FHWA Motorcycle Crash Causation Study

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2017 Lifesavers
March 25, 2017
Presentation Overview

• Background
• Data Collection
• Preliminary Results
Why Study Motorcycles Crashes?

![Motorcycle Fatalities vs. All Traffic Fatalities Graph]

- **Motorcycle Fatalities**: Yearly trends showing a rising trend, peaking around 2008, with fluctuations until 2014.
- **All Traffic Fatalities**: Yearly trends showing an increasing trend from 2000 to 2008, with fluctuations afterwards.

**Legend**:
- Motorcycle Fatalities
- All Traffic Fatalities

**Sources**:
- U.S. Department of Transportation
- Federal Highway Administration
Why Study Motorcycles Crashes?

Percentage of All Fatalities: Motorcyclists

- 14% in 2015

Data from 1997 to 2015 shows an increase in the percentage of fatalities involving motorcyclists.
Congressional Response

- Congress mandated the Motorcycle Crash Causation Study (MCCS)
  - OECD Data Collection Protocol
  - Oklahoma State University

- NHTSA Pilot Study
  - FHWA and NHTSA worked to develop data collection program
  - Final Report: June, 2010
FHWA MCCS Team

FHWA
Federal Oversight

Oklahoma State University
Project Lead

Dynamic Sciences, Inc.
Crash Investigation

Dynamic Research, Inc.
OECD Liaison / Quality Control

Westat, Inc.
Statistical Analysis

Motorcycle Accident Analysis
Quality Control

Collision and Injury Dynamics
Quality Control / Helmet Testing
MCCS Budget

- $3.5 Million
  - Financial Partners
    - USDOT
      - FHWA
      - NHTSA
    - Six State DOTs
      - New Mexico
      - New York
      - Ohio
      - Oklahoma
      - Texas
      - Wisconsin
    - American Motorcyclist Association (AMA)

- Sample Size
  - 351 Crash Investigations
  - 702 Control Rider Interviews
MCCS Data Collection

• Orange County, California
  – Urban
  – Rural
  – Commuters
  – Leisure Riders

• 3 Crash Investigators
  – 2 re-hired from the NHTSA Pilot
  – Experienced Crash Investigators
  – On call 24/7
OECD Methodology

• Organisation for Economic Co-operative Development (OECD)
  – On-Scene Investigation
  – Vehicle Inspection
  – Rider Interviews
  – Injury Data
  – Control Rider Interviews
    • 2 Controls/ Crash
  – 1,600+ Data Elements
MCCS On-Scene Data Collection
Crash Investigation Process

Respond On-Scene

- Scene / Evidence Documentation
- Interview participants / Witnesses
- Take initial measurements
Scene Diagram

- Detailed Measurements
  - Lane width
  - Curb height
  - Point of Final Rest

- Record any crash-related evidence
  - Tire marks
  - Remaining debris
  - Damage to roadside objects
Scene Diagram

Motorcycle Crash Causes and Outcomes Study

Vehicle 1: 2011 Suzuki GSXR 750 (750cc's)
Other Vehicle: 2006 Honda Element
Motorcycle Investigation
Other Information Resources

- **Police Accident Report**
  - Description of crash event
  - BAC measurements

- **Rider Interviews**
  - Crash account
  - Riding history
  - Licensing status
  - Rider training
  - Emotional state
Medical Records

- **Obtain Medical Records from Hospital**
  - Code all injuries using Abbreviated Injury Scale (AIS)
  - Identify location and description of all injuries

- **Obtain coroner’s report**
  - Injury details
  - Toxicology results
Helmet Reconstruction

- **Documentation**
  - Helmet certification
  - Manufacture date
  - Chin strap

- **Helmet recovery**
  - Offer $100 gift card for replacement helmet
  - Used for reconstruction (~10%)
Helmet Reconstruction

Recreate Crash Forces on Exemplar Helmet

Identify Impact Zones and Direction of Force
Control Interviews

- Serve as Control Population
- Detailed data collection
  - Rider history
  - Motorcycle detail
  - Protective equipment
  - Trip purpose
- $40 Gas Card
Quality Control

Collect All Case Data → In-House Review → External Review → Case Complete

Internal DB Range & Completeness Checks

Medical Coding Complete Review

CID MAA DRI
Preliminary Results
Preliminary Results

Age of Rider in Crash and Control

U.S. Department of Transportation
Federal Highway Administration
Preliminary Results (Crash)

- **95%** of crashed riders were male

- **98.9%** of crashed riders were wearing helmets
  - 74% were wearing full-face helmets

- **19%** of crashed riders did not have a MC license
  - 5% had no license at all
## Preliminary Results

<table>
<thead>
<tr>
<th>Type of Motorcycle Training</th>
<th>Crashes</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>24%</td>
<td>15%</td>
</tr>
<tr>
<td>State Recognized, Entry-Level Motorcycle Course</td>
<td>50%</td>
<td>45%</td>
</tr>
<tr>
<td>Experienced Rider Course</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>High Performance/ Competitive Track Course</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Self Taught*</td>
<td>6%</td>
<td>18%</td>
</tr>
<tr>
<td>Taught By Family and/or Friends</td>
<td>6%</td>
<td>7%</td>
</tr>
</tbody>
</table>
## Preliminary Results

<table>
<thead>
<tr>
<th>Age When Rider Began To Ride</th>
<th>Crashes</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never Rode Before, Or Rarely Ever Ride*</td>
<td>1%</td>
<td>0 %</td>
</tr>
<tr>
<td>Under The Age Of 17*</td>
<td>27%</td>
<td>40%</td>
</tr>
<tr>
<td>Age Between 17 - 25 Years*</td>
<td>51%</td>
<td>42%</td>
</tr>
<tr>
<td>Age Between 26-35 Years</td>
<td>13%</td>
<td>9%</td>
</tr>
<tr>
<td>Age Between 36-45 Years</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Age Between 46-55 Years</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Age More Than 55 Years</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Preliminary Results (Crash)

- 11% of crashes resulted in a fatality to the rider
  - 22% of single vehicle crashes resulted in a fatality
  - 62% of the fatalities involved a collision with a fixed object

- 77% coded as multiple vehicle
  - 63% involved a collision with another vehicle
  - 48% of multi-vehicle crashes were the result of a turn by the MC or OV
  - 41% of single vehicle crashes involved a rider leaving the roadway

- 10% crashes occurred between 10pm-6am
  - 13% of fatalities
  - 12% of single vehicle crashes
Preliminary Data (Environment)

• **66.7% of crashes** occurred at an intersection
  – **50% of fatal crashes** occurred at intersections compared to **28% of non-fatal**
  – **17% of crashes** occurred at driveways

• **34% of crashes** occurred on curves
  – **48% of fatal crashes** occurred on curves as compared to **32% of non-fatal crashes**

• **74% of crashes** occurred on principal or minor arterials
Preliminary Data (Causation)

• A failure by the rider was deemed the primary contributing factor in 44.3% of crashes and a failure by the other vehicle driver was attributed to 51% of crashes
  – Unsafe acts by the rider were deemed to be related to 50% of crashes
  – Traffic Scanning errors by the other vehicle driver contributed to 70% of crashes
  – Inadequate control skills of the rider contributed to 26% of crashes
Preliminary Data (Injuries)

Maximum Injury Severity for Each Case
(Single vs. Multiple Vehicle Crashes)

- Single Vehicle Crashes
- Multiple Vehicle Crashes

MINOR INJURY  MODERATE INJURY  SERIOUS INJURY  SEVERE INJURY  CRITICAL INJURY  MAXIMUM (UNTREATABLE)
Federal Highway Administration
U.S. Department of Transportation

ALCOHOL USAGE OF RIDERS INJURED IN CRASH

ALCOHOL USAGE OF RIDERS FATALLY INJURED IN CRASH

ALCOHOL OR DRUG CONSUMPTION OF RIDERS
### Day of Week Crash Occurrences

<table>
<thead>
<tr>
<th>Day of Week</th>
<th>MCCS</th>
<th>NASS/GES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>15.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Monday</td>
<td>10.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Wednesday</td>
<td>20.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Thursday</td>
<td>15.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Friday</td>
<td>10.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Saturday</td>
<td>10.0%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

### Day of Week the Crash Occurred

<table>
<thead>
<tr>
<th>Time</th>
<th>MCCS</th>
<th>FARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001-0100</td>
<td>10.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>0101-0200</td>
<td>15.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Wednesday</td>
<td>15.0%</td>
<td>10.0%</td>
</tr>
<tr>
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<td>20.0%</td>
<td>15.0%</td>
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</table>
Type of Intersections

- Not an Intersection
- Four-Way Intersection
- T-Intersection
- Y-Intersection
- Traffic Circle / Roundabout
- Five-Point, or More

MCCS  NASS/GES

Type of Intersections

- Not an Intersection
- Four-Way Intersection
- T-Intersection
- Y-Intersection
- Traffic Circle / Roundabout
- Five-Point, or More

MCCS  FARS
Data Access

• Finished Data Collection in January, 2016
• Data access administered by the FHWA Highway Safety Information System (HSIS) Program: www.hsisinfo.org
More Information

• Contact Information
  Carol.Tan@dot.gov
  Yusuf.Mohamedshah@dot.gov

• MCCS Website