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Myth 2: "Lower speed limits won't save lives" – BUSTED

Reducing vehicle speeds reduces the likelihood of a crash because drivers, riders and pedestrians have more time to see a hazard and react, and the breaking distance for vehicles is less. If a crash does occur, the severity is lower. There is conclusive evidence to support this (see below) but we must also understand how the regulatory speed limit influences travel speed.

So, the two questions to address are:

1. Does travel speed influence road trauma rates?
2. Does the regulatory speed limit influence road trauma rates?

1. Does travel speed influence road trauma rates?

A meta-analysis of research conducted by Elvik, Christensen and Amundsen (2004) looked at the relationship between travel speeds and casualty rates. Austroads (2008) summarises this in the Guide to Road Safety Part 3: *"The analysis included 98 separate studies which provided a total of 460 estimates of the relationship between changes in the mean speed of traffic on a road and changes in the casualty rate. Data from 20 countries were included. Studies conducted between 1966 and 2004 were included; about half the estimates came from studies conducted after 1990. The estimates were based on both rural and urban roads, and covered a speed range from about 25 km/h to about 120 km/h."*

This work confirmed the 'Power Model' that was originally developed by Nilsson (1981, 2004). The 'Power Model' (Figure 1) shows that changes in all injury crashes relates to the 2nd power of relative change in speed, serious injuries to the 3rd power and fatal crashes to the 4th power.

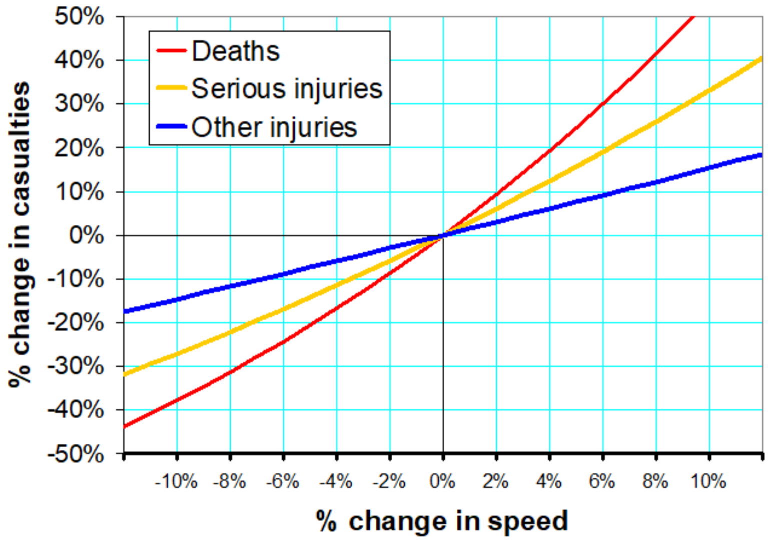

Figure 1: Relationship between travel speed change and change in casualty rates[1]

The evidence connecting travel speed to casualty rate is conclusive.

2. Does the regulatory speed limit influence road trauma rates?

In general, lowering the regulatory speed limit does not reduce mean travel speeds as much as the numerical drop in the speed limit. Or in other words, lowering the speed limit by 10km/h (say) will reduce the mean travel speed but the reduction will be less than 10km/h. Jurewicz (2010) shows the relationship between changes in speed limit and changes in mean speed (see Figure 2).

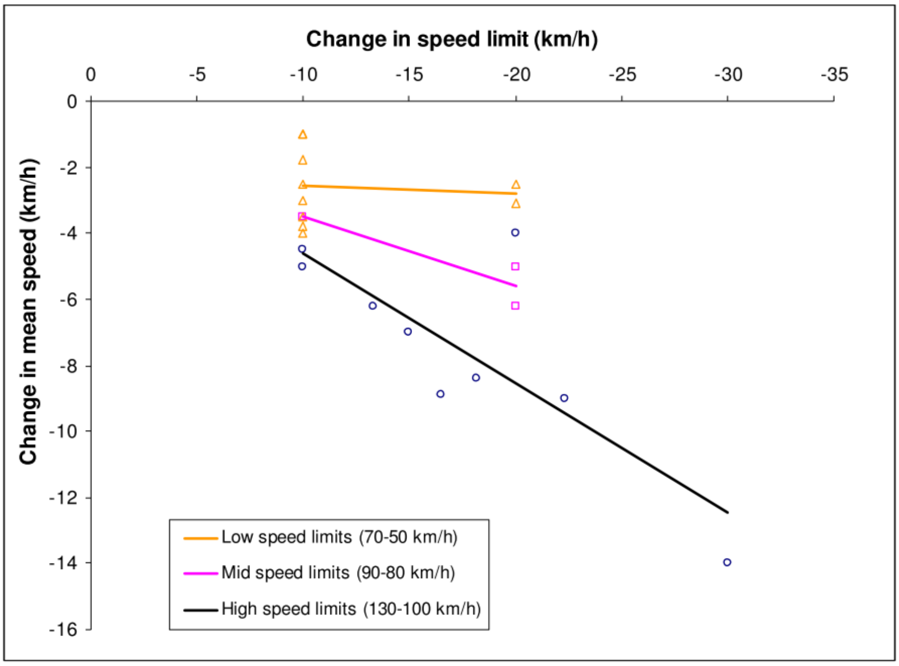

Figure 2: Relationship between speed limit changes and mean speed changes

Despite not achieving the full reduction in mean travel speed, the critical relationship between travel speed and trauma, as previously shown by the Nilsson power model, means that any reduction in speed limit (and therefore travel speed) will reduce fatal and serious injury crashes.

Woolley et al (2018) summarise some of the reasons why even a small reduction in travel speed creates a significant difference:

The effect of small travelling speed change into an injury outcome:

A small change in travel speed

↓

A relatively large change in stopping distance

↓

A much larger change in impact speed

↓

A still larger change in impact energy

↓

A very large change in probability of death and serious injury

Extensive research in Australia and overseas consistently shows that regulatory speed limits directly influence road trauma rates.

Australia:

Jurisdiction	Extent	Observations	Reference
Victoria	60 km/h default reduced to 50 km/h in built-up areas (introduced 22/01/01)	21% reduction in fatal crashes 3% reduction in serious injury crashes 12% reduction in all casualty crashes 41% reduction in fatal and serious injury crashes involving pedestrians	Hoareau, Newstead et al. (2006)
South-east Queensland	50 km/h default speed limit in built-up areas (formally 60 km/h), introduced March 1999	88% reduction in fatal crashes 20% reduction in serious injury crashes 23% reduction in all casualty crashes 2.2 km/h reduction in mean speed	Hoareau, Newwstead et al. (2002)
Western Australia (metropolitan Perth area)	50 km/h default speed limit in built-up areas (formally 60 km/h), introduced December 2001	25% reduction in fatal crashes 4% reduction in serious injury crashes 21% reduction in all casualty crashes 51% reduction in all crashes involving pedestrians	Hoareau and Newstead (2004)
Victoria	110 km/h speed limit on rural and outer Melbourne freeways (formally 100 km/h), introduced June 1987, with 100 km/h speed limit reintroduced September 1989	21% increase in fatal and serious injury crashes (100 to 110 km/h) 25% increase in all casualty crashes (100 to 110 km/h) 18% reduction in fatal and serious injury crashes (110 to 100 km/h) 19% reduction in all casualty crashes (110 to 100 km/h)	Sliogeris (1992)
South Australia	100 km/h speed limit along 1,100 km of rural roads (formally 110 km/h), introduced July 2003	29% reduction in fatal crashes 28% reduction in admitted to hospital severity crashes 27% reduction in all casualty crashes	Mackenzie, Kloeden et al. (2015)
South Australia	50 km/h default speed limit in urban areas (formally 60 km/h), introduced 1 March 2003	37% reduction in fatal crashes 20% reduction in admitted to hospital severity crashes 23% reduction in all casualty crashes 3.7 km/h reduction in mean speed	Kloeden, Woolley et al. (2006)

Overseas:

Jurisdiction	Extent	Observations	Reference
United States	55 mph (89 km/h) national speed limit on interstate and primary and secondary state controlled highways (latterly 65-75 mph (105-121 km/h) introduced in 1974 and repealed in full in 1995	18% reduction in fatalities 5-9% reduction in injuries No reduction in non-casualty crashes (after introduction) 17% increase in fatalities on interstate highways (after repeal)	Kamerud (1983) Farmer, Retting et al. (1999)
Israel	100 km/h speed limit on 115 km of interurban highways (formally 90 km/h) introduced in 1993	2.5 additional fatalities per month	Friedman, Barach et al. (2007)

Belgium	70 km/h speed limit along 116 km of Flemish roads (formally 90 km/h) introduced in 2001	33% reduction in severe (fatal and serious injury) crashes	de Pauw, Daniels et al. (2014)
Iowa, United States	70 mph (113 km/h) speed limit along interstate highways (formally 65 mph or 105 km/h) introduced in 2005	25% increase in all casualty and non-casualty crashes 52% increase in night-time fatal crashes	Souleyrette and Cook (2010)
Sweden	110 km/h to 90 km/h	Speeds declined by 14 km/h Fatal crashes declined by 21%	Nilsson (1990)
Denmark	60 km/h to 50 km/h	Speeds declined by 14 km/h Fatal crashes declined by 21%	Engel (1990)
UK	100 km/h to 80 km/h	Speeds declined by 4 km/h Crashes declined by 14%	Peltola (1991)
Switzerland	110 km/h to 90 km/h	Speeds declined by 14 km/h Fatal crashes declined by 21%	Finch et al. (1994)
Germany	60 km/h to 50 km/h	Crashes declined by 20%	Scharping (1994)

REFERENCES

[1] Elvik's 2009 review of the Power Model exponent (particularly for fatal crashes) has been slightly reducing over time. This means that the effect on safety from a change in speed has become slightly smaller. Elvik speculates that this is most likely due to improved safety devices (vehicle and infrastructure), and that some crashes that were not survivable years ago are now survivable.

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