

Characteristics of Single Vehicle Passenger Car Crashes on the Mumbai-Pune Expressway

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Overview

- Data Source & Sample size
- Characteristics
- Case Study
- Conclusions

Road Accident Sampling System – India (RASSI)

Crash
Investigation

Crash
Reconstruction

Victim
Interviews

Injury Data
Coding

RASSI Founder & Coordinator



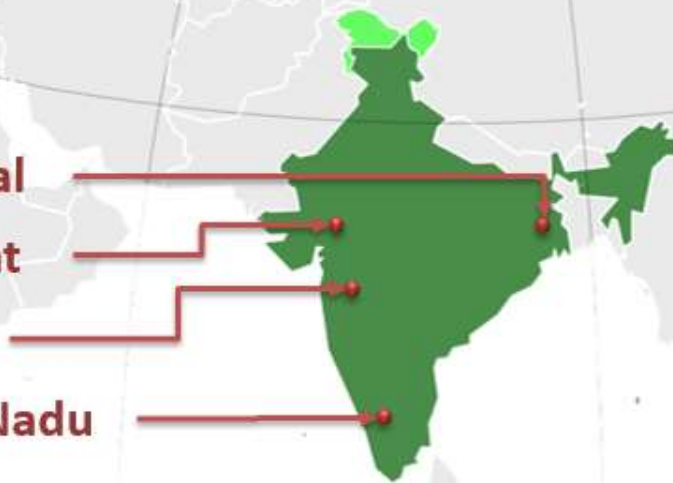
Sampling Locations

Kolkata, West Bengal

Ahmedabad, Gujarat

Pune, Maharashtra

Coimbatore, Tamil Nadu



RASSI Consortium Members



BOSCH DAIMLER



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Study Area & Case Selection Criteria

Mumbai – Pune Expressway

- 6-lane divided roadway spanning 94 km stretch connecting Mumbai & Pune.
- Motorized 2-wheelers, motorized 3-wheelers & pedestrians are prohibited.
- Speed limit of 80 kmph.
- All crashes involving at least minor injury or vehicle damage that needs towing, are investigated.
- Even cases that are not reported to police are considered for investigation.

Sample Size

404

Crashes investigated between October 2012 to December 2015

180 [45% of 404]

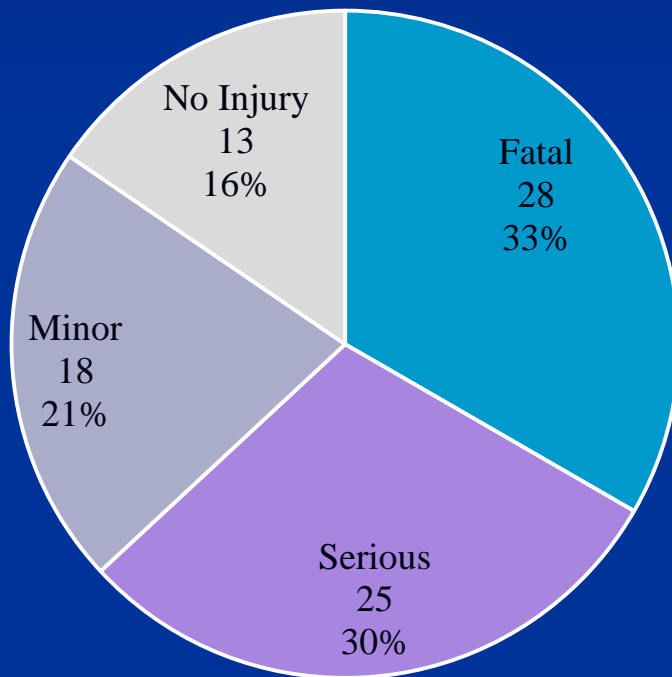
Crashing involving at least one passenger car

84 [47% of 180]

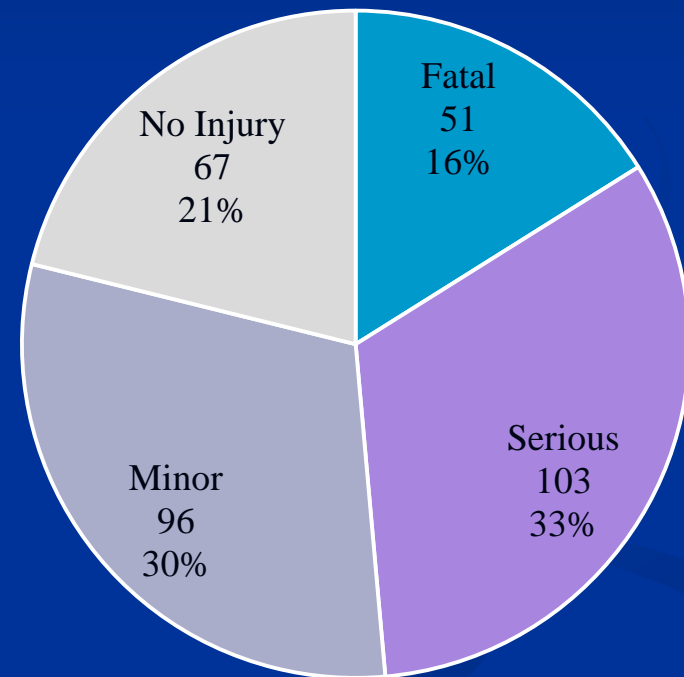
Single vehicle car crashes excluding pedestrians

Injury Severity

Vehicle Level (N = 84)

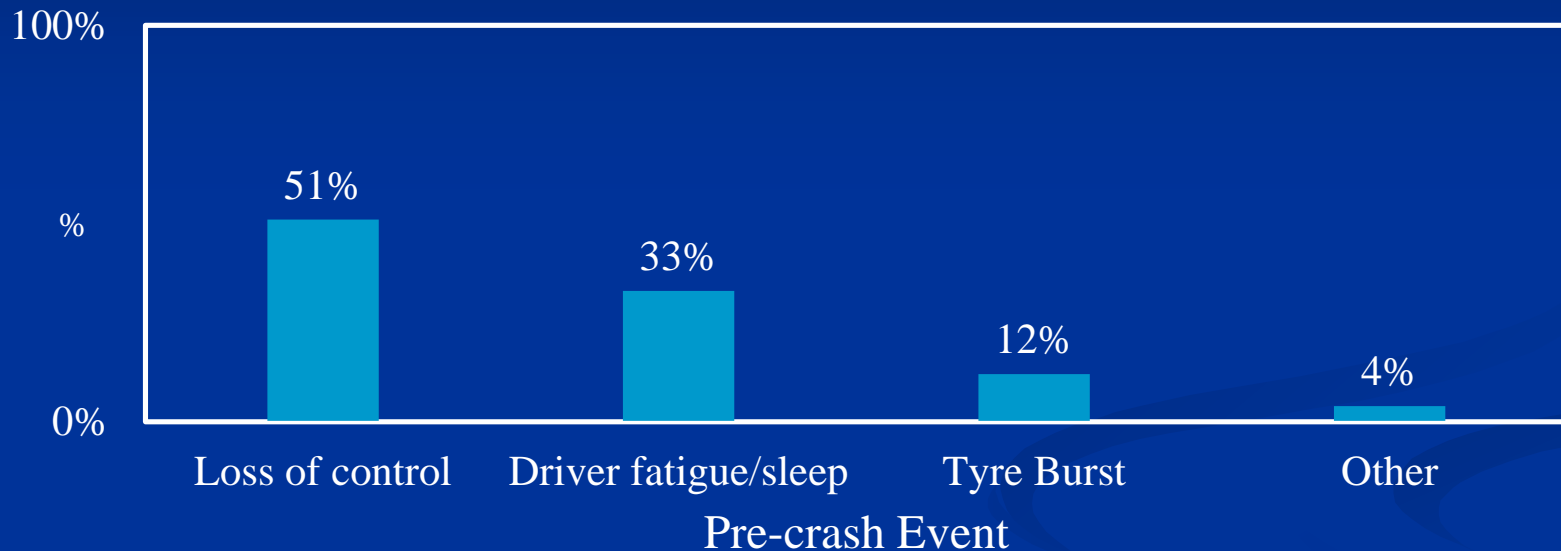


Occupant Level (N= 317)



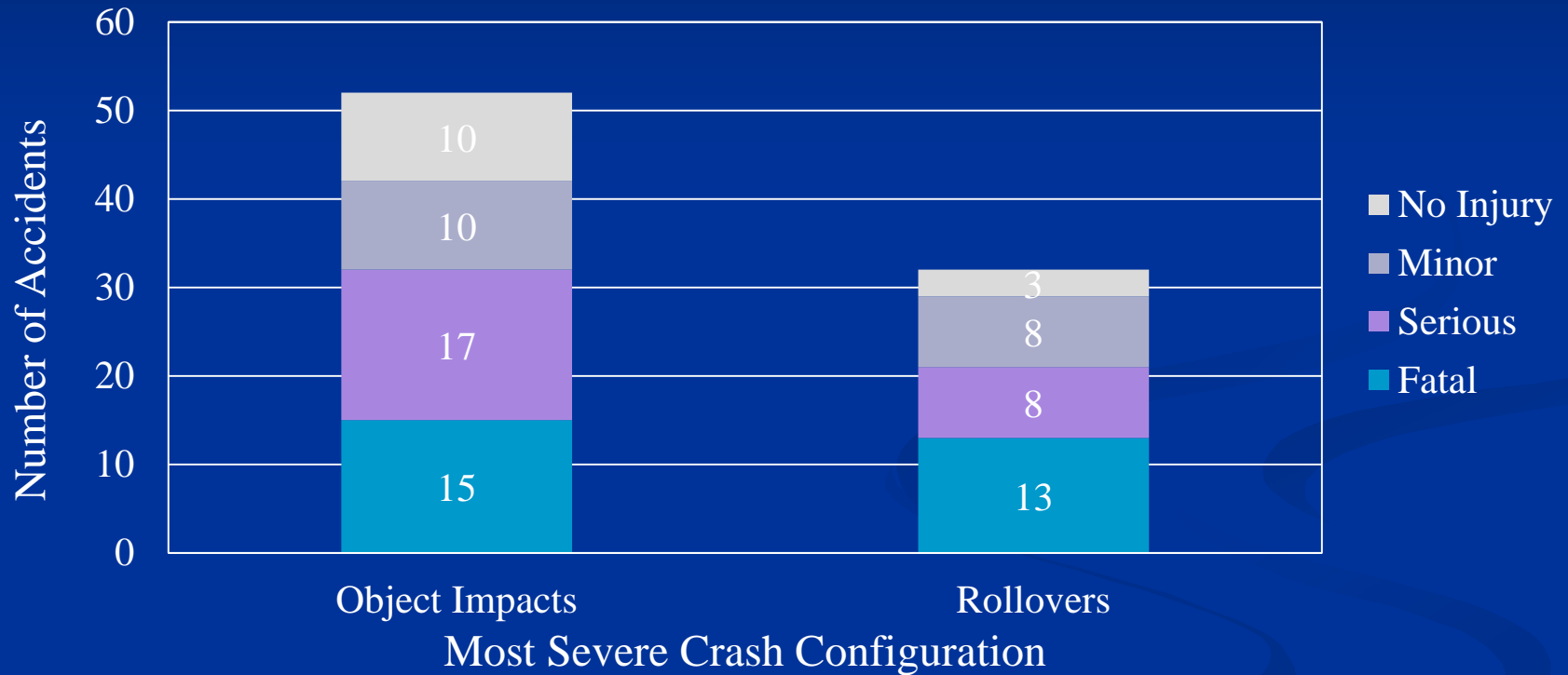
- 64% of the sample of accidents/vehicles is fatal/serious resulting in 51 fatalities & 103 serious injury victims.

Pre-crash Event: Accident Type



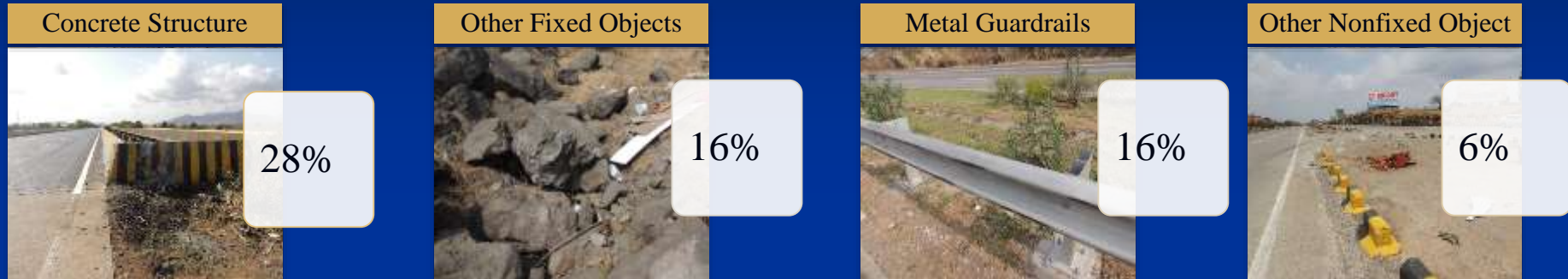
- All crashes involved vehicle running off road.
- 84% of crashes are due to Loss of control or driver fatigue/sleep .

Most Severe Crash Configuration

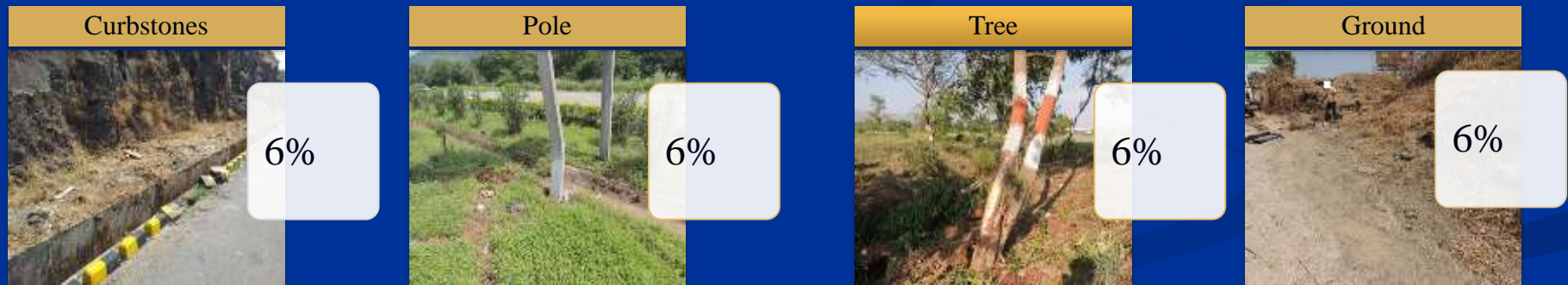


- Single vehicle crashes involved object impacts or rollovers.
- 66% of rollover accidents and 62% of object impacts resulted in fatal/serious injuries.

Type of object impacted



Mostly rigid objects impacted.



Factors examined in these crashes

- **Belt use**
 - If the occupant is not belted, injury risk is high.
- **Passenger compartment intrusion**
 - If passenger compartment intrudes (vehicle structure fails), then injury risk is high, even for belted occupants.
- **Crash severity**
 - If severity of crash is high, the vehicle structure has a high risk of failing.

Seatbelt Usage vs Seating Position

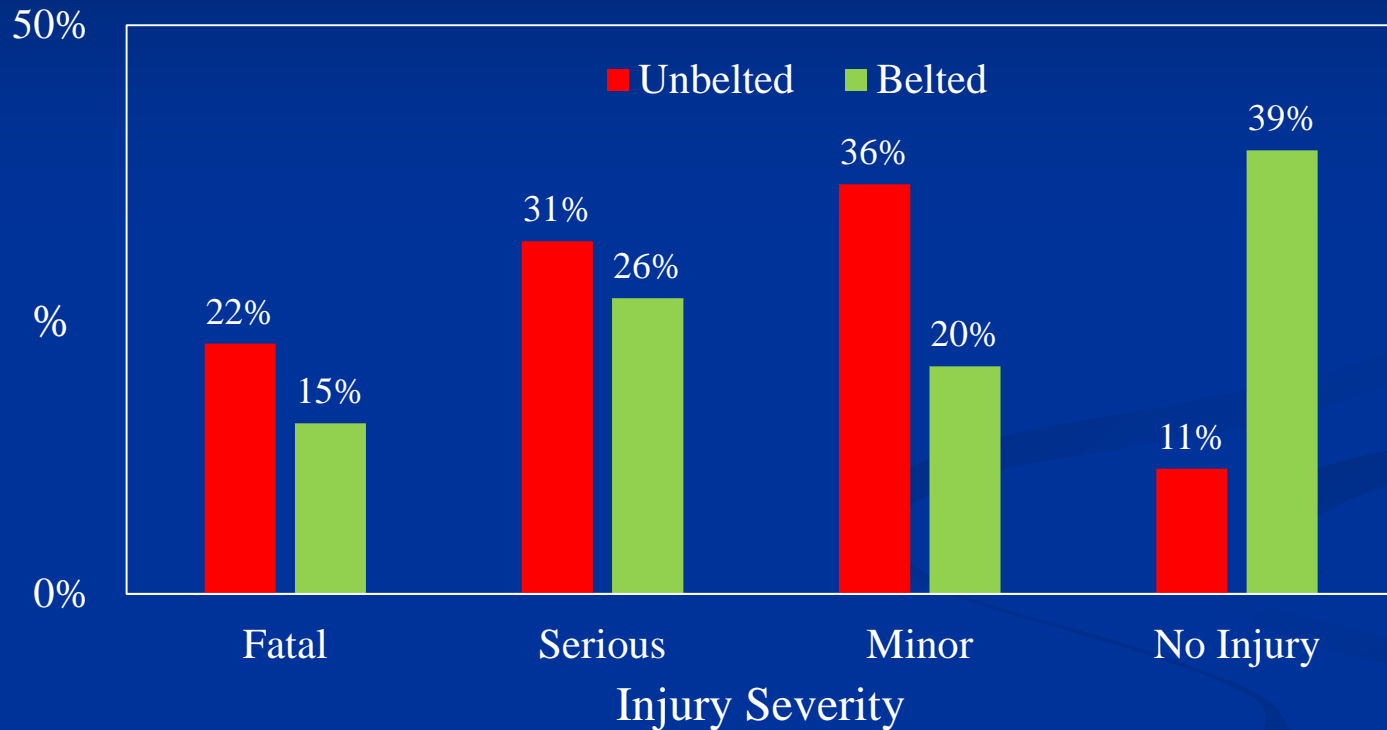
Since only front row occupants have high belt use, hence, front row occupants only have been used for analysis relating to belt use.



Source: RASSI
N = 84 Drivers, 76 Co-passengers
117 second row occupants

Belt use vs Injury severity

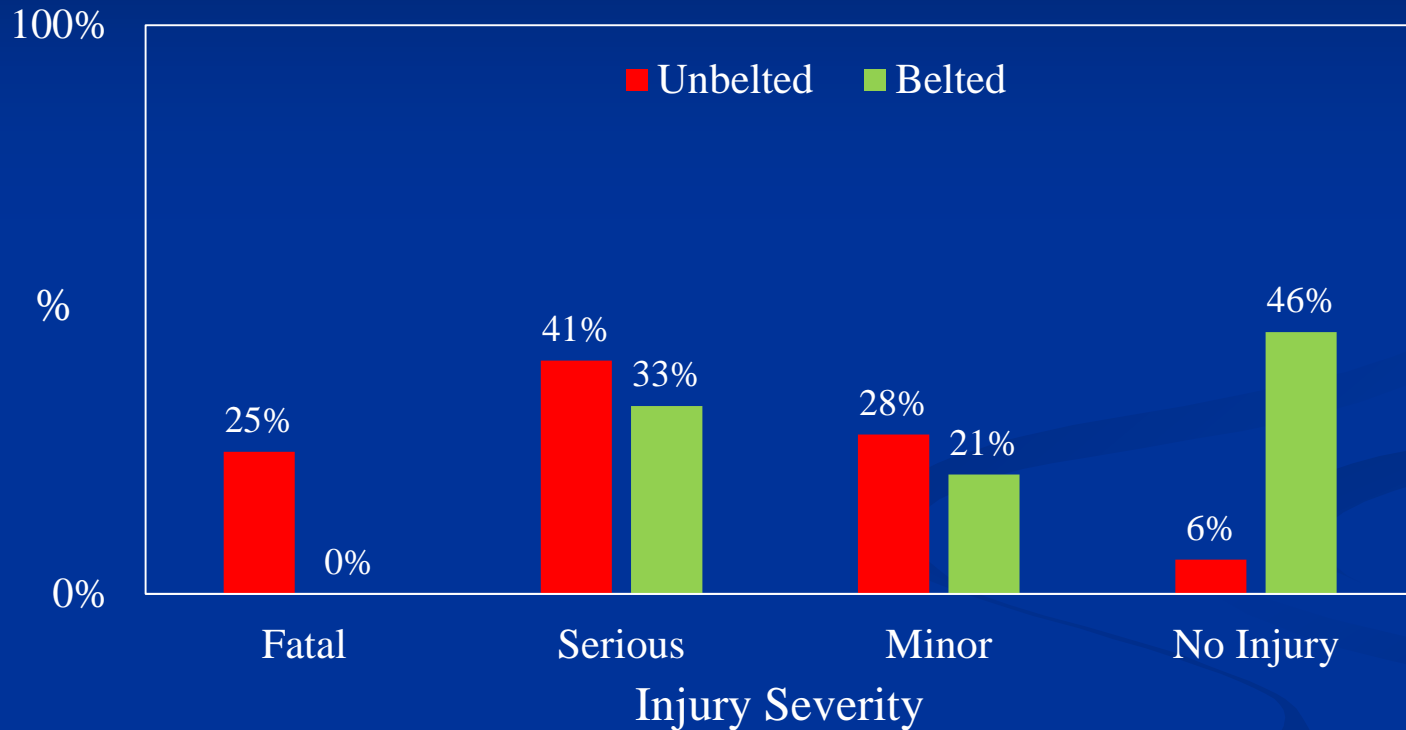
Object Impacts



- 41% of belted occupants sustained fatal/serious injuries.

Belt use vs Injury severity

Rollovers



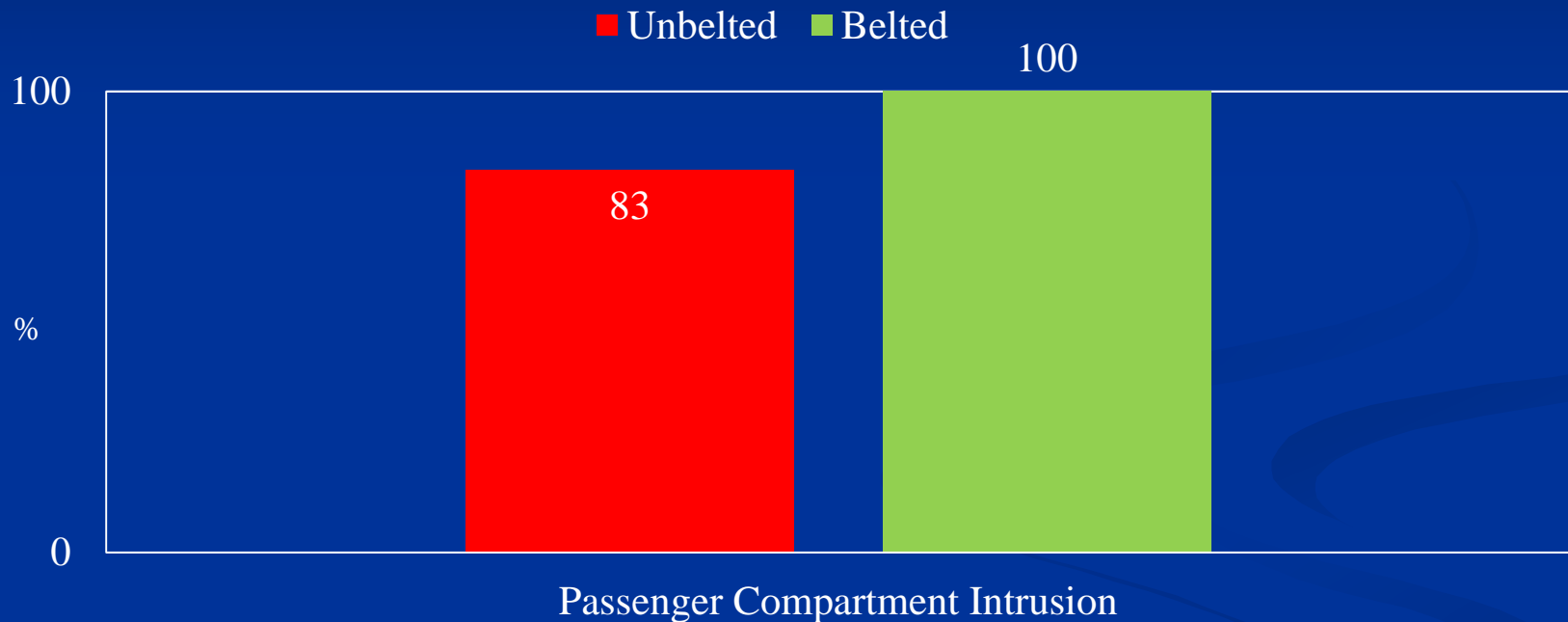
- Belted occupants did not suffer fatal injuries.
- 33% of belted occupants still sustain serious injuries.

Source: RASSI

N= 8 Fatal/Serious belted occupants,
21 Fatal/Serious unbelted occupants

Passenger compartment intrusion

Object Impacts



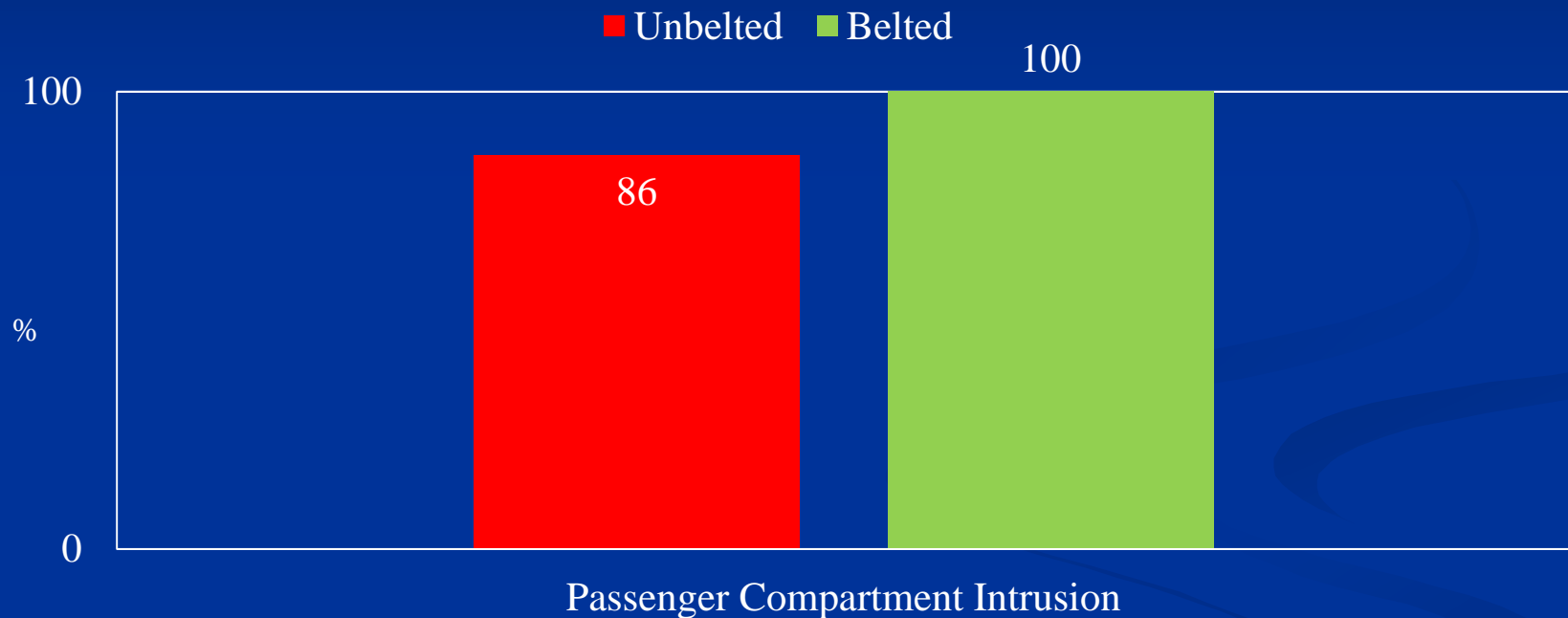
- Passenger compartment intrusion occurred in all the object impact crashes where front row belted occupants suffered fatal/serious injuries.

Source: RASSI

N= 20 Fatal/Serious belted occupants,
29 Fatal/Serious unbelted occupants

Passenger compartment intrusion

Rollovers



- Passenger compartment intrusion occurred in all rollover crashes where front row belted occupants suffered serious injuries.

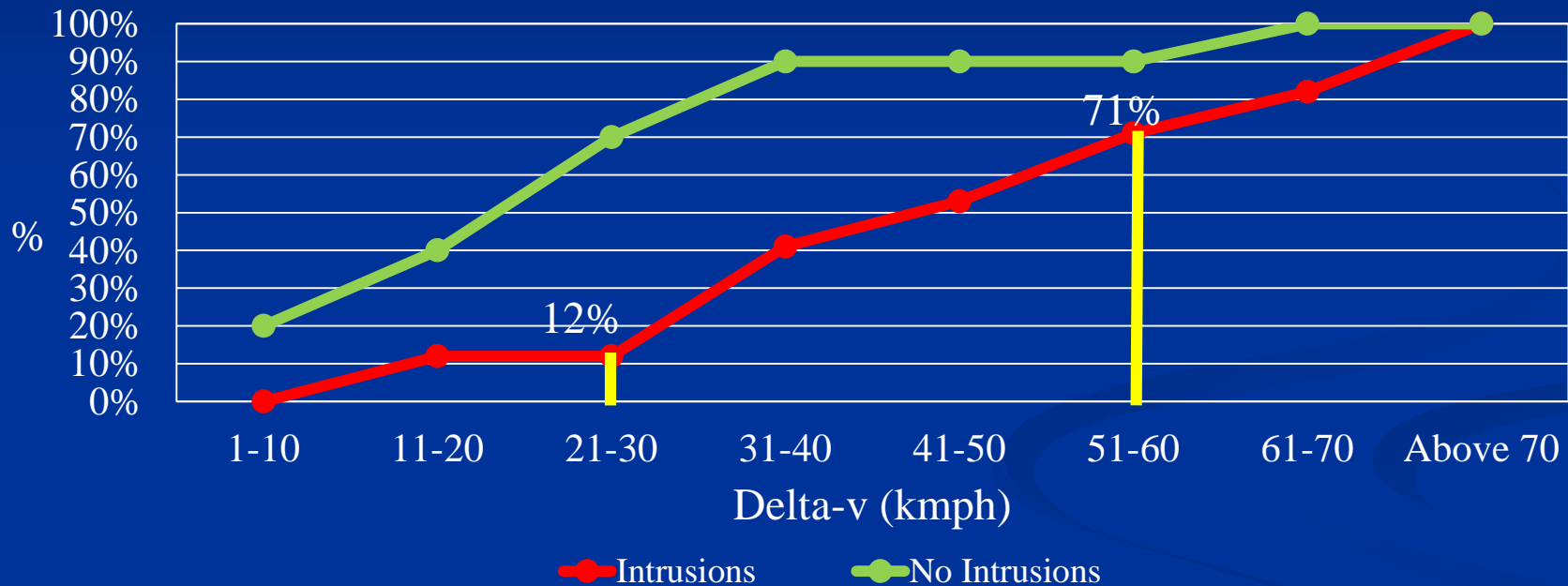
Source: RASSI

N= 8 Serious belted occupants,

21 Fatal/Serious unbelted occupants

Crash Severity

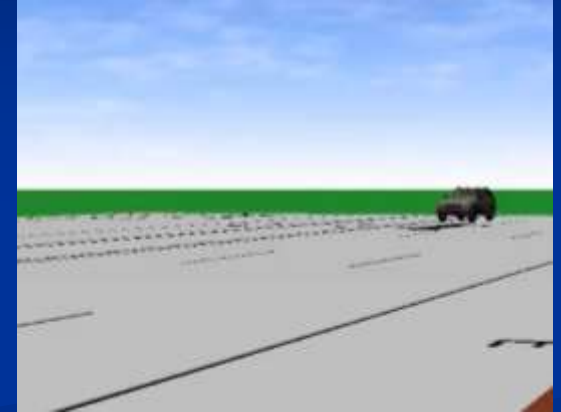
Object Impacts: Cumulative distribution of Delta-v



- 59% cases with deltaV between 31 kmph and 60 kmph sustain passenger compartment intrusions.

Case study: Object Impact (Delta-v 103 kmph)

Counter measure: *Impact attenuators*



Source:
RASSI case no. 91-2013-009-0015
<https://www.youtube.com/watch?v=8OOGv1HpzLU>

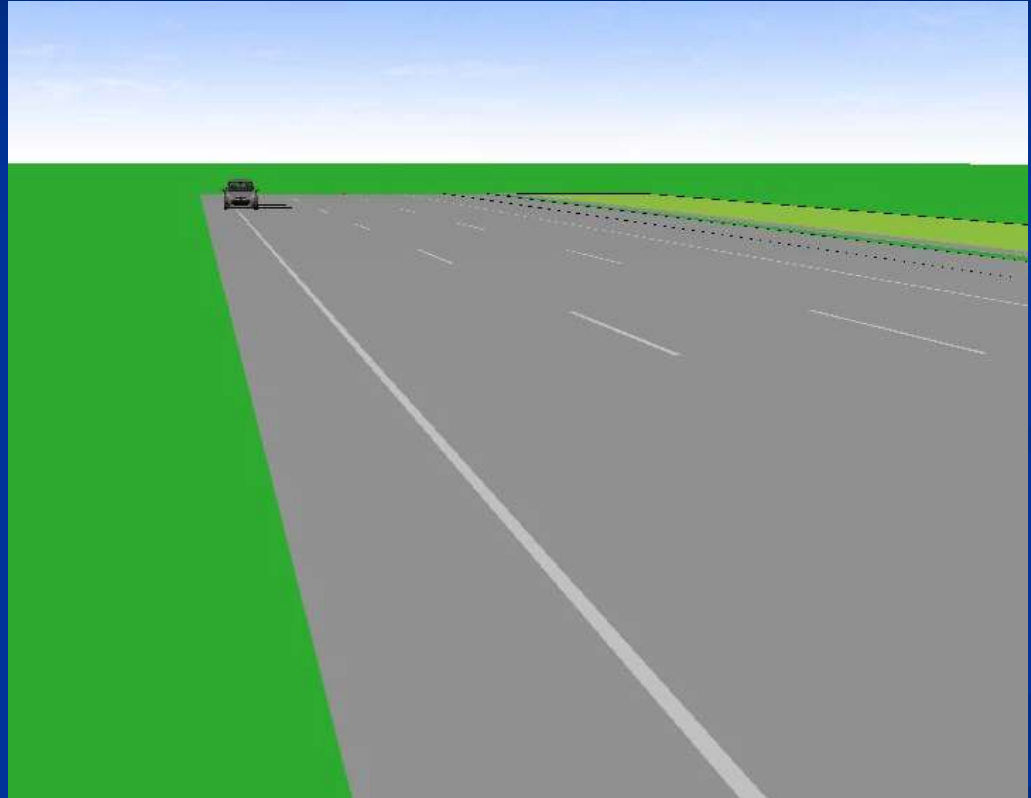
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Crash Severity

Rollovers

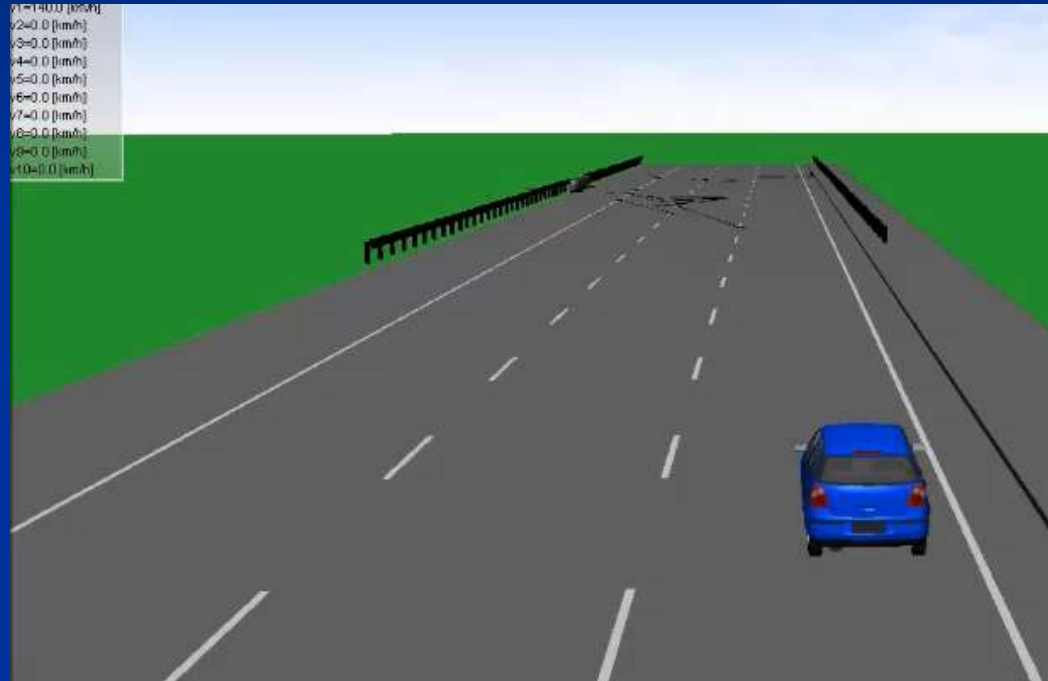
- 94% of crashes with occupants suffering fatal/serious injuries had completed 2 or more quarter turns.
- 85% rollover crashes were initiated off the roadway.
- These can be prevented with the help of roadside crash protection barriers.

Case Study: *Rollover*



Rear occupant sustained fatal injuries due to contact with interior components

Counter measures : Road side barriers



Life saved:
No rollover, No Intrusion, Belted occupants survive

Conclusion

- About 85% of passenger car single vehicle accidents are due to either loss of control or driver fatigue/sleep
- The most severe crash configuration is either object impact (62%) or rollovers (38%)
- Belt Use
 - In general, belt usage rates are poor. The highest belt use is for first row occupants (41%).
 - Belt usage can reduce injury severity
 - Belted occupants in these accidents also sustained fatal/serious injuries-Objects impacts (41%) & serious injuries- Rollovers (33%).
- Crash Severity
 - 59% cases with deltaV between 31 and 60 kmph sustain passenger compartment intrusion.
 - Better vehicle structure can reduce passenger compartment intrusions
 - Crash protection barriers in front of rigid objects can reduce the delta V for all cases
 - Crash protection barriers on roadside can reduce crash severity.

Thank You !!!

Acknowledgement:

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