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Exploring crash characteristics and injury outcomes among older truck drivers: An analysis of truck-involved crash data in the United States

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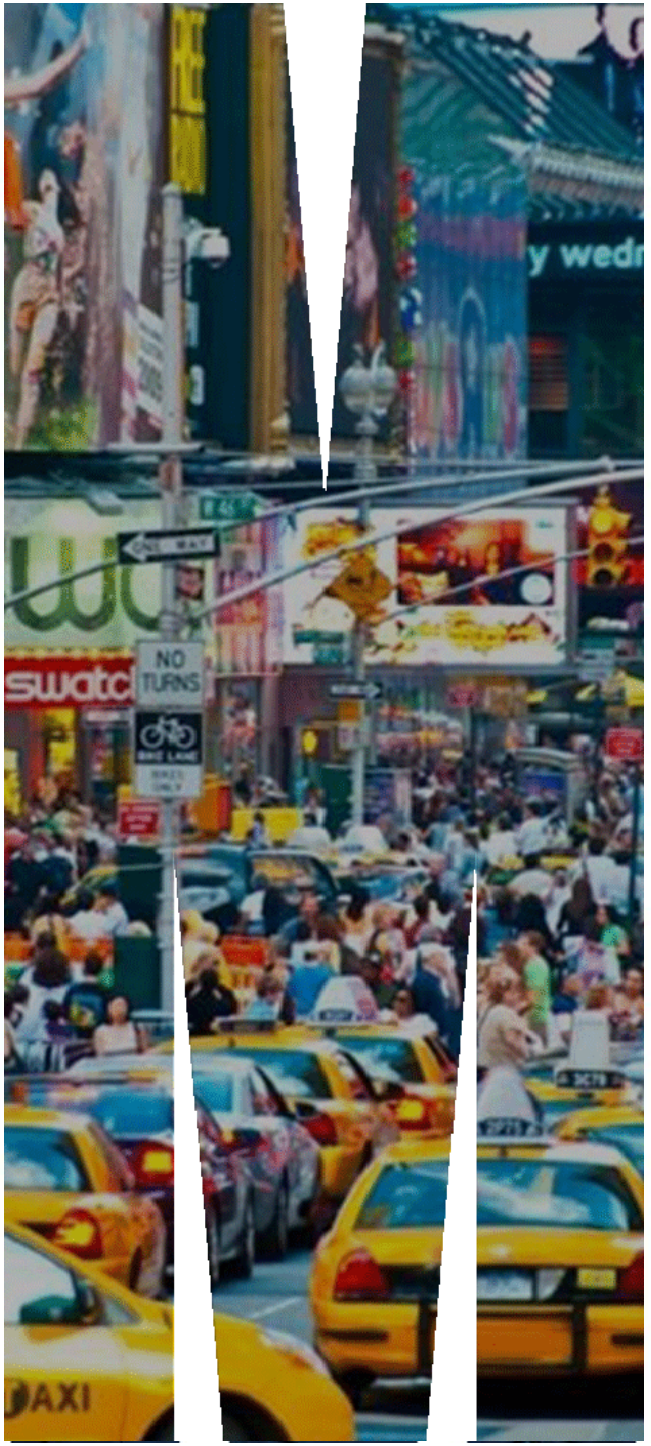
GROUP OF EIGHT AUSTRALIA



Older drivers in truck crashes

- In 2014, 3,903 people were killed and approx. 111,000 injured in truck crashes (National Highway Traffic Safety Administration, 2016)

- One group over-represented in fatal crashes is drivers aged 60 years and older (Duke et al., 2010)

- Drivers aged 65 years and older are at 4.3 times greater risk of being killed in crash compared with drivers aged 15-19 years (Chen et al., 2014).

Current Intervention

- No max. age limit for drivers
- No performance-based testing of drivers over a certain age
- Most drivers are required to meet the medical standards of the FMCSA
  - Assessment of capability to perform all driving and non-driving work-related tasks

Current research has identified that 'fitness-to-drive' should be based on drivers' functional performance rather than their age (Koppel & Charlton, 2013; Langford & Koppel, 2006).

Current state of knowledge

- With the exception of a few studies (Campbell, 1991; Duke et al., 2010) there is little information on risk factors that may contribute to crashes among older truck drivers.

- Skill degradation: Decline in functional abilities (e.g., visual field loss; decline in auditory sensitivity and discrimination)

Do degradations in skill put older drivers at increased risk of crash-related injury or death?

Aims of the study

- To identify risk factors that contribute to crashes among older truck drivers.

1. Distribution of crashes:

   - Severity type
   - Type of vehicle
   - Types of crashes
   - Environmental characteristics
   - Actions and errors

2. Difference between older (60+) and middle (27-59) aged drivers

Methods

Two sets of data in the U.S. were analysed:

1.Fatality Analysis Reporting System

2.National Automotive Sampling System General Estimates System

- Crashes were limited to tractor-semitrailer combinations - to control for differences in operations (i.e., core business activity) and crash risk exposure.

- Chi-square statistics were used to compare differences across older and middle aged groups on key variables.

Results: Crash severity

Truck Driver Age by Crash Severity

Crash Severity	Truck Driver Age	
	27-59	60+
Fatal	7,451 (1.9%)	1,239 (2.2%)
Non-fatal	375,812 (98.1%)	54,860 (97.8%)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and crash severity, $\chi 2\ (1) = 2.50$, $p > .05$.

Results: Injury severity

Distribution of Truck Driver Injury Severity by Age

Driver Injury Severity	Truck Driver Age	
	27-59	60+
Fatal	998 (0.3%)	269 (0.5%)
A-injury	3,052 (0.8%)	297 (0.5%)
B-injury	9,564 (2.5%))	1,176 (2.1%)
C-injury	8,865 (2.3%)	1,166 (2.1%)
No injury	358,741 (93.6%)	53,048 (94.6%)
Injury severity unknown	810 (0.2%)	1 (0.0%)
Unknown	1,233 (0.3%)	143 (0.3%)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and distribution of injury severity $\chi 2\ (6) = 1.07$, $p < .05$.

Results: Crash type

- Higher frequency of crashes:
  - veered off the road (10.5% vs 9.8%)
  - hit an object (6.7% vs 5.7%)
  - turned across the path of another vehicle (11.8% vs 8.4%).
  - Same direction sideswipes as the encroaching vehicle (10.1% vs 8.3%).
- Lower frequency of crashes:
  - opposite direction sideswipes as the encroaching vehicle (0.8% vs 1.5%).
  - striking vehicle in a rear-end crash (7.6% vs 9.4%).

- No statistically significant difference between truck driver age and crash type, $\chi 2\ (23) = 24.08$, $p > .05$

Results: Rollover fatal crashes

Distribution of Rollover in Fatal Crash Involvements

Rollover	Truck Driver Age	
	27-59	60+
No roll	364,623 (95.1%)	53,187 (94.8%)
Tripped	8,406 (2.2%)	1,684 (3.0%)
Untripped roll	6,947 (1.8%)	894 (1.6%)
Roll, unknown type	3,286 (0.9%)	333 (0.6)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and distribution of rollover, $\chi 2\ (3) = 3.99$, $p > .05$.

Results: Light conditions

Light conditions by driver age

Light conditions	Truck Driver Age	
	27-59	60+
Daylight	287,201 (74.9%)	43,338 (77.3%)
Dark – Not lighted	39,090 (10.2%)	4,934 (8.8%)
Dark – Lighted*	42,641 (11.1%)	5,266 (9.4%)
Dawn	8,029 (2.1%)	899 (1.6%)
Dusk	4,581 (1.2%)	1,523 (2.7%)
Dark – unknown lighting	1,042 (0.3%)	113 (0.2%)
Other/unknown	678 (0.2%)	27 (0.0%)
TOTAL	383,263 (100%)	56,099 (100%)

* Dark-Lighted conditions are typical of urban roads at night.

- No statistically significant relationship between truck driver age and light conditions, $\chi 2\ (6) = 10.30$, $p > .05$.

Results: Roadway alignment

Distribution of Roadway Alignment by Truck Driver Age

Road alignment	Truck Driver Age	
	27-59	60+
Non-trafficway	6,624 (1.7%)	292 (0.5%)
Straight	310,635 (81.1%)	46,092 (82.2%)
Curve right	14,820 (3.9%)	1,850 (3.3%)
Curve left	18,280 (4.8%)	2,050 (3.7%)
Curve, unknown direction	10,930 (2.9%)	1,657 (3.0%)
Unknown	21,975 (5.7%)	4,158 (7.4%)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and distribution of roadway alignment, $\chi 2\ (5) = 5.76$, $p > .05$.

Results: Road surface conditions

Distribution of Road Surface Condition by Truck Driver Age

Road surface condition	Truck Driver Age	
	27-59	60+
Non-trafficway	6,624 (1.7%)	292 (0.5%)
Dry	302,592 (79.0%)	46,053 (82.1%)
Wet	51,031 (13.3%)	6,647 (11.8%)
Snow/ice/frost/slush	19,492 (5.1%)	2,646 (4.7%)
Other conditions	1,369 (0.4%)	296 (0.5%)
Unknown	2,155 (0.6%)	165 (0.3%)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and distribution of road surface condition, $\chi 2$ (5) = 5.63, p >.05.

Results: Speed-related truck crashes

Distribution of Speeding Related Crashes by Truck Driver Age

Speed related crashes	Truck Driver Age	
	27-59	60+
No	348,910 (91.0%)	51,831 (92.4%)
Yes	24,077 (6.3%)	2,665 (4.8%)
Yes, exceeded speed limit	600 (0.2%)	2 (0.0%)
Yes, too fast for conditions	6,540 (1.7%)	1,192 (2.1%)
Yes, specifics unknown	101 (0.0%)	57 (0.1%)
Unknown	3,035 (0.8%)	352 (0.6%)
TOTAL	383,263 (100%)	56,099 (100%)

- No statistically significant relationship between truck driver age and distribution of speeding-related crashes, $\chi 2\ (5) = 4.82$, $p > .05$.

Results: Safety belt use

Distribution of Safety Belt Use by Truck Driver Age

Restraint use	Truck Driver Age	
	27-59	60+
None	3,739 (1.0%)	995 (1.8%)
Shoulder & lap	336,338 (87.8%)	51,650 (92.1%)
Shoulder only	857(0.2%)	13 (0.0%)
Lap only	5,136 (1.3%)	812 (1.4%)
Used, unknown type	15,092 (3.9%)	1,082 (1.9%)
Other/unknown	22,101 (5.8%)	1,547 (2.8%)
TOTAL	383,263 (100%)	56,099 (100%)

- A statistically significant relationship between truck driver age and safety belt use, $\chi 2\ (5) = 4.57$, $p < .05$.
  - Older drivers correctly used both lap and shoulder safety belts at a higher rate (92.1%) compared with middle aged drivers (87.7%).

Discussion

- No significant difference in crash outcomes or crash characteristics
  - Self-regulation/modification of driving in circumstances considered challenging.
  - Older drivers can compensate for deficiencies in certain areas by adapting their behavior (for reviews see Koppel & Charlton, 2013; Molnar et al., 2015).
  - When drivers are made aware of their declining abilities in the vehicle, many make appropriate adjustments to their driving behavior (e.g.,Molnar, et al., 2015; Molnar & Eby, 2008)
- More risk-adverse and have a more positive attitude towards safety

Practical implications

- A driving self-screening tool

➢ Assess functional abilities in driving behavior

➢ Provide suggestions for behavioral changes that could enable drivers to better self-regulate their behavior

- Adapt tool within routine training or skill development programs in the workplace

Practical implications, cont.

- Older drivers could play a key role in creating a culture of safety in the workplace.
- Implement mentoring activities into induction programs
  - training and education to younger counterparts in the workplace.

Conclusion

- Not enough is known about the unique challenges facing older truck drivers
- The findings both support and deviate from past research
- Recommendations focus on:
  - intervention that allows drivers to assess their driving behavior in an effort to self-regulate their own behavior over time.
  - leverage the experience and knowledge of older drivers within mentor-based induction programs to not only train younger drivers but create a culture where safety is valued and prioritised.

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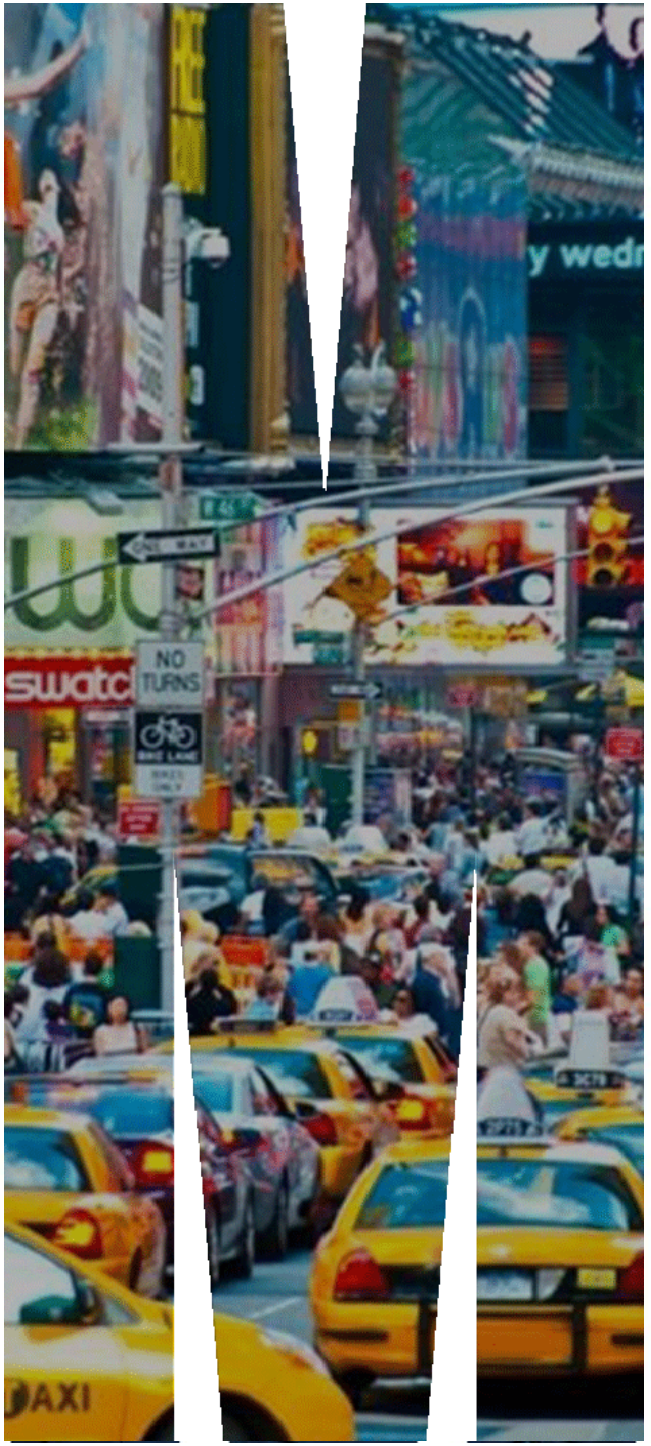

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