- Driver characteristics from Event Detail Table
Speed Prediction Model

Phase 1 analysis

**Methodology**
- Linear mixed effects model (LME)
- Accounted for repeated sampling within same work zone
- Developed best fit model, used AIC and other metrics

**Results**
- Presence of curve speed 7.2 mph lower
- Lower speeds with more lanes closed
- 1.6 mph lower when DMS is present
- 2.9 mph lower when workers present (90%CI)
- Result demonstrated feasibility of approach

**Limitations**
- Similar as for safety critical events
- Complete traces not available in baseline data
- Secondary tasks only coded for last 6 seconds of baseline
Speed Prediction Model
Phase 2 proposed task

- **Outcome**
  - Prediction of speed given roadway, work zone, and driver characteristic
  - Impact of specific work zone countermeasures on speed
    - *i.e. different work zone configurations*
  - Output can be used to select configurations/countermeasures which improve speed compliance and safety
Work Zone Reaction Point
Phase 1 analysis

- Addressed question of how to get drivers attention in advance of work zone

**Data**

- Utilized baseline events with data in advance of work zone (13 traces)
- Correlated time series data to location upstream of work zone
- Correlated position of work zone signs to time series
- Used driver characteristics (i.e. distraction from Event Detail Table)

**Methodology**

- change point models developed for each work zone
Work Zone Reaction Point

Phase 2 Proposal

- **Outcome/Benefit:**
  - Location where drivers react given specific work zone characteristics
  - Indicates responsiveness to signing
  - Implications for sign placement
  - Reaction to back of queue
    - *Drivers texting may be more likely to miss end of queue*
Questions?

- **FHWA SHRP2 website:** [fhwa.dot.gov/goSHRP2](http://fhwa.dot.gov/goSHRP2)
  - Apply for implementation assistance by April 29
  - Product details and webinars

- **AASHTO SHRP2 website:** [SHRP2.transportation.org](http://SHRP2.transportation.org)
  - Implementation information for AASHTO members
  - Information about SHRP2 safety implementation

- **Safety Implementation Managers:**
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