LINKING CRASH RECORDS WITH EMS REGISTRY DATA

Presentation by Nina Leung, PhD
Traffic Safety Grant

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  - History
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- **RESEARCH STUDY:** “Crash-related Factors and Emergency Medical Services (EMS) Field Measures Among Motorcycle Drivers in Texas”
  - Research Objectives
  - Methodology
  - EMS Outcomes
  - Future Steps
WHY IS DATA LINKAGE IMPORTANT?

1 database rarely has all information on a traumatic event...

Injury surveillance
Trauma system evaluation

TRAUMA CARE

- Pre-hospital Care
- Hospital Care
- Follow-up Care
HISTORY OF DATA LINKAGE

1946 - Recognized benefits of data linkage

1959 - Newcombe linked medical/vital records

1967 - Oxford Record Linkage Study

1984 - California Automated Mortality Linkage System

1992 - NHTSA - CODES
CRASH DATA - TxDOT

- CR-3 Form
- Texas Peace Officer
- Crash data
  - Vehicle type
  - Location
  - Severity of crash
  - Factors/conditions surrounding crash
  - Driver/passenger information
EMS DATA – TEXAS EMS & Trauma Registries

- Texas Administrative Code, Title 25, Part 1, Chapter 103, Rule §103.4
  - EMS providers are to report all runs to the Texas EMS & Trauma Registries

- EMS data
  - Immediate patient condition
  - Pre-Hospital emergency treatment
  - Timing of response
  - Cause of injury (E-code)
LINKING METHODOLOGY
DATA MANAGEMENT PROCESSES

- FINAL Data Pull
- Data Cleaning
- Formatting
- Linking Subset
DATA LINKING PROCESS

- **Probabilistic linkage**
  - Date of Birth
  - Sex
  - SSN
  - Injury County Code
  - Last Name
  - First Name
  - Middle Name
  - Injury Date
  - Injury Time
  - Dispatch Time

- **Implemented a “high” cut-off value**
DATA LINKAGE

2013

Crash Subset
N=867,478

EMS Subset
N=72,199

Linked Dataset
N=28,582
• 39.6% Linked
LESSONS LEARNED in the Linking Process

• Data cleaning
  • Record duplication
• For exceptionally large linkages (>1 million records), use mixed-methods linkage
• ‘Good’ data = Linked data
1. To characterize and determine crash-related risk factors for fatal/non-fatal motor vehicle crashes involving primary motorcycle drivers in the state of Texas.

2. To describe EMS pre-hospital times and field health characteristics among primary motorcycle drivers in the state of Texas.
STUDY METHODOLOGY

- Categorical – Pearson’s Chi-square / Fisher’s Exact
- Continuous – Independent Samples T-test
- Multiple logistic regression
  - Forward selection approach (α=0.05)
  - Marginal associations (p<0.25)
Fatal/Non-Fatal Motorcycle Crashes (N = 1,817)

- Non-Fatal: 94%
- Fatal: 6%

Primary Motorcycle Drivers (N = 1,937)

2013 Crash to EMS Data Linkage (N = 28,582)
# Most Prevalent ICD-9-CM E-Codes

<table>
<thead>
<tr>
<th>RANK</th>
<th>Cause of Injury</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MVT Accident of Unspecified Nature</td>
<td>62.6</td>
</tr>
<tr>
<td>2</td>
<td>Other MVT Accident Involving Collision with Motor Vehicle</td>
<td>10.6</td>
</tr>
<tr>
<td>3</td>
<td>MVT Accident Involving Collision with Other Vehicle</td>
<td>9.0</td>
</tr>
</tbody>
</table>
## DEMOGRAPHIC CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Fatal (n = 107) N (%)</th>
<th>Non-Fatal (n = 1,710) N (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male Gender</strong></td>
<td>104 (97.2)</td>
<td>1,589 (92.9)</td>
<td>0.0350</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>6 (5.6)</td>
<td>245 (14.3)</td>
<td>0.0404</td>
</tr>
<tr>
<td>25-34</td>
<td>22 (20.6)</td>
<td>411 (24.0)</td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>23 (21.5)</td>
<td>317 (18.5)</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>30 (28.0)</td>
<td>337 (19.7)</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>15 (14.0)</td>
<td>239 (14.0)</td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td>7 (6.5)</td>
<td>85 (5.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td>0.1657</td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 (7.5)</td>
<td>145 (8.5)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>3 (2.8)</td>
<td>125 (7.3)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>62 (58.0)</td>
<td>794 (46.4)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>18 (16.8)</td>
<td>299 (17.5)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13 (12.2)</td>
<td>266 (15.6)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


NOTE: Values represent percentages based on column totals. Percentages may not sum to 100% due to rounding.
FATAL/NON-FATAL MOTORCYCLE CRASHES AND HELMET USE

- Non-Fatal
- Fatal
- No Helmet: 60%
- Helmeted: 40%
HELMET USE AND THE KABCO SCALE
MULTIPLE LOGISTIC REGRESSION

VARIABLES (p<0.25)

- Sex
- Light
- Weather
- Road Surface
- Race/Ethnicity
- GCS ≤13
- SBP ≤90 mm Hg
- Dest. SBP ≤90 mm Hg
- RR <10, >29 breaths/min
- Helmet Use

FINAL MODEL (p<0.05)

- GCS ≤13
- Destination SBP ≤90 mm Hg
- RR <10, >29 breaths/min
- Helmet Use
- Age
### FATAL/NON-FATAL MOTORCYCLE CRASHES

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adjusted OR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>12.84</td>
<td>1.15-143.55</td>
<td>0.0382</td>
</tr>
<tr>
<td>GCS ≤13</td>
<td>27.14</td>
<td>12.63-58.34</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Destination SBP ≤90 mm Hg</td>
<td>15.59</td>
<td>4.72-51.52</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>RR &lt;10 or &gt;29 breaths/minute</td>
<td>9.30</td>
<td>3.71-23.30</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Helmet Use</td>
<td>0.50</td>
<td>0.30-0.70</td>
<td>0.0004</td>
</tr>
</tbody>
</table>
EMS TIME INTERVALS

- **Activation**
  - 911 call received at dispatch to alarm

- **Response**
  - Alarm activation to arrival of 1st responding vehicle on scene

- **On-scene**
  - Arrival of 1st vehicle on scene until leaving the scene

- **Transport**
  - Leaving scene to vehicle arrival at the receiving hospital

- **Total Pre-Hospital Interval**
EMS TOTAL PRE-HOSPITAL TIMES

- Fatal Pre-hospital Interval
- Non-Fatal Pre-hospital Interval

Time (Minutes)
CONCLUSIONS

- Individuals with sub-normal field health measurements may require specialized trauma resources.
- Prioritizing triage decisions with respect to the field measures evaluated among these drivers may be a point of consideration regarding field interventions.
- This study emphasizes the importance of helmeted motorcyclists and the impact on increasing the odds of survival.
FUTURE STEPS

• Missing data - standard multiple imputation
• Hospital discharge data linking
• Texas EMS & Trauma Registries data quality review
  • Review protocols for ‘test record’ entry and de-duplication
  • Examine/revise data validation rules
CONTACT INFORMATION

INJURY EPIDEMIOLOGY & SURVEILLANCE BRANCH
DEPARTMENT OF STATE HEALTH SERVICES
1100 WEST 49TH STREET
AUSTIN, TEXAS 78714

- WEBSITE: www.dshs.state.tx.us/injury/data
- EMAIL: Nina.Leung@dshs.state.tx.us
## SUPP. SLIDE 1: SUCCESSFUL LINKS

Crash $\rightarrow$ EMS $\rightarrow$ Hospital

<table>
<thead>
<tr>
<th></th>
<th>Observations</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash $\rightarrow$ EMS</td>
<td>28,582</td>
<td>100</td>
</tr>
<tr>
<td><strong>FULL LINK</strong></td>
<td>3,408</td>
<td>11.9</td>
</tr>
</tbody>
</table>

* Based on cause of injury e-codes: 810-819, 820-825
† Percent of linked records to MV-related, non-transfer records