

MUARC ECIS Fact Sheet 2: The regulating role of speed in determining the safety of the road transport system^{1, 2}

Speed is central to Vision Zero and the Safe System approach

The foundational principle of *Vision Zero* is that no person should be seriously injured when using the road transport system.

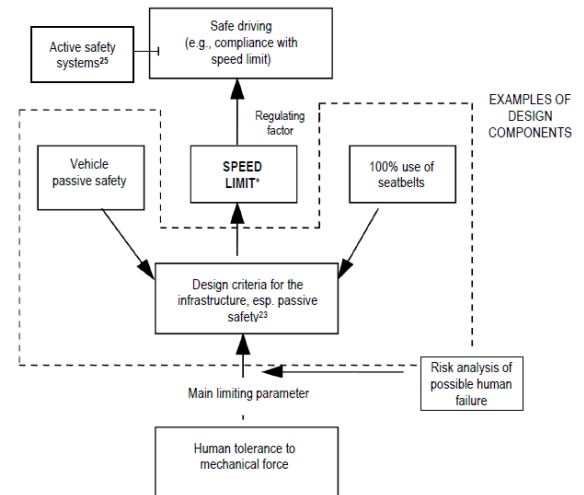
Per the *Vision Zero Model of Safe Travel* (see diagram), human tolerance to mechanical force is the main limiting parameter around which the road transport system must be designed and operated.

For injury to be avoided, the criteria for a *Safe Driver*, a *Safe Vehicle* and *Safe Roads* must be set in such a way that were a crash to occur, the level of force the driver is exposed to is limited, and then managed, by the design components of the system (per panel on right).

The speed limit is the overarching design parameter that *regulates* the inherent safety of the road transport system. In the *Vision Zero Model of Safe Travel*, the speed limit is set in accordance with the road infrastructure and the safety offered by vehicles (see diagram).*

The speed limit is then directly – or indirectly through impact speed – embedded in the *Safe Driver*, *Safe Vehicle* and *Safe Roads* elements of the system (see Fact Sheet 1).

The Vision Zero Model of Safe Travel^{2 3}



Data: The ECIS database consisted of data from 400 hospitalised drivers injured in crashes (case) and 1,942 non-crash-involved drivers (control) whose travel speed was measured at 172 locations where an ECIS-studied crash occurred.

That speed is a regulator of the safety of the road transport system rests on three relationships, as shown by:

1. Travel speed is highly correlated with the speed limit

High correlation ($r = 0.74$, $p < 0.05$) between driver speed choice and the speed limit. The mean and median travel speed were at, or slightly below, the speed limit in all speed zones (50 km/h to 110 km/h zones included).

Across all speed zones, 15% of drivers were exceeding the speed limit by 3 km/h or more. This included data from 2,180 drivers where travel speed was known.²

2. Vehicle speed at impact is highly correlated with travel speed

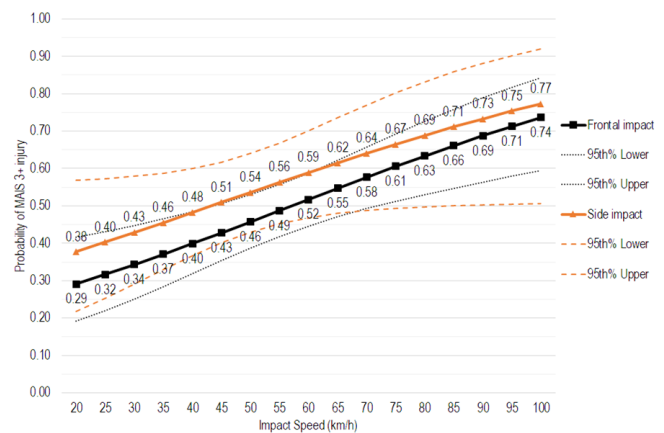
Very high correlation ($r = 0.86$, $p < 0.05$) in crashes where no pre-crash braking was seen (45.5% of crashes).

Less than a third (-31%) of travel speed was 'wiped off' due to short braking time (1.3 s on average).

In crashes where braking occurred (54.5% of crashes), braking modified the relationship between travel speed and the speed at impact, but the correlation remained high ($r = 0.67$, $p < 0.05$).

3. Impact speed is directly related to injury severity

Higher probability of MAIS 3+ injury at higher impact speeds for drivers involved in frontal and side impact crashes.

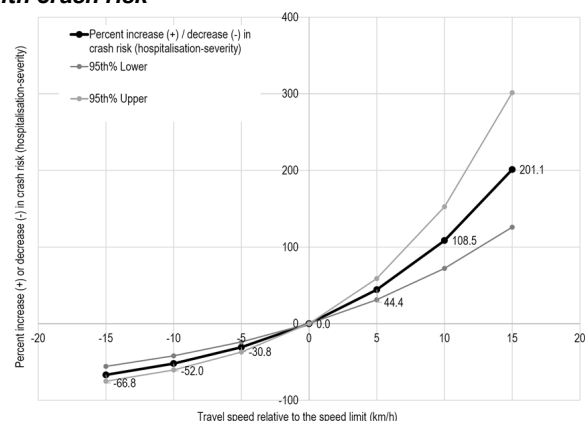


Driver speed choice relative to the speed limit was associated with crash risk

Travelling 5 km/h above the speed limit was associated with a 44% increase in crash risk (RR: 1.44, 95% CI: 1.31–1.59) while driving 10 km/h above the speed limit more than doubled the crash risk of drivers travelling at the speed limit (+108.5%; RR: 2.09, 95% CI: 1.72–2.53).

Travelling below the speed limit had a protective effect for crash involvement, e.g., driving 5 km/h below the speed limit was associated with a 30.8% lower risk of involvement in a hospitalisation severity crash (RR: 0.69, 95% CI: 0.63–0.76).

Exceeding the speed limit was found to be a contributing factor for 26.2% of all crashes and 36.6% of MAIS 3+ injury severity crashes (per ECIS Report 1), with this being higher for drivers involved in Lane Departure crashes.



Implications – ECIS demonstrates the central regulating role that speed limits play in determining crash and injury risk.

Reductions in the number of drivers seriously injured can be achieved through lower impact speeds, with a 10 km/h lower impact speed translating to 12.3% fewer drivers sustaining MAIS 3+ severity injuries. Without any change, a 7.9% reduction in hospitalisation crashes can be achieved through 100% driver compliance with the speed limit. This reduction can be even higher by ensuring high levels of driver compliance with speed limits set in accordance with the *Safe Roads* criteria (see Fact Sheet 1).

1 Fitzharris, M, Lenné, MG, Corben, B, Pok Arundell, T, Peiris, S, Liu, S, Stephens, A, Fitzgerald, M, Judson, R, Bowman, D, Gabler, C, Morris, A & Tingvall. Enhanced Crash Investigation Study (ECIS): Report 1: Overview and Analysis of Crash Types, Injury Outcomes and Contributing Factors. Melbourne Vic Australia: Monash University, 2020. <https://www.monash.edu/muarc/ecis>
 2 Fitzharris, M, Corben, B, Lenné, MG, Peiris, S, Pok Arundell, T, Liu, S, Stephens, A, Bowman, D, Morris, A & Tingvall. Enhanced Crash Investigation Study (ECIS): Report 2: Speed, crash risk and injury severity. Melbourne Vic Australia: Monash University, 2022. <https://www.monash.edu/muarc/ecis>
 3 Tingvall C, Lie A, Johansson R. Traffic Safety in Planning - A Multidimensional Model for the Zero Vision. In: von Holst H, Nygren Å, Andersson ÅE, editors. Transportation, Traffic Safety and Health – Man and Machine: Second International Conference. Brussels, Belgium: Springer Berlin Heidelberg; 1996. Published 2000. p. 61-9.