Development and Implementation of a Commercial Driver Safety History Indicator into the Roadside Inspection Selection System
Agenda

- Initial Carrier-Driver-Conviction (CDC) Study (2000)
  - Prior Research / Motivation
  - Methodology / Results
- CDC-ISS Pilot Project (2005)
  - Methodology / Results
- ISS-D Implementation in Production (2007)
CDC - Prior Research

- Driver/Carrier Relationship Project
  - Used 1994 citation data from IN and MI
  - Conclusions:
    - Violation rates differ among carriers
    - Higher violation rates associated with higher crash rates
CDC - Motivation / Background

- Driver citation information linked to carriers may be useful, but problems collecting it
- Similar results with conviction data?
- CDLIS – Commercial Driver’s License Information System
  - Created through CMVSA, operational since 1992
  - Does not identify the employing carrier
- MCMIS – Motor Carrier Management Information System
  - Use crash/inspection reports to link drivers to carriers
CDC Study Methodology

MCMIS - Database

- CMV Inspection Data
- CMV Crash Data

CDLIS Search

Combined CDC Records

State DMV Driver Records

 Contains:
- Driver CDL#
- Conviction data

Contains:
- Carrier DOT#
- Driver CDL#
- Safety Data
Commercial Vehicle and Driver Safety Data

• Crashes – towaway, injury, or fatality

• Driver/vehicle inspections
  • Level I - check driver and vehicle (including underneath)
  • Level II - check driver and walk around vehicle
  • Level III - check driver only
  • Level V - vehicle inspection at a carrier’s terminal
  • Any serious violations found then placed OOS

• SafeStat - Four Safety Evaluation Areas (SEAs)
  • Accident, Driver, Vehicle, Safety Management
  • For each SEA, measures are calculated
  • Measures are then ranked relative to all other carriers, producing indicators
  • Indicators are combined to compute SEA values
Create Driver Conviction Measure (DCM)

\[ 3 \times \text{(disqualifying offense)} + 2 \times \text{(serious offense)} + 1 \times \text{(any other offense)} = DCM \]

Create Carrier Driver Conviction Measure (CDCM)

Sum of severity weighted # of convictions (DCM) / # of drivers for carrier
Create Carrier Driver Conviction Indicator (CDCI)

- If sum of DCMs < 2 then do not use
- If sum of DCMs = 2-3 then = group 1
- If sum of DCMs = 4-6 then = group 2
- If sum of DCMs = 7-14 then = group 3
- If sum of DCMs > 14 then = group 4

For each group: rank CDCM values & transform into percentiles (0-100)

Result is Carrier Driver Conviction Indicator (CDCI)
CDC Results

• Correlation analysis of CDCM with OOS rates, crash rates, and SEA values revealed statistical and practical significant positive correlations
  • Highest correlation coefficients with driver SEA value, accident SEA value, and driver OOS rate
    • \( r = 0.15 \text{ to } 0.19 \)
  • Correlations held across all size groups and regions
    • For largest groups, \( r = 0.32 \text{ to } 0.55 \)

• More than 10\% of carriers had CDCI, but no other SafeStat indicator
• Motivation
  • Large Truck Crash Causation Study
  • How do we apply CDC results to the real world?
    • CDC – Next step to use CDCM
      – Further analysis of DCM
    • ISS – Improve both the algorithm and the use
      – Implement CDCM as part of ISS
• Confirmation analysis
• Survey of States (via email and web site)
  • Hardware and software used to support the existing algorithm
  • Use of screening / electronic clearance systems
  • Current usage level of the ISS algorithm
  • Suggested improvements to the algorithm and delivery platform
• ISS and Query Central on the PDA development
• Proof of concept field tests in OH and TN
• Methodology to test CDCM as part of ISS
• ISS-D implementation
• Analysis and Results
Methodology to test CDCM with ISS

• Implemented similar to SafeStat
  • Used CDC measure to create an indicator (CDCI)
  • Added it to Safety Management SEA
  • Calculated ISS values in same way
    • Certain carriers now receive safety values
    • Some carriers have higher values
CDC-ISS Implementation (ISS-D)

- States selected to pilot test
  - States with best data available
  - Varied location / size

- Software (ISS-D) installed for majority of users in:
  - ID, NC, OH, and UT mid-January 2005
  - VT, CT, KY, and AK mid-March 2005

- ISS-D installed for a limited number of users in:
  - MO (4), WV (4), AZ (2), and WA (7)
ISS vs. ISS-D: Before and After Results

• ID, NC, OH, and UT
  • ISS
    • For Oct-Dec 2004, driver OOS rate = 7.72%
    • 38,270 Level 1, 2, 3 and 6 inspections
  • ISS-D
    • For Feb-Apr 2005, driver OOS rate = 8.33%
    • 38,812 Level 1, 2, 3 and 6 inspections

• AK, CT, KY, and VT
  • ISS
    • For Dec 2004-Feb 2005, driver OOS rate = 6.43%
    • 23,717 Level 1, 2, 3 and 6 inspections
  • ISS-D
    • For Apr-Jun 2005, driver OOS rate = 7.10%
    • 30,069 Level 1, 2, 3 and 6 inspections
Overview of ISS-D Implementation

- Algorithm implemented in production March 5, 2007
- Algorithm still based on SafeStat with an additional carrier-driver-conviction measure
Driver Conviction Data Process

- Last week of the month, obtain driver (and carrier) data from last month’s inspection and crash reports
- Run the driver data through CDLIS to obtain conviction history for the drivers
- Associate the conviction history for each driver with the appropriate carrier(s)
ISS-D Algorithm

• Use prior year of event data to associate drivers with carriers
• Calculate driver conviction measure (DCM) using convictions three years prior to the event date
  • Time and severity weight the convictions and sum
• For the carrier measure, calculate the average of all the carrier’s DCMs
• Convert to a percentile indicator based on size grouping
  • Use the higher of this indicator and the SafeStat Safety Management SEA as the new ISS Safety Management SEA
• Remainder of the ISS algorithm remains the same
For More Information

Brenda Lantz
North Dakota State University

brenda.lantz@ndsu.edu
(720) 238-0070

www.ugpti.org/tssc/projects/drivesafe.php