Improving Rural Roadway Safety: Enactment to Engineering
(Multi-Disciplinary Approach to Implementation Policy)

Iowa State University Seminar
April 10, 2009
PRESENTATION CONTENT

• Center for Excellence in Rural Safety (CERS) Overview

• Rural Roadway Safety Characteristics

• Two Specific CERS Tools
  – Rural Safety Policy Improvement Index (RSPII)
  – SafeRoadMaps V1 & V2

• Other Engineering-Related Activities (e.g., CLRS, FEMV, & IDRSA)
CENTER FOR RURAL SAFETY

• National Center Funded in SAFETEA-LU

• Located at Humphrey Institute of Public Affairs – State and Local Policy Program (U. of Minnesota)

• Mission: Facilitate and Focus on Research, Training, and Outreach related to Rural Transportation Safety
CERS ACTIVITIES

• **Research:** Behavior, Technology, and Policy

• **Outreach:** Better Safety Decision-Making

• **Training:** Researcher, Practitioner, and Citizen Activities

• **Contribute/Coordinate:** Existing/Proposed National Rural Safety Programs/Projects
Policy: Plan, course of action, procedure, or guideline to influence/determine decisions and actions
RESEARCH

• Urban & Rural Traffic Safety Perceptions
• Rural Community EMS System Improvements
• Quantitative Rural Safety Policy-Based Index
• SafeRoadMaps Tool & County Partnerships
OUTREACH AND TRAINING

• Annual Summer Institute (VA, 2009)
• Needs Assessment Stakeholder Groups
• Local/State Training
• Information Dissemination
  – Website (www.ruralsafety.umn.edu/)
  – Newsletter, Annual Report, etc.
• Journal/Magazine/Newsletter Articles
• Rural Highway Safety Clearinghouse (http://www.ruralhighwaysafety.org)
Rural Highway Safety Clearinghouse

The Rural Highway Safety Clearinghouse is intended to be an easy-to-use starting point for information about safety on our nation's rural roads.

Have a resource to suggest? Please fill out this submission form.

Find resources about safety on rural roads by topic

The "Four Es"
- Education
- Emergency Medical Services (EMS)
- Enforcement
- Engineering

Other Topics
- Data & Statistics
- Driver Behavior
- General Rural Transportation Safety
- Intelligent Transportation Systems (ITS)
- Laws & Regulations
- Planning
- Seat Belts
- Work-Zone Safety

View Organizations

View a listing of organizations related to rural transportation safety:

- Federal
- State
- Academic
- Non-profit

Additional information

- The National Transportation Library's digital collection of Rural and Agricultural Resources on Safety and Security.
- TRIS Online, a bibliographic database produced by the Transportation Research Board.

www.ruralhighwaysafety.org
RURAL ROADWAY SAFETY
RURAL SAFETY - GENERAL

• 23% of US Population is Rural, but 55% of Fatalities Occur There

• Rural Fatality Rate > 2 x Urban Fatality Rate (1/3 the travel)

• About 50% of Fatalities Occur on Two-Lane Rural Roadways

• About 66% of Rural Drivers Die at the Scene vs. 51% of Urban Drivers (2006)
CRASH CHARACTERISTICS

- Seat Belt Use (78% vs 84%)
- Alcohol-Impaired (58% Rural)
- Speed-Related (57% Rural)
- Roadway Departure (58% of Total)
  - Horiz. Curves (25% of Total, 75% Rural)
  - Over 80% of SV ROR Fatalities on 2-Lane Rural Undivided Roadways (1999)
- Intersection Conflict (21% of Total)
RURAL SAFETY POLICY IMPROVEMENT INDEX (RSPII)
RSPII FEASIBILITY

- Problem Addressed & Objective
- Phase 1 Status/Results
  - Existing Research/Indices
  - Measure Selection
  - Application Framework
  - Challenges
  - Pilot Application Results
- Next Steps (Phase 2)?
PROBLEM & OBJECTIVE

• Problem Addressed
  – Behavior & Choice Impacts on Rural Safety
  – Several Related Measures with Known Impact
  – Some Indicated in SHSPs
  – Require Action outside DOT

Objective: Investigate, Identify, and Quantify (Using Current Research) the Direct Rural Safety Impacts of Changes in Policy-Based Safety Improvement Measures
EXISTING RESEARCH

• Extensive Literature Base with Wide Range of Robustness

• Human Behavior Safety Policy Research tends to be a Specialty with Generalized Results

• Two Primary Summary Documents Released in the Last Year
EXISTING RESEARCH (Cont.)


• NCHRP Report 622 – “Effectiveness of Behavioral Highway Safety Countermeasures” (November 2008)

• Expert Evaluations
NCHRP 622

• 108 Countermeasures Reviewed

• Types: Voluntary, Law/Regulation/Policy, Laws with Enhancements, and Sanctions/Treatments

• Effectiveness: Proven, Likely, and Unknown/Uncertain/Unlikely

• 23 Declared “Proven” with Direct Impact Reductions (e.g., Fatalities, Injuries, and/or Crashes)
EXISTING INDICES/STATUS

• Three Policy-Focused Indices
  
  – IIHS State Traffic Laws Index (Partially Point Based - Good, Fair, Marginal, and Poor Ratings)
  
  – ENA National Scorecard on State Highway Laws (Point Based Rating and Ranking)
  
  – AHAS Roadmap to State Highway Safety Laws (Point Based – Yellow, Green, and Red)

• Status Available at Several Sites
MEASURE SELECTION CRITERIA

• Legislatively-Based

• Related to Human Behavior and/or Choices

• Direct Safety Impact Quantified in an Acceptable Manner

• Potential for Rural Roadway Safety Impact
MEASURE SELECTION
CRITERIA (Cont.)

• Large Rural Target Impact Group (e.g., Belt Use, Speed, etc.)
• One Measure per Target Group
• Safety Impact Research Focused on Fatality/Injury Desirable
• Starting Point: 23 “Proven” Measures with Direct Impacts
• Voluntary
  – School Pedestrian Training for Children
  – Booster Seat Promotions
• Laws, Regulation, & Policy
  – Bike helmet laws for children
  – GDL Programs
    • Extended learner permit
    • Night restrictions
    • Passenger restrictions
  – ALR law
  – Primary Seat Belt Law
  – Motorcycle Helmet Law
  – Reduced Speed Limits for Pedestrians

• Laws + Enhancements
  – Sobriety Checkpoints
  – Short Term/High Visibility Belt Law Enforcement
  – Automated Speed Enforcement for Speeding
  – Automated Enforcement for RLR
  – Mass Media to Support Alcohol Program, etc.
  – Comm. Programs w/ age Underage Driving Comp.

• Sanctions/Treatments
  – Aggressive Driving
    • License Suspension
    • Individual Meetings
    • Group Meetings
    • Warning Letters
  – Mandatory Attendance at Alcohol Treatment
  – Ignition Interlocks
APPLICATION FRAMEWORK

1. Define Potential Safety Impact
2. Determine Applicable Target Group
3. Identify States with Applicable “Before” Status
4. Calculate Rural Portion of Target Group within Selected “Before” States
5. Apply Potential Safety Impact to Rural Portion of Target Group
6. Present Individual and/or Combined Results
PILOT APPLICATION - PSL

-8% Fatalities/+10% Use

Unbelted, Front Seat, 13+ Years Old

24 States w/ No Primary Seat Belt Law

Rural/Urban Unbelted Fatalities by State

See Next Slide for Fatality Reduction and NHTSA Estimated Deaths Avoided

Results will Overlap with Others
Table 4.2. Estimated Rural Fatalities Avoided and Fatality Reduction due to the Enactment of a Primary Seat Belt Law (2006)

<table>
<thead>
<tr>
<th>State</th>
<th>BELTUSE Software Estimate of Rural Fatalities Avoided</th>
<th>Estimate of Unbelted Rural Front Seat Fatality (≥ 13 Years Old) Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Arkansas</td>
<td>30</td>
<td>14</td>
</tr>
<tr>
<td>Colorado</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Florida</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>Idaho</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Kansas</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Minnesota</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Missouri</td>
<td>45</td>
<td>27</td>
</tr>
<tr>
<td>Montana</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Nebraska</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Nevada</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>North Dakota</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Ohio</td>
<td>40</td>
<td>22</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>40</td>
<td>22</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Utah</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Vermont</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Virginia</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td>West Virginia</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>Wyoming</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>488</strong></td>
<td><strong>248</strong></td>
</tr>
</tbody>
</table>
APPLICATION CHALLENGES

• State Status vs. Research Basis
• Target Impact Group Definition, Data Accuracy, and Overlap
• Normalization Techniques
• Comparable Measure for Potential Rating and/or Ranking
• Methodology for Combined Consideration
NEXT STEPS

• Finalize Phase 1 Report
• Apply Individual Measures
  – Criteria for State Inclusion
  – Determination of Impact
  – Varies by Measure
• Develop Combination Method if Appropriate
• Determine Best Method of Sharing Results
Researchers in the Center for Excellence in Rural Safety (CERS) have integrated data from the Fatality Analysis Reporting System to visually map out every reported traffic fatality in the nation. It is now possible to see the roads with the most fatal crashes in your neighborhood.

This website features an innovative new tool, which will allow users to enter their address and see a map or satellite image all of the road fatalities that have occurred in their area. Users can narrow down their search to determine the age of the driver, whether speeding or drinking was a factor and if the driver was wearing a seatbelt.

CERS researchers hope this tool will educate the public about road fatalities as well as provide a valuable resource for transportation safety policy makers. Safe Road Maps also visually maps outs transportation safety legislation by region so you can easily see the impact that public policy had made in a given area. Safe Road Maps can be useful for everyone: drivers, instructors, parents and public officials.

Safe Road Maps – Envisioning Safer Roads
SAFEROADMAPS

• Fatality Location Visualization Information System

• Objective: Raise Public and Policy Maker Awareness to Increase Action

• Integrates the Following Data
  – Crash Characteristics
  – Driver/Occupant Behaviors
  – Existing Transportation Legislation
SEARCH OPTIONS

• Query by Crash Characteristics
  – State
  – Rural or Urban Functional Class
  – Date (Summer, etc.)
  – Speeding Involvement
  – Drinking Involvement
  – Restraint Use
  – Driver or Not
  – Ages
  – Gender

• View Fatalities by State, Street Address, District, & Zip Code
OTHER INFORMATION

• Policy-Based Maps (Seat Belt, Aggressive Driving, & Admin. Law Suspension)

• Data Description, Tutorials, Resources, Videos, etc.
Safe Road Maps

Welcome to Safe Road Maps! This website is a groundbreaking tool that combines information from the Fatality Analysis Reporting System with Google Maps to give you a visual representation of traffic safety across the entire nation. With this system, you can enter an address and view the roads that have the highest number of traffic fatalities in a specified area. You can also view dynamically generated maps that show how public policy has been implemented to improve transportation safety by region. Our hope is that this site brings both increased safety and awareness to transportation policy makers and private citizens.

Using This Site

The valuable resources offered through this website can be accessed via the orange menu bar, above. The following list summarizes what is available within each section.

- **Maps**: You can set search criteria and view statistical data by street or state, view traffic fatality videos and view area maps to learn where certain laws are in effect.

- **Tutorials**: In this section, you can view a video demonstration of how the Safe Road Maps Mashup works or you can watch a video on how Google Earth can be used to dynamically create interactive maps.

- **Data**: The statistics used by this site come from the Fatality Analysis Reporting System. Visit this section to find out more about how the National Highway Traffic Safety Administration manages this data repository.

- **Resources**: This section contains educational tools related to Geographic Information Systems and U.S. Highway Safety policy legislation.

- **Videos**: Visit this section to watch informative videos on the importance of safe driving.

- **Press Room**: Here is where you will find the latest videos and articles about Safe Road Maps.

The Center for Excellence in Rural Safety (CERS)
Fatalities: 1
Details: Click this link or click the button above.

Display Filter Results In Google Earth
Display Aggressive Driving Law In Google Earth
Display Administrative License Suspension Law In Google Earth
Display Primary Seat Belt Enforcement Law In Google Earth

(Need Google Earth?)
<table>
<thead>
<tr>
<th>State Case</th>
<th>Road Type</th>
<th>Speeding</th>
<th>Drinking</th>
<th>Restraint Type</th>
<th>Person Type</th>
<th>Age</th>
<th>Sex</th>
<th>Deceased</th>
</tr>
</thead>
<tbody>
<tr>
<td>61411</td>
<td>Rural Principal Arterial - Other</td>
<td>Yes (Speeding Involved)</td>
<td>Yes (Alcohol Involved)</td>
<td>None Used/Not Applicable Not a Motor Vehicle Occupant</td>
<td>Driver</td>
<td>27</td>
<td>Male</td>
<td>Yes</td>
</tr>
<tr>
<td>61411</td>
<td>Rural Principal Arterial - Other</td>
<td>Yes (Speeding Involved)</td>
<td>No (Alcohol Not Involved)</td>
<td>Lap and Shoulder Belt</td>
<td>Driver</td>
<td>60</td>
<td>Male</td>
<td>No</td>
</tr>
</tbody>
</table>
California
Traffic Fatality Videos

2 EJECTED IN FATAL GREENHAVEN CRASH
OCT 16, 2007 - aprx. 1:00 AM
Flamin Rd @ El Macoroc
RELEASE INFORMATION

• SafeRoadMaps Released on July 29, 2008

• Website: www.saferoadmaps.org

• First Week:
  – Approx. 140-150 News Articles
  – More than 3 Million Hits (3 days)
  – More than 150,000 In-Depth Queries
PROPOSED VERSION 2

• More Years of Data
• Information about Severe Injury Crashes
• Other Local and Regional Level Program Information
• Interface Refinement and More Search Possibilities
• Fatality Hot Spots or Heat Maps
7th June 2001, 20:44, 3 Persons, 2 Fatalities
27th June 2002, 13:46, 5 Persons, 1 Fatality
19th July 2002, 16:00, 10 Persons, 1 Fatality

US 52 and 160th Street East (CR 42)
7th June 2001, 20:44, 3 Persons, 2 Fatalities
27th June 2002, 13:46, 5 Persons, 1 Fatality
19th July 2002, 16:00, 10 Persons, 1 Fatality

US 52 and 160th Street East (CR 42)
Interstate 10 and 15
OTHER ENGINEERING-RELATED ACTIVITIES
PROJECTS/PRESENTATIONS

- Centerline Rumble Strip Evaluation
- Farm-Equipment Motor Vehicle Crash Reduction Presentation
- Intersection Design Research White Paper (IDRWP)
- Others: Children At Play Sign Impacts and Dynamic Horizontal Curve Signs
CENTERLINE RUMBLE STRIPS

• Evaluating MN Installations (200+ Miles)

  – 14-15% Total & Injury Crash Decrease
  – 21-25% Total and Injury Head-On and Opposing Direction Sideswipe Crash Decrease

• FHWA Listed as “Proven Safety Countermeasures” with Implementation Guidelines
CLRS ISSUES

• Awaiting NCHRP 17-32 Results
• Implementation/Few Policies
• Concerns Related to
  – Noise
  – Motorcycle Impacts
  – Driver Reaction
  – Winter/Pavement Maintenance Impacts
• Guidance/Best Practices & Designs Vary
FEMV CRASH REDUCTION

• Presentation at Des Moines Conference (GPCAH)

• Challenges
  – Bigger Safety Issue than Shown through Data
  – Varying Crash Characteristics
  – Multi-Disciplinary Problem
  – Reduction Measure Point of View
THE FEMV SCENARIO

- Many Miles of Hilly Rural Roadway
- Lack of High Quality Design – Vert. Curve Design and Intersection Sight Distance
- Add in “Residential” Traffic with Aggressive & Distracted Commuters
- Mix in Young Permitted Drivers with Cell Phones and Texting
- Combine Larger Farms with More Travel that May Occur during Morning Commute
- Result - “Perfect Storm” Mixture for a Rural Safety Issue
TOTAL FATALITIES

• Total Fatalities in the U.S.
  – 42,708 (2006)
  – 41,059 (2007)

• Total U.S. Fatalities on Farm Equipment

• 9 State Region: Fatalities on Farm Equip.
  – 12 + MV = 30 (2006)
  – 14 + MV = 26 (2007)
  – Overall Approx. 25 Deaths, 500 Inj., 1,100 Crashes
FATALITY RATES

• Total U.S. Fatality Rates
  – 1.42 per 100 million VMT (2006)
  – 1.36 per 100 million VMT (2007)

• Urban & Rural U.S. Fatality Rates
  – Urban: 0.93 per 100 million VMT (2006)
  – Rural: 2.25 per 100 million VMT (2006)

• FEMV Crash & Fatality Rate Estimate?
POTENTIAL ENG. IDEAS

• Super 2 and 2 + 1 Cross Sections
• Proactive “Spot” Cross Section or “Intersection” Improvements
• Signing Applications
  – Permanent & Temporary
  – New Reflectivity Requirements for On-Road Signs
  – Consistent/Proper Use of On-Vehicle Signing, Lighting, Turn Signals, and Reflectors
• In-Vehicle, Other Technologies, etc.
PROACTIVE INSERTION

• Safety Conscious Planning
• Strategic Highway Safety Plans
• Road Safety Audits
• Roadway Projects: Resurfacing, Rehabilitation, & Reconstruction
• Context Sensitive Roadway Design
IDRWP “HOT TOPICS”

- Intersection Accessibility
- High-Speed and Innovative Intersection Design
- Left-Turn Treatments
- Safety and Design (Sight Distance, Capacity, Access, etc.)
- Roundabout Design
- Design for Peds and Older Drivers
- Several New Ideas