

Critical Industry Safety Research: Past, Present, and Future

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Institute**

- Direct Costs & Benefits are Primary
- Real-World Data & Field Testing over Modeling
- Proactive over Reactive
- Real-time over Archived

**2011 update to ATRI's 2005
truck crash predictor model**

**Data analysis of over
570,000 individual driver
records**

Predicting Truck Crash Involvement: A 2011 Update

April 2011



Prepared by the American Transportation Research Institute



Predicting Truck Crash Involvement: 2011 Update

| *2005* If a Driver has: | The Crash Likelihood Increases: |
|--|--|
| A Reckless Driving violation | 325% |
| An Improper Turn violation | 105% |
| An Improper or Erratic Lane Change conviction | 100% |
| A Failure to Yield Right of Way conviction | 97% |
| An Improper Turn conviction | 94% |
| A Failure to Maintain Proper Lane conviction | 91% |
| A Past Crash | 87% |
| An Improper Lane Change violation | 78% |
| A Failure to Yield Right of Way violation | 70% |
| A Driving Too Fast for Conditions conviction | 62% |

Predicting Truck Crash Involvement: 2011 Update

| *2011* If a Driver has: | The Crash Likelihood Increases: |
|---|--|
| A Failure to Use / Improper Signal conviction | 96% |
| A Past Crash | 88% |
| An Improper Passing violation | 88% |
| An Improper Turn conviction | 84% |
| An Improper or Erratic Lane Change conviction | 80% |
| An Improper Lane/Location conviction | 68% |
| A Failure to Obey Traffic Sign conviction | 68% |
| A Speeding 15+ Speed Limit conviction | 67% |
| Any conviction | 65% |
| A Reckless/Careless/Negligent Driving conviction | 64% |

| Violations | SMS Violation Severity Weight | Increase in Crash Likelihood |
|--|--------------------------------------|-------------------------------------|
| Crash Indicator BASIC | | |
| Past Crash | * | 88% |
| Driver Fatigue BASIC | | |
| Hours-of-Service violation | 7 | 45% |
| False or No Log Book violation | 7 | 42% |
| Cargo-Related BASIC | | |
| Size and Weight violation** | - | 18% |
| Unsafe Driving BASIC | | |
| Reckless Driving violation | 10 | 88% |
| Failure to Yield Right of Way violation | 5 | 41% |
| Improper Turns violation | 5 | 15% |
| Improper Passing violation | 5 | 88% |
| Improper Lane Change violation | 5 | 41% |
| Following Too Close violation | 5 | 41% |
| Speeding violation | 5 | 38% |
| Failure to Obey Traffic Control Device violation | 5 | 21% |
| Driver Fitness BASIC | | |
| Disqualified Driver violation | 8 | 15% |
| Medical Certificate violation | 1 | 2% |

*Weights are assigned to crashes contingent on crash severity (e.g. injuries, fatalities)

**Size and Weight violation has been removed from the Cargo-Related BASIC equation

Industry Research Example: Real-Time Roll-Over Notification



Mapping Large Truck Rollovers: Identification and Mitigation Through Spatial Data Analysis

Mapping Large Truck Rollovers: Identification and Mitigation Through Spatial Data Analysis

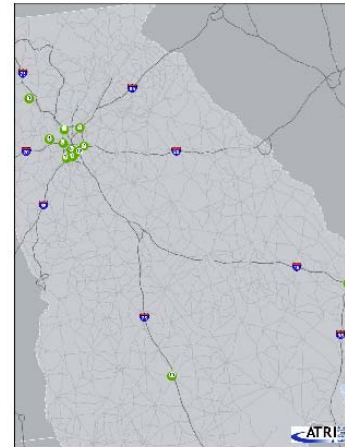
May 2012



Prepared by the American Transportation Research Institute



Georgia



| Rollovers by Year and Severity | | | |
|--------------------------------|-------|-----------|-----------------|
| Year | Fatal | Non-Fatal | Total Rollovers |
| 2001 | 16 | 451 | 467 |
| 2002 | 18 | 421 | 439 |
| 2003 | 21 | 524 | 545 |
| 2004 | 15 | 563 | 578 |
| 2005 | 18 | 630 | 648 |
| 2006 | 26 | 600 | 626 |
| 2007 | 28 | 488 | 516 |
| 2008 | 23 | 471 | 494 |
| 2009 | 19 | 249 | 268 |
| All Years | 184 | 4397 | 4581 |

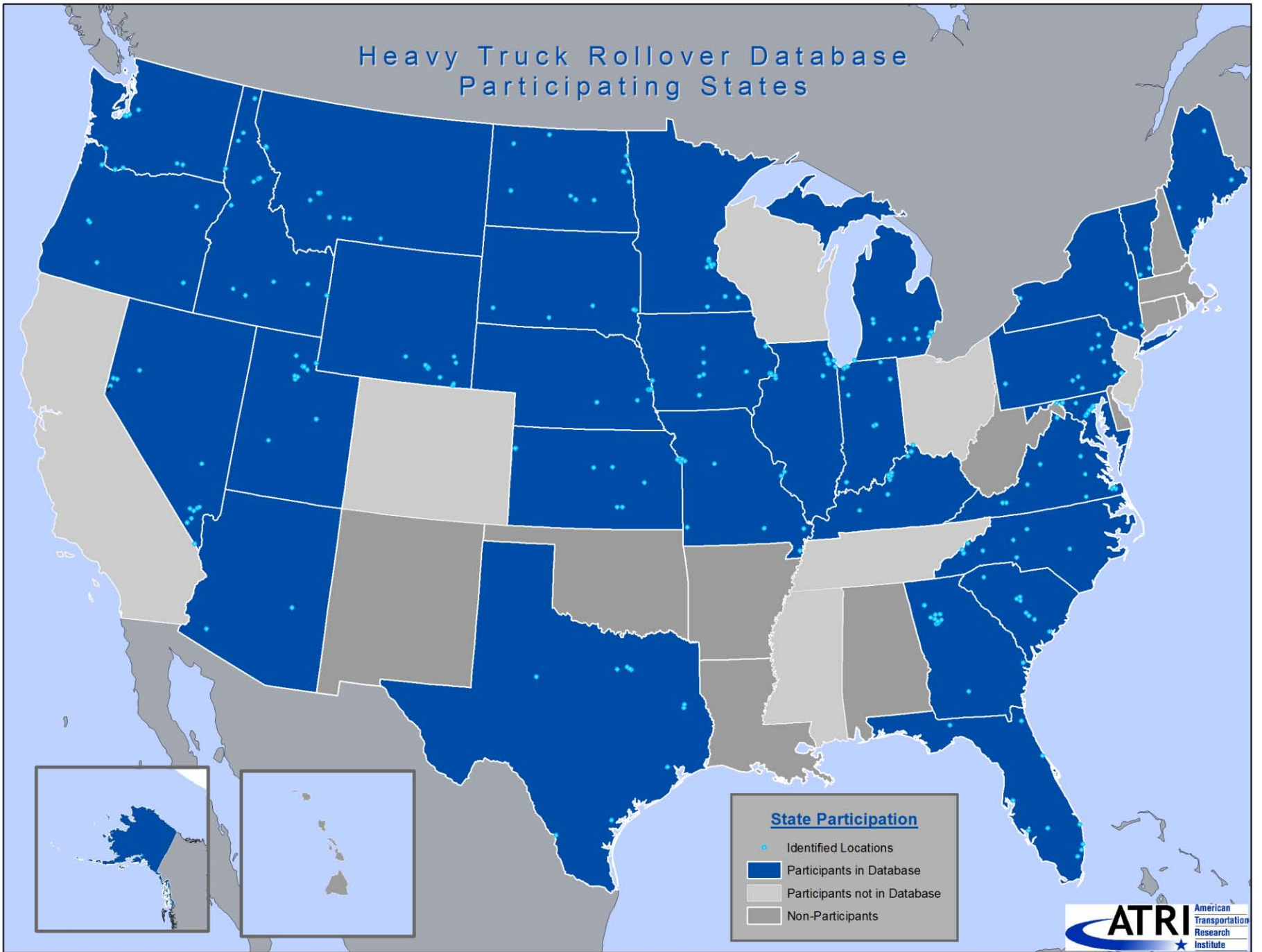


| Top Rollover Locations | | |
|------------------------|--|---------------------|
| ID | Location | Number of Rollovers |
| 1 | I-285 and I-75 (South Side) | 35 |
| 2 | I-285 and I-20 (East Side) | 32 |
| 3 | I-285 and I-85 (South Side) | 31 |
| 4 | I-285 and I-85 (North Side) | 17 |
| 5 | US 278 and Spur 6 | 16 |
| 6 | I-75 between SR 166 and I-85 | 16 |
| 7 | I-95 and I-16 | 15 |
| 8 | I-285 and I-20 (West Side) | 14 |
| 9 | US 411 and US 41/Joel Frank Harris Pkwy SE | 11 |
| 10 | I-75 between US 319 and Old Omega Rd | 11 |
| 11 | I-285 and I-75 (North Side) | 11 |
| 12 | I-285 and US 23/Moreland Ave | 11 |

Please refer to the full report, *Mapping Large Truck Rollovers: Identification and Mitigation Through Spatial Data Analysis*, available from ATRI at www.atri-online.org for methodology and data sources.



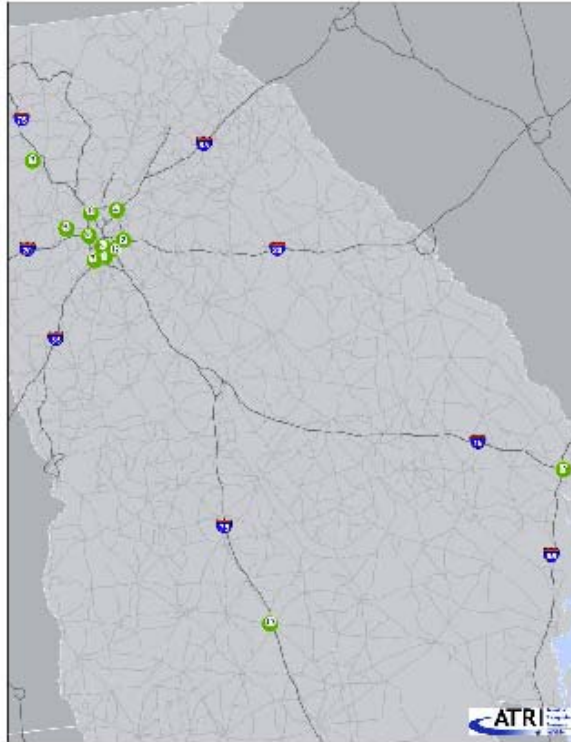
Heavy Truck Rollover Database Participating States



State Participation

- Identified Locations
- Participants in Database
- Participants not in Database
- Non-Participants

Georgia



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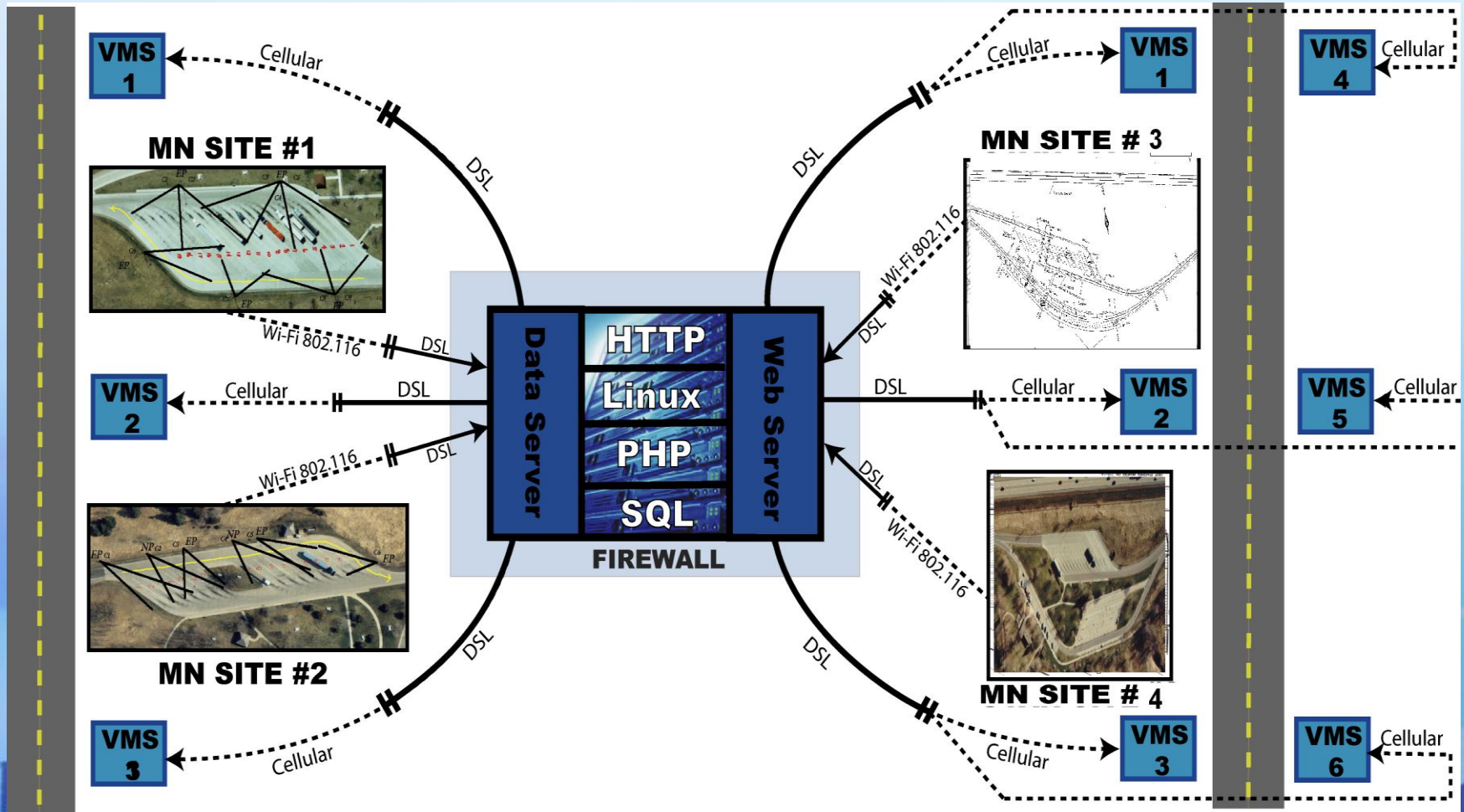


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Industry Research Example: Employer Notification System

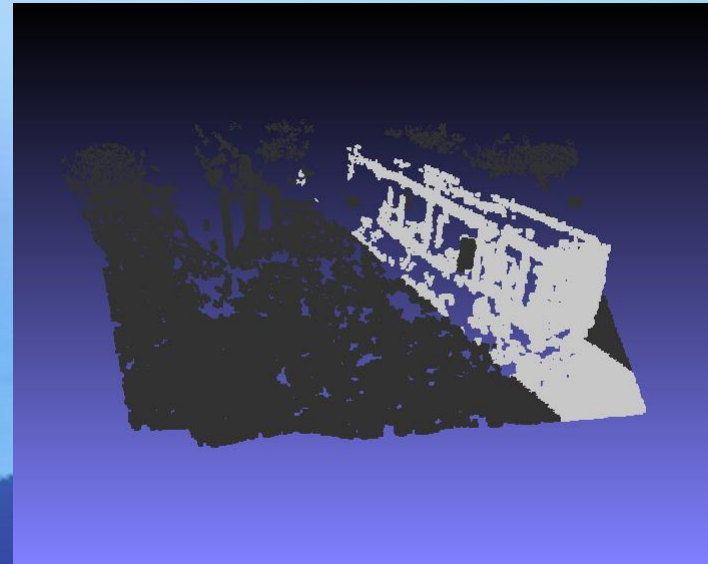
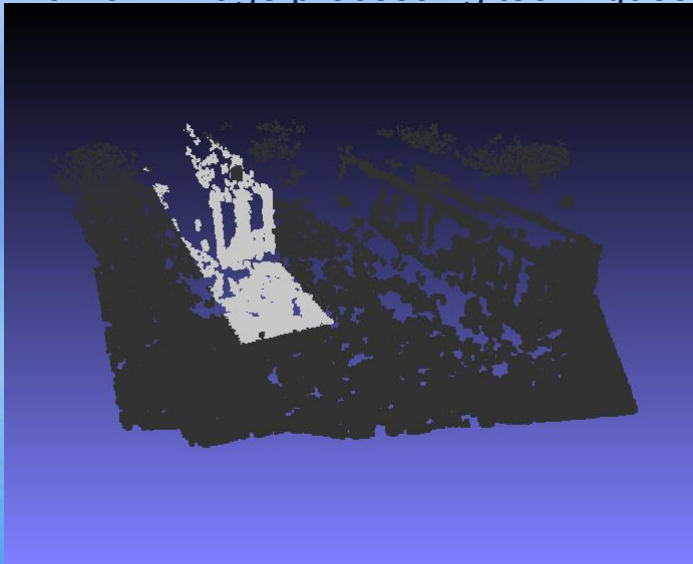
- **Annual pull regulation results in serious safety consequences**
- **50 – 80% of drivers may not notify employers of convictions within the required 30-day period**
 - Conviction gets posted to Driver History Record within 3-12 months
- **8 out of 10 pulls result in no actionable items**
- **ENS provides exception-based, near-real-time reporting**

Industry Research Example: Real-Time Truck Parking Info

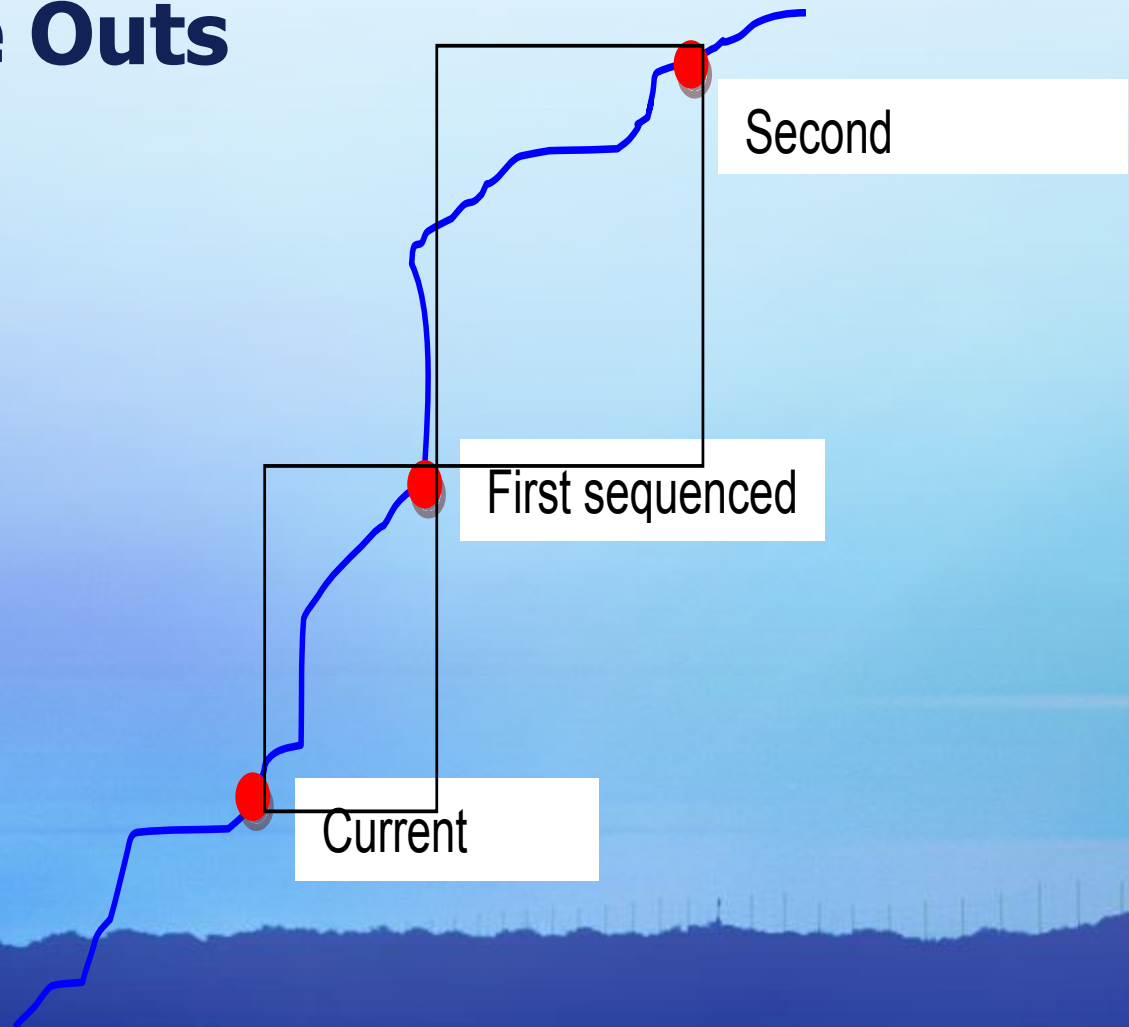


3-D Space Analysis

- 3D reconstruction: Measures space occupancy directly by 'seeing' the vehicles present or absent in a way similar to the way people do, in 3D.
- Three cameras observe the scene and triangulate to understand what they see in 3D.
- Remains robust to problems with sharp shadows, partial occlusion, and other lighting changes that traditionally confound 'non-3D' image processing techniques



- **Snow/White Outs**
- **Rain**
- **Black Ice**
- **Wind**



- **Research focused carrier cost/benefits for three onboard safety systems (OSS)**
 - Forward Collision Warning Systems (FCWS)
 - Lane Departure Warning Systems (LDWS)
 - Roll Stability Control Systems (RSC)
- **OSS has potentially high acceptance**
 - Can address irresponsible 4-wheelers (responsibility neutral solution)
 - Can address two of the most costly crash types (R/E, Roll-Over)
 - Voluntary versus mandatory?

Benefit-Cost Analysis of OSS

- **Crash types used to estimate the costs included:**
 - Property damage only (PDO)
 - Injury
 - Fatality
- **Crash avoidance costs were estimated for various VMT (80,000-160,000)**
- **ROI and payback periods were calculated**

Benefit-Cost Analysis of OSS

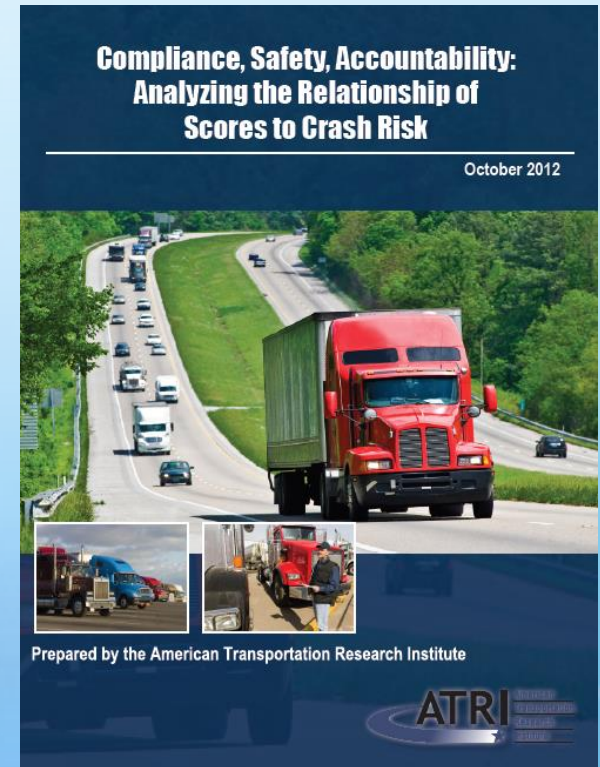
| Technology | Return on Investment (for every \$1 invested) |
|---|--|
| Forward Collision Warning System | \$1.33 - \$7.22 |
| Lane Departure Warning System | \$1.37 - \$6.55 |
| Roll Stability Control | \$1.66 - \$9.36 |

Industry Research Example: CSA & Crash Risk

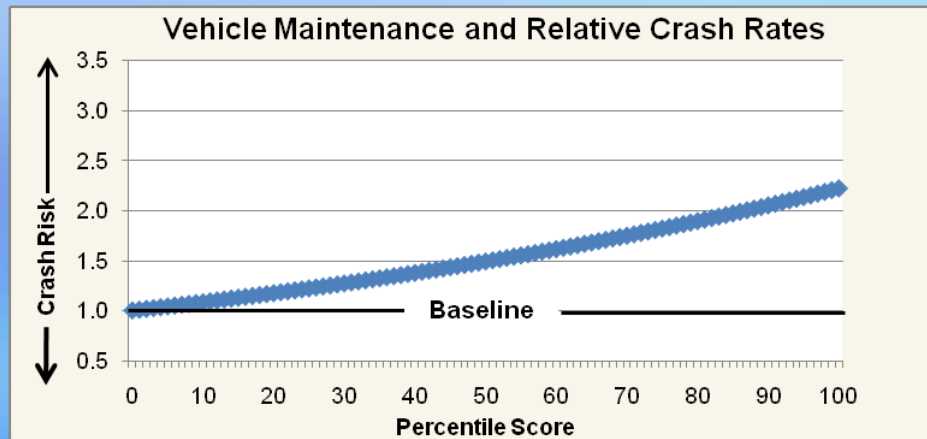
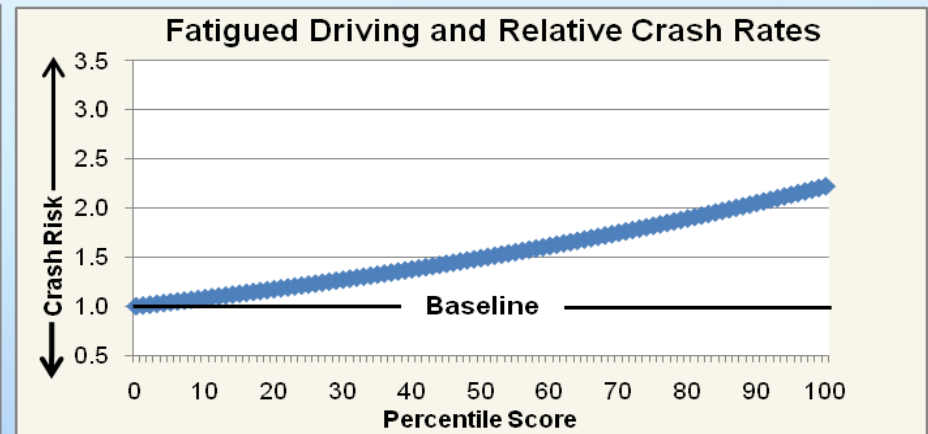
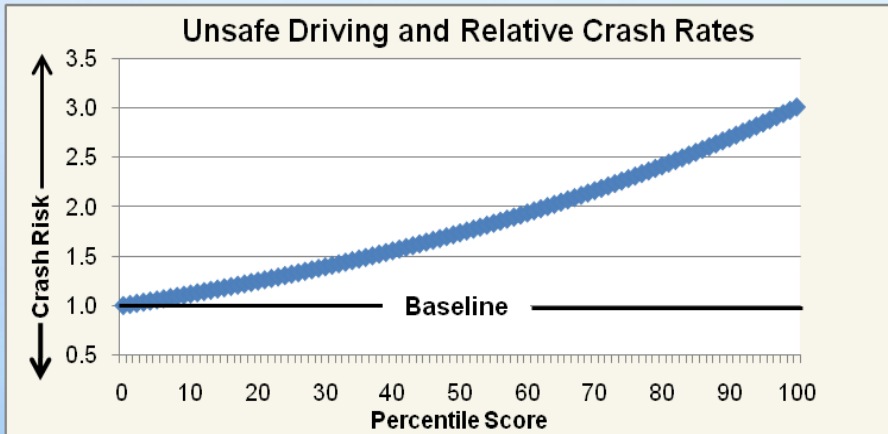


CSA Scores and Crash Risk

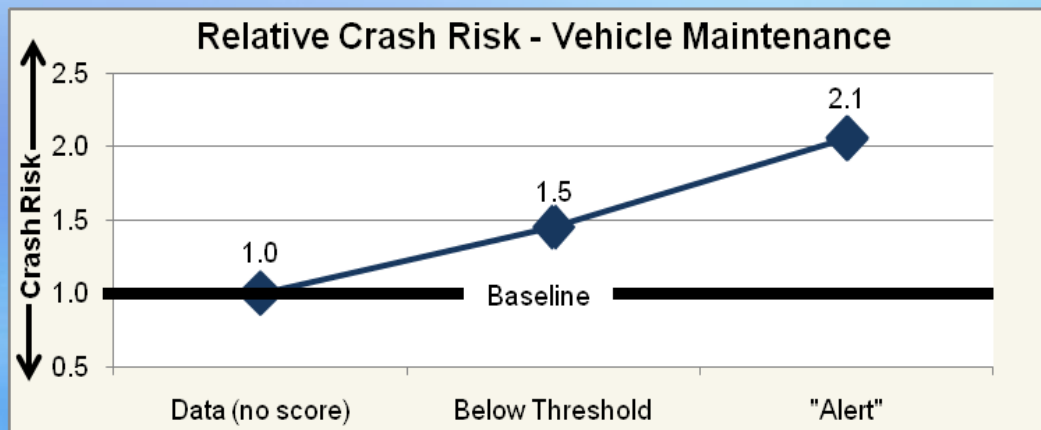
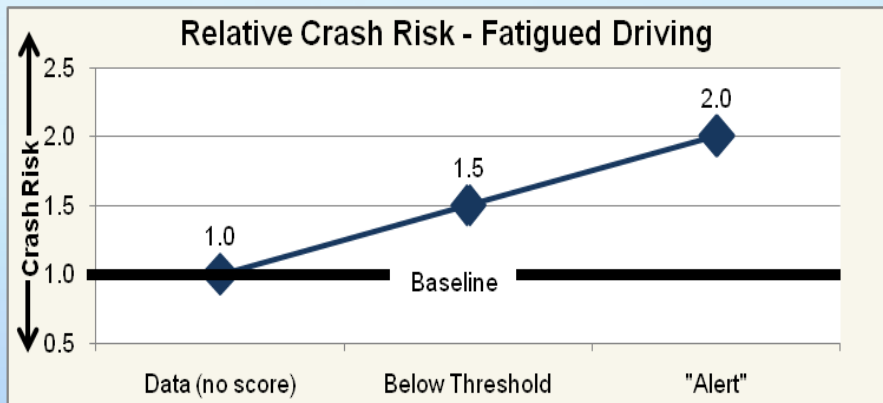
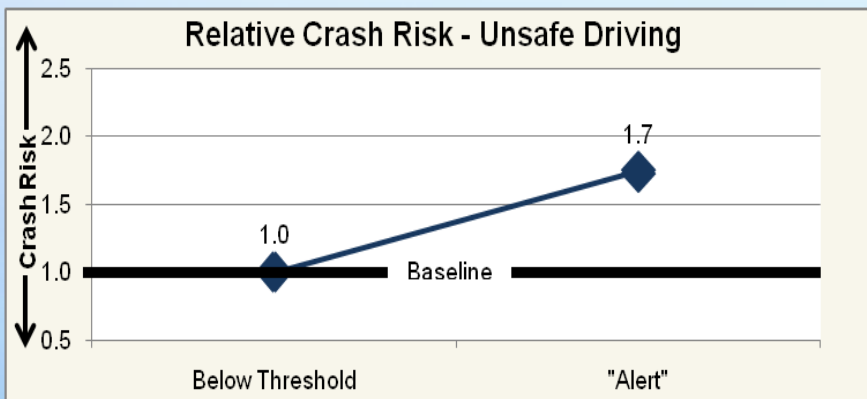
- **Highlights from Previous Research**
- **Comparative Review of Statistical Tools**
- **ATRI's Findings**
 - Analyzed Both Percentile Scores & “Alerts”
- **Interest from U.S. DOT IG**



BASIC Scores and Crash Risk

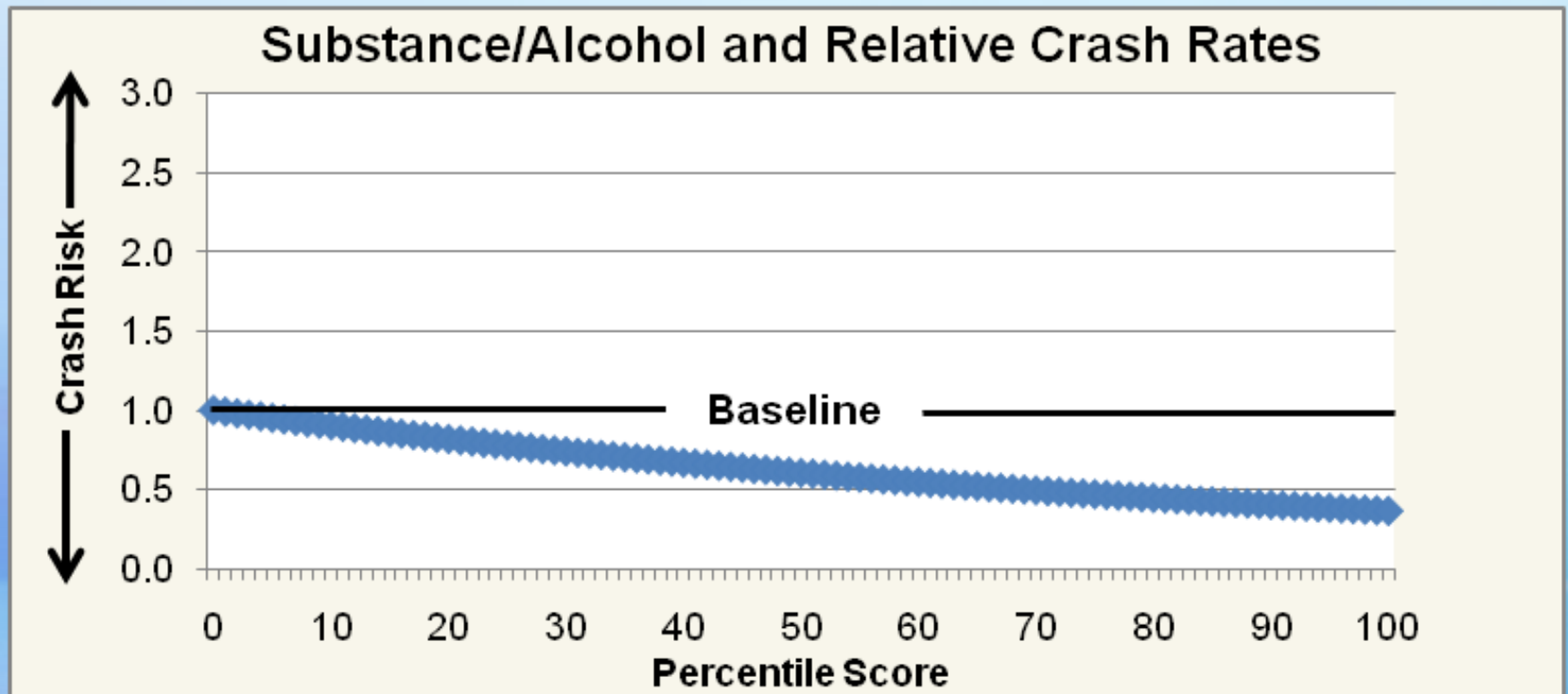


Scores Below vs. Above Threshold



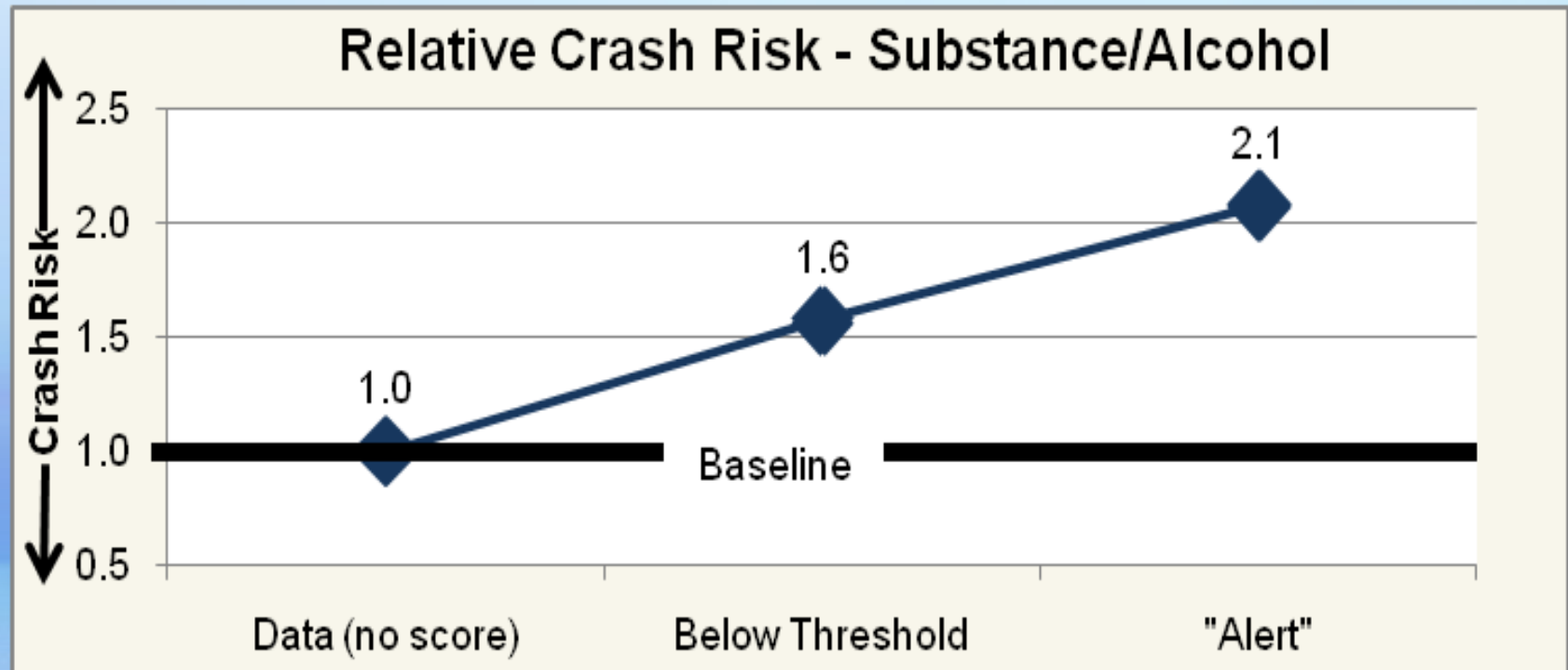
Controlled Substances/Alcohol

- **Percentile Scores and Crash Rates**



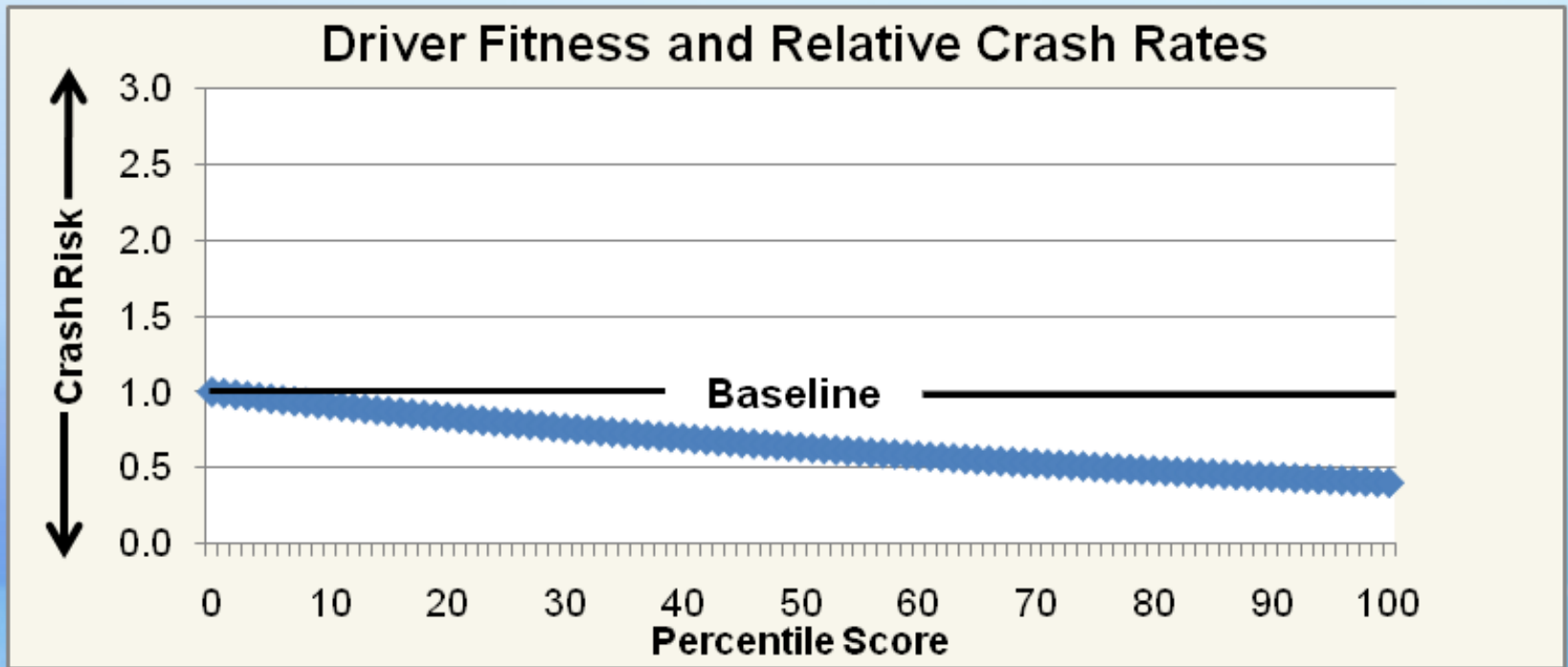
Controlled Substances/Alcohol

- **No Score vs. Below Threshold vs. "Alert"**



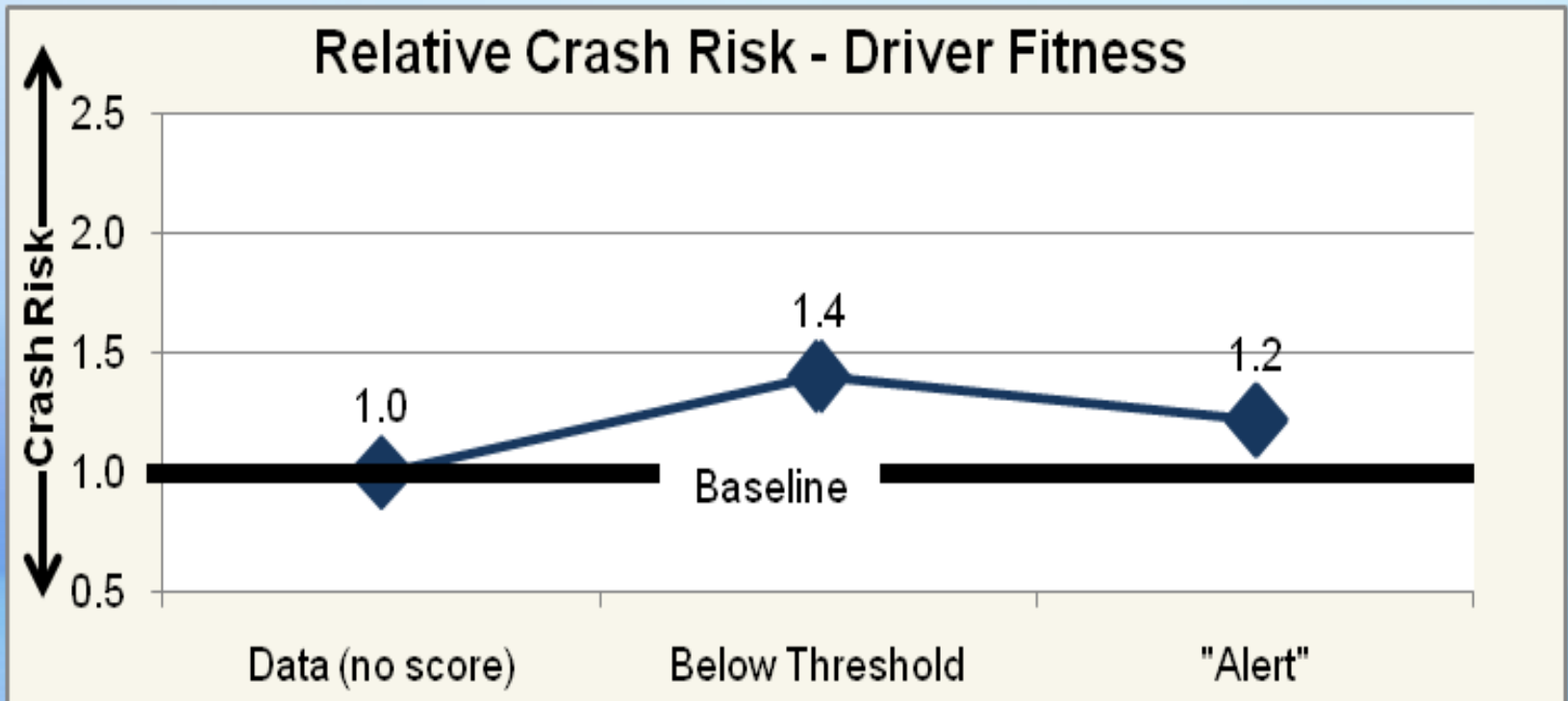
Driver Fitness

- **Percentile Scores and Crash Rates**



Driver Fitness

- **No Score vs. Below Threshold vs. "Alert"**



Questions?

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