U.S. Department of Transportation
Federal Highway Administration

Office of Safety Research and Development

FHWA Motorcycle Crash Causation Study

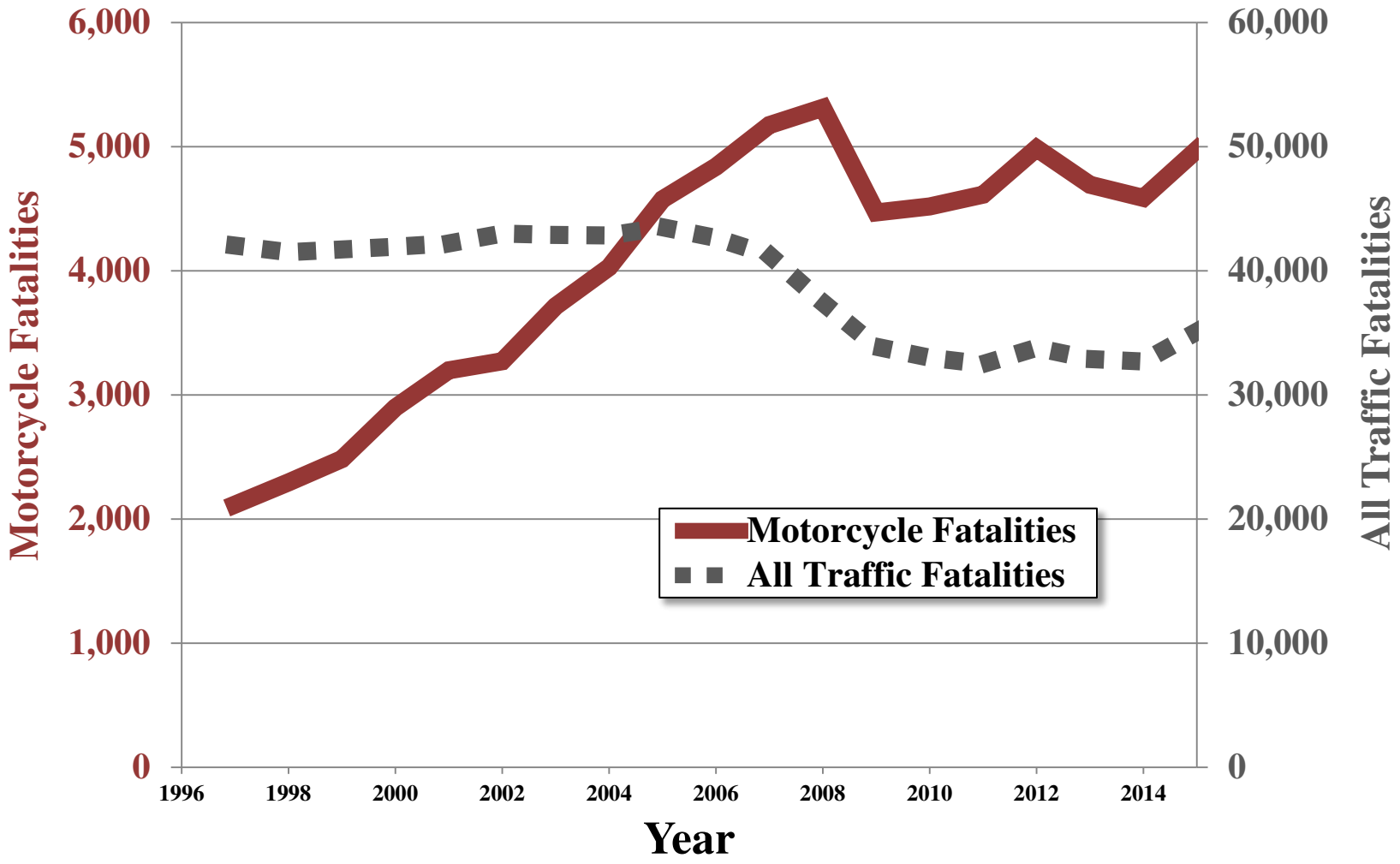
Carol H. Tan, Ph.D

2017 Lifesavers
March 25, 2017

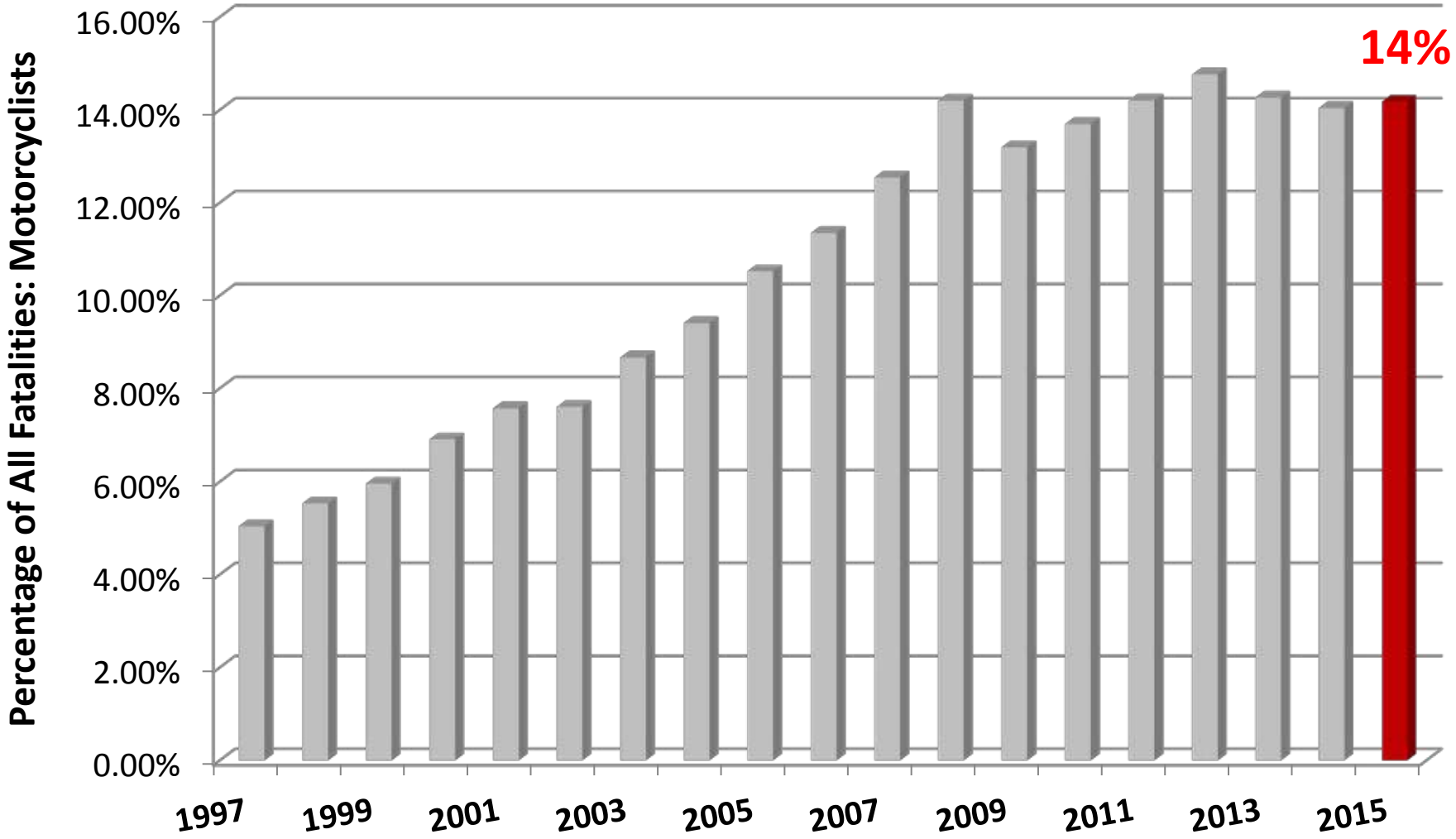
Presentation Overview

- Background
- Data Collection
- Preliminary Results

Why Study Motorcycles Crashes?



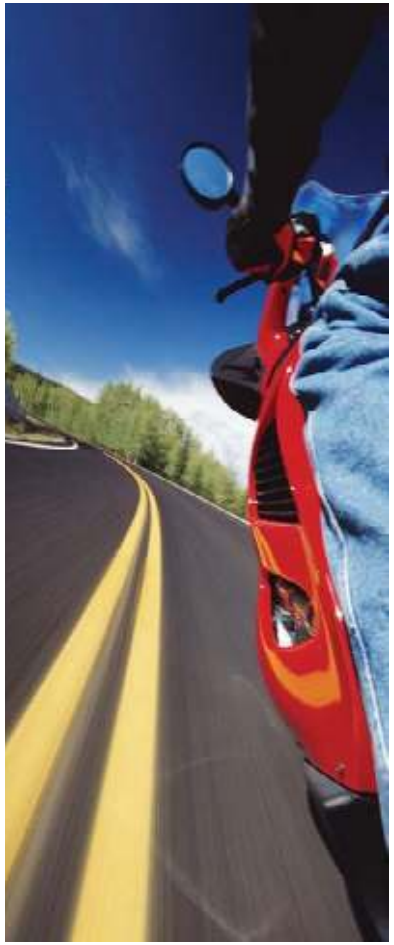
Why Study Motorcycles Crashes?



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

Westat, Inc.
Statistical Analysis

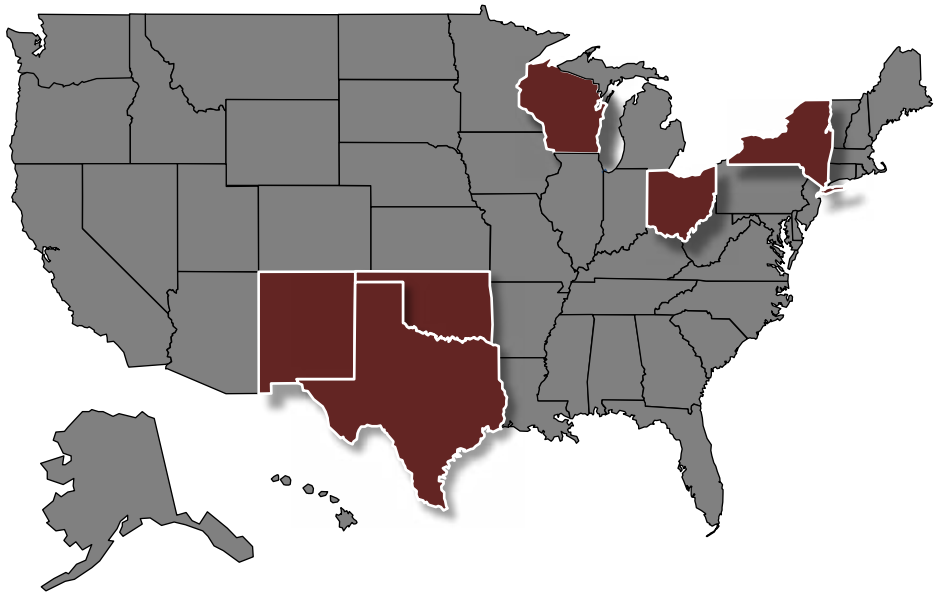
Dynamic Research, Inc.
OECD Liaison / Quality Control

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

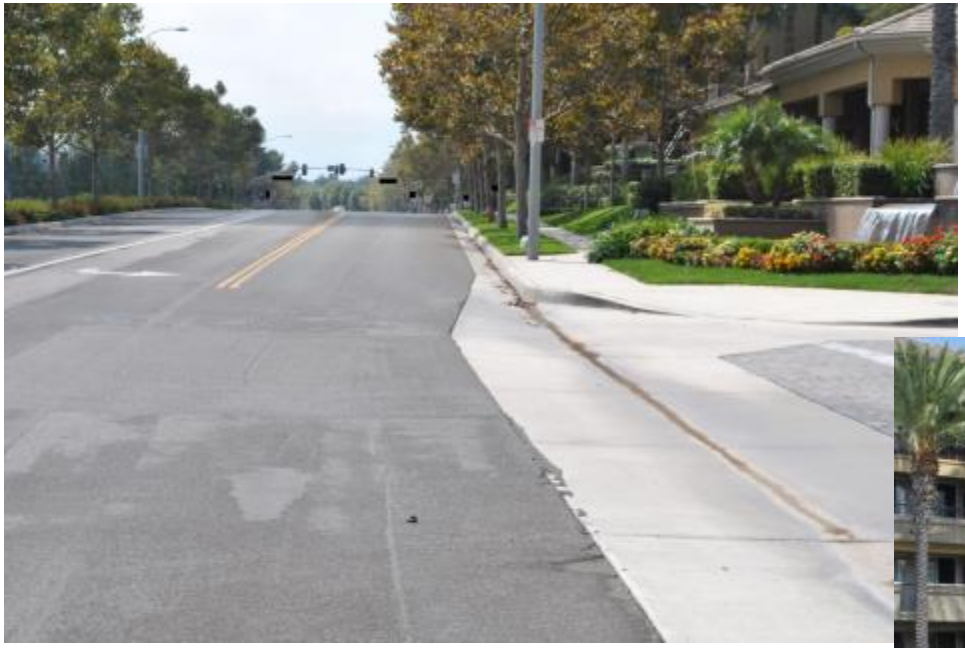
MCCS On-Scene Data Collection

Crash Investigation Process

Respond On-Scene

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

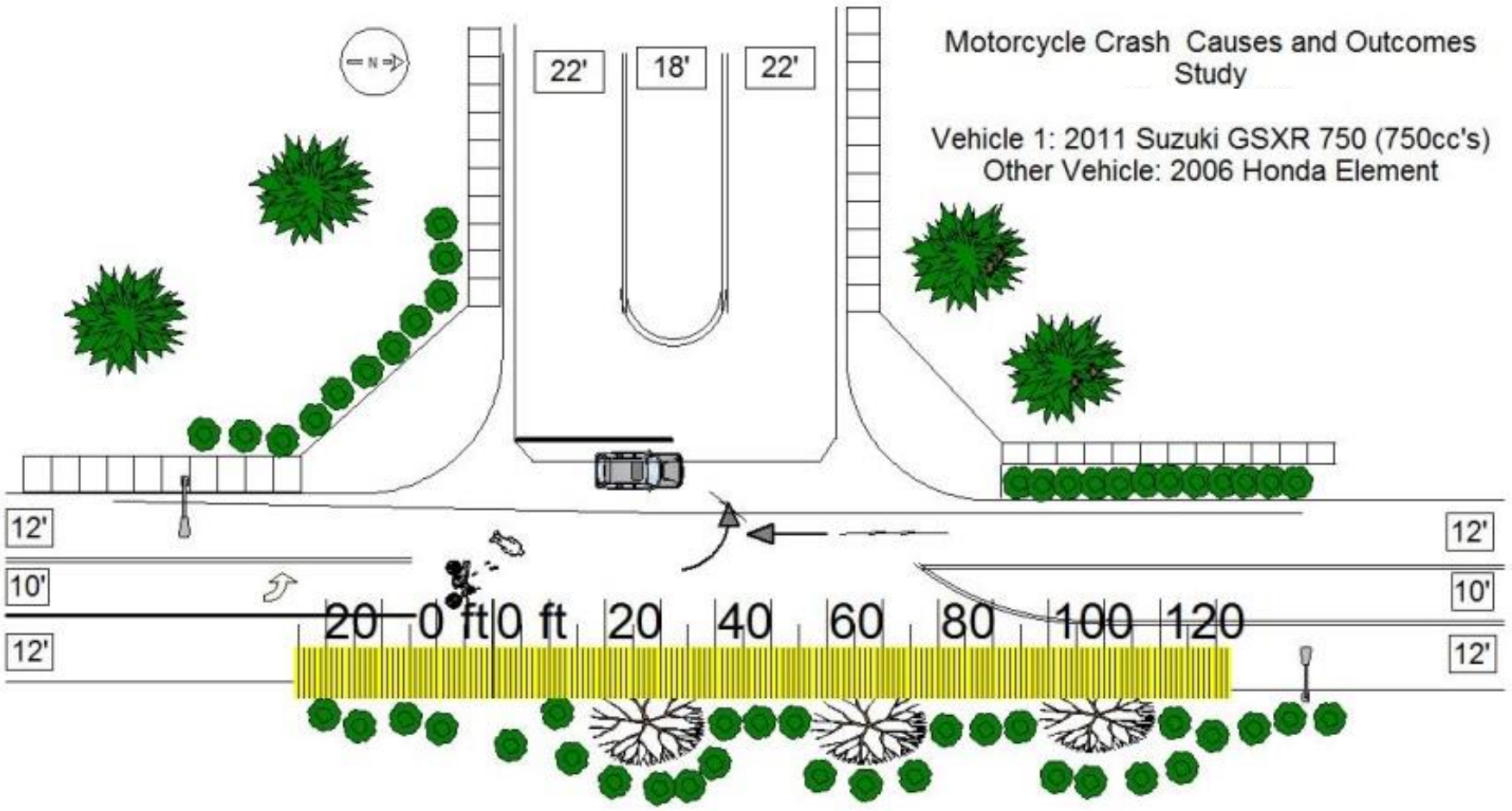
Scene Diagram



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

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

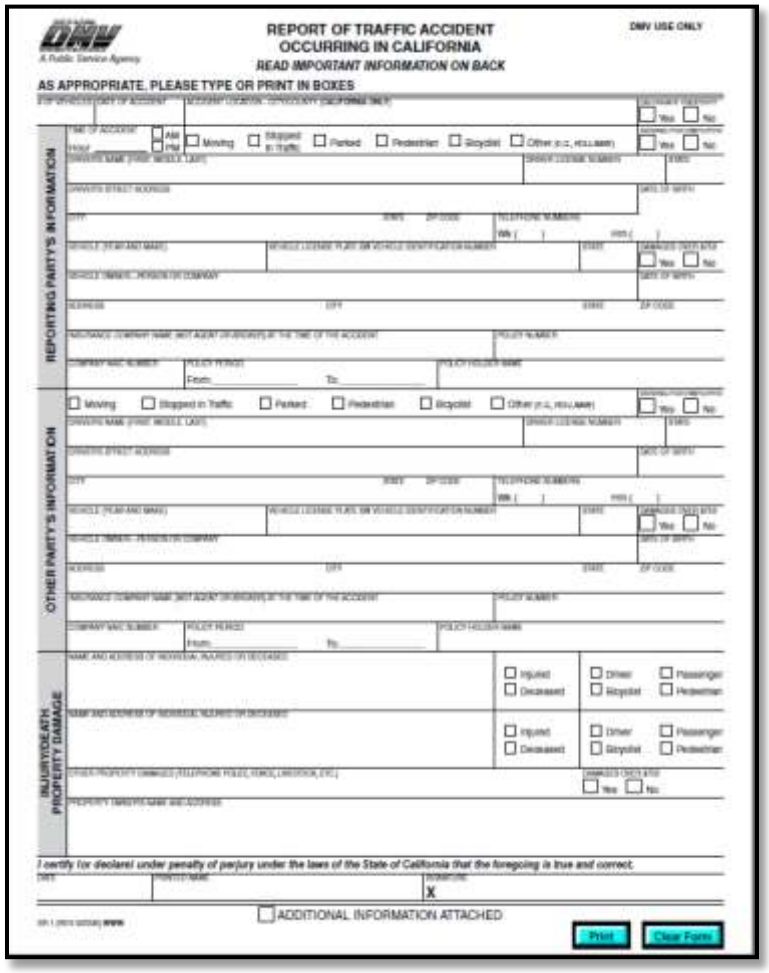
Scene Diagram



Motorcycle 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



REPORT OF TRAFFIC ACCIDENT OCCURRING IN CALIFORNIA

READ IMPORTANT INFORMATION ON BACK

DMV USE ONLY

AS APPROPRIATE, PLEASE TYPE OR PRINT IN BOXES

REPORTING PARTY'S INFORMATION

OTHER PARTY'S INFORMATION

INJURY/DEATH/ PROPERTY DAMAGE

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

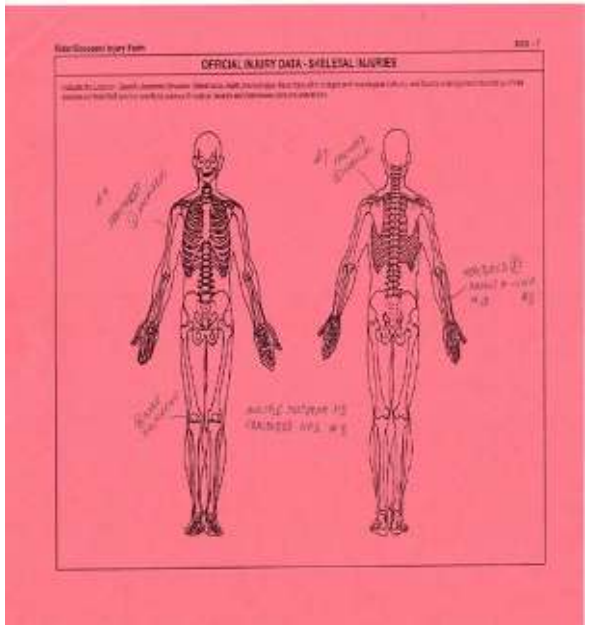
ADDITIONAL INFORMATION ATTACHED

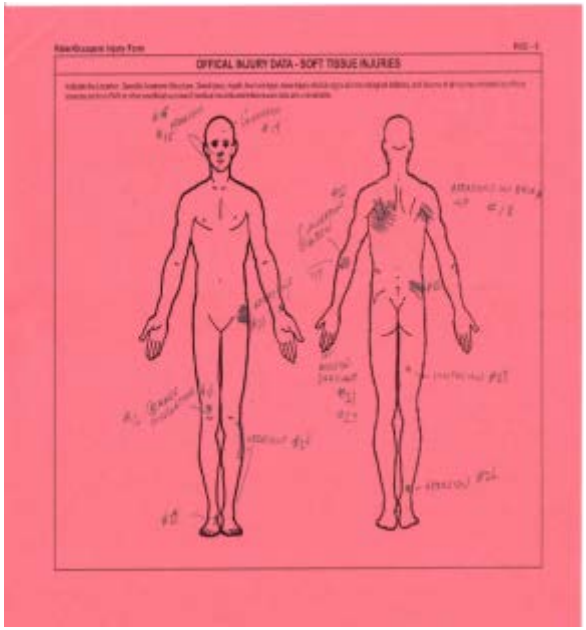
Print

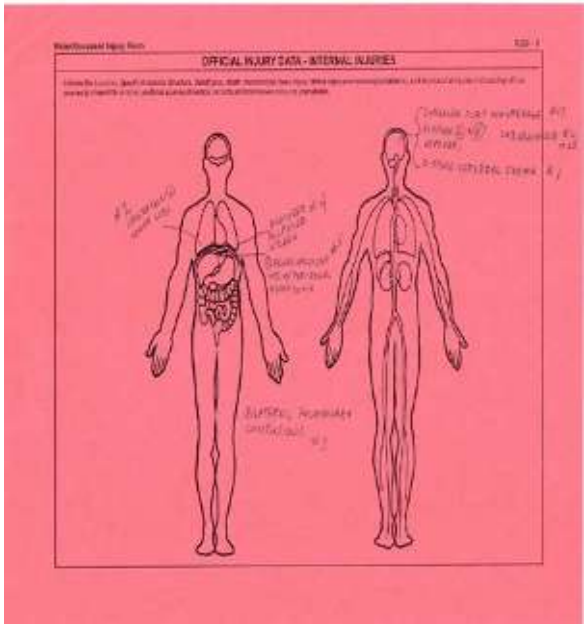
Clear Form

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

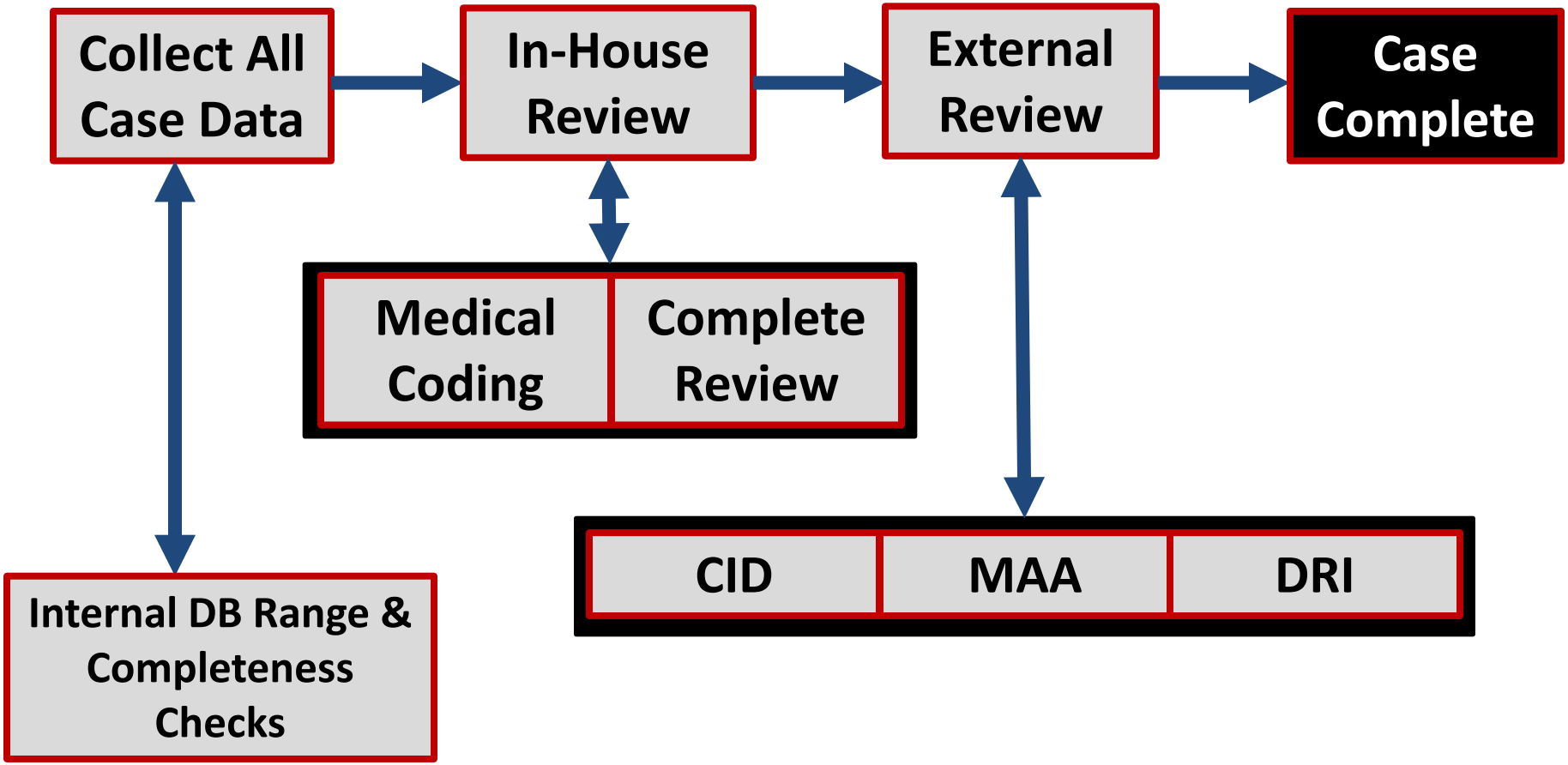
Recreate Crash Forces on Exemplar Helmet

Identify Impact Zones and Direction of Force

Control Interviews

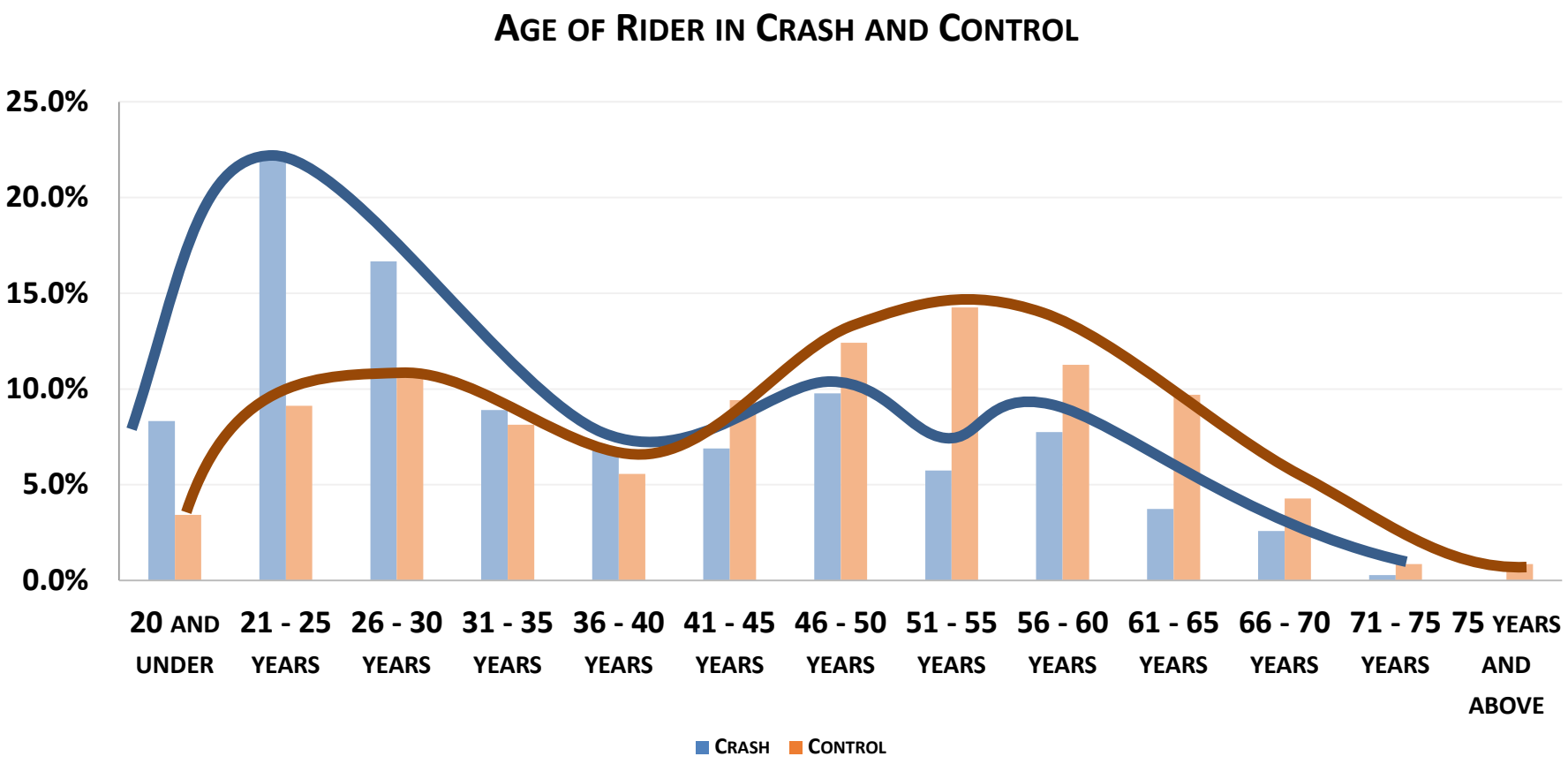
- **Serve as Control Population**
- **Detailed data collection**
  - Rider history
  - Motorcycle detail
  - Protective equipment
  - Trip purpose
- **$40 Gas Card**

Quality Control



Preliminary Results

Preliminary Results



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

Type of Motorcycle Training	Crashes	Controls
None *	24%	15%
State Recognized, Entry-Level Motorcycle Course	50%	45%
Experienced Rider Course	8%	10%
High Performance/ Competitive Track Course	5%	5%
Self Taught*	6%	18%
Taught By Family and/or Friends	6%	7%

Preliminary Results

Age When Rider Began To Ride	Crashes	Controls
Never Rode Before, Or Rarely Ever Ride*	1%	0 %
Under The Age Of 17*	27%	40%
Age Between 17 - 25 Years*	51%	42%
Age Between 26-35 Years	13%	9%
Age Between 36-45 Years	5%	5%
Age Between 46-55 Years	2%	3%
Age More Than 55 Years	1%	1%

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

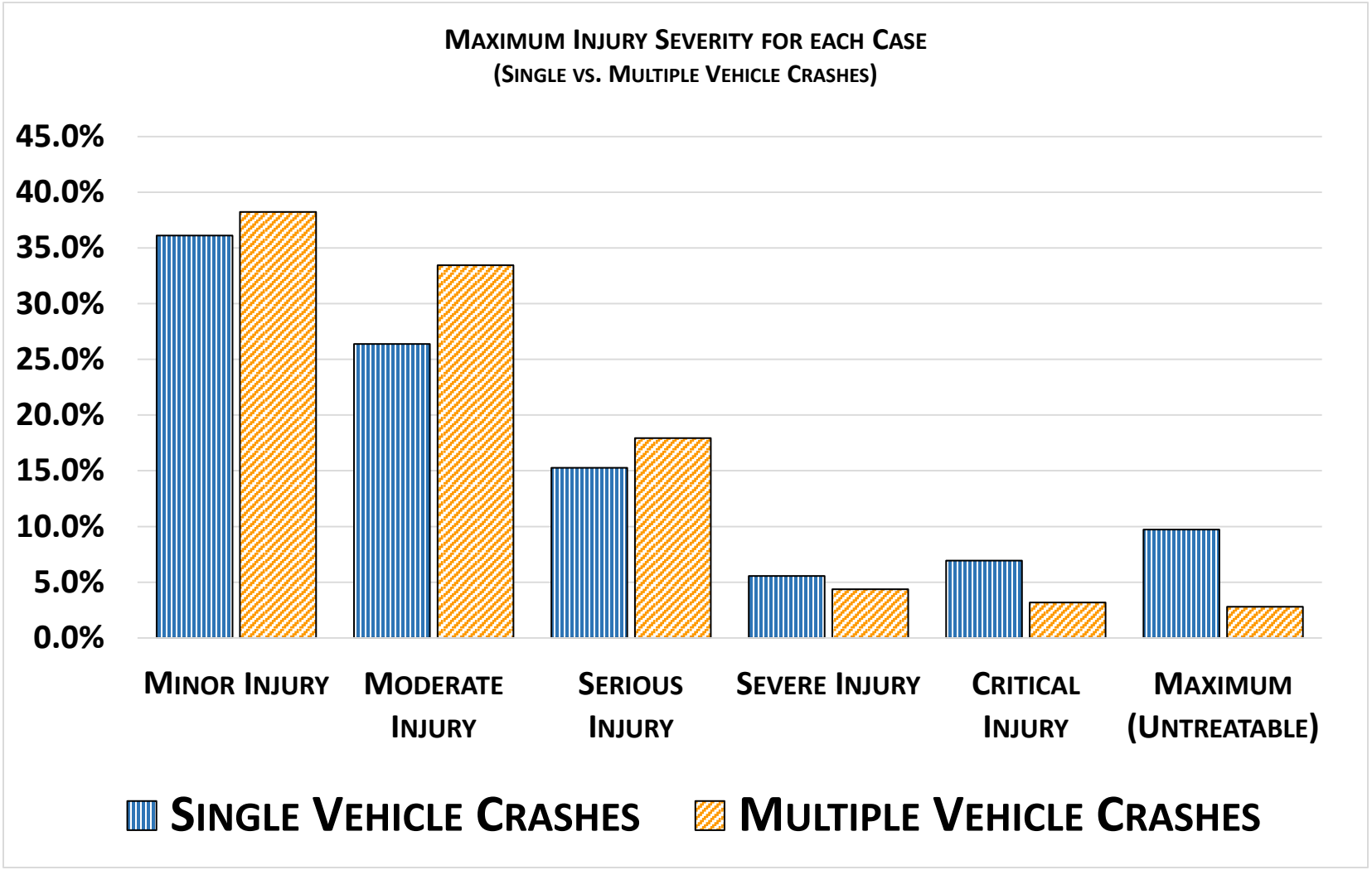
Preliminary Data (Environment)

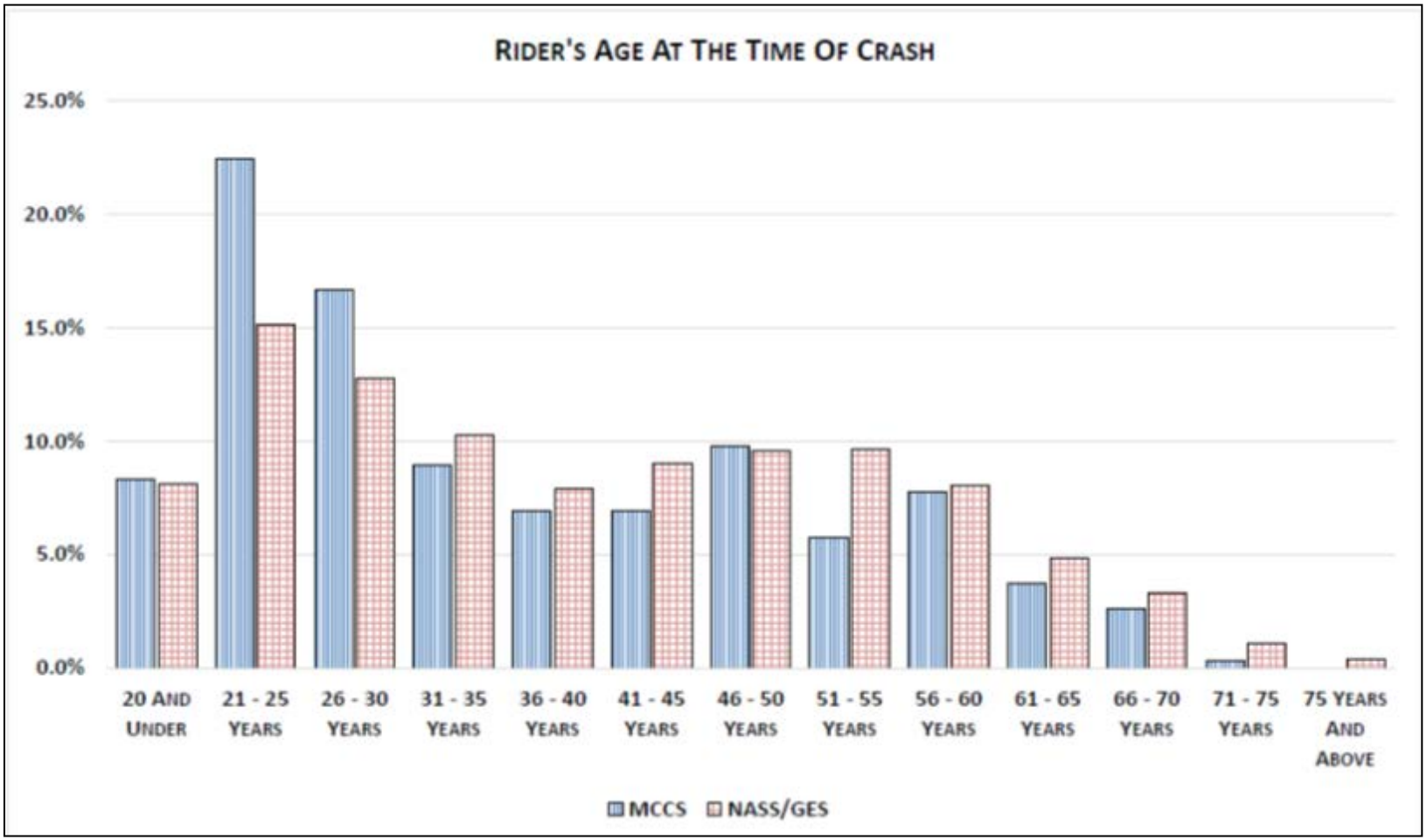
- **66.7% of crashes** occurred at an intersection
  - **50% of fatal crashes** occurred at intersections compared to **28% of non-fatal**
  - **17% of crashes** occurred at driveways
- **34% of crashes** occurred on curves
  - **48% of fatal crashes** occurred on curves as compared to **32% of non-fatal crashes**
- **74% of crashes** occurred on principal or minor arterials

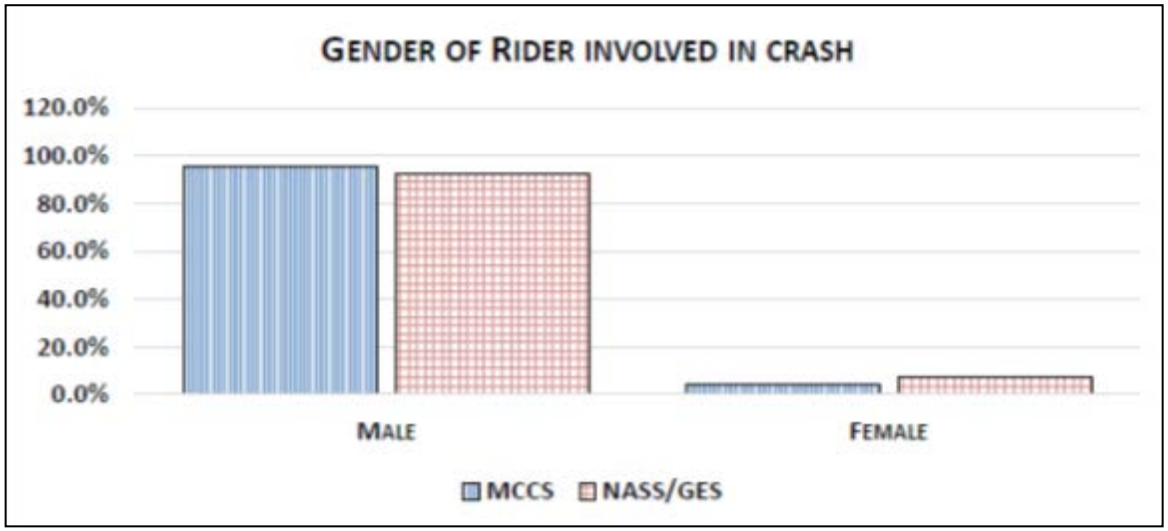
Preliminary Data (Causation)

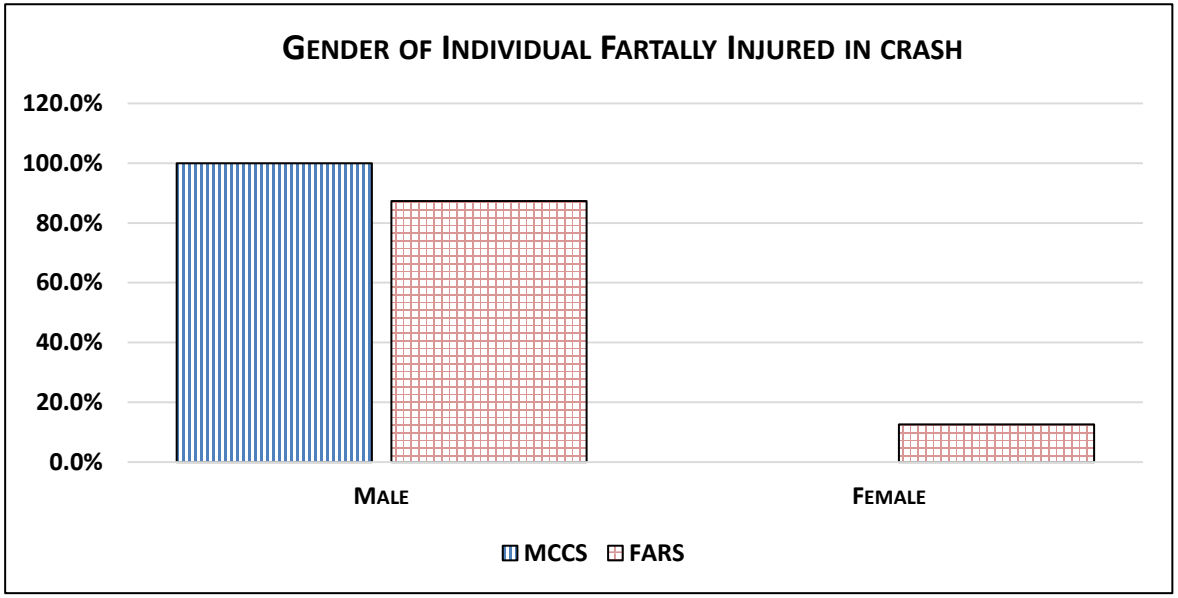
- A failure by the rider was deemed the primary contributing factor in **44.3% of crashes** and a failure by the other vehicle driver was attributed to **51% of crashes**
  - **Unsafe acts by the rider** were deemed to be related to **50% of crashes**
  - **Traffic Scanning errors** by the other vehicle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

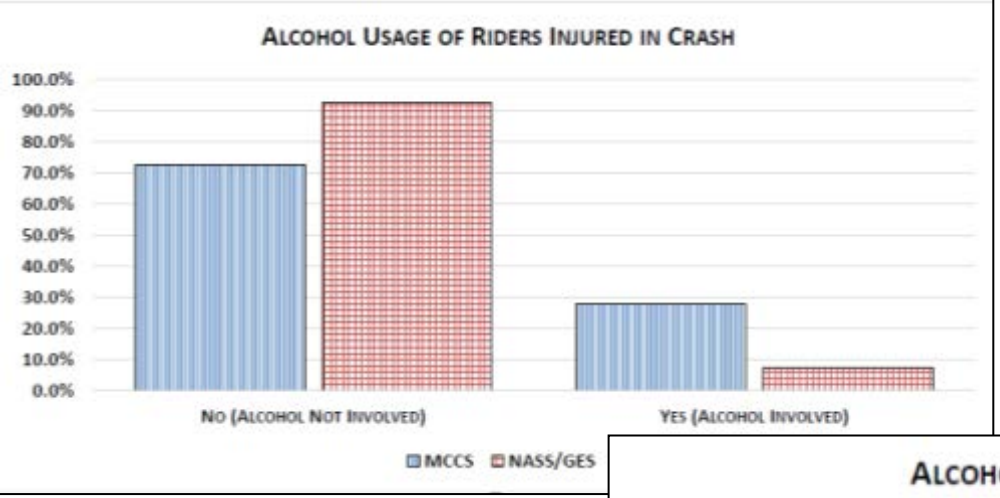
Preliminary Data (Injuries)

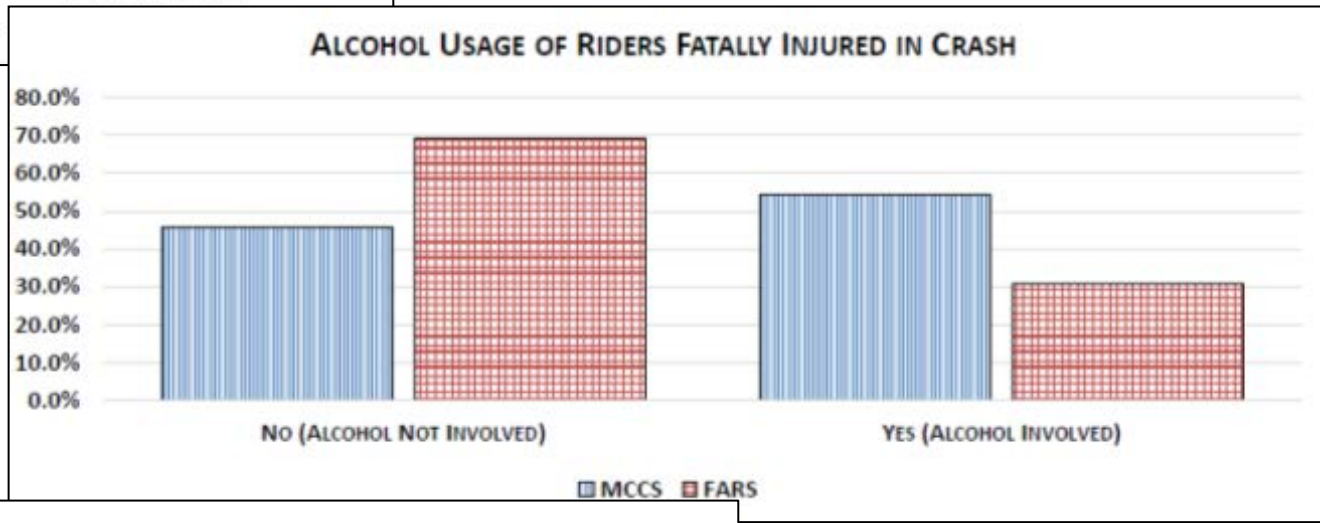


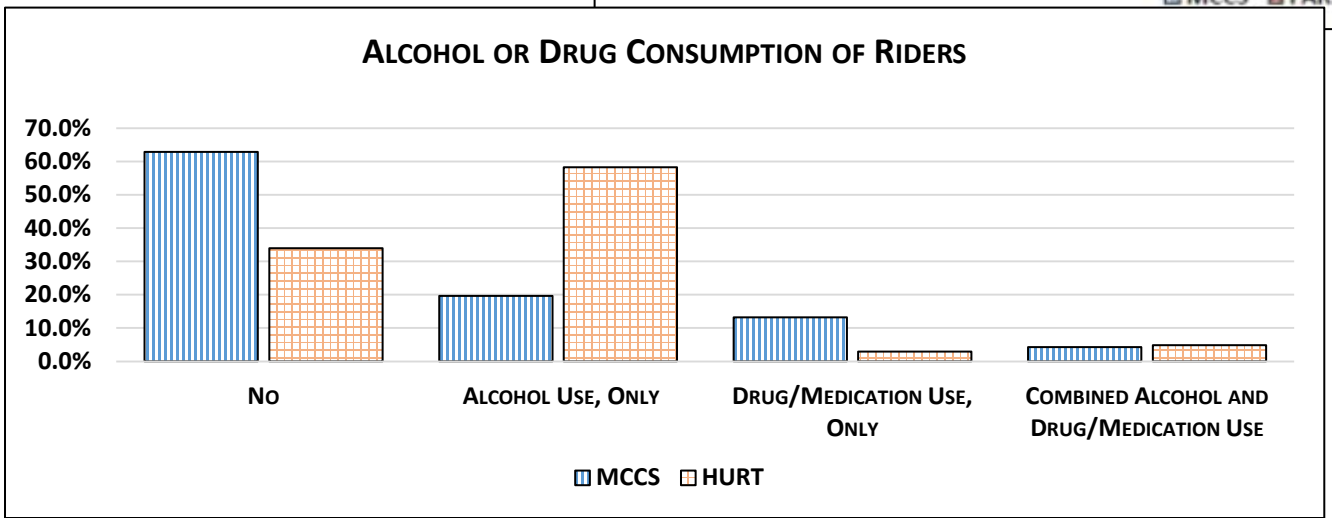

RIDER'S AGE AT THE TIME OF CRASH
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
20 AND UNDER
21 - 25 YEARS
26 - 30 YEARS
31 - 35 YEARS
36 - 40 YEARS
41 - 45 YEARS
46 - 50 YEARS
51 - 55 YEARS
56 - 60 YEARS
61 - 65 YEARS
66 - 70 YEARS
71 - 75 YEARS
75 YEARS AND ABOVE
MCCS
NASS/GES

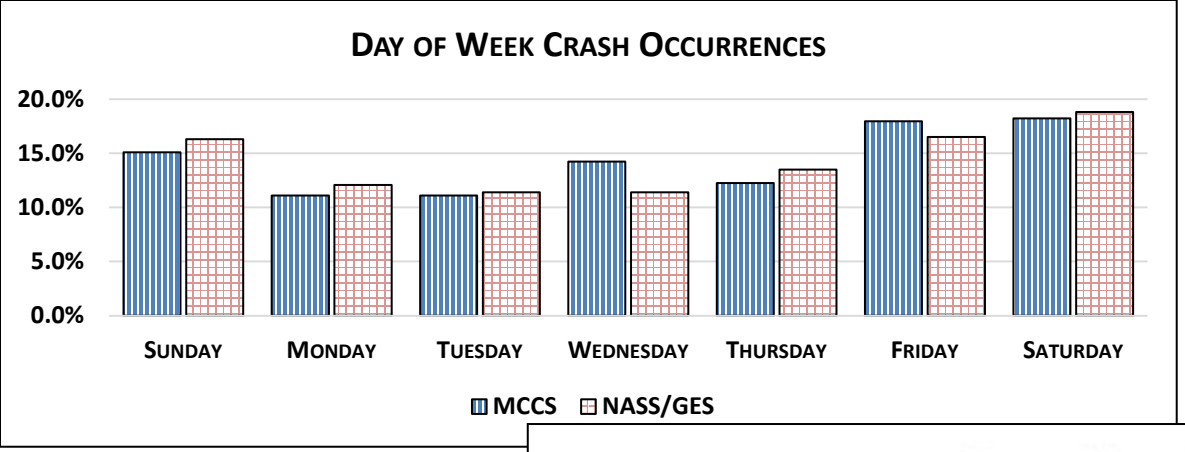

GENDER OF RIDER INVOLVED IN CRASH
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
MALE
FEMALE
MCCS
NASS/GES

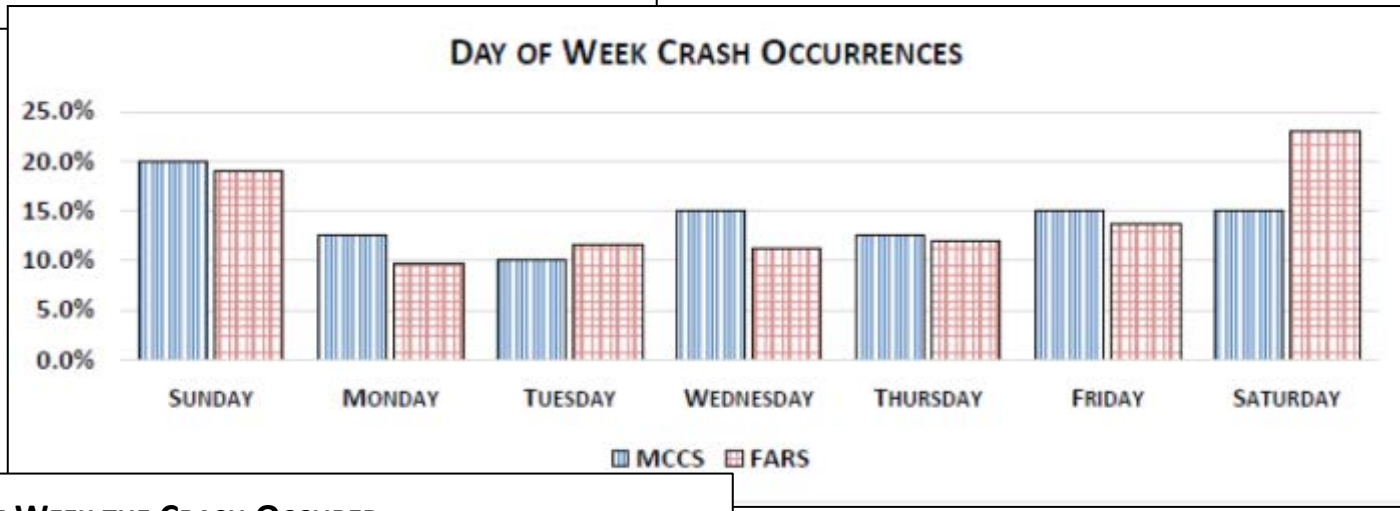

GENDER OF INDIVIDUAL FARTALLY INJURED IN CRASH
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
MALE
FEMALE
MCCS
FARS

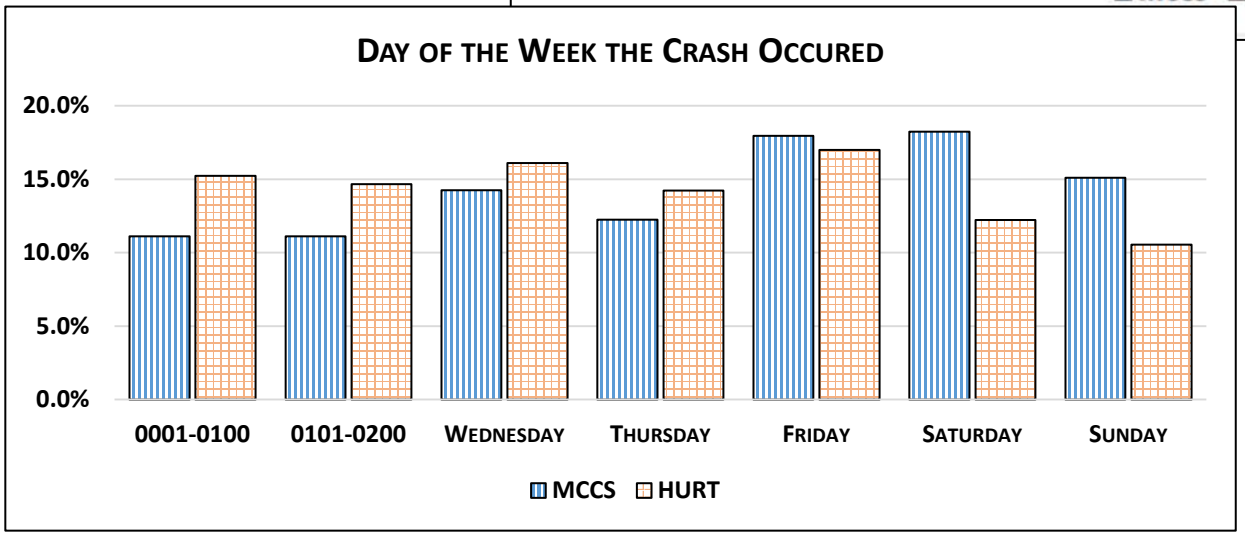

Alcohol Usage of Riders Injured in Crash
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
No (Alcohol Not Involved)
Yes (Alcohol Involved)
MCCS
NASS/GES

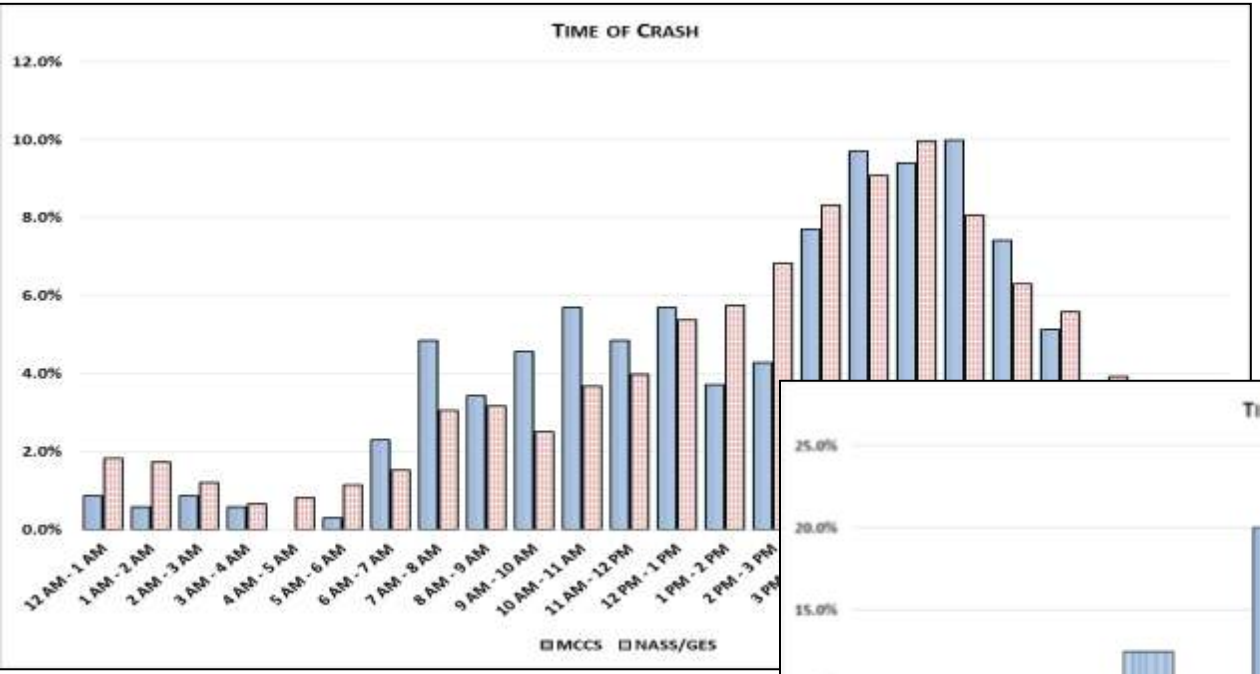

Alcohol Usage of Riders Fatally Injured in Crash
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
No (Alcohol Not Involved)
Yes (Alcohol Involved)
MCCS
FARS

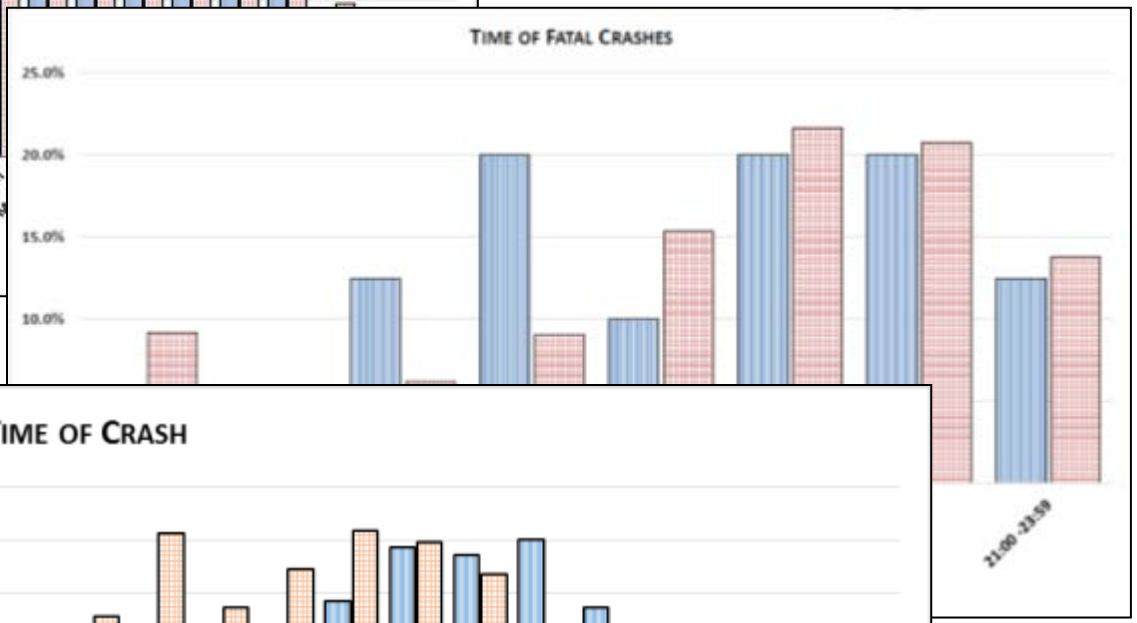

Alcohol or Drug Consumption of Riders
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
No
Alcohol Use, Only
Drug/Medication Use, Only
Combined Alcohol and Drug/Medication Use
MCCS
HURT

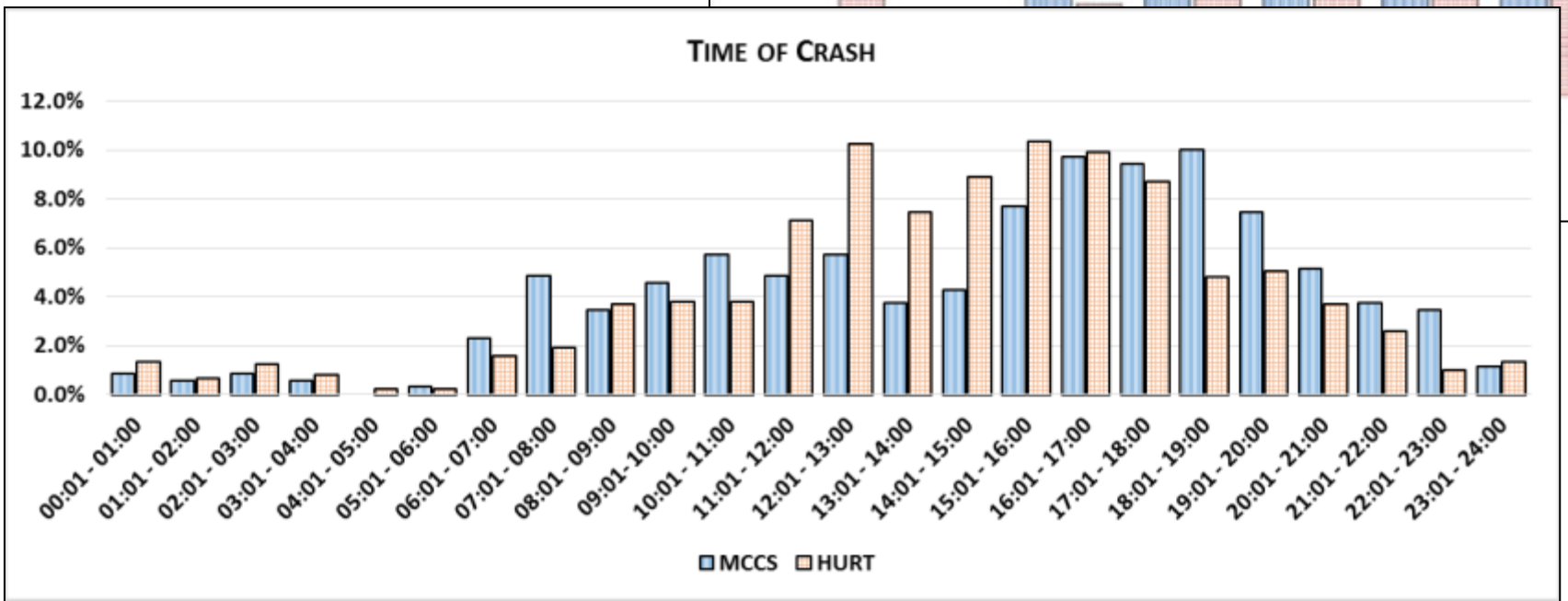

DAY OF WEEK CRASH OCCURRENCES
20.0%
15.0%
10.0%
5.0%
0.0%
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
MCCS
NASS/GES

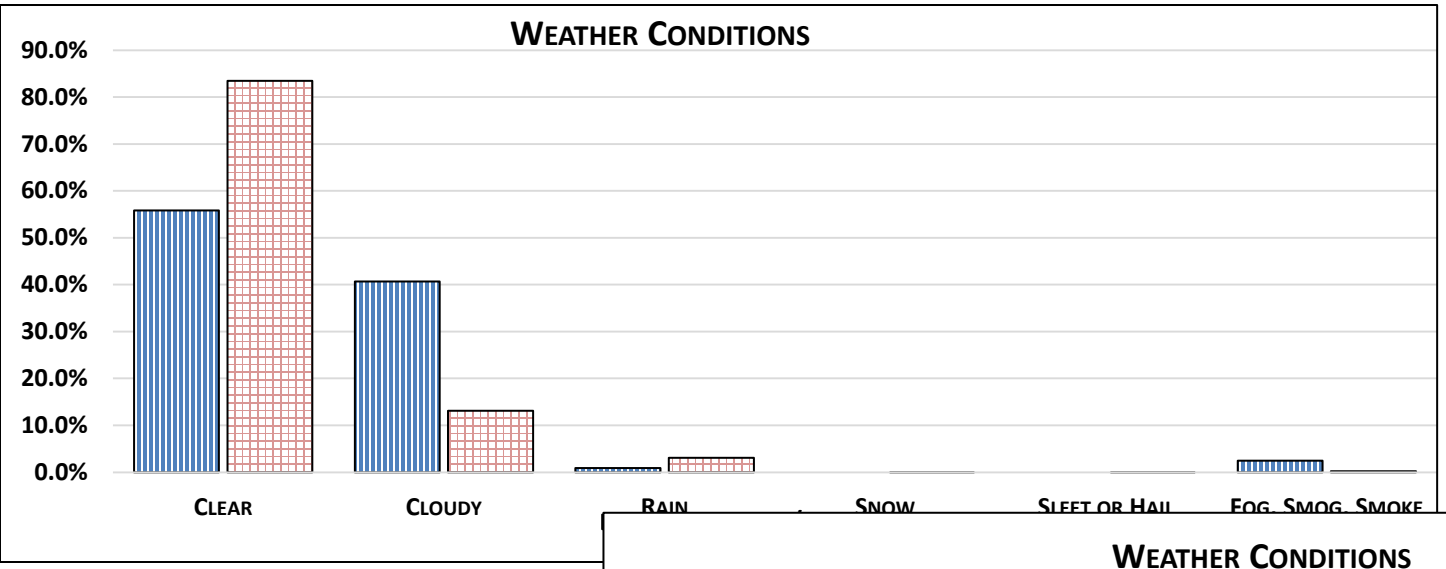

DAY OF WEEK CRASH OCCURRENCES
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
MCCS
FARS

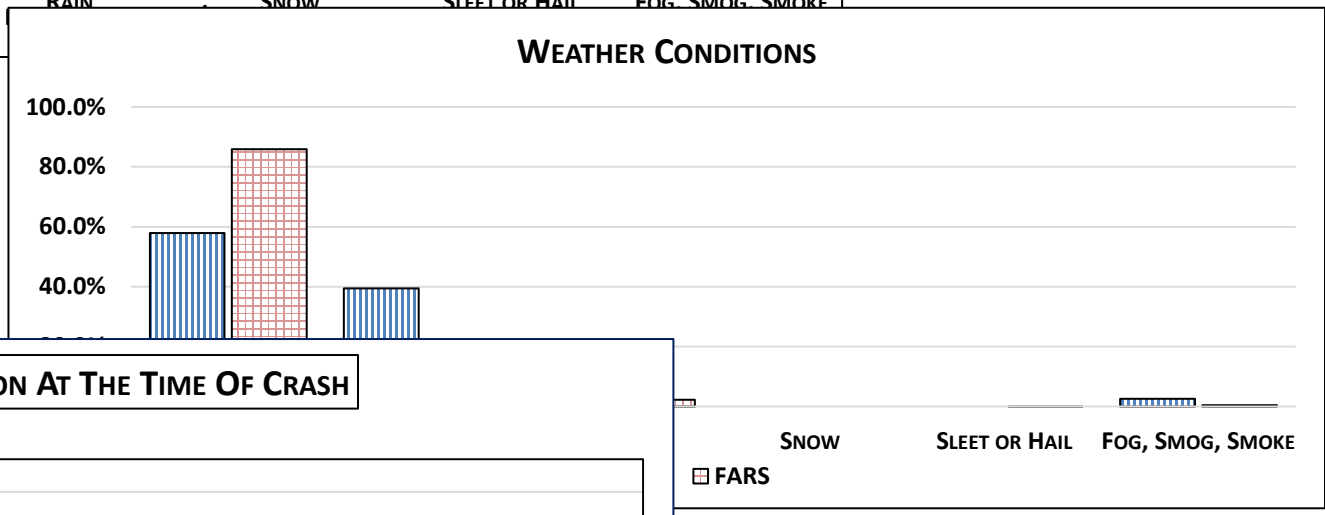

DAY OF THE WEEK THE CRASH OCCURED
20.0%
15.0%
10.0%
5.0%
0.0%
0001-0100
0101-0200
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
MCCS
HURT

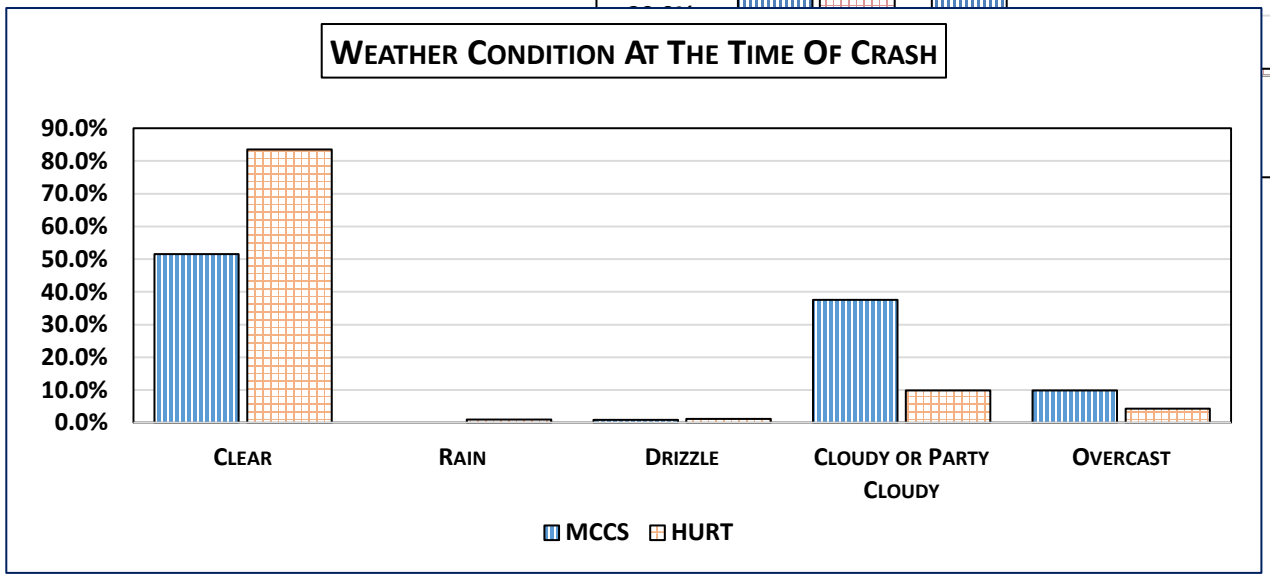

TIME OF CRASH
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
12 AM - 1 AM
1 AM - 2 AM
2 AM - 3 AM
3 AM - 4 AM
4 AM - 5 AM
5 AM - 6 AM
6 AM - 7 AM
7 AM - 8 AM
8 AM - 9 AM
9 AM - 10 AM
10 AM - 11 AM
11 AM - 12 PM
12 PM - 1 PM
1 PM - 2 PM
2 PM - 3 PM
MCCS
NASS/GES

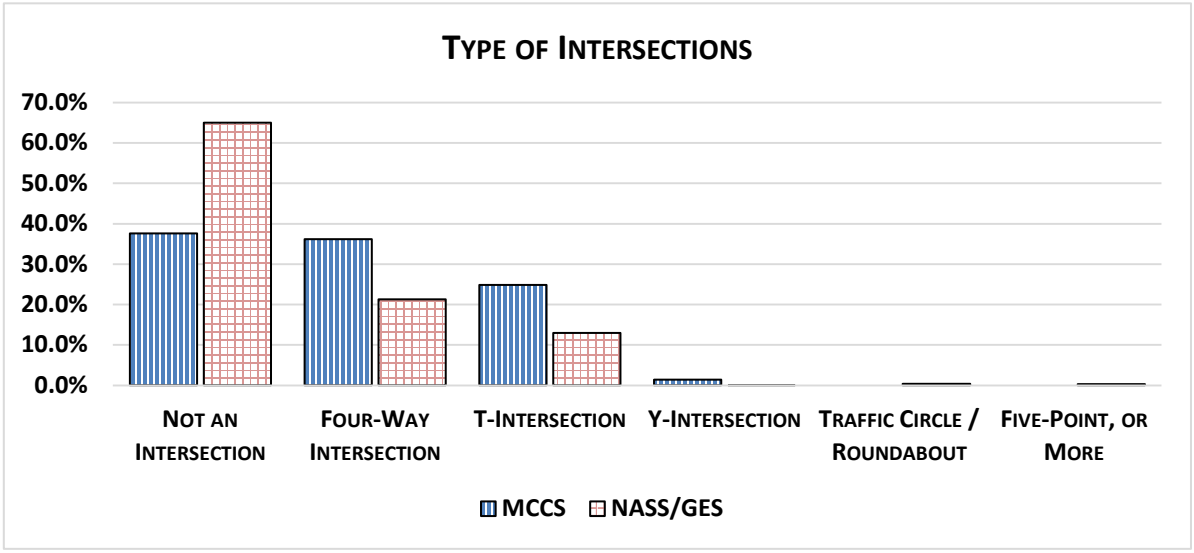

TIME OF FATAL CRASHES
25.0%
20.0%
15.0%
10.0%
21:00 -23:59

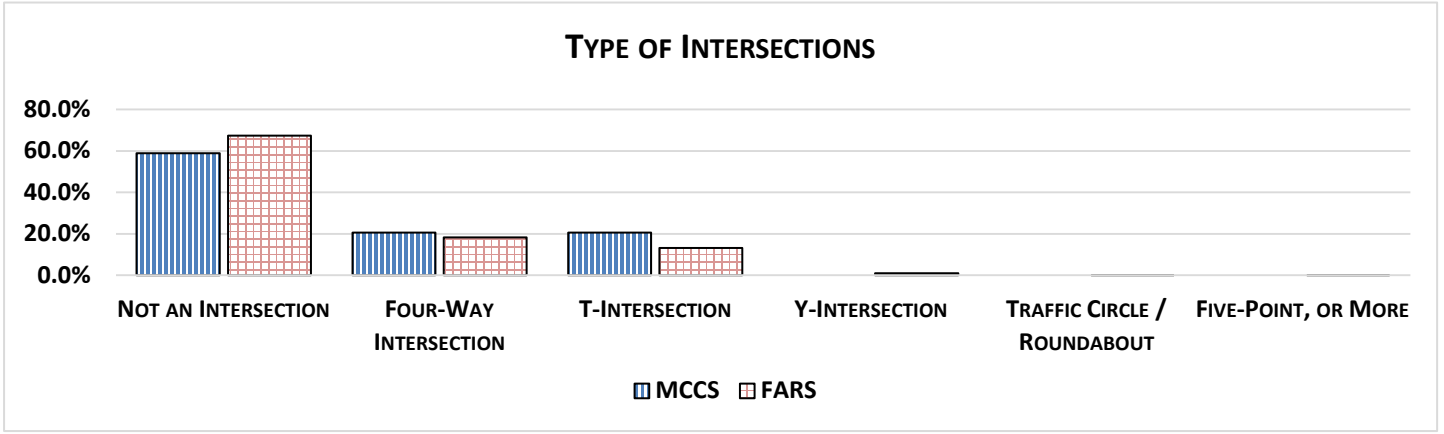

TIME OF CRASH
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
00:01 - 01:00
01:01 - 02:00
02:01 - 03:00
03:01 - 04:00
04:01 - 05:00
05:01 - 06:00
06:01 - 07:00
07:01 - 08:00
08:01 - 09:00
09:01 - 10:00
10:01 - 11:00
11:01 - 12:00
12:01 - 13:00
13:01 - 14:00
14:01 - 15:00
15:01 - 16:00
16:01 - 17:00
17:01 - 18:00
18:01 - 19:00
19:01 - 20:00
20:01 - 21:00
21:01 - 22:00
22:01 - 23:00
23:01 - 24:00
MCCS
HURT


WEATHER CONDITIONS
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
CLEAR
CLOUDY
RAIN
SNOW
SLEET OR HAIL
FOG, SMOG, SMOKE


WEATHER CONDITIONS
100.0%
80.0%
60.0%
40.0%
SNOW
SLEET OR HAIL
FOG, SMOG, SMOKE
FARS


WEATHER CONDITION AT THE TIME OF CRASH
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
CLEAR
RAIN
DRIZZLE
CLOUDY OR PARTY CLOUDY
OVERCAST
MCCS
HURT


TYPE OF INTERSECTIONS
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
NOT AN INTERSECTION
FOUR-WAY INTERSECTION
T-INTERSECTION
Y-INTERSECTION
TRAFFIC CIRCLE / ROUNDABOUT
FIVE-POINT, OR MORE
MCCS
NASS/GES


TYPE OF INTERSECTIONS
80.0%
60.0%
40.0%
20.0%
0.0%
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**

HSIS

HIGHWAY SAFETY INFORMATION SYSTEM

More Information

- **Contact Information**

  Carol.Tan@dot.gov

  Yusuf.Mohamedshah@dot.gov

- **MCCS Website**

  http://www.fhwa.dot.gov/research/tfhrc/projects/safety/motorcycles/MCCS/index.cfm

Questions?

Thank You