Model Performance Measures for State Traffic Record Systems

Mehdi Nassirpour, Ph.D.

Presented at the Illinois Traffic Engineering and Safety Conference on October 22, 2009
Project Staff

- PRG – Contractor
- Jim Hedlund, Highway Safety North – Project Director
- Jackie Schraf – NHTSA Project Director

- GHSA – Subcontractor
- Barbara Harsha and staff
  - liaison with States, Traffic Records community
  - facilities for panel meetings

- Expert panel – draft the performance measures
Expert Panel: 25 State and 7 Federal Members

- **States:** 25 members from 20 States, from all NHTSA regions
- **Feds:** 7 members from 4 agencies – CDC, FHWA, FMCSA, NHTSA – including all the 408 team members
- **5 teams, each with chair and 5 or 6 others**
  - C: crash data
  - D/V: driver and vehicle data
  - R: roadway data
  - E: enforcement and adjudication data
  - I: EMS and injury data
Objectives

1. Develop a minimum set of data quality performance measures that is intended to be used by federal, State, and local governments in the development and implementation of their traffic records data systems, strategic plans, and programs.

2. A minimum of six quality performance measures addressing timeliness, accuracy, completeness, uniformity, integration, and accessibility for each of the six State traffic safety core data systems (crash, vehicle, driver, roadway, enforcement/adjudication, and injury surveillance) will be developed.
Reason for the Project

- Improve State traffic record systems
- Help State TRCCs involve all traffic record systems
- Promote greater cooperation and coordination within and between traffic record system components
- Provide States with direction when developing performance measures for their data systems and data grant programs
- Get ahead of the performance measure curve
- Performance measures will be prominent in reauthorization: “If we don’t do this, Congress will do it for us (or to us)”
Data Systems

- Crash: State crash file
- Vehicle: State vehicle registration file
- Driver: State driver license and history files
- Roadway: State files on roadway characteristics, condition, Average Annual Daily Traffic (AADT)
- Citation and Adjudication: traffic citations, arrests, convictions, sentences
  - State, municipal, and local files
- Injury: State EMS, Emergency Department (ED), Hospital Discharge (HD), Trauma Registry files
  - not all States have all these files
What is a Performance Measure?

- For each cell, a performance measure is an indicator of the performance criterion for that data system.
- Performance measures apply to data systems, not activities.
- Performance measures are not performance goals:
  - States will set their own goals.
  - Measures will be used to track progress within a State, not to compare across States.
Criteria for Performance Measures

• Quantifiable
  • numeric value
  • not unreasonable burden on States to derive

• Meaningful
  • measures core functions of the data system

• Useful to States
  • to obtain State funding, 408 grants

• Straightforward
  • clear and concise, easy to explain and understand in non-technical language
Performance Areas

• **Timeliness:**
  • time from event until data on file and available for use
  • time from event until data passed on to user system

• **Accuracy:**
  • data valid, internally consistent
  • data coded properly per external checks

• **Completeness:**
  • no missing data for records on file
  • file contains all events
Performance Areas

- **Uniformity (consistency):**
  - all reporting jurisdictions have same procedures, data
  - agree with national guidelines and standards

- **Integration:**
  - data files can be linked to appropriate other files

- **Accessibility:**
  - information readily and easily available to main users
### Performance Measure Matrix

<table>
<thead>
<tr>
<th></th>
<th>Timely</th>
<th>Accurate</th>
<th>Complete</th>
<th>Uniform</th>
<th>Integrated</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cit/Adj</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Status of Performance Measures

• Panel produced initial draft:
  • 58 recommendations for the 36 cells

• By data system:
  • 12 crash
  • 6 vehicle
  • 10 driver
  • 11 roadway
  • 8 enforcement/adjudication
  • 11 injury
Where We Are Now

- By performance criterion:
  - 11 timeliness
  - 10 accuracy
  - 12 completeness
  - 7 uniformity/consistency
  - 10 integration
  - 8 accessibility
## Recommended Performance Measures

<table>
<thead>
<tr>
<th></th>
<th>Timely</th>
<th>Accurate</th>
<th>Complete</th>
<th>Uniform</th>
<th>Integrated</th>
<th>Accessible</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Vehicle</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Driver</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Roadway</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Cit/Adj</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Injury</td>
<td>1*</td>
<td>1*</td>
<td>4*</td>
<td>1*</td>
<td>3*</td>
<td>1*</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>10</td>
<td>12</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>58</td>
</tr>
</tbody>
</table>

* Some measures apply to more than one Injury data system.
What They Look Like (in General)

- **Timeliness**
  - time from event generating the data until it reaches the data file
  - sometimes until “available for analysis or reporting”
  - median or mean; sometimes percent within fixed time period

- **Accuracy**
  - internal to file: errors for critical data elements
  - external: validation from external sources (like VIN) or audits

- **Completeness**
  - internal: missing values for critical data elements
  - external: percent of agencies reporting (for applicable files)
What they look like (in general)

- **Uniformity - consistency**
  - use of common variables statewide
  - compliance with national standards

- **Integration**
  - linkage with appropriate other files

- **Accessibility**
  - ability of authorized users to access in timely manner
  - use of files by authorized users
## Examples of Recommended Measures

<table>
<thead>
<tr>
<th></th>
<th>Timely</th>
<th>Accurate</th>
<th>Complete</th>
<th>Uniform</th>
<th>Integrated</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadway</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cit/Adj</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
Examples of Recommended Measures

- **Crash timeliness:**
  - Median number of days from the date of a reported crash until it is entered into the State crash file.

- **Vehicle accuracy:**
  - Percent of records on the State vehicle registration file with successfully validated VINs using standardized VIN verification software.

- **Driver completeness:**
  - Percent of missing or unknown critical data elements on the State driver record file.
  
  Critical elements are those required by CDLIS except for those that apply only to commercial drivers.
Examples of Recommended Measures

• Roadway uniformity/consistency:
  • Number or percent of MMIRE roadway inventory elements collected and entered into the State roadway inventory file.

• Citation/adjudication integration:
  • Percent of law enforcement agencies issuing traffic citations that have policies in place to facilitate the transfer of citation data between authorized users.

• Injury accessibility:
  • Time (number of days after January 1) until the annual State EMS file is closed and available for analysis by other stakeholders.
# Performance Measures for Crash Data

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Timeliness</th>
<th>Accuracy</th>
<th>Completeness</th>
<th>Uniformity</th>
<th>Integration</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>median days from crash to file entry</td>
<td>% crashes w/ &lt; #XX data elements w/ errors</td>
<td>% crashes missing ≥ 1 critical data elements</td>
<td># MMUCC-compliant data elements</td>
<td>% in-State drivers on crash file linked to driver file</td>
<td># auth. agencies capable of accessing crash file</td>
</tr>
<tr>
<td>2-</td>
<td>% crashes on file in #XX days</td>
<td>% in-State vehicles VIN match to vehicle file</td>
<td>% crashes w/ ≤ #XX incomplete data elements</td>
<td></td>
<td>% crashes w/ EMS linked to EMS file</td>
<td></td>
</tr>
<tr>
<td>3-</td>
<td>median days from crash to location coding on crash file</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Performance Measures for Vehicle and Driver Data

<table>
<thead>
<tr>
<th>Category</th>
<th>Vehicle</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
<td>1- median days from owner change to vehicle file update</td>
<td>1- median days from conviction to driver file entry</td>
</tr>
<tr>
<td></td>
<td>2- % convictions on driver file in 10 days</td>
<td>3- median days from final adjudication to driver file entry</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>1- % vehicles on vehicle file w/ valid VIN</td>
<td>1- % in-State driver convictions linked to driver file</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- % drivers on file w/ verified Soc. Sec. #</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>1- % vehicles on vehicle file w/ no missing MMUCC data elements</td>
<td>1- % missing or unknown critical data elements on driver file</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- % adjudication agencies reporting convictions to driver file</td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>1- % vehicle file data elements comply w/ AAMVA and MMUCC stds.</td>
<td>1- % driver data elements complying w/ AAMVA, MMUCC, Real ID standards</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>1- # relevant data files linked to vehicle file</td>
<td>1- # relevant data files linked to driver file</td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>1- avg. # days from temp. vehicle reg. to vehicle file entry</td>
<td>1- % adj. agencies or adjudicators w/ immediate driver file access</td>
</tr>
</tbody>
</table>
## Performance Measures for Roadway Data

<table>
<thead>
<tr>
<th></th>
<th>Timeliness</th>
<th>Accuracy</th>
<th>Completeness</th>
<th>Uniformity</th>
<th>Integration</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
<td>1- avg. days from construction project end to road file update</td>
<td>2- avg. days from critical data element collection to entry on road file</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>1- % road segments w/ errors on critical data elements</td>
<td>2- % crashes on public roads located on basemap or file</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>1- # or % of public road miles on basemap</td>
<td>2- # or % of public road miles w/ critical data on basemap or file</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>1- # or % of MMIRE data elements collected and entered on road file</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>1- road file linked to crash, other files</td>
<td>2- # or % of highway inventory files linked to basemap or road file</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>1- # or % of auth. users acquiring data from road file</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2- % requests filled by State deadline</td>
</tr>
</tbody>
</table>
### Performance Measures for Citation/Adjudication Data

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
<td>1- median days from citation to file entry at first repository</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>1- % citation file records w/ errors in critical data elements</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>1- % missing critical data elements on citation files</td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>1- % citations on driver file w/ unif violation codes</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>1- % law enforcement agencies w/ policies for citation data transfer</td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>1- % citation files accessible to auth. users</td>
</tr>
<tr>
<td></td>
<td>2- % auth. users w/ access to citation files</td>
</tr>
</tbody>
</table>
# Performance Measures for Injury Data

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
<td>1- median days from event to file entry</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>1- % error-free records</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>1- % agencies reporting&lt;br&gt;2- % EMS records w/ no missing NEMSIS data elements&lt;br&gt;3- % records w/ ICD-9 E-code&lt;br&gt;4- % records w/ missing data for ≤ 5 standard data elements</td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>1- % records compliant w/ national standards</td>
</tr>
<tr>
<td><strong>Integration</strong></td>
<td>1- % Trauma Reg records w/ EMS linked to EMS file&lt;br&gt;2- % EMS records fr. crash linked to State file&lt;br&gt;3- % records on file w/ crash E-code linked to crash file</td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td>1- # days after Jan. 1 until file closed and available</td>
</tr>
</tbody>
</table>
Opportunities

- Improve State traffic record systems
- Get ahead of the performance measure curve
- Help State TRCCs involve all traffic record systems
- Promote greater cooperation and coordination within and between traffic record system components
- Provide States with direction when developing performance measures for their data systems and data grant programs
Challenges

- Six component data systems
  - each system has one or more data files
  - some files have multiple purposes, constituencies, owners, funding – traffic safety only one of many players
  - some data not statewide

- Performance criteria definitions
  - define accessibility or integration

- Panel meetings
  - lots of work required of panel in short meeting time
Implications for States

- What will the final performance measures look like?
- What will we be required to do?
- When must we start?
- How do these measures relate to the Sec. 408 grants?
- What help will we get from NHTSA and GHSA?
Next Steps

- Oct. – Dec. 2008: panel, background materials
- Feb. 18-19, 2009: first panel meeting
- March 6: teams agree on recommendations
- April 1: white paper out to full panel
- June 1: white paper out for public comment
- Summer: present at Traffic Records Forum, GHSA, other meetings
- Sept. 12: comments back, summarized
- Sept. 29: second panel meeting
- Nov. 1: final report draft to panel
- Jan. 1, 2010: final report draft to NHTSA
- April 1: final report revised, complete