The Future:
Culture, Policy, Technology Integration?

Prepared by
The Western Transportation Institute
Montana State University

Prepared for
National Rural ITS Conference
Traffic Safety is a Primary Need for Society

Projected change in the ranking of the 15 leading causes of death and disease (DALYs) worldwide, 1990-2020 (WHO, 2002)

<table>
<thead>
<tr>
<th>1998 Disease or Injury</th>
<th>2020 Disease or Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lower respiratory infections</td>
<td>1. Ischaemic heart disease</td>
</tr>
<tr>
<td>2. HIV/AIDS</td>
<td>2. Unipolar major depression</td>
</tr>
<tr>
<td>3. Perinatal conditions</td>
<td>3. <strong>Road traffic injuries</strong></td>
</tr>
<tr>
<td>4. Diarrhoeal diseases</td>
<td>4. Cerebrovascular disease</td>
</tr>
<tr>
<td>5. Unipolar major depression</td>
<td>5. Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>6. Ischaemic heart disease</td>
<td>6. Lower respiratory infections</td>
</tr>
<tr>
<td>7. Cerebrovascular disease</td>
<td>7. Tuberculosis</td>
</tr>
<tr>
<td>8. Malaria</td>
<td>8. War</td>
</tr>
<tr>
<td>9. <strong>Road traffic injuries</strong></td>
<td>9. Diarrhoeal diseases</td>
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<td>10. Chronic obstructive pulmonary disease</td>
<td>10. HIV/AIDS</td>
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</tbody>
</table>

*Source: WHO, Evidence, Information and Policy, 2000*
Rural Crash Risk

US Fatal Crashes - 2004

Driver State → Driver Behavior → Other

Animal in Roadway
Passing
Speed
Environment

Risk Multiplier vs. Urban

[Bar chart image]

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Exurban Development

Exurban development, indicated by the grey areas surrounding black urban centers, across the United States.

Sutton et al. 2006; permission to use by Paul Sutton.

[Map of the United States with exurban development highlighted]
Rural

- Traffic safety is most critical in rural areas
- Risk only likely to INCREASE as population (older demographic) increases
# Changing Demographic

## Ranking of States by Population, Age 65 and older in 2030

<table>
<thead>
<tr>
<th>State</th>
<th>2005</th>
<th>2030</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>11.7%</td>
<td>26.5%</td>
<td>3</td>
</tr>
<tr>
<td>Montana</td>
<td>13.4%</td>
<td>25.8%</td>
<td>5</td>
</tr>
<tr>
<td>North Dakota</td>
<td>14.7%</td>
<td>25.1%</td>
<td>6</td>
</tr>
<tr>
<td>South Dakota</td>
<td>14.3%</td>
<td>23.1%</td>
<td>10</td>
</tr>
<tr>
<td>United States</td>
<td>12.4%</td>
<td>19.7%</td>
<td></td>
</tr>
</tbody>
</table>
North/West Passage Safety

Almost 25% of all nationwide rural ice/frost fatal crashes occur in NWP states.

Fatal Crashes with Lane Departure as a Factor

- National: 58%
- Washington: 60%
- Idaho: 62%
- Montana: 74%
- Wyoming: 74%
- North Dakota: 59%
- South Dakota: 74%
- Minnesota: 60%
- Wisconsin: 58%
  - Source: AASHTO
Transportation Systems

- Transportation system is centered on driver
- Therefore, applications must be derived from driver needs
- Interface with driver is THE critical component
Human-Centered Focus

- Human Factors
  - Data analysis
  - Task analysis
    - Driver support
  - Function
  - Interface
    - Interface with driver is critical component
  - Usability testing
    - Cost-benefit
Human Factor

Perception
- Unaware
  - Forget seatbelt

Decision
- Deliberate Risk
  - Decide to not use belt

Response
- Insufficient Skill
  - Unable to use belt

Safety Culture
- Values
- Beliefs
New Paradigm

- Belief, Attitudes, Norms
- Change culture to remove pathogens
- Human
- Speed
- Alcohol, Fatigue, ...
- Warn or control speed
- Improve vehicle Control (speeding)
- Build road Minimize crash
- ASW
- ESC
- Barriers
- Treat symptom, not pathogen
Cultural Interventions

Belief System
- Change beliefs
- Calibrate norms
- Role models

Value Set
- Add cost
- Reveal cost
- Add reward
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“Citizens can be made more interested in displaying self-protective behavior if they are better rewarded for safety. Then they will put greater pressure on governments to pursue the goal of safety more rigorously.”

[Source: Wilde, 1994, p. 211]
Fatal Crash Rates by Rural Road Class

- As rural road class moves from Interstate to Local, the fatal crash rate increases.
Wildlife Vehicle Collisions

1 in 5 of all nationwide fatal rural crashes caused by animals occur in NWP states

Total Wildlife Vehicle Collisions and Total Crashes by Year

Source: GES
Risk Management

Human Factors
- Driver Age
- Driver Experience
- Driver Risk Behavior

Geo-Referenced Roadway Data
- Road Geometry
- Historical Crash Data
- Upstream Speed Data
- Upstream Road Condition Data

Risk Management and Pricing
- Vehicle Speed
- Vehicle Position
- Local Road Conditions
- Animals in Roadway
- Real Time Sensing

Animals in Roadway
Local Road Conditions
Real Time Sensing
Conceptual Illustration
Pre-crash Analysis

- **Risk Factors**
  - Animals
  - Traffic
  - Weather
    - Visibility
    - Surface
  - Speed
    - Limit
    - Conditions
  - Geometry
    - Curves
    - Sightlines
  - History
    - Crashes
    - Wildlife/Vehicle

- **Task Support**
  - Hazard detection
  - Speed choice
    - Limit, conditions, curve
  - Passing advisory

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VII Input
(Roadside sensor, Maps, Vehicle Probes)

VII Output
(Roadside Display or in-vehicle)

Risk Display

Integrated Application

Individual Applications
Summary

- Dialogue on “new paradigm”
- Strategic Vision
  - How use culture?
  - What are the critical gaps?
  - What are the key steps
  - How can policy and technology be integrated solution?