### Improving Rural Roadway Safety: Enactment to Engineering (Multi-Disciplinary Approach to

Implementation Policy)



Iowa State University Seminar April 10, 2009



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# **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

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# **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



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Policy: Plan, course of action, procedure, or guideline to influence/determine decisions and actions

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### 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)



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#### What's inside

About the Clearinghouse

Browse Topics

View Organizations

Submit a Resource

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Clearinghouse Home

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### 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.

Other Topics

Data & Statistics

### Find resources about safety on rural roads by topic

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

Engineering

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

### FEATURED

The U.S. Department of Transportation (USDOT) Rural Safety Initiative will help states and communities develop ways to eliminate the risks drivers face on America's rural roads and highlight available solutions and resources.

USDOT Rural Safety Initiative

Rural Safety Innovation Program

### **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)?





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### **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



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### **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



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# **EXISTING RESEARCH (Cont.)**

- "Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices" (Early 2008)
- 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

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# 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



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# INITIAL "23" & FINAL "6"

- 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

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### **PILOT APPLICATION - PSL**



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

 

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

### **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



### **SAFEROADMAPS V1 & V2**

### SafeRoadMaps | ENVISIONING SAFER ROADS



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 web site 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

ENTER SITE



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## **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



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# **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.



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### Safe Road Maps

Welcome to Safe Road Maps! This website is a ground-breaking 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)

### Maps MN

Announcements

### SafeRoadMaps MN

### Director

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#### **Robert Johns**

Training and Outreach Director, Center for Excellence in Rural Safety

#### Decearch Manager



Fatalities	Month	Day	Hour	Minute	Website L	.ink		
1	6	2	19	2				
State Case	Road Type	Speeding	Drinking	Restraint Type	Person Type	Age	Sex	Deceased
61411	Rural Principal Arterial - Other	Yes (Speeding Involved)	Yes (Alcohol Involved)	None Used/Not Applicable □ Not a Motor Vehicle Occupant	Driver	27	Male	Yes
61411	Rural Principal Arterial - Other	Yes (Speeding Involved)	No (Alcohol Not Involved)	Lap and Shoulder Belt	Driver	60	Male	No







Display Search 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?)

Safe State Maps Safe Street Maps	Congressional District Maps Traffic Fatality Videos	Printable Maps			
Congressional Districts	Congressional Districts 2006 FARS Map		Safety Statistics		
✓ California Congressional Districts	Recolling Substantial	Hybrid Terrain	California 💌		
Minnesota Congressional	Mike Thompson (D)		All Road Types	0	
Districts	Congressional District Website: <u>Click Herel</u>		Rural Road	õ	
		Barra Fin	Urban Road	0	
		Reno 80			
Safety Profile		Mart Stre	All Date Types	0	
California, Rural Road, Summer,	Varialeity	arson City	Summer	۲	
All Speed Types, Alcohol Involved,		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Non-Summer	0	
No Restraint Used, Driver, Age 22					
and Above, Male	Sarta Rosa Sacram A Polsen		All Speed Types	۲	
	V Contraction Tove		Speeding	0	
Minnesota, Rural Road, Non-	Na 10 Telc Luc		Not Speeding	0	
Summer, Speeding, Alcohol	Richmo P 🛆	The states			
Involved, No Restraint Used, Driver,	San Man era		All Drinking Types	0	
<u>Age 17 - 21, Male</u>	Francisco Tracional Antonio		Alcohol Involved	۲	
	Here anon A		Alcohol Not Involved	0	
	Sun yvale San Use		Not Reported	0	
		Madera	Unknown	0	
		Cret no			
	alnas		All Restraint Types	0	
	vecto ev		No Restraint Used	۲	
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_		alinha L'emocre 💋	Unknown	0	
	Display Filter Results In Google Earth	[ =	All Person Types	0	
	Display Addressive Driving Law In Google	<u>Earth</u> Coogle Forth	Driver	۲	
	Display Primary Seat Belt Enforcement Law In G	nogle Earth	Not a Driver	0	
	Display California Congressional Districts In G	oogle Earth			
	Display Minnesota Congressional Districts In G	pogle Earth	All Ages	0	
			Age 0 - 16	0	
	(Need Google Earth?)		Age 17 - 21	0	
			Age 1 pkpowp	0	
			Age OffKhown	0	



## **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



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# **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











## 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



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# **CENTERLINE RUMBLE STRIPS**

- Evaluating MN Installations (200+ Miles)
- Persaud, et al (2003)
  - 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



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### **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



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### **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

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# **TOTAL FATALITIES**

- Total Fatalities in the U.S.
  - **42,708 (2006)**
  - **41,059 (2007)**
- Total U.S. Fatalities on Farm Equipment
  - 46 + MV = 88 (2006)
  - 55 + MV = 102 (2007)
- 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.



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# **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



### **DISCUSSION/QUESTIONS**

