• HSM Lead State Peer to Peer Workshop
• Highlights
• Illinois HSM Implementation
HSM Lead State Peer to Peer Workshop

• Share best practices, challenges, lessons learned to help advance HSM implementation nationally

• November 17 – 18, 2010
  – Schaumburg, Illinois
  – Sponsored by IDOT, Illinois Center for Transportation and FHWA
HSM Lead State Peer to Peer (LSP2P) Workshop: Participants

102 participants

Figure 2. Breakdown of participants by affiliation.
What Does a Successful LSP2P Workshop Look Like?

• Learn and exchange best practices
  – How to collect and maintain a sustainable data system
  – Data integration
  – Policy
  – HSM integration into processes
  – Use of the HSM and other related software tools
  – Marketing within the agency and motivating staff
  – Overcoming funding shortages
Successful LSP2P Workshop

• Gain information toward the development of an implementation roadmap
• How to develop training for the different roles and levels in the DOT and Locals
• How to build confidence in the HSM and buy-in to modify practices
• What is the value added relative to the cost of HSM implementation
HSM LSP2P Workshop Discussion Topics

– Global Perspective on HSM Implementation
– Approach to Institutionalization
– State Implementation Plans
– Policy
– Resources and Funding
– Training
HSM LSP2P Workshop Discussion Topics

– Data and Data Needs Discussion
– HSM Applications – Part B
– SPF Development and Calibration
– HSM Applications – Part C
– Implementation Next Steps
HSM Lead State Peer to Peer Workshop: Highlights

- Design Exception HSM Application
- *SafetyAnalyst* Application
- Implementation Assistance
- Adjustments to Existing Policy to Incorporate HSM into Day-to-Day Practice
- DATA, DATA, DATA
HSM LSP2P Workshop
Louisiana Highlights

• HSM incorporated into practices through policy changes:
  – Scope and feasibility study
  – Environmental study
  – Safety assessment for pavement preservation project
  – Impact on new developments, permits, traffic signals, median opening
  – Documenting design exceptions, variances and waivers.

• LADOT is overcoming challenges by:
  – Working with the LTAP.
  – FHWA resource center workshops, NCHRP 17-38 workshop.
Data and Data Needs
- State System: Basic roadway elements are in-place
- Local System: Limited data available

Solutions
- Fill data gaps through grant and contract
- Expand data access to MPOs, locals and law enforcement
- Apply predicted methodology in Part C to Crash1 program analysis
- Continue to improve crash data quality, accuracy and timeliness
- Develop Louisiana’s specific SPF.
HSM LSP2P Workshop
Illinois Highlights

– Illinois HSM Implementation Plan

• Data Improvements
• Safety Performance Functions
• Highway Safety Improvement Program Process
• SafetyAnalyst
• Safety In Project Development Policy
• HSM Training
• Encourage use of the science of safety for design exceptions
Strategic Highway Safety Plan

- Zero Fatality Goal
- All public roads
- Severe Crashes
- Substantive Safety
- 4E Partnership
- Continual Evaluation

Driving Zero Fatalities to a Reality
Partnering for Illinois
System Planning and Programming

- Assess system needs & identify projects/studies
- Program projects
- Evaluate programs system-wide safety effects
Safety Performance Functions

Using Advanced Approaches for Network Screening
Zero Fatality Goal

- Improved Evaluation
- Safety Analyst
- Improved Network Screening

Evaluation
- Develop CMFs
- Improved Systematic Screening
- Improved B/C Tool

Network Screening
- Safety Analyst
- Predictive Modeling
- Compare Alternatives
- Design Exceptions

SPF From 2007 SPF from 2011
Safety Performance Functions (SPFs)

PSI (Potential for Safety Improvements)

Weighted PSI

- PSI – how much a site’s safety performance exceeds the expectation
- Empirical Bayesian (EB) Method: Find a weighted average of the predicted and observed numbers of crashes
- Default values of weights: Fatal-K (25), Injury-A (10), and Injury-B (1)


SPF Applications for Safety Analysis in Illinois

- SPFVs have facilitated a culture change from all crashes to severe crashes
- SPFVs have allowed a proactive approach to addressing fatal and severe crashes
- SPFVs are used to describe the safety performance of all state routes and intersections
- PSI number will be used along with Pavement Condition and Bridge Condition Ratings
IDOT HSM Part B Application

- Completes state-wide screening annually
- Presented in 100% and 5% GIS and MS Excel lists
  - Analysis of:
    - 16,000 miles
    - 47,000 intersections
Benefit-Cost Tool for Illinois

- Efficient, consistent comparison of the effects of applying multiple countermeasures to a location
- User friendly interface and manual
- Flexible – User can define countermeasures, service life, costs or use defaults
- Used for HSIP evaluation and project approvals for state and local system
IDOT HSIP Process

• IDOT Districts, locals and State and local police review
• IDOT BSE
  – Completes state-wide network screening
  – Presents the results in the FIVE PERCENT REPORT for District IDOT and ISP review
• Districts should
  – Review FIVE PERCENT locations for site or systematic improvements
  – Apply for HSIP funding to support projects
    • BC Ratio of greater than 1
    • Exhibit the potential to reduce severe crashes
    • High BC ratio and relatively low NPV
Different approaches

Reactive
Spot Locations

Proactive
Determine Common Contributing Factors
Apply System-Wide Overrepresentation Tool

HSM
Highway Safety Manual
Different approaches

- Traditional Practice
- Site-specific projects
- System-wide projects
- Low Cost Improvement Opportunities
- Benefits through Systematic Improvements
- Opportunities During Project Scoping and Design
- Thinking out of the Box
- Opportunities to Optimize Safety Benefits
Working with a test data set:

3 test counties and 1 Chicago township
28,093 roadway segments (7,471 miles)
18,704 intersections
118,093 crashes (K, A, B, C, PDO)

Plan to conduct further testing at Central Office
Recommendations

- Use HSM Excel Spreadsheets where appropriate
- Apply IHSDM where appropriate
- Safety Analyst
  - Start the process of data identification and mapping
  - Start educating staff at central office
  - Engage IT staff
  - Start with a small test data set
  - Good team coordination & decision making in data set-up
  - Seek assistance from AASHTO, peers
Planning

- Define problem(s) / assist scoping
- Identify potential solutions
- Evaluate alternatives & expected quantitative safety effects
- ID preferred alternative
Safety in Project Development

• **Data/Resources Analysis** (HSM Chapter 5.2 and 5.3)
  - Tabulations
  - Mapping
    • Straight Line
    • Collision Diagram
  - Trends/Overrepresentation
  - Other Items

• **Crash Report Review** (HSM Chapter 5.2)
  - Read the Narratives
  - Review the Sketches
  - Check the Severity & Contributing Factors
### Haddon Matrix

#### Crash Types & Contributing Factors

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Possible Contributory Factor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right-angle</td>
<td>Poor visibility of signals, Inadequate signal timing, Excessive speed</td>
</tr>
<tr>
<td>Rear-end or sideswipe</td>
<td>Inappropriate approach speeds, Poor visibility of signals, Unexpected lane changes on approach</td>
</tr>
<tr>
<td>Left- or right-turn</td>
<td>Misjudged speed of oncoming traffic, Pedestrian or bicycle conflicts, Inadequate signal timing, Inadequate sight distance</td>
</tr>
<tr>
<td>Nighttime</td>
<td>Poor nighttime visibility or lighting</td>
</tr>
</tbody>
</table>

### Pre-Crash

- Age
- Sex
- Driving Experience
- Impairment or Lack thereof
- Physiology
- Psychology
- Familiarity with Vehicle
- Familiarity with Environment
- Distractions
- Crash History
- Speed

### Vehicle

- Crash
- Avoidance
- Type
- Size and Weight
- Condition
- Defects
- Brakes
- Tires

### Environment

- Visibility
- Medians
- Traffic Control Devices
- Location
- Functional Class
- Surface type
- Cross-Section

POSSIBLE CRASH CONTRIBUTORY FACTORS FOR SIGNALIZED INTERSECTION PEER GROUPS
Safety in Project Development

• Field Review (HSM Chapter 5.4)
  – Validate and Augment Safety Concerns
    • Consistency?
    • Other Factors?

• Identify Concerns (HSM Chapter 5.5)
  – Culmination of Diagnosis Effort (Ch 5)
Safety in Project Development

• Countermeasures
  – HSM Chapter 6, and Part D Chapters 13 through 17
  – Crash Modification Factors Clearinghouse
  – Recommended Countermeasures
    (HSM Chapter 7 – Economic Appraisal)
Safety Analysis

• Prioritization (HSM Chapter 8)
• IDOT Procedures NOT as Quantitative as Shown in HSM Chapter 8
  – Other Factors
    • Crash Reduction
    • Route Consistency
    • Cost
  – Constraints
    • Possible Comparison Using Predictive Methods (HSM Reference)

• Range of Countermeasures
  – Short Term/Low Cost
  – Intermediate/Project Level
  – Future Programming
Design

- Existing Conditions
- Alternative 1
- Alternative 2
- Alternative 3
Design and Construction

- Evaluate safety of alternative designs
- Review & document design exceptions, variances and waivers
- Inform construction decisions
Operations & Maintenance

- Monitor operations balance - safety, mobility and access
- Evaluate improvement effectiveness
Where do I fit in?

**Part B: Road Safety Management**

**CHAPTER 4**
Network Screening/HSIP & Multi-Year Project Identification/Identifying sites with potential for improvement

**CHAPTER 5**
Site investigation/Diagnosis/ Crash Investigation

**CHAPTER 6**
Countermeasure Selection/Countermeasure Evaluation

**CHAPTER 8**
Economic Assessment of Countermeasure Benefit/Benefit-Cost Analysis

**CHAPTER 9**
Evaluation of sites, projects, corridors/before-after studies/Performance Measurement

**Part D: Crash Modification Factors**

**Part C: Predictive Methods**

- Central Office: PLANNING
  - Develop SPFIs and identify PSIs.
  - Develop the top 5% list and the 100% list
- Districts: PLANNING
  - Long-range planning
  - Project Scope
  - Review top 5% list and 100% list and PSIs to identify potential projects

- Districts - PLANNING/PHASE I:
  - Evaluate sites on the top 5% list & identify likely contributing factors

- Districts: PLANNING/PHASE I
  - Identify alternative treatments at sites with potential for improvement
- Districts: OPERATIONS
  - Identify alternative treatments at sites with potential for improvement

- Central Office: PLANNING
  - Conduct B/C analysis
- Districts: PLANNING/PHASE I:
  - Compare different countermeasures with B/C analysis
  - Conduct B/C analysis for recommended project (HSIP)
- Districts: OPERATIONS
  - Compare safety and economic (B/C) impact of signal timing alternatives, RLR camera programs, and evaluation of alternative traffic control measures

- Districts:
  - Evaluate safety impact of individual projects/sites
- Central Office:
  - Evaluate safety impact of HSIP program & individual projects/sites/countermeasures

- Districts: DESIGN
  - Evaluate alternatives in detailed analysis during design process
  - Evaluate the impact of design exceptions
HSM Implementation In Illinois

• Conducting HSM Training
  – Provided 3 of 5 2-day courses for DOT Districts and local agencies
  – Provided a 1-day course at the Illinois Traffic Engineering and Safety Conference-focus was local agencies and their consultants

• Develop a Safety Management Policy
Ranking - Based on organizational policy
Prioritization - Incl. assessment of potential countermeasure
Countermeasure Selection, B/C - Site diagnosis, countermeasure selection, economic analysis
Network Screening - Based on policy focus (e.g. SHSP, systematic approaches, risk-based (proactive) approaches, and reactive approaches; some as a result of STIP, TIP, route development process and corridor planning
Evaluating Individual Projects - Before-after studies
Evaluating System Performance - Performance Measures for Safety
Evaluate Alternatives - Evaluate alternatives in operations, maintenance, and construction

The Project Development Process at a state DOT, activities, and the relationship with the HSM

Compare Safety Impact vs Other Impacts (e.g. environmental)

Countermeasure Selection & B/C - Site diagnosis, countermeasure selection, economic analysis

3R vs 4R - (i.e. less restrictive design requirements vs Green Book new construction criteria)

Design exceptions/ deviations Evaluate design alternatives

Compare safety impact vs other impacts (e.g. environmental)

Evaluate design-build proposals - Using value-based evaluation that includes safety
HSM LSP2P Workshop: Next Steps and On-Going Efforts

• States would like more support:
  – more examples of applications
  – tools and data discussion and support
  – training
HSM LSP2P Workshop: Next Steps and On-Going Efforts

• **AASHTO**
  – [www.highwaysafetymanual.org](http://www.highwaysafetymanual.org)
  – User Discussion Forum

• FHWA Office of Safety HSM Implementation Support

• NCHRP 17 – 50 HSM Lead State Initiative
  – 2 peer exchanges, support for HSM implementation
  – Analysis Tool Workshop
Questions? Follow-up.

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