Ontario
MINISTRY OF TRANSPORTATION

Ontario's Large Truck Studies

Fatigue and Carrier vs Driver Risk

11-06-18

Two Studies – One Goal

Truck Safety Oversight Evaluation

- Determine effectiveness of CVOR interventions and optimize application

Focus:

Carriers

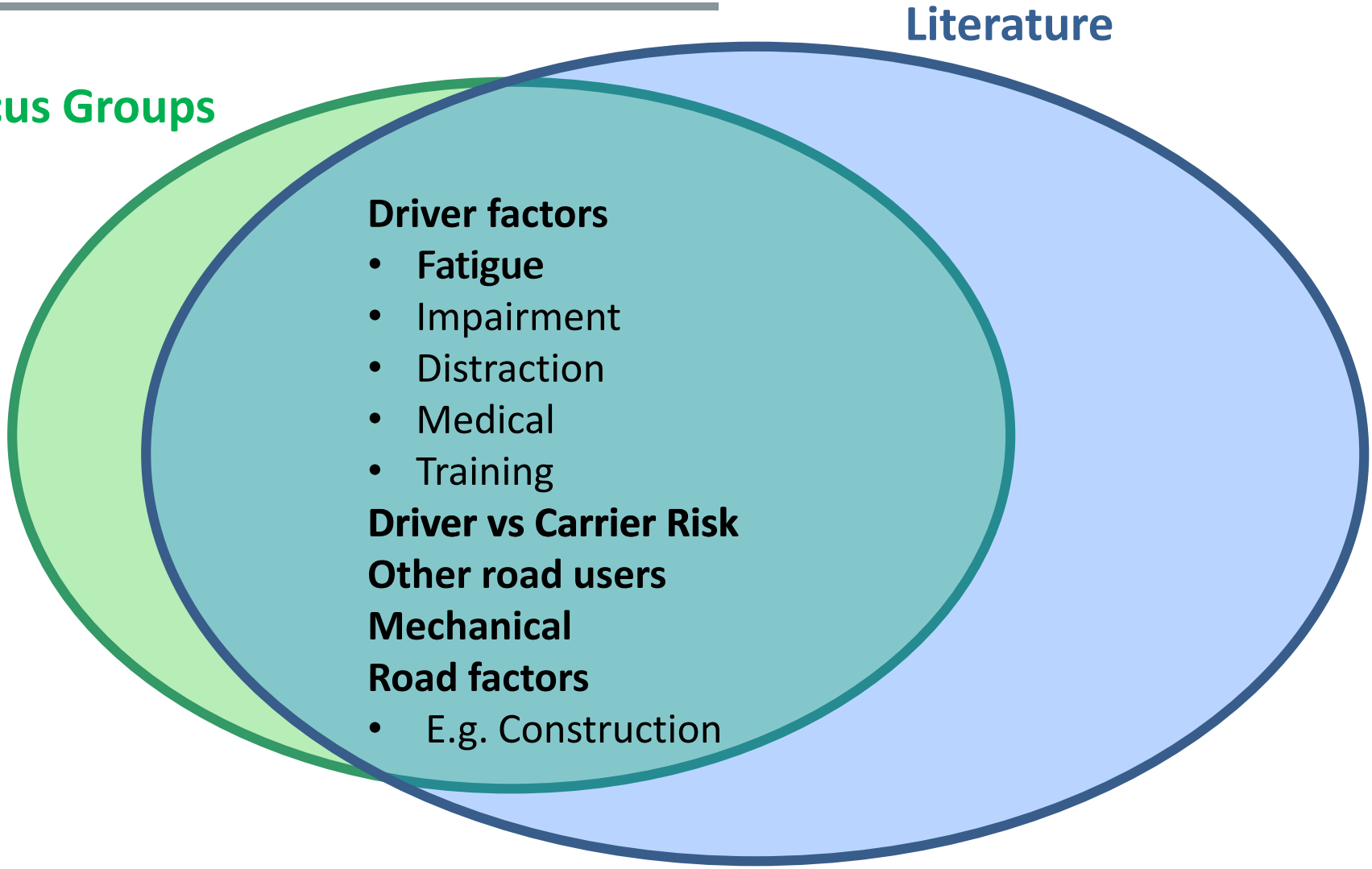
Large Truck Collision Causation

- Use MTO's truck oversight, collision, driver, vehicle, and medical data to discover root causes of Large Truck collisions in Ontario

Focus:

Large Truck drivers, Other road users, Road factors, Vehicle factors

LTCCS Approach



Fatigue

Police reported Large Truck collisions (2007-2015)

Driver Condition	No. vehicles	%
Not Applicable	2,031	1.8
Unknown	9,615	8.7
Normal	80,627	73.1
Had been Drinking	166	0.2
BAC > 0.8	116	0.1
Alcohol Impaired	54	0.0
Drug Involved	61	0.1
Fatigue	686	0.6
Medical	192	0.2
Inattentive	16,379	14.8
Other	434	0.4

From 2013, FARS data indicates 1.5% of fatal LT collisions due to fatigue

Many view this estimate…..as biased low because driver fatigue is difficult to detect during police accident investigations …… police investigators, not usually trained in how to recognize fatigue post hoc, are somewhat reluctant to identify it as such ….. because they subsequently will be expected to explain in court why they labeled a crash as related to driver fatigue.

-NAS (2016) Commercial Motor Vehicle Driver Fatigue, Long-Term Health, and Highway Safety: Research Needs

Fatigue: Estimation Strategy

Step 1

Find a driver group where fatigue mechanism is “visible”

Step 2

Estimate proportion of their collisions that are due to fatigue

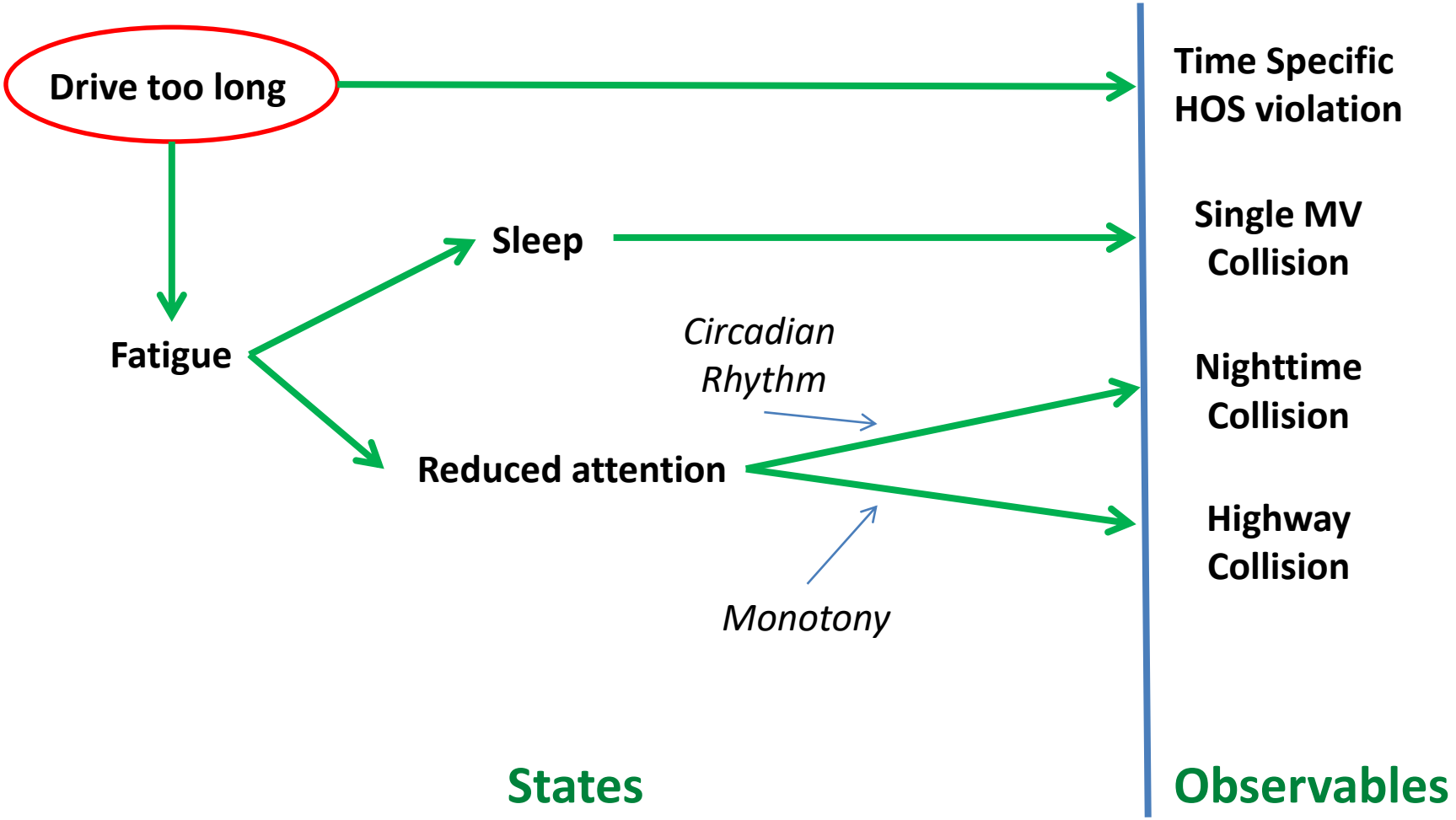
Step 3

Compare with police coding to estimate detection rate

Step 4

Apply rate to all Large Truck collisions

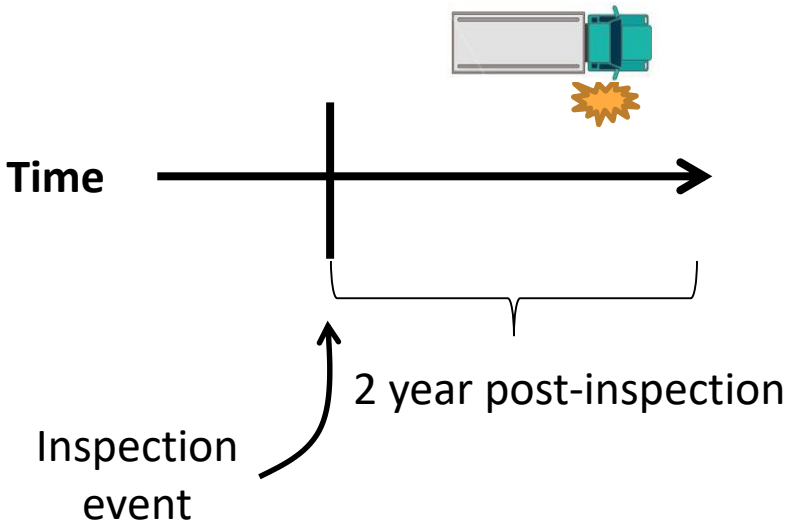
Fatigue: One Mechanism



Fatigue: Evidence of Mechanism

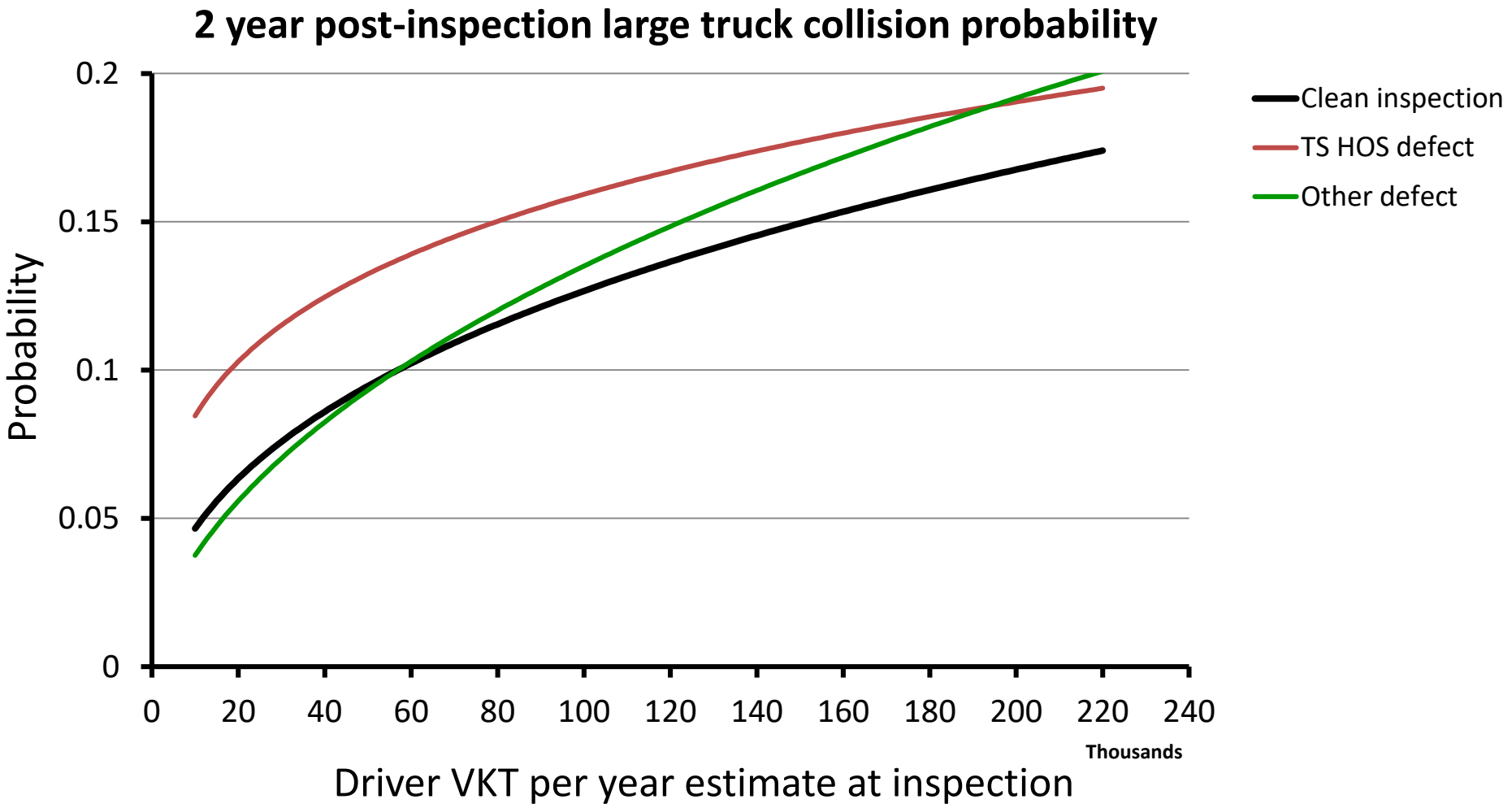
134,528 Large Truck drivers inspected 2007-2013

- 11,527 collide with two years of “index” inspection



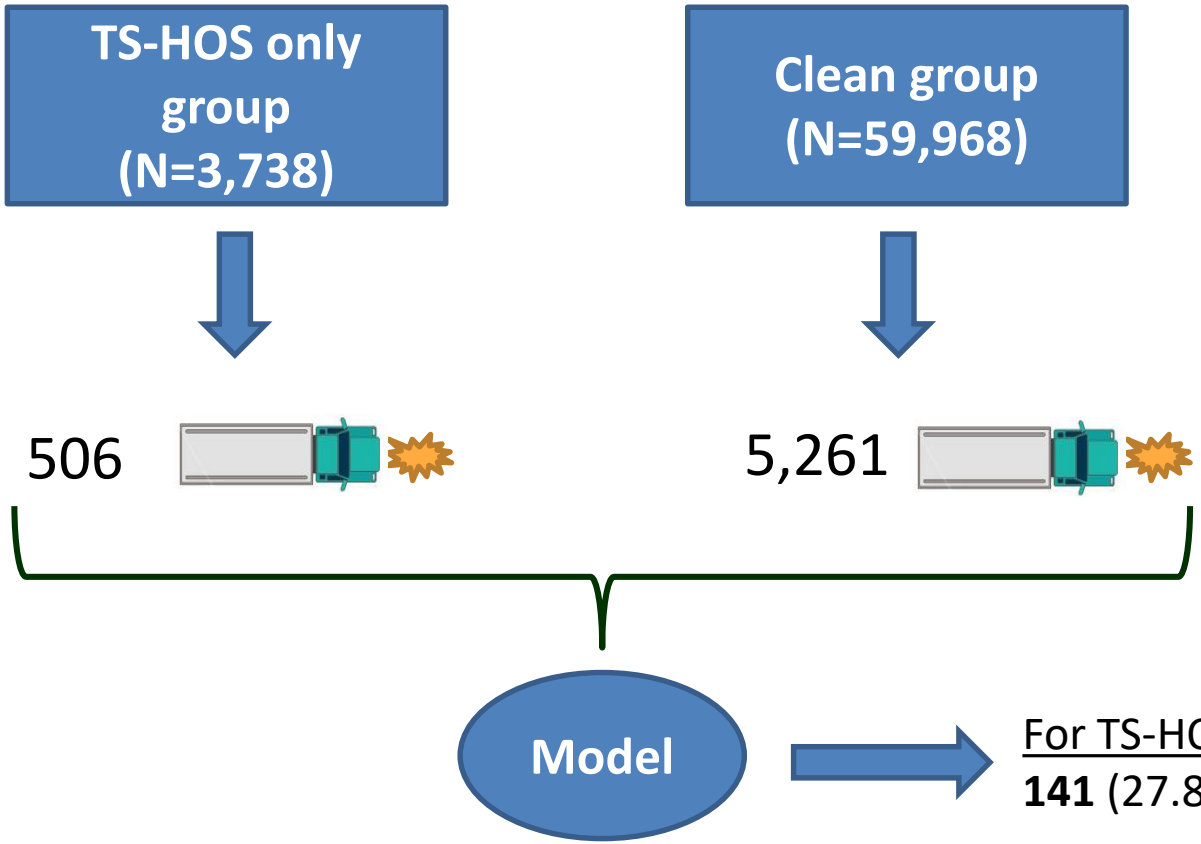
$$\ln(Odds_i) = \ln(VKT_i) \times [\beta_0 + TSHOS_i + NonHOS_i]$$

Fatigue: Evidence of Mechanism



Fatigue: Evidence of Mechanism

Restrict to drivers with TS-HOS only, or nothing (clean)



<u>For TS-HOS group:</u>
141 (27.8%) of 506 collisions are “extra”

Fatigue: Evidence of mechanism

Type of collision	Proportion of a driver group's collisions	
	Drivers with only TS-HOS	Clean drivers
Single Motor Vehicle	33%	24%
Darkness	26%	15%
Provincial Highway	63%	49%
Critical collision types **(i.e. at least one of above)**	**72%**	**60%**

Expected if mechanism valid

Necessary to remove **152** "critical" collisions (30% of 506) from TS-HOS group to balance with clean drivers

Lets split difference:

146.5 follow-up TS-HOS driver collisions due to fatigue

Fatigue: Detection rate and generalization

Time Specific HOS group (no other defects)

→ 506 collisions

→ 146.5 (minimum) due to fatigue

→ 5 detected by police as fatigue-related

→ Police detect 3.4% of fatigue-induced collisions

*Minimum: **18.2%** of all LT collisions due to fatigue*

CCMTA Operational Definition of Fatigue

Recently Updated and Validated by MTO (Haya, et al. 2015)

- Uses only collision data
- Stepwise process of elimination
- Applied to 2011-2015 Ontario fatal/injury Large Truck collisions

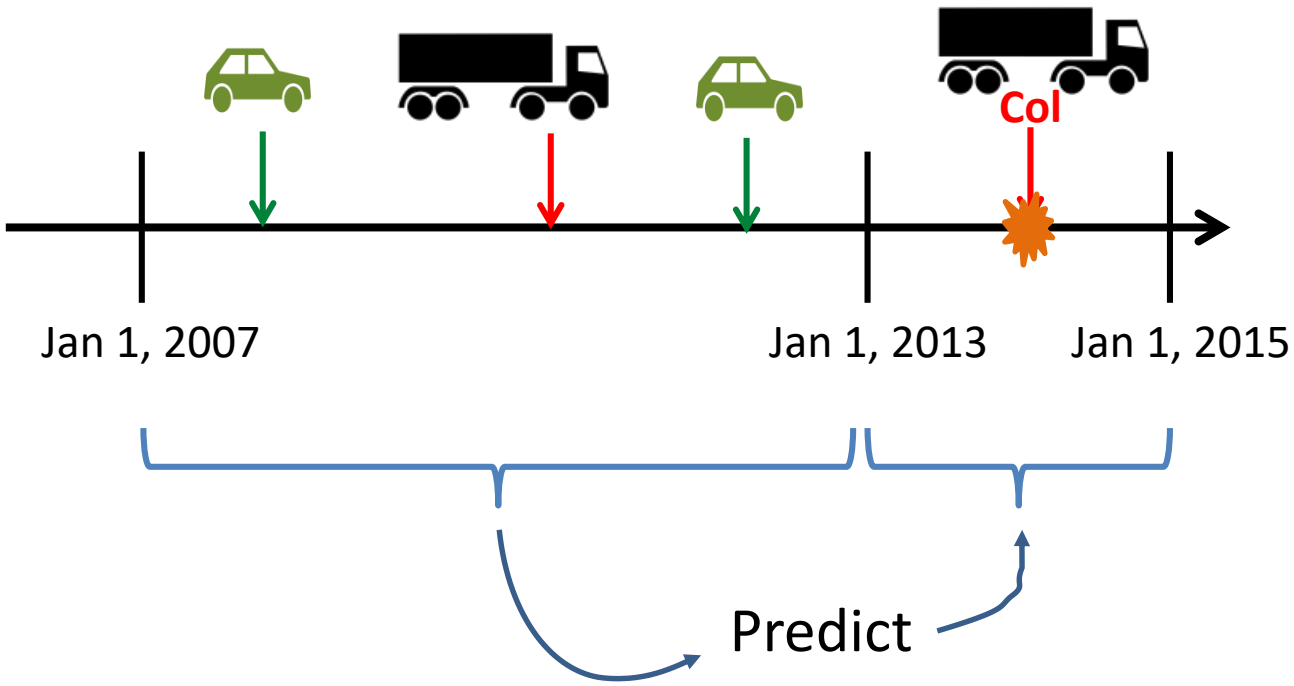
→**18.0%** involve Large Truck driver fatigue

- Collision reports suggest LT drivers "at-fault" less than 50% of time

  → More than 1 in 3 "LT-caused" collisions due to fatigue?

Driver vs Carrier: Contributions to risk

Driver history and carrier association



Driver vs Carrier: Contributions to risk

Results from 12,575 drivers grouped into 2,720 carriers

Important examples (Green Events in non-CVOR vehicle)	Increased LT collision risk per event
Aggressive I (collisions involving: fail to yield, improper turn, too fast for conditions)	26%
Aggressive II (collisions involving imp lane change, following too close; convictions for disobeying red light)	33%
Unaware (convictions for improper lane changes, fail to yield)	261%
Fatigue-related collisions	700%
Carrier Effect Size	+/-24%

Personal risk correlated with at-fault status in LT collisions

Seemingly uncorrelated with LT collision type

→ **Duration of increased risk due to "personal" events <u>up to 5 years or more</u>**

Some of our main findings

1. **Fatigue is still a major problem**
2. **The risk associated with moderate to high risk LT drivers exceeds any mitigating effects imposed by carrier, and is long-lived**
3. We do not know enough about substance use by LT drivers
4. We do not know enough about distraction, and finding information remains a challenge
5. Extensive on-road driving experience appears to be a critical component of a driver's "training"
6. Medical problems seem to be a minor contribution to LT collisions, but under-reporting might be an issue

Some of our main findings

7. Truck blind spots, dynamics, and manoeuvrability are challenging for other road users, especially around intersections
8. Mechanical defects detected at inspection seem to serve as indicators of more systematic carrier issues
9. The effectiveness of inspection in reducing future collision involvement is substantially enhanced by laying charges
    - Many carriers are not exposed to the “beneficial” effects of inspection
10. Carrier interviews are a highly effective intervention, possibly due to personal commitment