SmartDriver Training:

Boost Your Bottom Line While Reducing Emissions AND Improving Safety

May 15, 2024

Celebrating 20 Years SmartWay U.S. Environmental Protection Agency

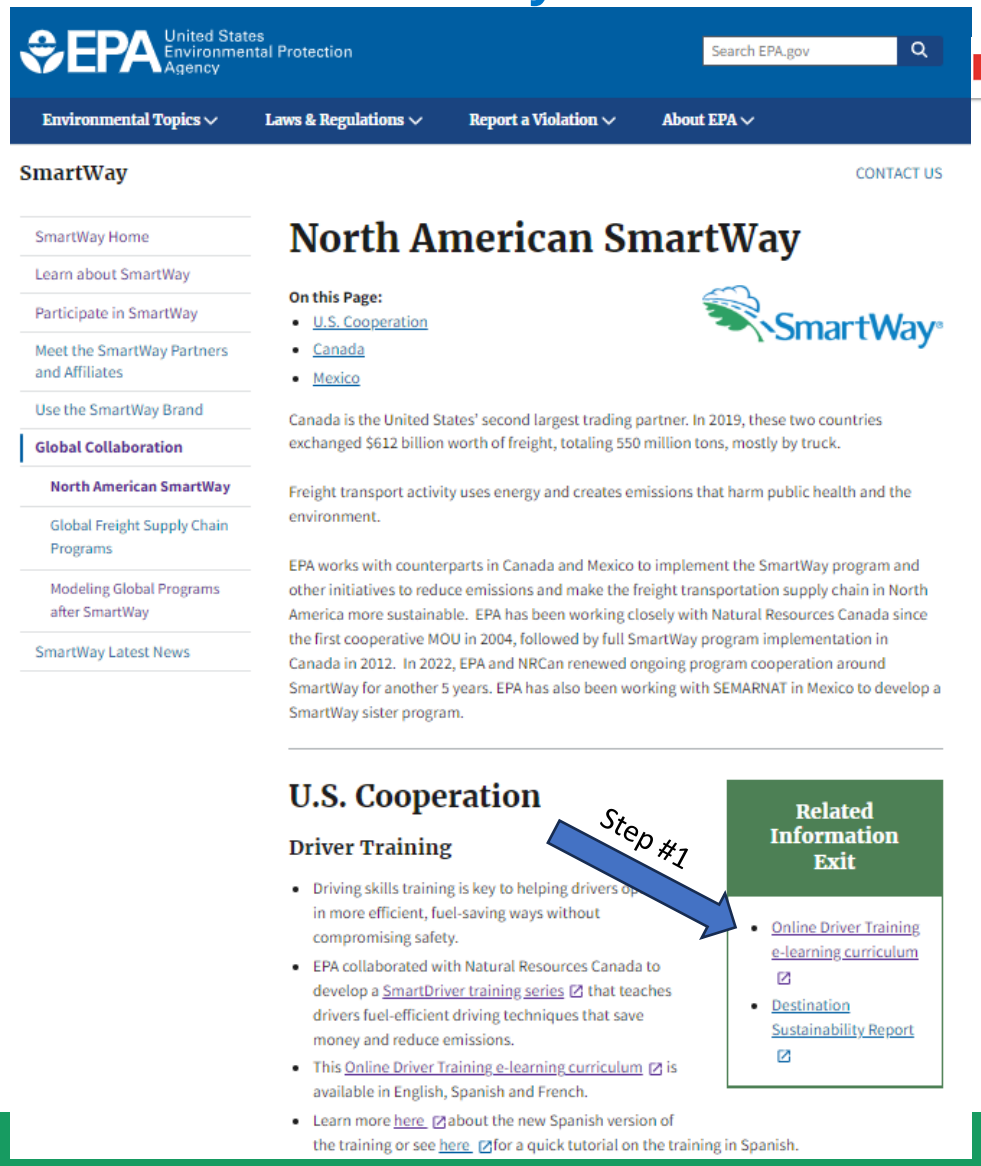
Today's Speakers

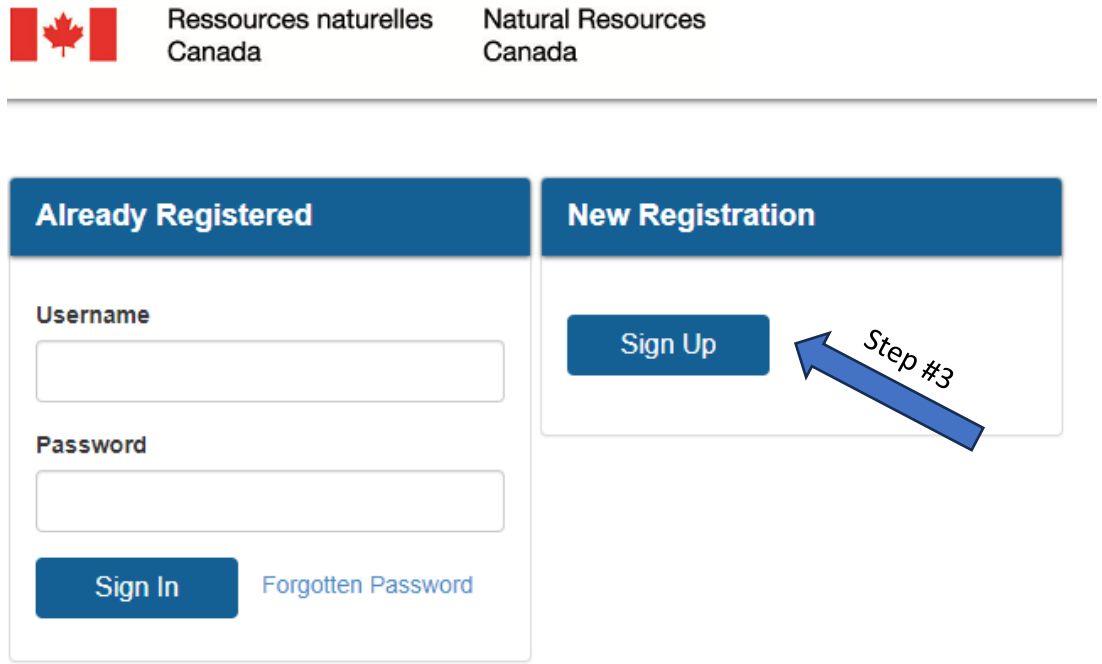
Buddy Polovick
Team Leader
US Environmental Protection Agency
SmartWay Transport Partnership

Andreij Pozdniakov
Senior Program Officer
Natural Resources Canada
Greening Freight Unit

Ward Vanlaar
Chief Operating Officer
Traffic Injury Research Foundation

U.S. and Canada Cooperation on SmartWay and Driver Training





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Natural Resources Canada

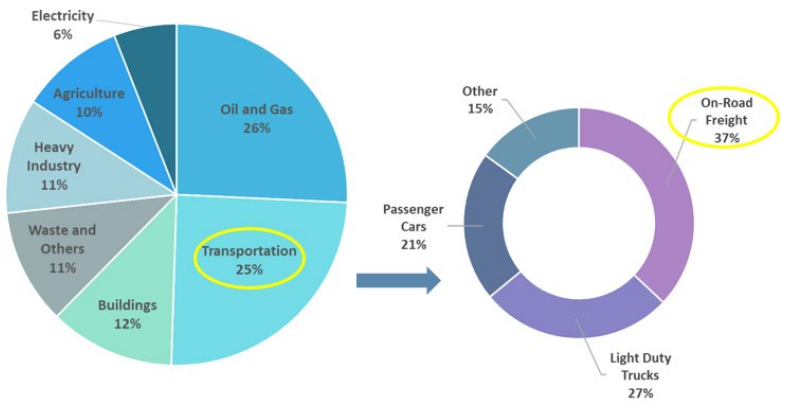
Smart*Driver* Training Series

May 15, 2024

Canada

BACKGROUND

Transportation Accounts for 25% of GHGs in Canada



TRAINING SERIES

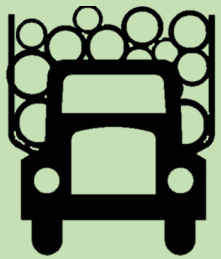
Smart*Driver* for Highway Trucking

Smart*Driver* in the City

Smart*Driver* for Forestry Trucks

Smart*Driver* for School Bus

Smart*Driver* for Work Trucks



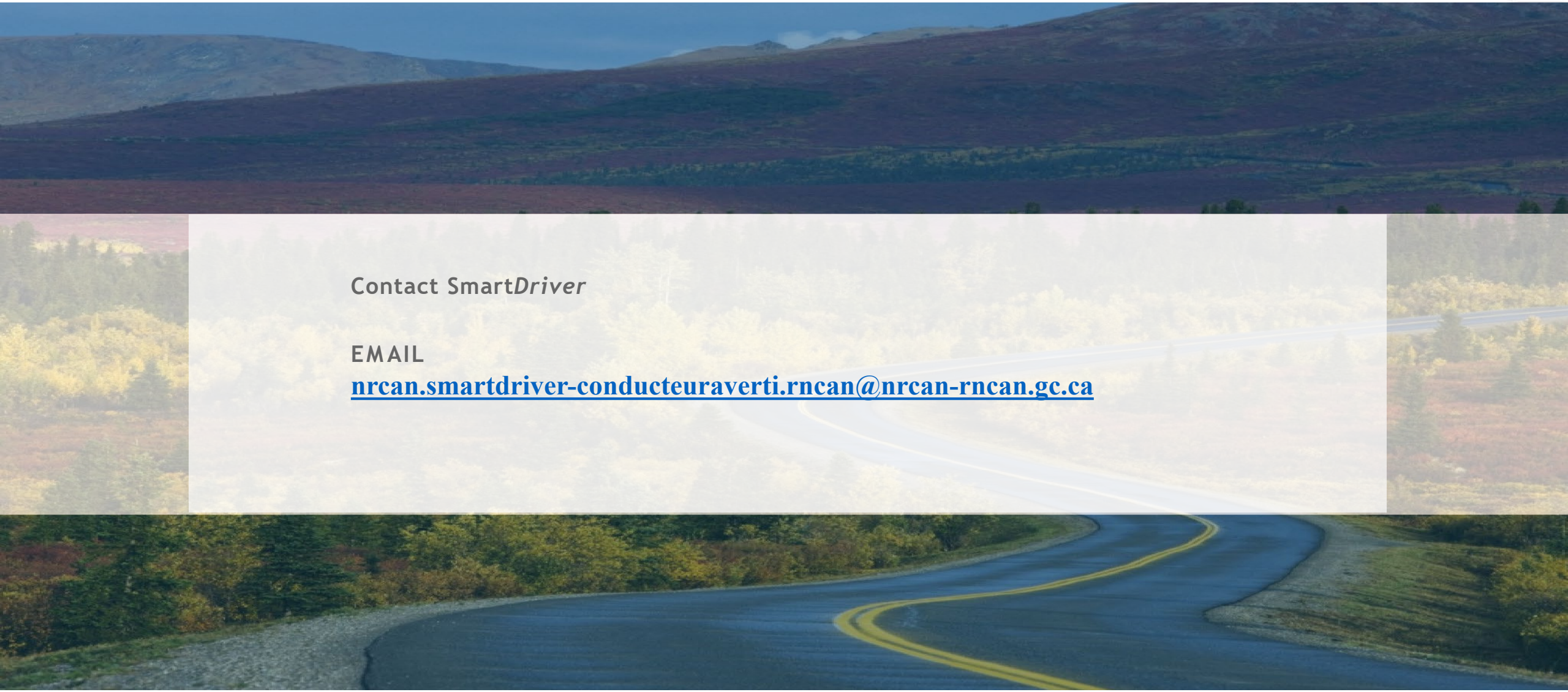
SmartDriver for Highway Trucking

International Efforts

Smart*Driver*

Free Training Resources

Driver training
+
Investments in new technologies
=
Up to **3.8%** savings



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Effects of Eco-Driving on Commercial Motor Vehicle Driver Crash Risk

May 15, 2024

Ward Vanlaar, Chief Operating Officer

TRAFFIC INJURY RESEARCH FOUNDATION

Applying research to the real world.

About TIRF

TIRF is a registered charity providing the following services:

- Research on road crashes;
- Program and policy development;
- Evaluation plans, program, and policy evaluations; and
- Knowledge transfer

Giving Communities | Safe Roads Home

The **vision** of TIRF is to ensure people using roads make it home safely every day by eliminating road deaths, serious injuries and their social costs.

TIRF's **mission** is to be the knowledge source for safer road users and a world leader in research, program and policy development, evaluation, and knowledge transfer.

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Effect of eco-driving on commercial motor vehicle driver collision risk

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ARTICLE INFO

Keywords:
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Hard-braking
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ABSTRACT

Introduction: This study investigates the effect among commercial motor vehicle (CMV) drivers of the adoption of fuel-efficient driving techniques (commonly known as eco-driving) on the odds of being involved in safety-related events. *Method:* For 2,637 long-haul class 8 drivers employed by four carriers in Canada, information on driving style, total distance driven, and safety-related events like collisions, hard-braking, hard-turning, and stability control events were collected for each trip. Three carriers provided driving style-related data from the ISAAC instrument, which provides a score on a 0 to 100 scale that measures the degree to which a driver is using an appropriate amount of engine power according to driving conditions. The fourth carrier provided data on driving style characteristics, including fuel consumption, use of cruise control, and use of top gear. Depending on the carrier, information on speeding, driver age, and years of experience driving a commercial vehicle was also collected. Logit statistical models were developed to estimate the change in odds of a driver experiencing a safety-related event dependent on the measures of driving style. *Results:* A one-unit increase in the ISAAC score was associated with a 7%, 8%, 8%, and 4% reduction in the odds of having a hard-braking event, hard left-turn event, hard right-turn event, and collision, respectively. For the carrier not employing the ISAAC system, an increase of 10% in the time spent driving in top gear with steady speed near 100 km per hour (km/h) was associated with a substantial 34% decrease in stability control events. In addition, a year increase in the driver's age, as well as a 1% increase in the amount of time spent driving using cruise control, reduced the number of hard-braking events by 9% and 3%, respectively. *Conclusion/Practical Applications:* The adoption of fuel-efficient driving techniques enhances the safety of CMV drivers.

Overview

- Research background
- Study objectives & hypothesis
- Study population
- Method
  - Data collection
  - Statistical analysis
- Study findings: Overview
- Implications for improving the safety of commercial vehicle fleets
- Conclusions

Research Background

- How to modify driving styles?
  - selected speeds and maintaining a steady speed
  - smooth driving and speed profile
  - shifting up sufficiently early or downshifting ALAP
  - anticipate traffic and route choice
  - driver assistance system (e.g., cruise control)
  - monitoring technologies by providing real-time feedback (e.g., ISAAC Coach)

Research Background

- Benefit of eco-driving style:
  - fuel cost savings
  - safety benefits for fleet operators
  - lower insurance costs
  - increased productivity
  - improve road safety for the population at large

Objective

- Evaluating the effect of commercial motor vehicle (CMV) drivers adopting fuel-efficient driving techniques on the odds of being involved in near-hit events and collisions.

- **Hypothesis:** Adoption of an Eco-Driving style decreases the odds of CMV driver involvement in near-hit events and crashes.

Study population & sample

- Long-haul class 8 vehicle drivers employed by commercial companies in Canada
- Three commercial companies used ISAAC including:
  - 2,531 drivers
  - Total 18,024,525 driving segments
  - Total 336,133,277 km (≈ 208,863,535 mi) of driving exposure
- One commercial company did not use ISAAC including:
  - 106 drivers
  - Total 5,257,761 km (≈ 3,267,021 mi) of driving exposure

Data Collection

- Data collected from 3 companies using the ISAAC from January 19th, 2020 to April 12th, 2022
- Number of collisions
- Near-hit events including stability control events, hard-braking, hard left-turn, and hard right-turn events
- Weighted mean of ISAAC score (driving performance score)
- Total distance traveled
- Total number of segments a driver exceeded the posted speed limit (110 or 120 km/hr equal to 68.35 or 74.56 mi/hr)

Data Collection

- Data collected from one transportation company between June 2021 through October 2021
- Age and experience of drivers
- No use of ISAAC
- Driving style characteristics such as highest gear, engine revolutions per minute (RPM), cruise control and speeding
- Total distance travelled

Statistical Analysis

- Quantify the odds ratio of a near-hit event or collision by one unit increase of an explanatory variable
- Using logit models in Stata software
- Define higher-risk driving by various thresholds of hard near-hit events and collisions
- Benefiting from several measures of goodness-of-fit:
  - Maximum value of Pseudo R2
  - Area under the Receiver Operating Characteristic (ROC) curve
  - Correctly classified (%)

Study Findings: Overview

Odds of having near-hit collisions: Logit regression results

Near-hit collisions	WM ISAAC		Sum distance (per 10,000 km)		Sum Speeding110		Sum Speeding120		Pseudo R2	Area under ROC curve	Correctly classified (%)
	Odds	P>|z|	Odds	P>|z|	Odds	P>|z|	Odds	P>|z|			
Hard-braking	0.928	0.000	1.511	0.000	1.000	0.282	1.005	0.808	0.360	0.919	92.92
hard left-turn	0.918	0.000	1.057	0.000	1.000	0.858	1.000	0.933	0.098	0.710	67.06
hard right-turn	0.920	0.000	1.061	0.000	1.000	0.336	1.006	0.044	0.103	0.718	71.06

Study Findings: Overview

Odds of having collisions: Logit regression results

Company	WM ISAAC			Sum distance (per 10,000 km)			Pseudo R2	Area under ROC curve	Correctly classified (%)
	Odds	95% CI	P>|z|	Odds	95% CI	P>|z|			
Total	0 .964	[0 .946, 0.984]	0.000	1.066	[1.055, 1.077]	0.000	0.115	0.726	66.76

Study Findings: Overview

- Increasing one unit in the weighted mean of the ISAAC score is associated with:
  - 7% reduction in the odds of a hard-braking event
  - 8% reduction in the odds of hard left-turn and hard right-turn events
  - 4% reduction in the odds of having a collision

Study Findings: Overview

- A 1% increase in the use of cruise control is associated with:
  - 3% reduction in the odds of a hard-braking event

- An increase in the driver's age is associated with:
  - 9% reduction in the odds of a hard-braking event

Study Findings: Overview

- Driving in top gear with steady speed (101 km/h equal to 62.76 mi/hr) is associated with:
  - 34% reduction in the odds of a stability control event

- 1% increase in speeding is associated with:
  - 4% increase in the odds of a stability control event

- An increase in distance traveled of 10,000 km (≈ 6,214 mi) is associated with:
  - 55% increase in the odds of a stability control event

Implications for Improvement

- Increasing the awareness regarding benefits of the Eco-Driving style
- Paying attention to smooth driving
- Focusing on the target population (e.g., young drivers)
- Training to improve the ISAAC score (SmartDriver for Highway Trucking online course from Natural Resources Canada)

Conclusions

- Adopting an Eco-Driving style involving less time spent speeding, more use of cruise control, and more time spent in top gear results in:
  - Significant reductions in the odds of all types of near-hit events and crashes
  - Reduces fuel consumption
  - Savings in insurance costs and increase in productivity
  - Increased age of CMV drivers is associated with a reduced risk of collisions

Acknowledgement

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Thank you

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TRAFFIC INJURY RESEARCH FOUNDATION

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