



# UMTRI

## Measuring Safety Effects of a CMV-Driver Training Program

*Lidia Kostyniuk, Ph.D., P.E.*

***THINGS THAT WORK***

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# Background

- Michigan Trucking Association – industry organization
- Michigan Truck Safety Commission (MTSC)
  - Appointed by Governor
  - Representatives from trucking industry, MI State Police, DMV, Gov Office of Highway Safety, Universities, Community Colleges, Public
  - Oversees expenditures, controls grants associated with training, interventions, research, evaluation
- Michigan Center for Truck Safety (MCTS)- run by MTA
  - CMV training courses





# Background



- In 2012, The Michigan Truck Safety Commission (MTSC) asked UMTRI to evaluate effectiveness of their Michigan Center for Truck Safety (MCTS) driver training program.
  
- Specifically asked for safety outcomes
  - Most evaluations ask for participant perceptions, ratings of instructors, will this be useful, etc.
  - Effects on safety difficult to measure

# Presentation Outline

- Training Courses at MCTS
- Participation
- Considerations and Challenges
- Approach
- Available Data
- Methods
- Results
- Summary and Next Steps



# Training Courses at MCTS

- **Michigan Center for Decision Driving (MCDD)**
  - Understanding stopping, skid control, crash avoidance techniques, decision-making skills, quick reactions for emergencies, 8-hr classroom & skid pad
- **Defensive Driving Course (DDC)**
  - Defensive driving techniques, safe maneuvers to avoid collisions and violations – 4-hr classroom
- **Fatigue Management Course (FMC)**
  - Causes, effects, myths, management of fatigue - On-line Interactive 7 sessions
- **Mobile Truck Simulator Program (MTSP)**
  - Emulates various transmissions and tractor-trailer combinations, drivers practice emergency maneuvers, collision avoidance methods – 4-hr session
- **Professional Driver Coaching (PDC)**
  - Evaluation of driving skills by driving coach – 1-hr, on-road
- **Other**
  - Seminars, Management training, Hazmat,.....

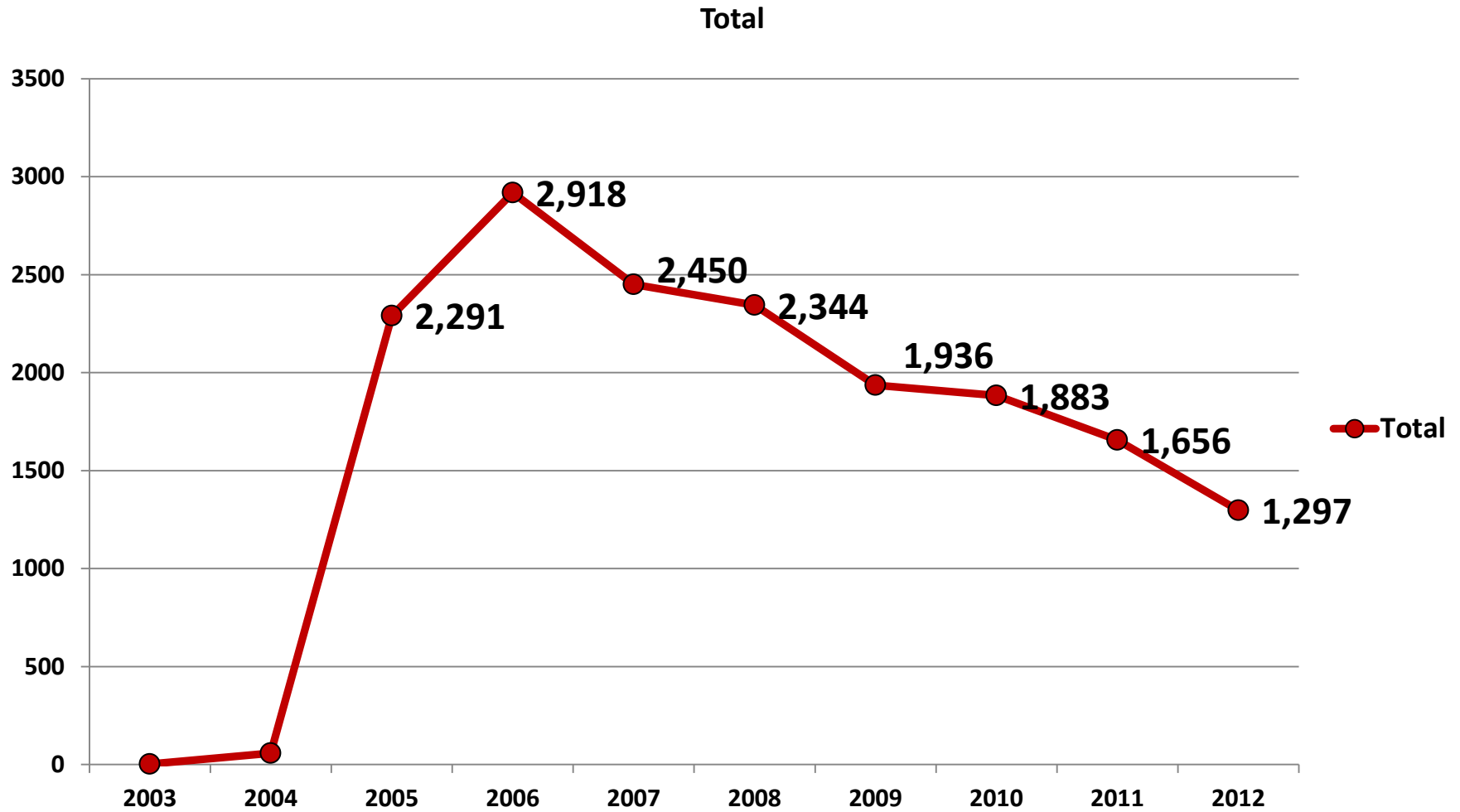


# MCTS Course Participants 2003-2012

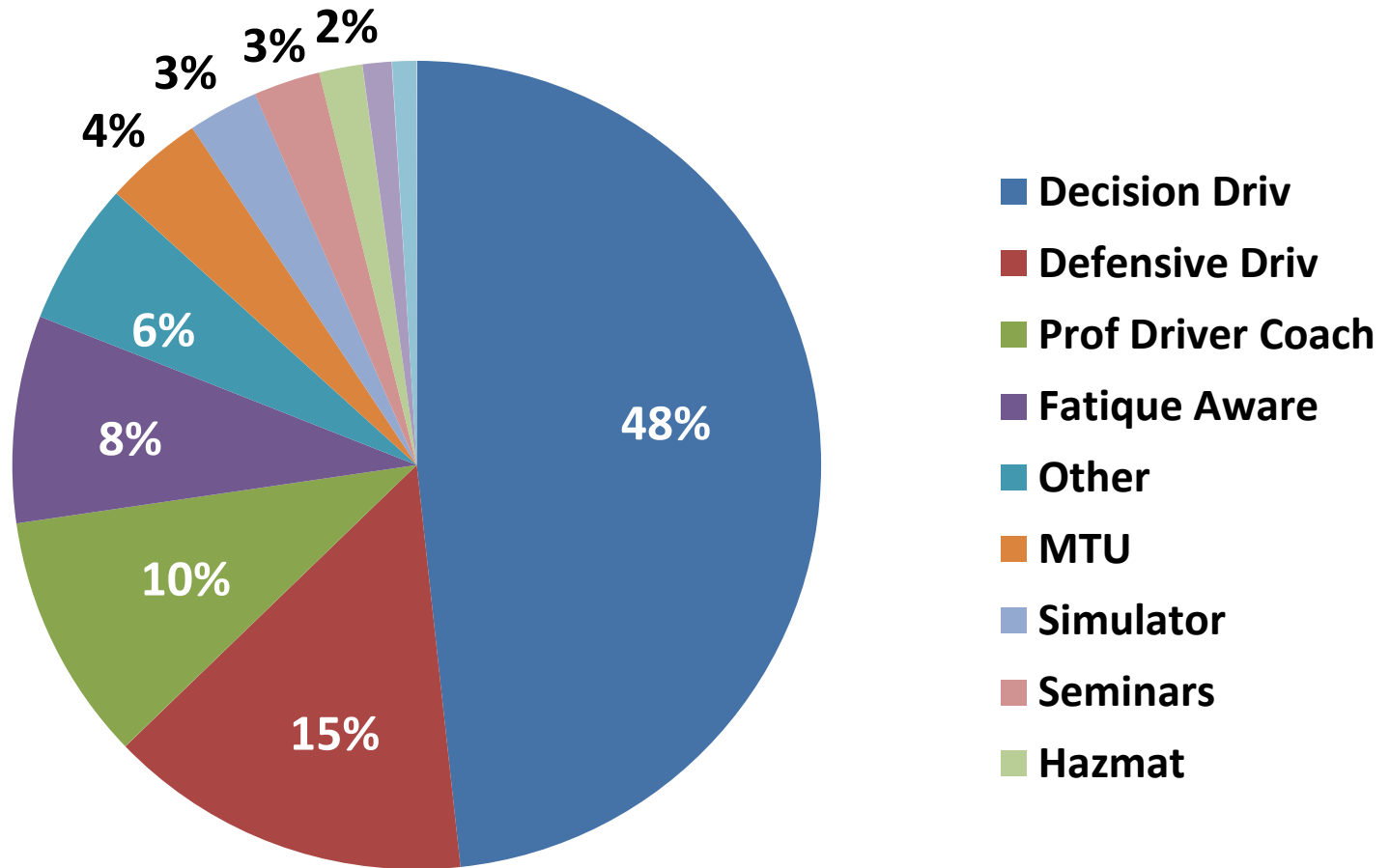
- **24,992 Total number of course participant records**
- **86% - from Michigan companies**
  - 85% - carriers, 4% carrier/brokers, 3% shipper/carriers
  - More likely engaged in interstate operations and transport of hazardous materials
- **16,768 - Complete records with valid Michigan driver license number**
- **12,363 Unique participants**
  - 1 course                    9,788 (79%)
  - 2 courses                 1,369 (11%)
  - 3 or 4 courses         1,096 ( 9%)



# Course Participation by Year

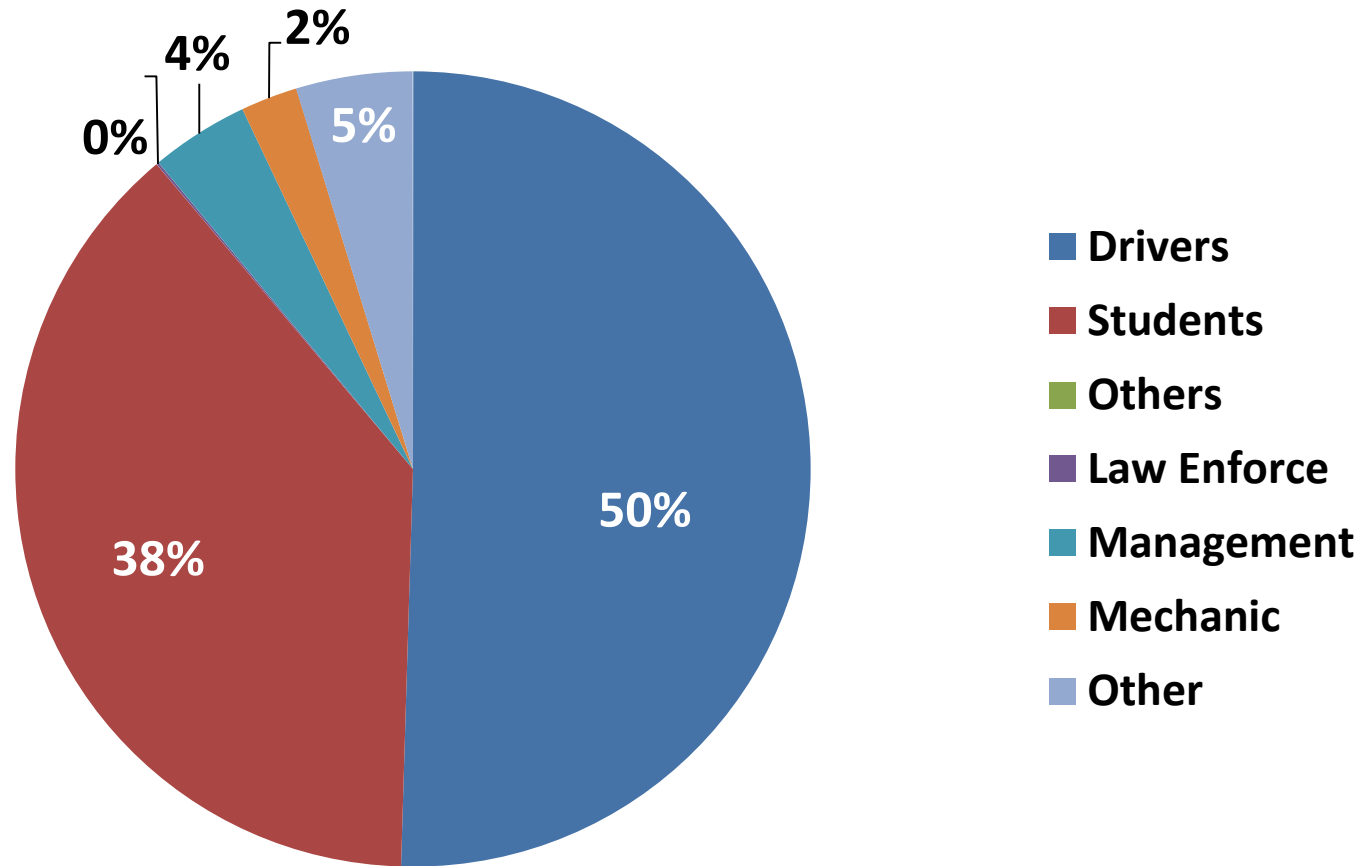


# Distribution of Participation by Course





# Distribution of Course Participants



# Considerations and Challenges in Evaluation of Safety Effects

- Objective of training - improve driving skills and safety practices of CMV drivers
- Crash-involvement - fundamental measure of driving safety
  - Crashes -rare events - many contributing factors
- Traffic violations – typically from individual’s own actions
  - Driving violations – good indicator of driving practices.
- So, we need to look at both crashes and violations
- Need to consider mileage of professional CMV drivers > most others
  - Rates – (incidents per VMT) – desired measure NOT available
  - Need analysis design not totally dependent on VMT



# Approach

## 1. Before/After with Comparison Design

- Compare number of crashes, CMV crashes, traffic violations before and after training and against a comparison group



## 2. More Detailed CMV Crash Comparison

- Examine distribution of CMV crashes by type and hazardous actions of MCTS drivers after training against random sample of comparison CDL drivers.



# Available Data

- **MCTS Course Records**
  - Identify MCTS drivers, training (type and date)
- **Michigan Driving History Records**
  - Identify random sample CDL comparison drivers – match to age/sex distribution of MTSC drivers
  - Obtain traffic violation records for MCTS drivers and CDL comparison drivers
- **Michigan Vehicle Crash Data Files**
  - Obtain crash records for MCTS and CDL comparison drivers

## Methods:

### 1. Before/After with Comparison Design

- Driver history records - full data record from 2006-2012
- Need 2 full years before MCTS training and 2 full years after MCTS training
- Identified 1,766 MCTS drivers with training in 2008, 2009, 2010
- Assigned two-year before and after periods for each MCTS driver
- Drew random sample of 4,558 CDL & non MCTS drivers
- Assigned “training” year randomly to each CDL comparison driver  
→ before and after periods
- Compare measures between periods and groups

Course Year	Before Period	After Period
2008	2006-2007	2009-2010
2009	2007-2008	2010-2011
2010	2008-2009	2011-2012

# Methods:

## 2. More Detailed CDL Crash Comparisons

- **Records of all MCTS course participants**
  - 5,402 unique MCTS drivers matched to 1,479 CMV crashes
  - Of these crashes, 739 crashes occurred after MCTS course
- **Selected random sample of CDL (non MCTS) drivers**
  - 15,606 CDL comparison drivers,
  - 1,605 were matched to CMV crash record.
- **Compare crash types and hazardous actions**
  - 739 MCTS-after training vs. 1,606 non-MCTS crashes



# Results - B/A Crash Comparisons

MCTS Drivers  
(n = 1,766)

CDL Comparison Drivers  
n = 4,558

2 Years Before

All Crashes	557
Crashes/Driver	0.32
CMV Crashes	280
% Crashes in CMV	50%
CMV Crashes/Driver	0.16
% CMV Crashes – PDO	86%
% CMV Crashes-Single Veh	18%

All Crashes	936
Crashes/Driver	0.21
CMV Crashes	226
% Crashes in CMV	24%
CMV Crashes/Driver	0.05
% CMV Crashes – PDO	79%
% CMV Crashes-Single Veh	12%

no crashes  
65%

Course Year

2 Years After

All Crashes	576
Crashes/Driver	0.33
CMV Crashes	241
% Crashes in CMV	42%
CMV Crashes/Driver	0.14
% CMV Crashes – PDO	85%
% CMV Crashes-Single Veh	18%

All Crashes	759
Crashes/Driver	0.17
CMV Crashes	165
% Crashes in CMV	22%
CMV Crashes/Driver	0.04
% CMV Crashes – PDO	83%
% CMV Crashes-Single Veh	15%

no crashes  
68%

# Results - B/A Crash Comparisons

- Proportion of drivers with no crash higher in comparison group ( $p=.004$ )
- Comparison group had lower overall crash/driver, CMV crash/driver, and single-vehicle CMV crash/driver.
- Overall decrease in CMV crashes in both groups.
- Proportion of CMV crashes decrease MCTS drivers ( $p=.004$ ) and not significant for comparison driver crashes.
- CMV crashes/driver decreased for each group (marginal significance).
- Single vehicle crash rate did not change significantly for either group.
- Larger portion of MCTS CMV crashes – DO (less severe) – evident among younger drivers





# Results - B/A Violation Comparisons

MCTS Drivers  
(n = 1,766)

CDL Comparison Drivers  
n = 4,558

2 Years Before

<b>All Violations</b>	<b>566</b>
<b>Violations/Driver</b>	<b>0.32</b>
<b>Violations in CMV</b>	<b>170</b>
<b>% Violations in CMV</b>	<b>30%</b>
<b>% CMV Violations/Driver</b>	<b>0.10</b>
<b>% CMV Crashes – Speed</b>	<b>60%</b>
<b>CMV Speed Viol./Driver</b>	<b>0.06</b>

<b>All Violations</b>	<b>1,688</b>
<b>Violations/Driver</b>	<b>0.37</b>
<b>Violations in CMV</b>	<b>271</b>
<b>% Violations in CMV</b>	<b>16%</b>
<b>% CMV Violations/Driver</b>	<b>0.06</b>
<b>% CMV Crashes – Speed</b>	<b>50%</b>
<b>CMV Speed Viol./Driver</b>	<b>0.03</b>

no violations  
62%

Course Year

2 Years After

<b>All Violations</b>	<b>505</b>
<b>Violations/Driver</b>	<b>0.29</b>
<b>Violations in CMV</b>	<b>148</b>
<b>% Violations in CMV</b>	<b>29%</b>
<b>% CMV Violations/Driver</b>	<b>0.08</b>
<b>% CMV Crashes – Speed</b>	<b>48%</b>
<b>CMV Speed Viol./Driver</b>	<b>0.04</b>

<b>All Violations</b>	<b>1,646</b>
<b>Violations/Driver</b>	<b>0.36</b>
<b>Violations in CMV</b>	<b>291</b>
<b>% Violations in CMV</b>	<b>18%</b>
<b>% CMV Violations/Driver</b>	<b>0.06</b>
<b>% CMV Crashes – Speed</b>	<b>49%</b>
<b>CMV Speed Viol./Driver</b>	<b>0.03</b>

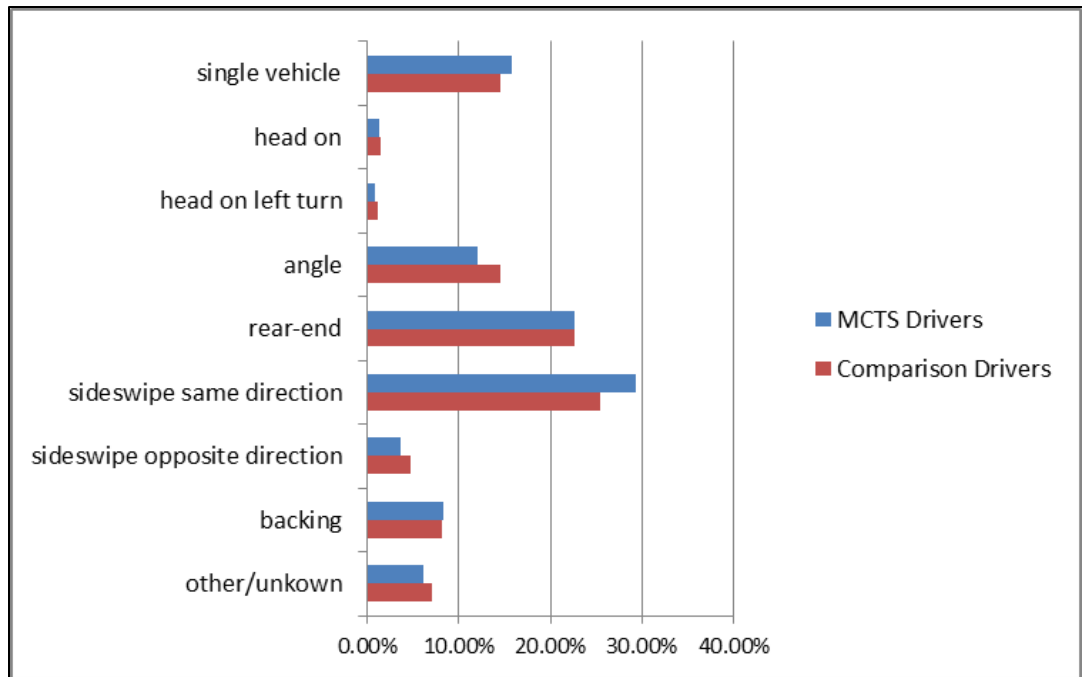
no  
violations  
61%

# Results - B/A Violation Comparisons

- Proportion of drivers with no violations ~ same for both groups
- Rate of violations/driver (in all vehicles) – stable over time, lower for MCTS drivers
- Rate of violations in CMV – stable over time, about 2 times greater for MCTS drivers
- Changes in CMV violation rates/driver – no significant change for either group
- Speeding accounts for greatest portion of violations (both groups)
- Significant reduction in proportion of speeding violations for MCTS drivers
  - Mostly due to reduction of speeding viol. in 21-30 age group
- Violation rate decreased with age in both groups

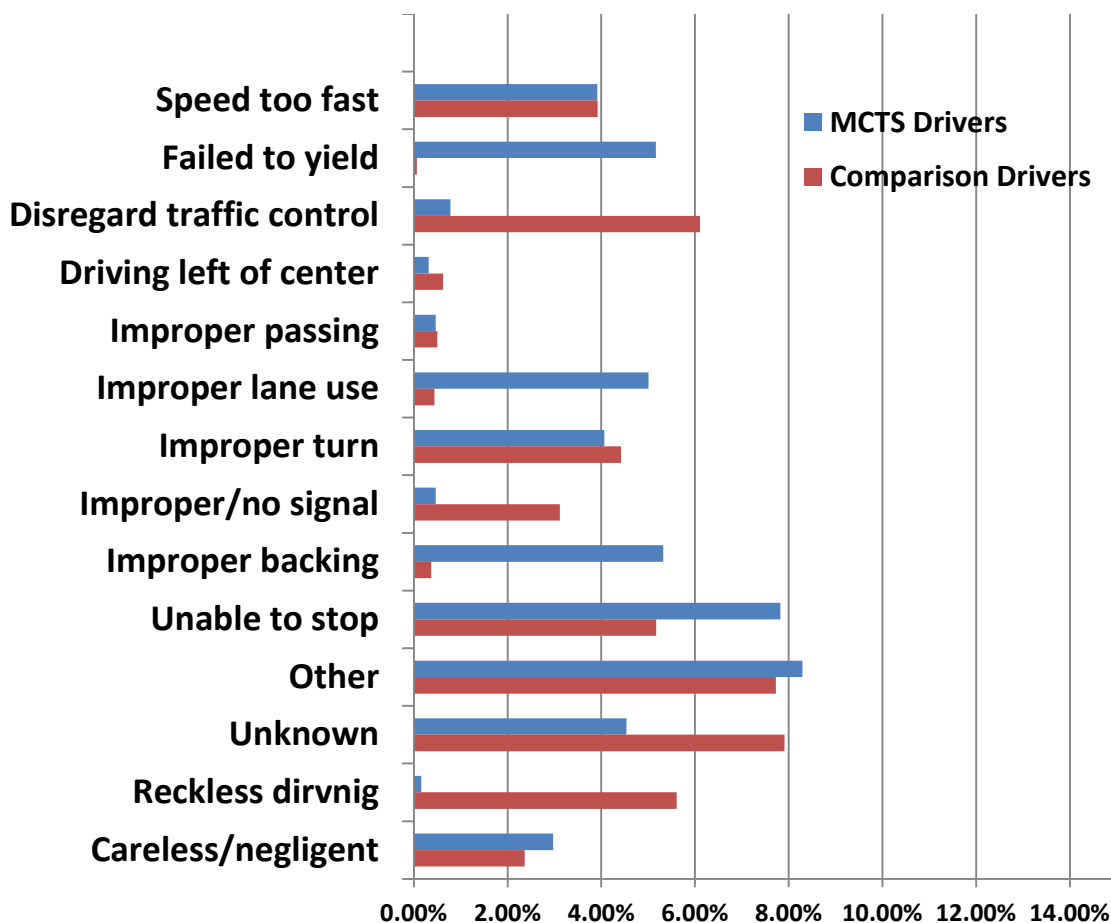


## Crash Types: after-MCTS training vs CDL Comparison group



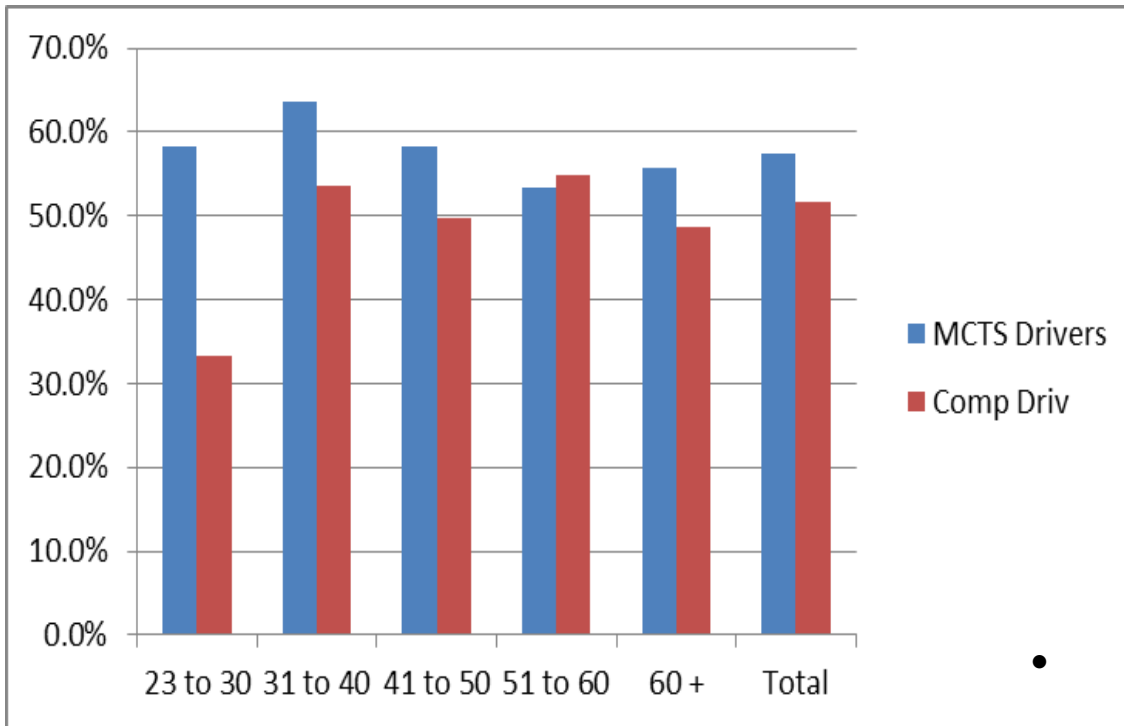
- MCTS drivers involved in a lower proportion of angle crashes (12% versus 15%)
- but higher proportion of sideswipe-same-direction crashes (29% versus 26%).
- Overall, not much difference

## Hazardous Actions in CMV Crash



- Not assigned hazardous action in their crash - 57% MCTS and 52% comparison CDL comp. drivers.
- Overall, differences small (note the scale)
- MCTS drivers less likely to be assigned Haz act for the *disregard traffic control* (1% versus 6%).
- Larger proportions MCTS drivers assigned *improper lane use* and *unable to stop* than the comparison drivers.

## Comparison of No-Hazardous Action in Crash by Age



- MCTS drivers - fewer hazardous actions in their crashes than comparison drivers
- The largest difference in youngest driver age group  
58% (MCTS) vs 33% of comparison drivers.
- Difference in proportions decreases with age.



# Summary



- **CMV crash rate/driver for MTSC drivers ~ 2 times more than Comparison CDL drivers.**
- **MCTS drivers employed as truck drivers, Comparison CDL drivers hold a CDL, employment unknown - most likely large portion not professional truck drivers.**
  - Data availability did not allow for driving exposure control.**
  - However, even if comparison drive less, they drive trucks, are involved in truck crashes, so comparisons can be made.**
- **Patterns of CMV crash types, severity, violations— similar for MCTS and Comparison CDL drivers.**
  - **Among youngest drivers (21-30) severity of CMV crashes lower for MCTS drivers.**
- **Difference was found in Hazardous Action in CMV Crash**
  - **MCTS drivers less likely to have Haz action in crash than Comparison CDL drivers → less likely to be at fault in CMV crash.**
  - **Largest difference among youngest (21-30) drivers with MCTS drivers less likely to have hazardous action than CDL comparison drivers.**

# Next Steps

- **MTSC asked UMTRI to help redesign training program record keeping system**
  - Ease and accuracy for MCTS
  - For future evaluations
- **MTSC asked UMTRI to conduct a CMV training needs assessment – input into strategic plan for CMV safety.**
- **Both project currently underway.**

