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Department of Infrastructure and Transport

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Fatalities and Serious Injuries in Side Impact Crashes by Impact Type, Occupant Age and Year of Vehicle Manufacture.

Victoria, Australia, 1999-2010

Thomas Belcher

3rd Meeting - GRSP Informal Group on Pole Side Impact

Washington DC, USA, 9 June 2011

Definitions for this analysis

- Pole Side Impact: *A side impact with a rigid narrow object including; road signs/traffic signals, lamp posts, telegraph poles, electricity poles, trees, fire hydrants, and bridge supports/abutments.*
- Serious Injury: *Taken to hospital and admitted or taken to hospital and admission status unknown.*



Detailed Side Impact Data Collection by Impact Type, Occupant Age and Year of Manufacture

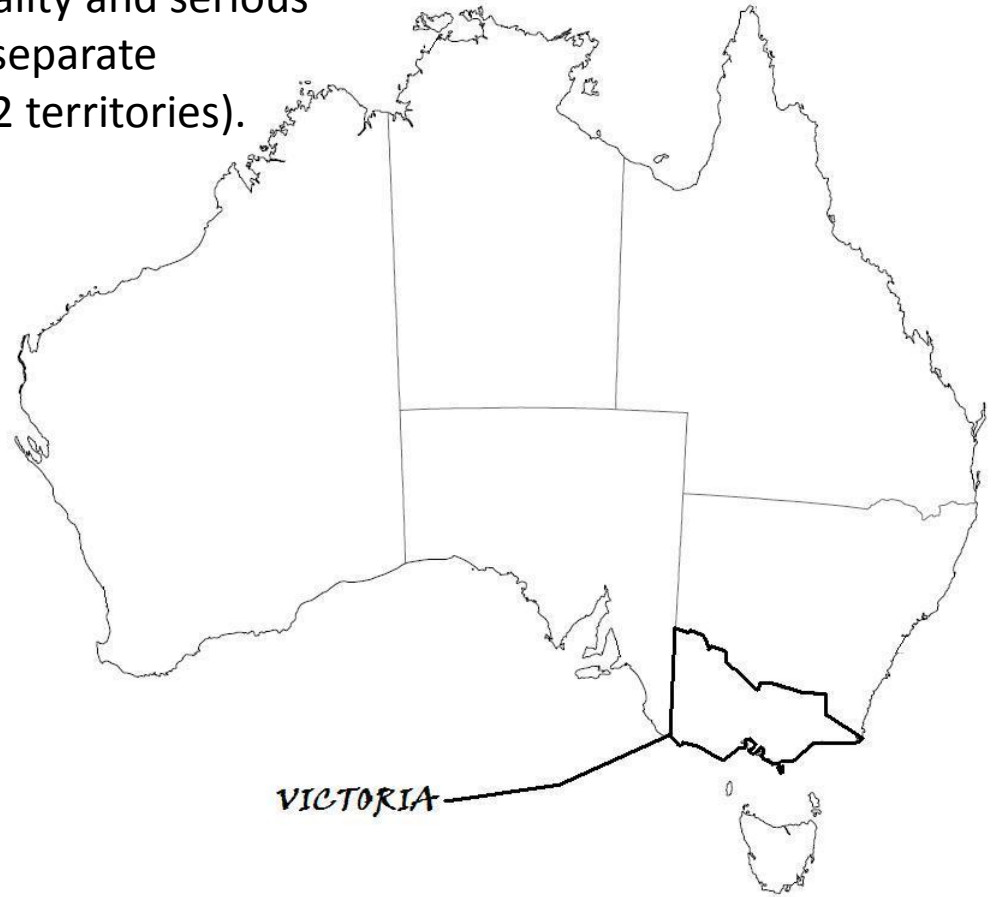
In Australia, road crash fatality and serious injury data is collected by separate jurisdictions (6 states and 2 territories).

Australian Fatality File:

- PSI and OSI data only available to 2006 (3 year delay for detailed national data compilation from police and coroner's reports).

Most comprehensive and up to date data exists in state of Victoria:

- Approx 25% of Australian population & vehicles; and
- Approx 25% of Australian pole side impact fatalities (2000-2006) occurred in Victoria.



Detailed Victorian data provided by VicRoads from analysis of Victorian CrashStats database.



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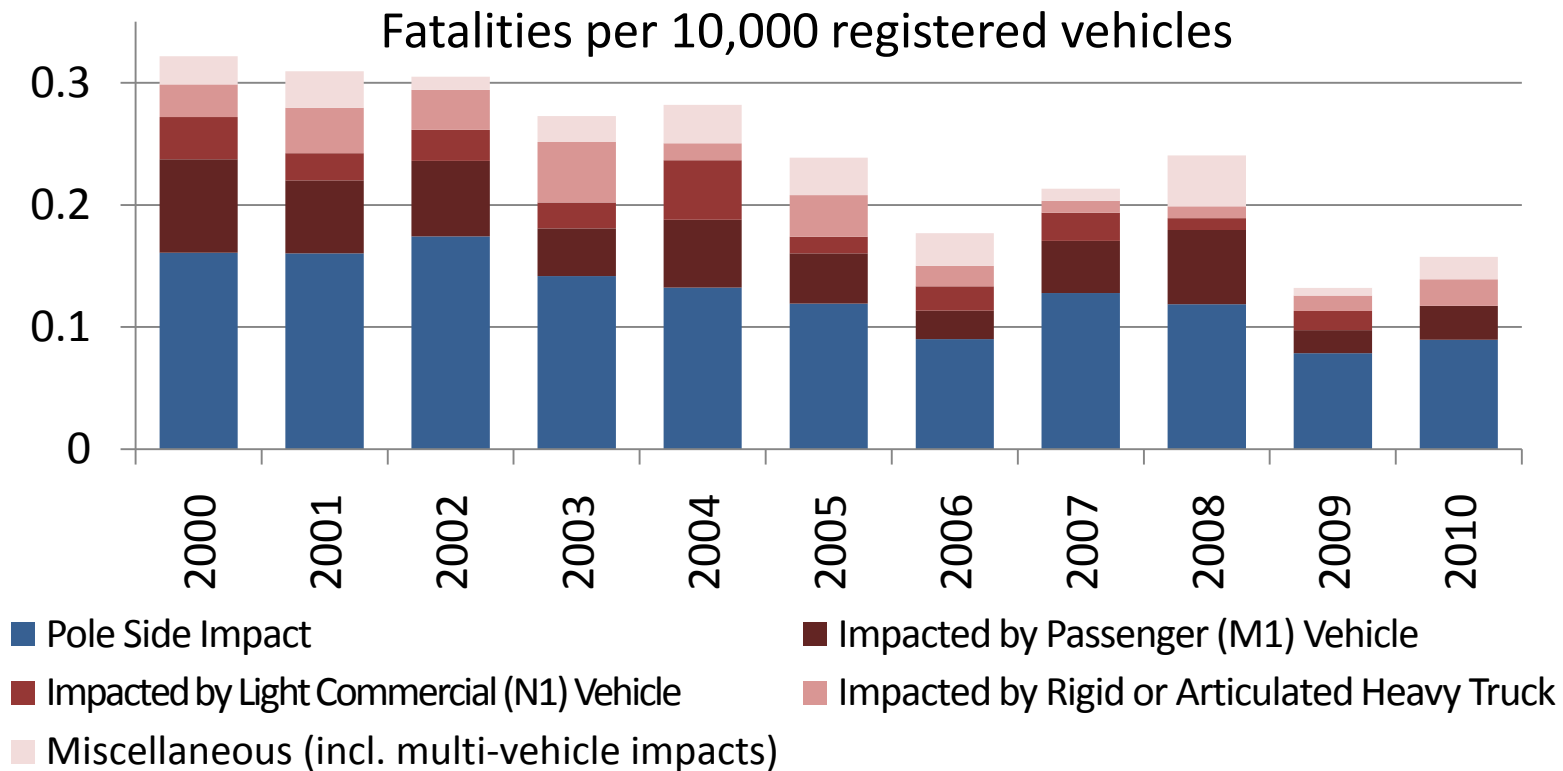
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Side Impact Regulation in Australia

- Australian Design Rule (ADR) 72 (Dynamic Side Impact Occupant Protection)
 - ADR 72 harmonized with UNECE R95
 - All editions of UNECE R95 up to and including the 02 series of amendments are currently accepted under ADR 72.
 - Technical requirements of FMVSS 214 barrier test as amended by 58 F.R. 14169 have been accepted as an alternative standard.
 - Applied to new-model passenger cars from 1 January 1999 and all new passenger (M1) vehicles from 1 January 2004.
 - Has also been applied to light commercial (N1) vehicles.



Passenger (M1) Vehicle Occupant Side Impact Fatality Rate vs. Time: Victoria, Australia



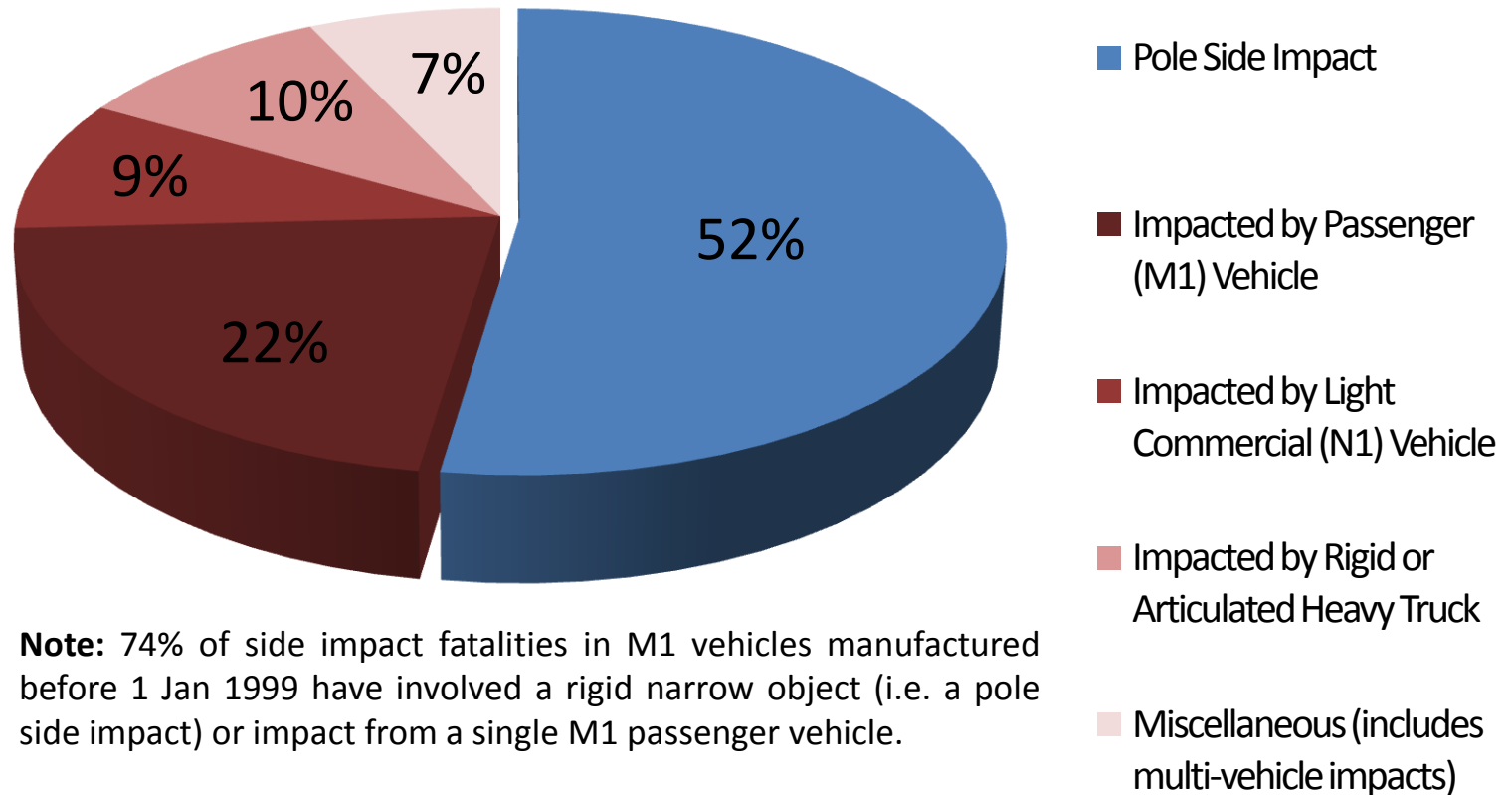
Pole side impacts have consistently accounted for many more fatalities than passenger car to passenger car side impacts simulated by the UNECE R95 mobile deformable barrier test requirement introduced from 1 Jan 1999 in ADR 72.



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Pre 1999* Built Passenger (M1) Vehicle Occupant Fatalities by Side Impact Type (Victoria: 1999-2010)



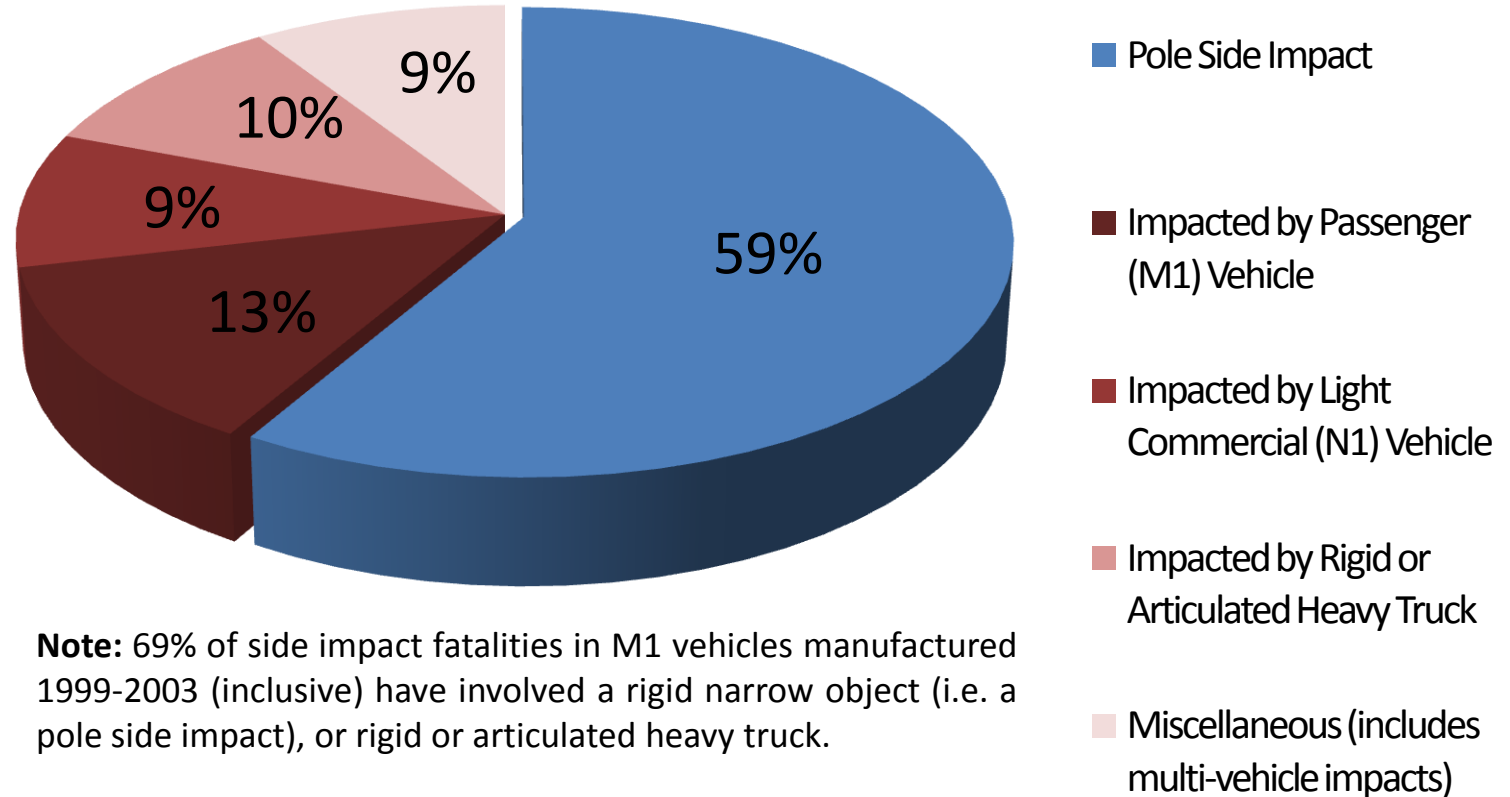
Note: 74% of side impact fatalities in M1 vehicles manufactured before 1 Jan 1999 have involved a rigid narrow object (i.e. a pole side impact) or impact from a single M1 passenger vehicle.

Note: Side impacts with rigid narrow objects (poles) have caused 2.4 times the fatalities as impacts from single passenger vehicles.

* May include a small number of vehicles with unknown year of manufacture.



1999-2003 Built Passenger (M1) Vehicle Occupant Fatalities by Side Impact Type (Victoria: 1999-2010)



Note: 69% of side impact fatalities in M1 vehicles manufactured 1999-2003 (inclusive) have involved a rigid narrow object (i.e. a pole side impact), or rigid or articulated heavy truck.

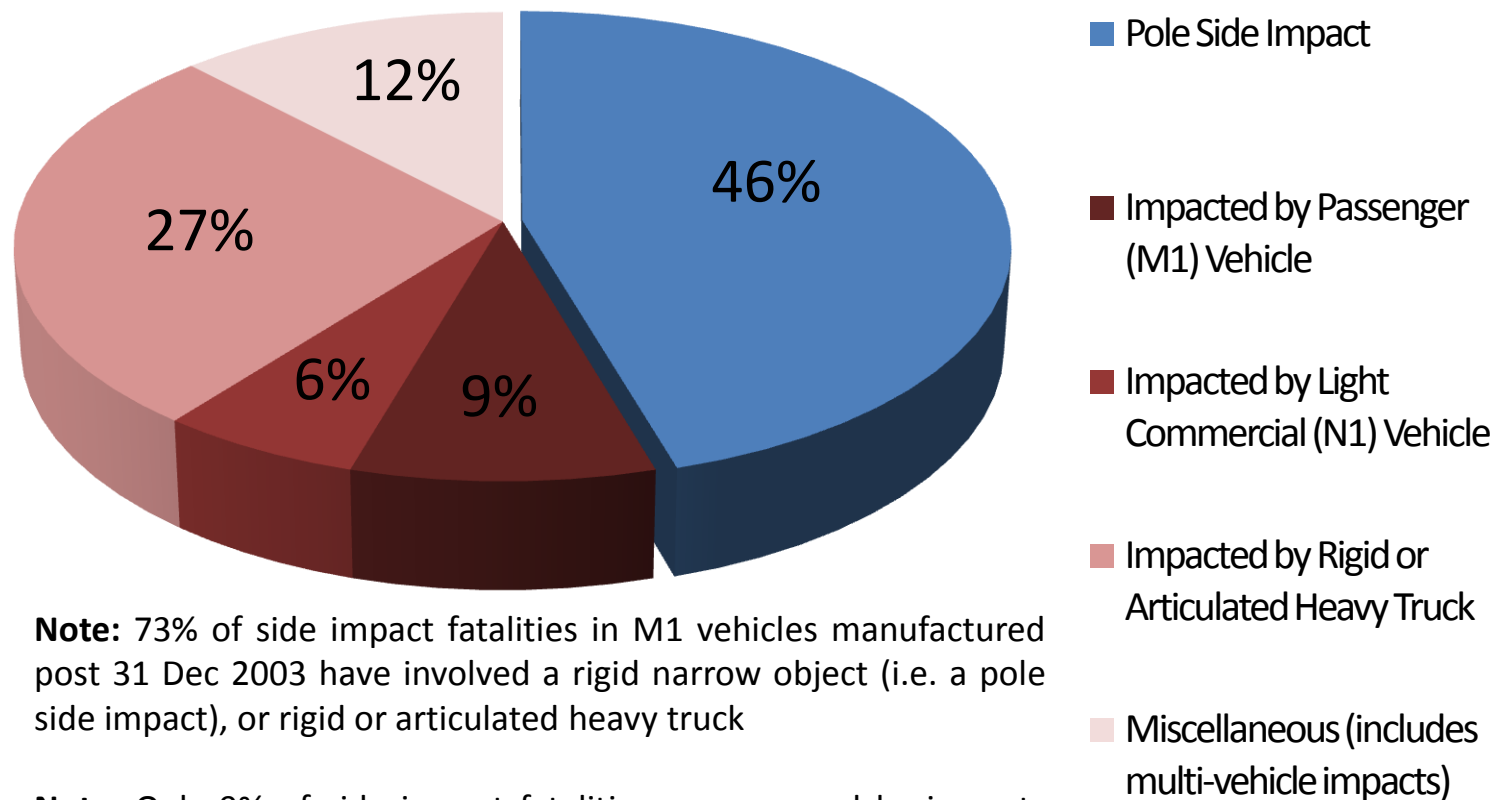
Note: Only 13% of side impact fatalities were caused by impacts from single M1 passenger vehicles (down from 22% in pre 1999 vehicles).



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Post 2003* Built Passenger (M1) Vehicle Occupant Fatalities by Side Impact Type (Victoria: 1999-2010)



Note: 73% of side impact fatalities in M1 vehicles manufactured post 31 Dec 2003 have involved a rigid narrow object (i.e. a pole side impact), or rigid or articulated heavy truck

Note: Only 9% of side impact fatalities were caused by impacts from single M1 passenger vehicles (down from 22% in pre 1999 vehicles).

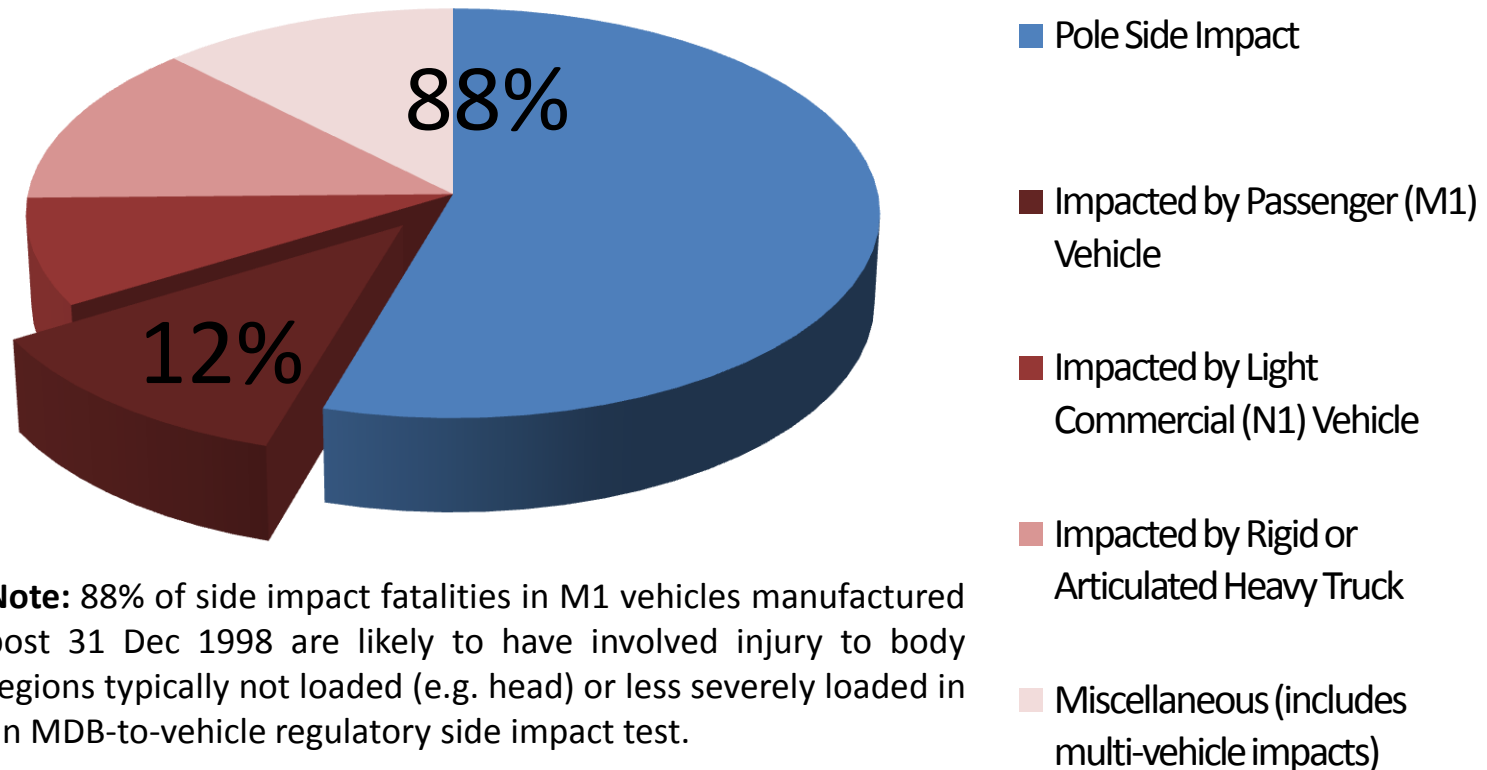
*Important to note that only around 20% of fatal pole side impact crashes are occurring in first 7 years of vehicle life.



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Post 1998 Built Passenger (M1) Vehicle Occupant Fatalities by Side Impact Type (Victoria: 1999-2010)

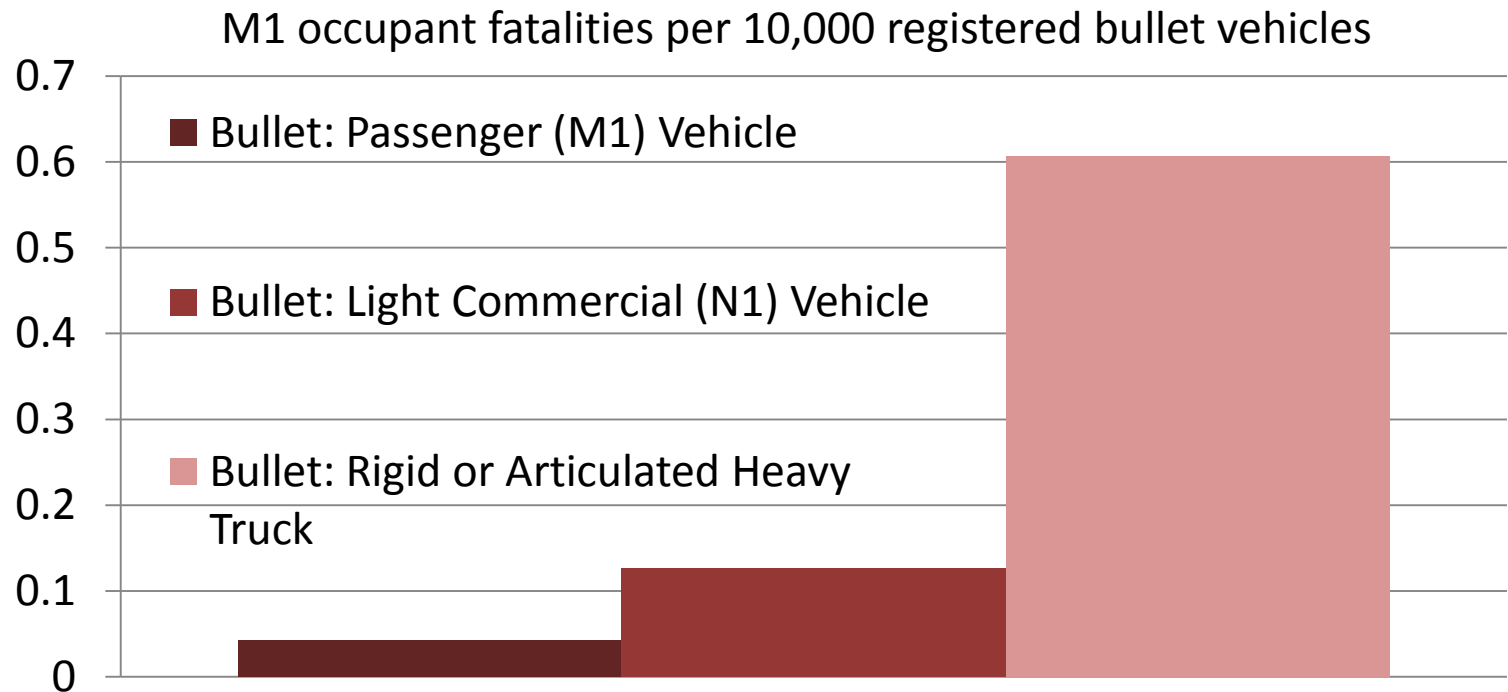


Note: 88% of side impact fatalities in M1 vehicles manufactured post 31 Dec 1998 are likely to have involved injury to body regions typically not loaded (e.g. head) or less severely loaded in an MDB-to-vehicle regulatory side impact test.

A pole test would deliver benefits in more than just pole side impacts because it loads the head, thorax, abdomen and pelvis and serves as a performance based test requirement for side impact supplementary restraint systems (e.g. airbags).



Passenger (M1) Vehicle Occupant Side Impact Fatality Rate by Bullet Vehicle (Victoria: 2001-2010)



Injury risk is clearly altered by the impacting (bullet) vehicle type in a vehicle-to-vehicle side impact. As is to be expected, light commercial vehicles, and in particular, rigid or articulated heavy trucks are proportionally over-represented as bullet vehicles in fatal vehicle-to-vehicle side impacts due to **side impact incompatibility** with passenger vehicles.



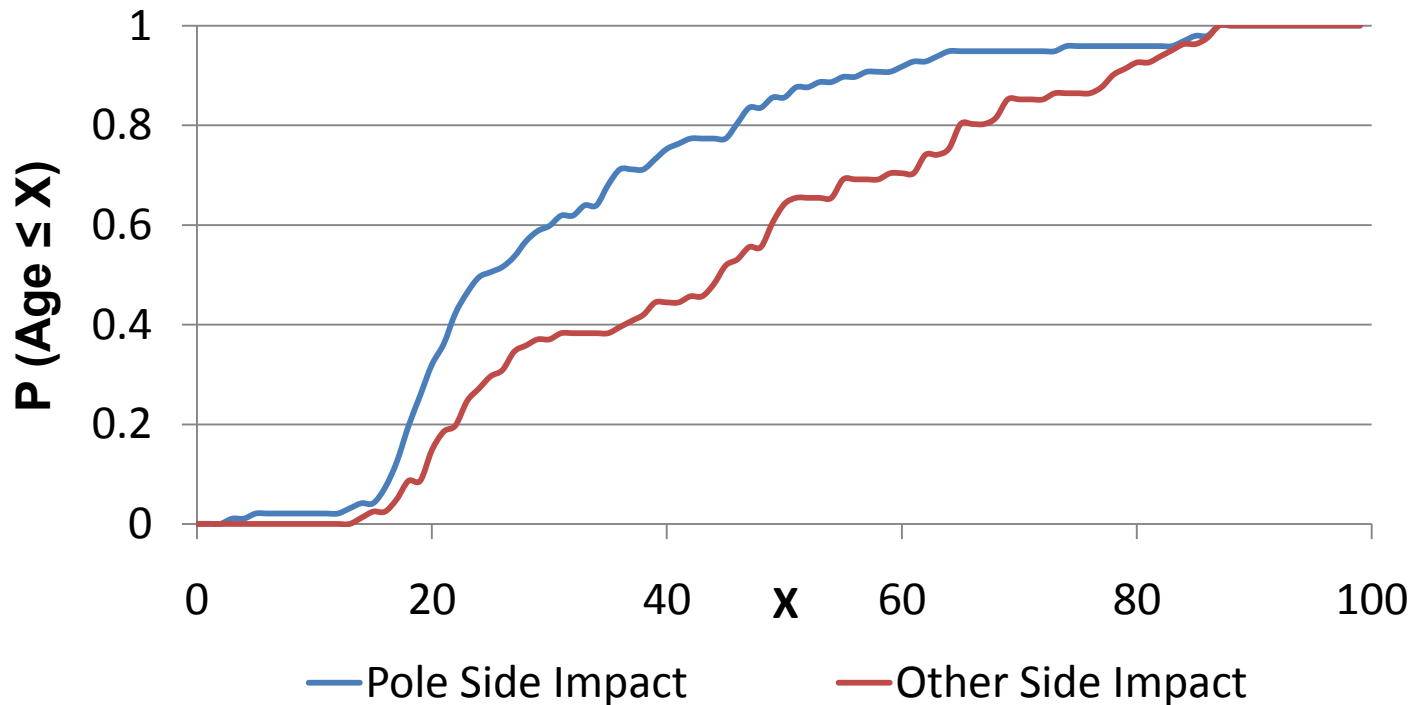
Vehicle Incompatibility

- Incompatibility of different vehicles and vehicle types in vehicle-to-vehicle side impact crashes could be addressed by:
 - a) Improving geometric compatibility between vehicles (difficult to achieve for side impact); and/or
 - b) Improving the self protection available to the occupants of the side impacted vehicle (more achievable/practical).
- A pole side impact regulation that requires additional or improved self protection countermeasures in vehicles (e.g. effective head protecting side airbags), may help address vehicle incompatibility in vehicle-to-vehicle side impact crashes.
- Pole side impact test will also address high ΔV crashes.



Cumulative Distribution: Fatalities (1999-2010)

By occupant fatality age for M1 vehicles manufactured post Dec 31 1998



Mean age: 32 years (pole side impact); 45 years (other side impact)
Median age: 24.5 years (pole side impact); 44.5 years (other side impact)

P (Age ≤ 45): 0.77 (pole side impact); 0.52 (other side impact)
P (Age ≤ 55): 0.90 (pole side impact); 0.69 (other side impact)

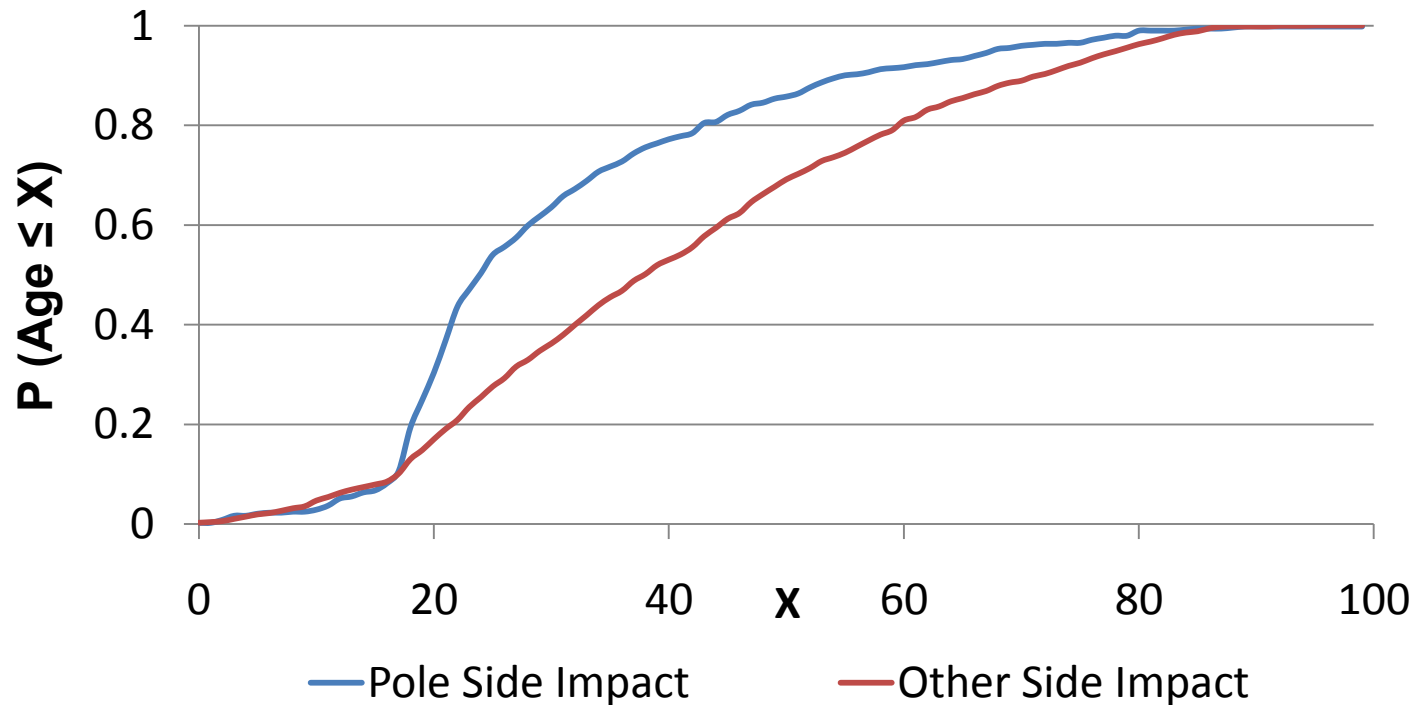


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Cumulative Distribution: Serious Injuries (1999-2010)

By injured occupant age for M1 vehicles manufactured post 31 Dec 1998



Mean age: 30 years (pole side impact); 40 years (other side impact)
Median age: 23.9 years (pole side impact); 37.9 years (other side impact)

P (Age ≤ 45): 0.82 (pole side impact); 0.61 (other side impact)
P (Age ≤ 55): 0.90 (pole side impact); 0.74 (other side impact)

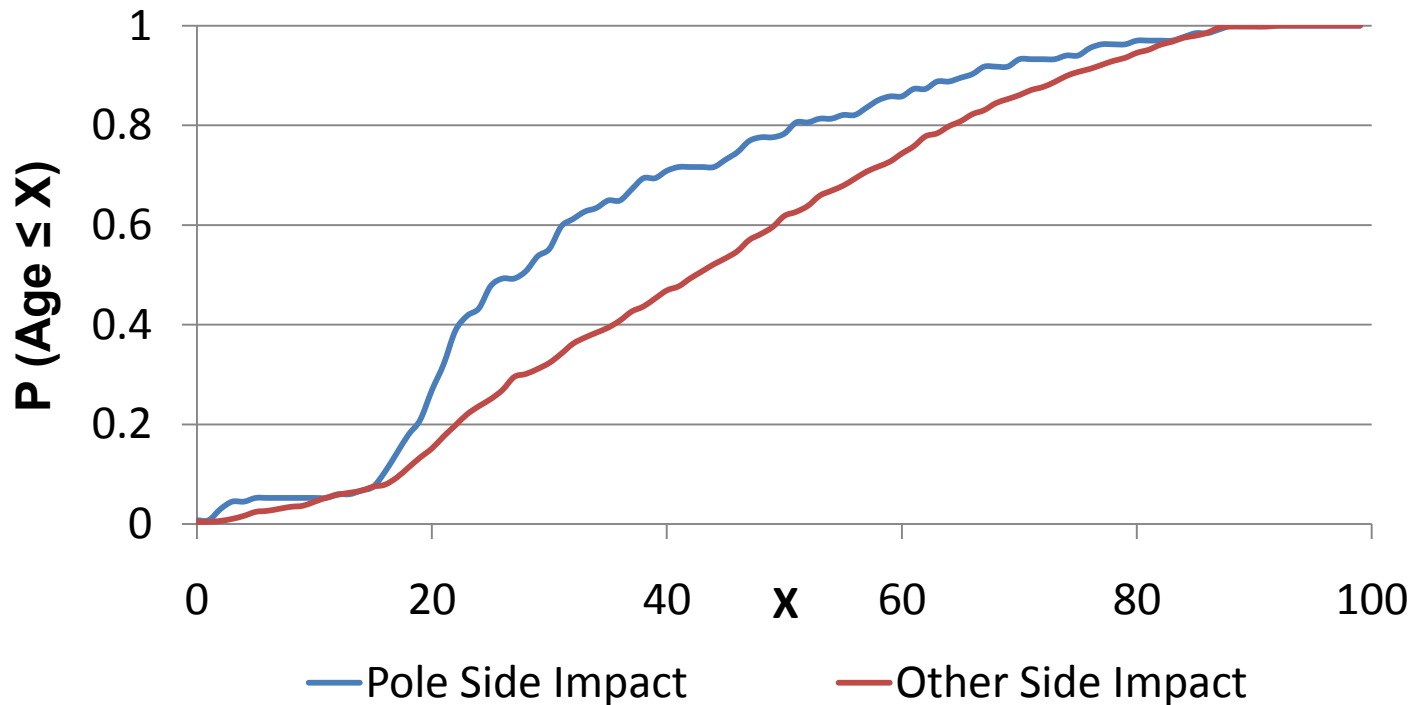


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Cumulative Distribution: KSI (2004-2010)

By casualty age for M1 vehicles manufactured post 31 Dec 2003



Median age: 27.5 years (pole side impact); 42.5 years (other side impact)

P (Age ≤ 45): 0.73 (pole side impact); 0.53 (other side impact)

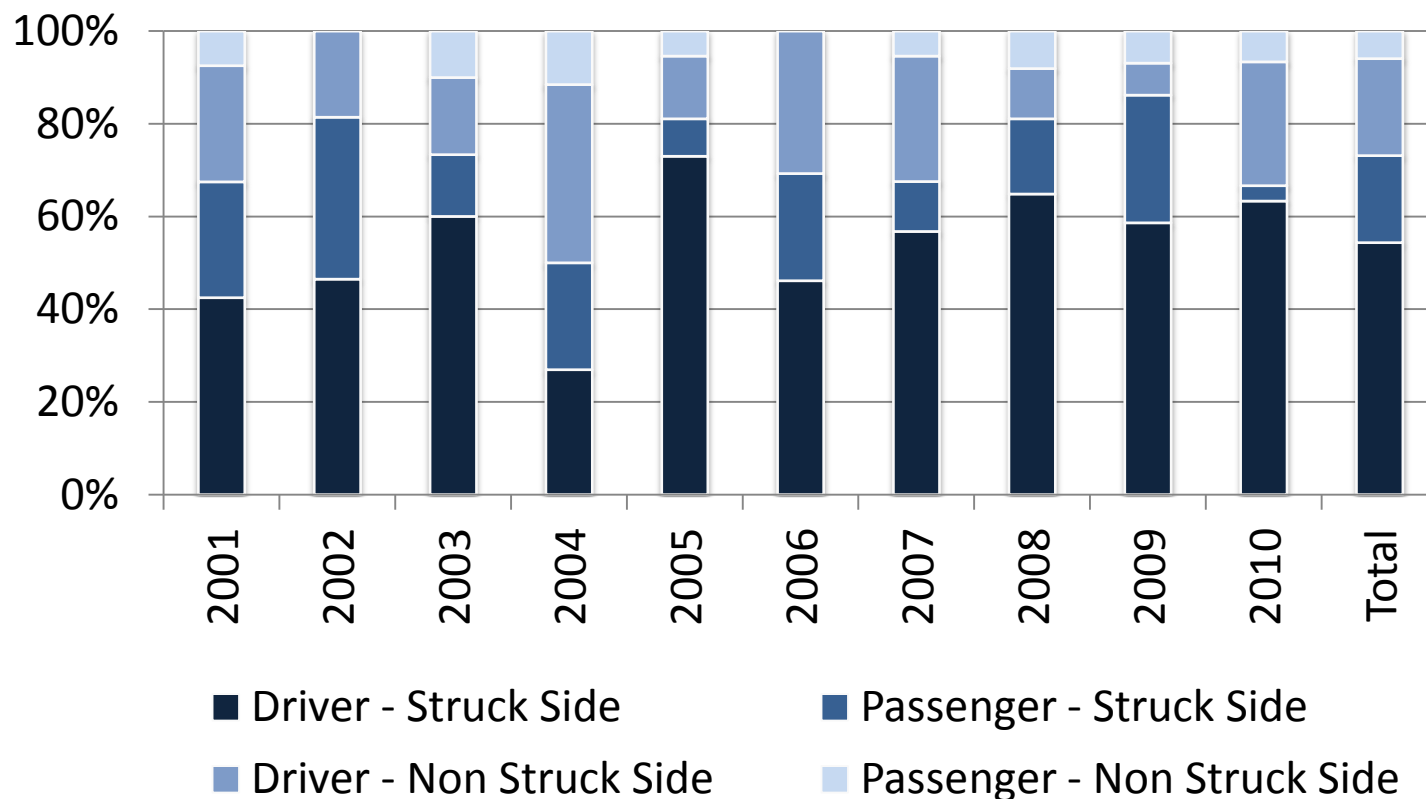
P (Age ≤ 55): 0.82 (pole side impact); 0.68 (other side impact)



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Pole Side Impact Fatalities by Front Row Seating Position, Victoria, Australia



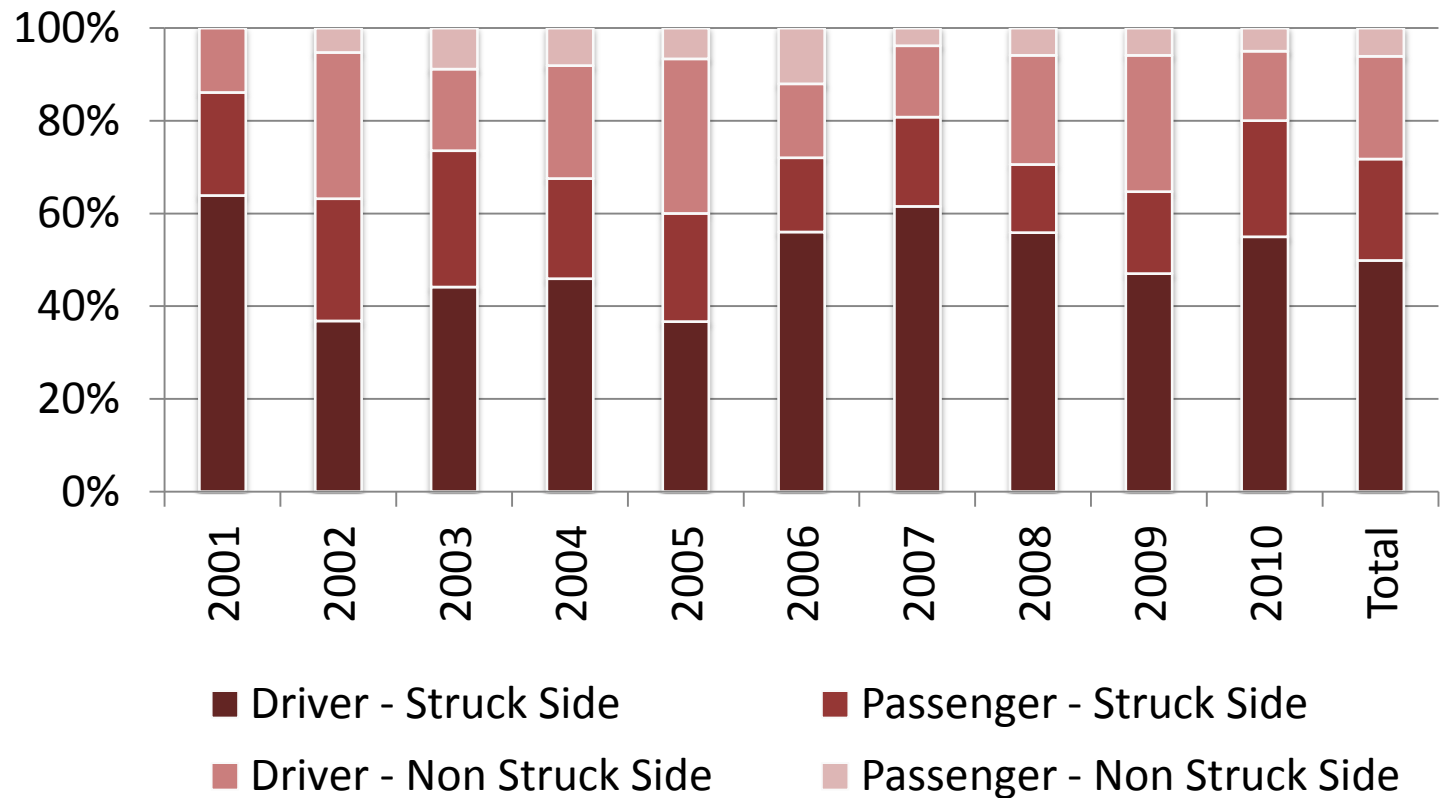
In 10 years between 2001 and 2010 (see Total above), 73% of fatally injured front row 4-wheel vehicle occupants were seated on the struck side.



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Other Side Impact Fatalities by Front Row Seating Position, Victoria, Australia



In 10 years between 2001 and 2010 (see Total above), 72% of fatally injured front row 4-wheel vehicle occupants were seated on the struck side.



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Summary

- Only a small proportion of side impact fatalities were passenger (M1) vehicle occupants impacted by a single passenger (M1) vehicle - fatal pole side impacts more common.
- Pole side impact test drives countermeasures to address head injury risk as well as high delta V crashes. Important given many fatal side impact crashes are likely to have had increased head injury risk or higher delta V than side impacts from single passenger vehicles.
- Age distributions for pole side impact and other side impact fatalities are similar for pre 1999, 1999-2003 and post 2003 manufactured vehicles.
- Nearly $\frac{3}{4}$ of pole side impact and other side impact fatalities were seated on the struck side.



Acknowledgement

- Elizabeth Hovenden – VicRoads
 - For efforts in extracting detailed fatality and serious injury side impact data from the VicRoads CrashStats database.



Thank you



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