



U.S. Department of Transportation  
Federal Motor Carrier Safety Administration

# Evaluating the Safety Benefits of Electronic Hours of Service Recorders (EHSRs)

2015 Transportation Research Board 94<sup>th</sup> Annual Meeting  
Federal Motor Carrier Safety Administration  
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Office of Research and Information Technology



# Research Purpose and Overview

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- Assess the potential safety benefits of EHSRs.
  1. Do trucks with EHSRs have lower crash rates?
  2. Do trucks with EHSRs have lower hours-of-service (HOS) violation rates?

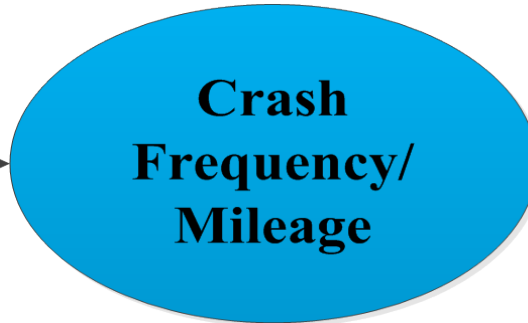
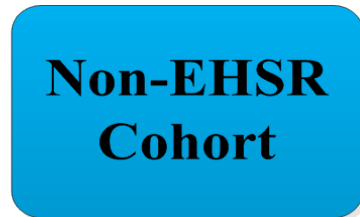
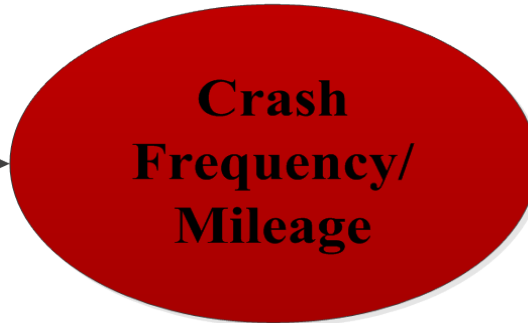
# Merge and Reduce Carrier Data

- Class 7 and 8 trucks.
  - Short-haul excluded.
- Carrier data sets merged into one data set.
  - Common set of data variable headers.
- Data reduction.
  - Removed “claim only.”
  - Fatigue-related.

# Retrospective Cohort Design

**EHSR Installed?**

**Safety Outcome**



Study  
Begins:  
Retrospective

# Supplementary Analysis: Before/After Only for Carrier B

- Considerable number of trucks instrumented during the study period.



- **Number of crashes**
  - **Exposure: miles traveled**
- Compare the crash rate before and after EHSRs installed.

# Data Overview

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- Final data set included:
  - 224,034 truck-years.
  - 82,943 crashes.
  - 970 HOS violations (only years 2011 and 2012).
  - 15.6 billion miles traveled.

# EHSR Installation

- Final data set included 15.6 billion miles traveled.

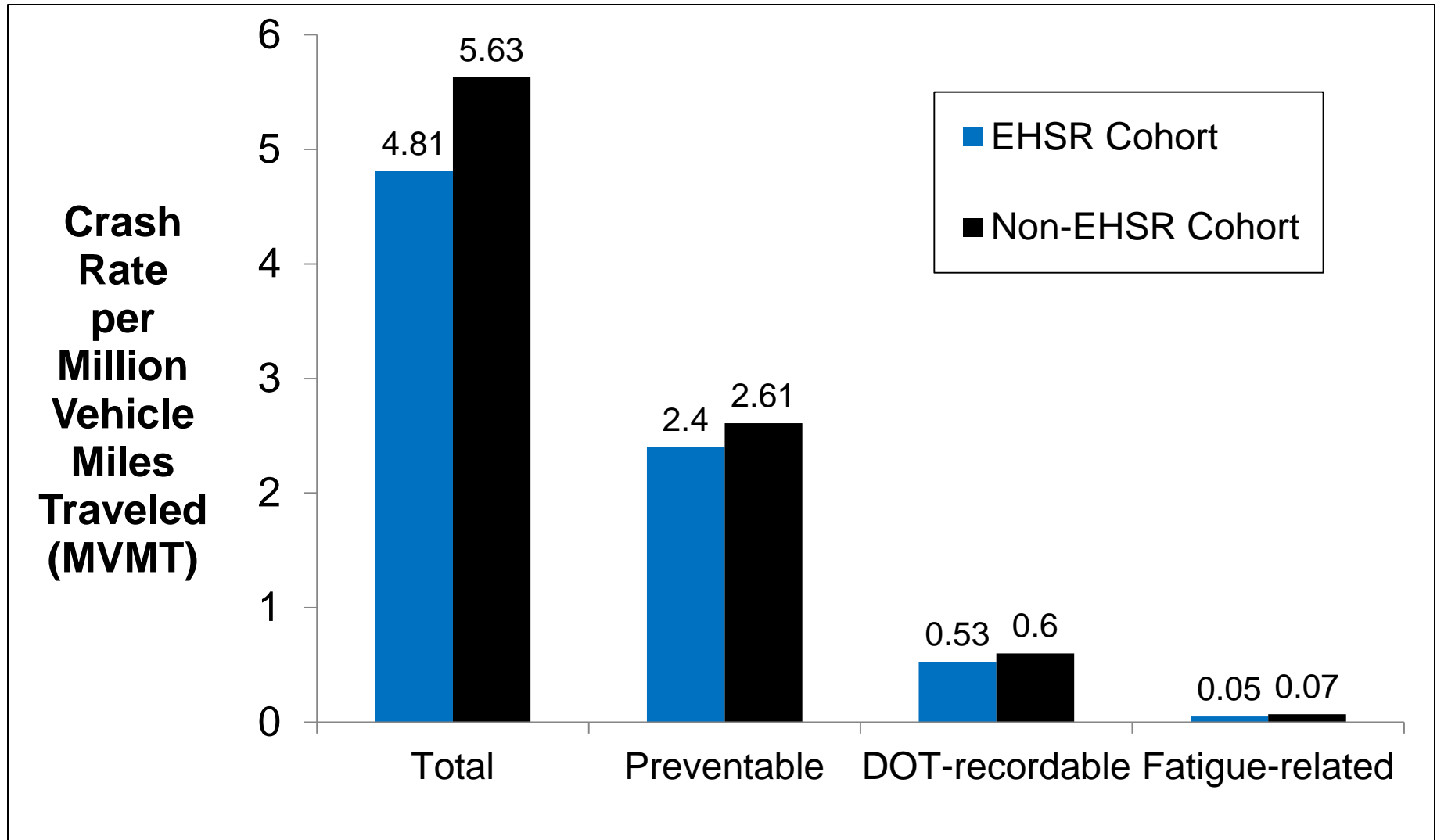
Year	Trucks with EHSRs (A)	Trucks w/out EHSRs (B)	% Trucks with EHSRs [(A/A+B)*100]	Total
2008	1,170	27,843	4.0%	29,013
2009	3,210	37,102	8.0%	40,312
2010	15,864	26,358	37.6%	42,222
2011	27,774	24,458	53.2%	52,232
2012	35,147	25,108	58.3%	60,255
<b>Total</b>	<b>83,165</b>	<b>140,869</b>	<b>37.1%</b>	<b>224,034</b>

# EHSR Penetration by Carrier

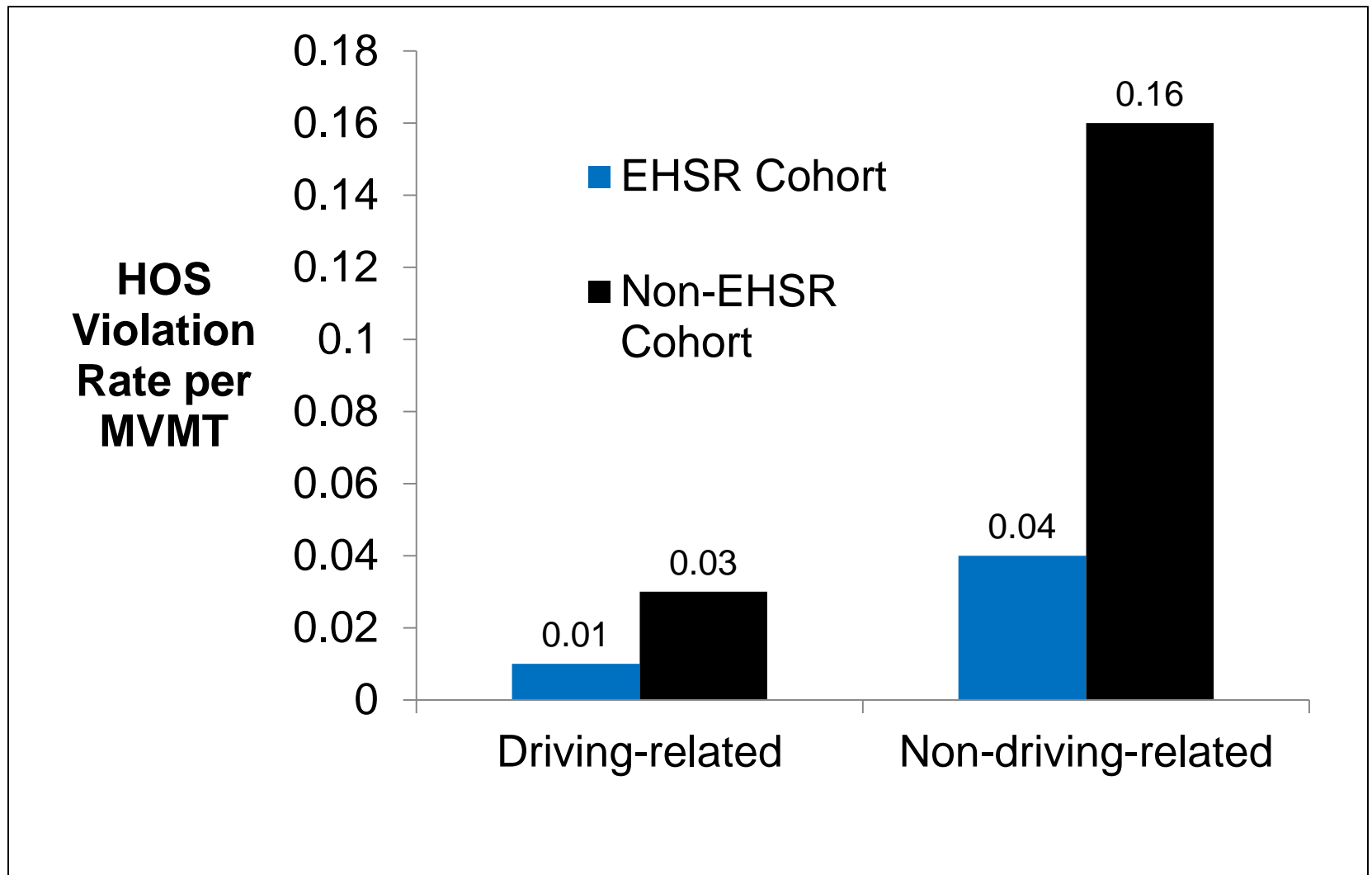
Carrier ID	EHSR Cohort	Non-EHSR Cohort
A	2,096	6,263
B	5,369	4,596
C	37,764	23,914
D	0	6,585
E	0	16,559
F	0	418
G	0	42,361
H	0	1,306
I	3,746	16,488
J	14,083	9,380
K	20,107	12,999
<b>Total Truck Years</b>	<b>83,165</b>	<b>140,869</b>



# Crash Rates by EHSR Cohort



# HOS Violation Rates by EHSR Cohort



# Effects of EHSRs

Safety Measure	Rate Ratio for EHSRs vs. Non-EHSRs	% Reduction	Statistically Significant (p < 0.5)
<b>Total Crashes</b>	0.88	12.0	Yes
<b>Preventable Only</b>	0.95	5.0	Yes
<b>HOS Violation Rate (Driving-related)</b>	0.47	53.0	Yes
<b>HOS Violation Rate (Non-driving-related)</b>	0.51	49.0	Yes
<b>DOT-recordable Only</b>	0.99	Not enough data	No
<b>Fatigue-related Only</b>	0.99	Not enough data	No

# Case Study: Before-After Crash Rate Comparison

<b>Crash Type</b>	<b>Crash Rate Ratio EHSRs vs. Non-EHSRs</b>	<b>% Reduction</b>	<b>Statistically Significant (<math>p &lt; 0.05</math>)</b>
<b>Total Crashes</b>	0.55	45.0	Yes
<b>Preventable Only</b>	0.62	38.0	Yes
<b>DOT-recordable Only</b>	0.45	55.0	Yes
<b>Fatigue-related Only</b>	0.69	Not enough data	No

# Discussion

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- EHSRs have safety benefits.
- With Cantor et al. (2009), supports safety benefits of EHSRs.
- Broad spectrum of crashes.
- Real-world crash and HOS violation efficacy.
- Ability to filter crashes.
- Controlled for exposure and covariates.

# Caveats

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- Limited data to assess fatigue.
- Data skewed toward large, for-hire carriers.
- Driver information not used.
- Non-matching vehicle identification numbers (VINs) in HOS data set.
- Differences in safety culture.

# Contact Information

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