

## RECENT ADVANTAGES OF LOWER SPEED LIMITS IN AUSTRALIA

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**Abstract:** Along with alcohol and fatigue, speed has been identified in Australia as one of the biggest contributors to road traffic accidents. Over time, changing enforcement techniques and technology has been applied with some degree of success in rural and urban areas. From 1997, the speed limits on residential roads were slowly changed from the default 60km/h to 50km/h. By 2003, all but one of the jurisdictions had adopted the new lower speed limit. Although only applying to residential roads and not major roads, considerable crash benefits have been reported. Reductions in the order of 20% in casualty crashes have been observed and in particular, significant benefits appear to exist for vulnerable road users such as pedestrians. This paper discusses some of the research observations surrounding the adoption of the lower speed limit in Australia and discusses the link between overall vehicle speeds and crash frequency based on international literature.

**Key Words:** Speed limit, crashes, accidents, road safety, countermeasures

### 1. INTRODUCTION

Travelling above the speed limit is endemic amongst communities in all parts of the world. Excessive speed, along with driving while intoxicated with alcohol, accounts for the majority of road crashes. Enforcement has been the traditional management tool with breath testing and speed detection devices now in common use in many countries. However, such enforcement cannot be everywhere all of the time and a cultural change in behaviour and attitudes is required. Obtaining this change has been one of the hardest challenges facing most countries trying to reduce the trauma on their roads. In the case of speeding, there are many reasons why this is so (Elliott, 2001):

1. The concept of speeding differs between individuals
2. Speed is a graduated measure
3. Speed can be easily measured and enforced; the mass of data quantify the problem
4. There are conflicting messages to society in relation to speeding
5. Roads are engineered to accommodate travelling at the speed limit safely in average conditions
6. There is an issue regarding one's ability not to speed (self efficacy)
7. There are strong personal norms associated with speeding
8. There are strong perceptions that most other drivers are also speeding.

These lead to a culture endorsing speeding and situations where, for example, new car advertising competes against government road safety messages. The final three points relate to the way in which speeding behaviour is justified (Elliott 2001). Self-efficacy relates to the

belief an individual has that a task (ie not to speed) can be successfully achieved. Other drivers who speed believe that it is hard not to speed and they find it difficult to keep to the speed limit. Personal norms relate to the widespread lack of feeling of remorse or regret when drivers engage in speeding behaviour. Finally, there is a strong perception amongst drivers that the majority of other drivers are also speeding. This perception is usually an overestimate but forms the basis for excusing one's own speeding behaviour. This has been well established by numerous studies (for example, Svenson, 1981; Walton and McKeown, 2001; McKenna, Stanier and Lewis, 1991; Delhomme, 1991; and De Joy, 1989).

In essence, we are trying to convince people who have a lifetime experience of driving and speeding that their behaviour is dangerous. The fact that they have spent so many years engaging in such behaviour without any ill-effects makes it very difficult to convince them to change their behaviour.

Over the last decade in Australia there has been a move to reduce the default urban speed limit (DUSL) from 60 to 50km/h. This may seem a small and insignificant change to the casual observer however there was strong evidence to suggest that considerable reductions in crashes and trauma could result from such a change. In addition, the community had to approve of such a change and many years of political debate and education preceded the introduction of the new lower speed limit.

This paper discusses some of the research observations surrounding the adoption of the lower speed limit in Australia and discusses the link between overall vehicle speeds and crash frequency based on international literature.

## **2. DEFINING THE PROBLEM**

Speeding has been acknowledged as a major cause of, and contributor to, road trauma. Past efforts to gain general compliance to ongoing speed limits have largely been unsuccessful both in Australia and internationally (OECD, 1994; and Elliott, 2001).

There are two aspects to the problem of crashes where speed is a factor. When we talk of a crash involving speed, most people would have images in their mind of a driver travelling very fast (>20km/h over the speed limit) and consequently being involved in a spectacular crash (see Figure 1). Despite being relatively rare, due to the extreme risks involved this poses a significant road safety problem for the few drivers who engage in such behaviour and the victims involved in their crashes.

However, there are also the vast majority of drivers who are travelling slightly above the speed limit, many of whom are involved in crashes (see Figure 2). This carries substantial risk and cumulatively this also represents a significant road safety problem.



Figure 1. Remains of a Vehicle after Impacting with a Pole at an Estimated Impact Speed of 120km/h, Speed Zone 60km/h; Driver was Fatally Injured



Figure 2. Damage to a Vehicle after Impacting with a Pole at an Estimated Impact Speed of 68km/h, Speed Zone 60km/h; Left Rear Passenger was Hospitalised

## 2.1 International Evidence

Much evidence exists worldwide (the most noted being from Scandinavia and Australia) linking considerable reductions in casualty crashes to small reductions in travelling speed.

The Road Accident Research Unit (RARU) at the University of Adelaide carried out ground-breaking research into relating driving speed with the incidence of serious crashes (Kloeden et al 1997; Kloeden et al, 2001 and Kloeden et al, 2002). By comparing the distribution of the estimated speeds of vehicles just before crashing and the measured speed distribution of similar vehicles, subsequently, at the crash scenes they derived a speed-relative risk relationship. Of the traffic travelling at a given speed on arterial roads, the proportion of vehicles which crashed effectively doubled with each 5km/h increment above the 60km/h limit. This study has been used extensively as a justification for attempts to lower travelling speeds in Australia. The basic relationship is shown in Figure 3.

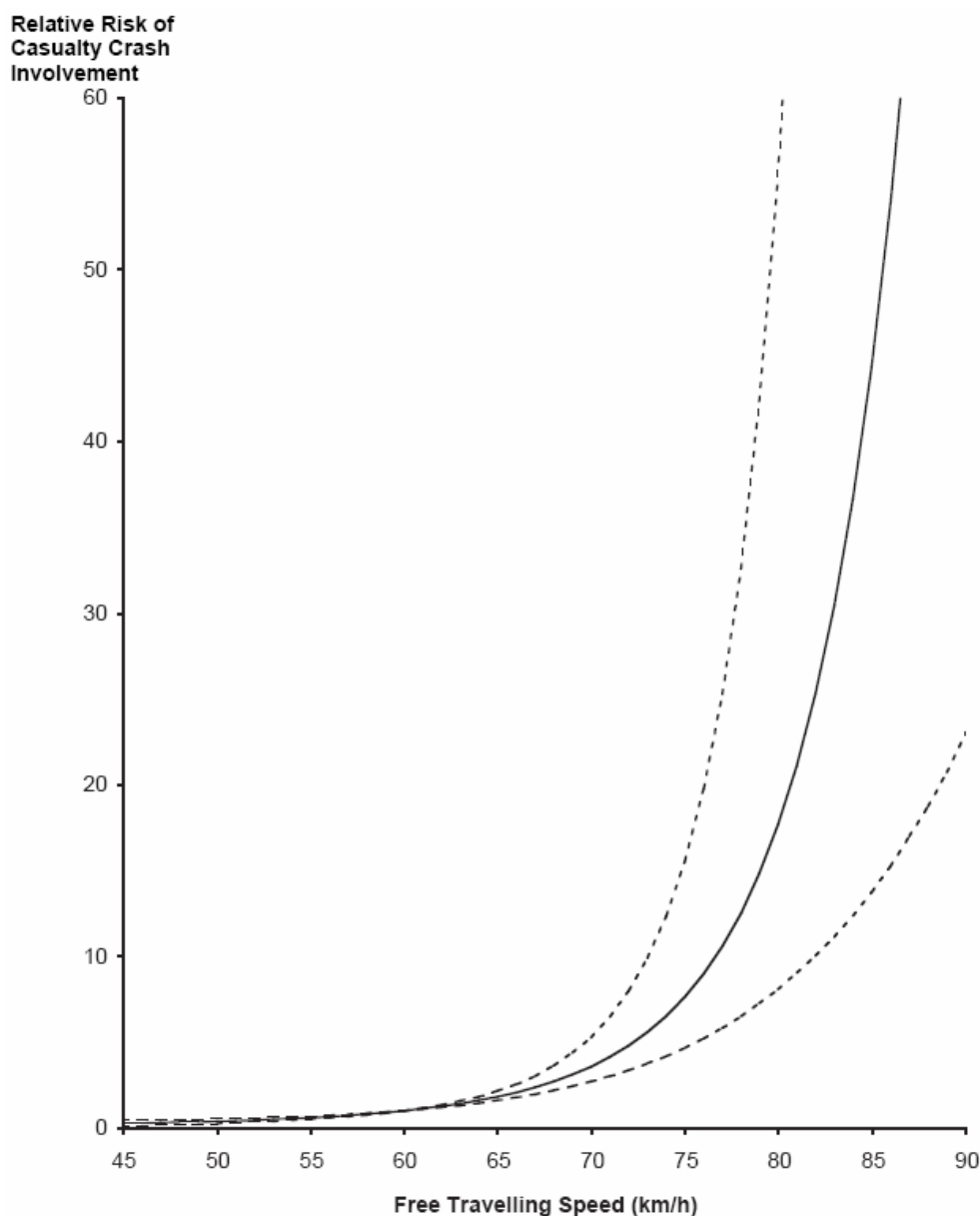


Figure 3. Relative Risk of Being Involved in a Casualty Crash in a 60km/h Zone by Free Travelling Speed in an Urban Area (95% Confidence Limits Shown as Dashed Lines)

Speed and crash relationships have also been well documented in publications from the Nordic countries. In particular, the work presented in Elvik *et al.* (1997) and Nilsson (2004) have found widespread use internationally. Elvik *et al.* documents linear regression models based on more than 70 investigations from the first half of the 1990s. Nilsson has hypothesised and validated power models which agree closely with the regression models described in Elvik *et al.* The power models suggest three relationships relating the change in the numbers of fatalities and casualties as a result of changes in mean or median speed. The range of the relationships are summarised in Figure 4 although Nilsson notes that the model for fatal crashes tends to underestimate the situation when validated against Swedish accident data. Put simplistically, the number of fatality crashes has a fourth power relationship with changes to the mean speed, a third power relationship for severely injured crashes and a squared relationship for all injury type crashes.

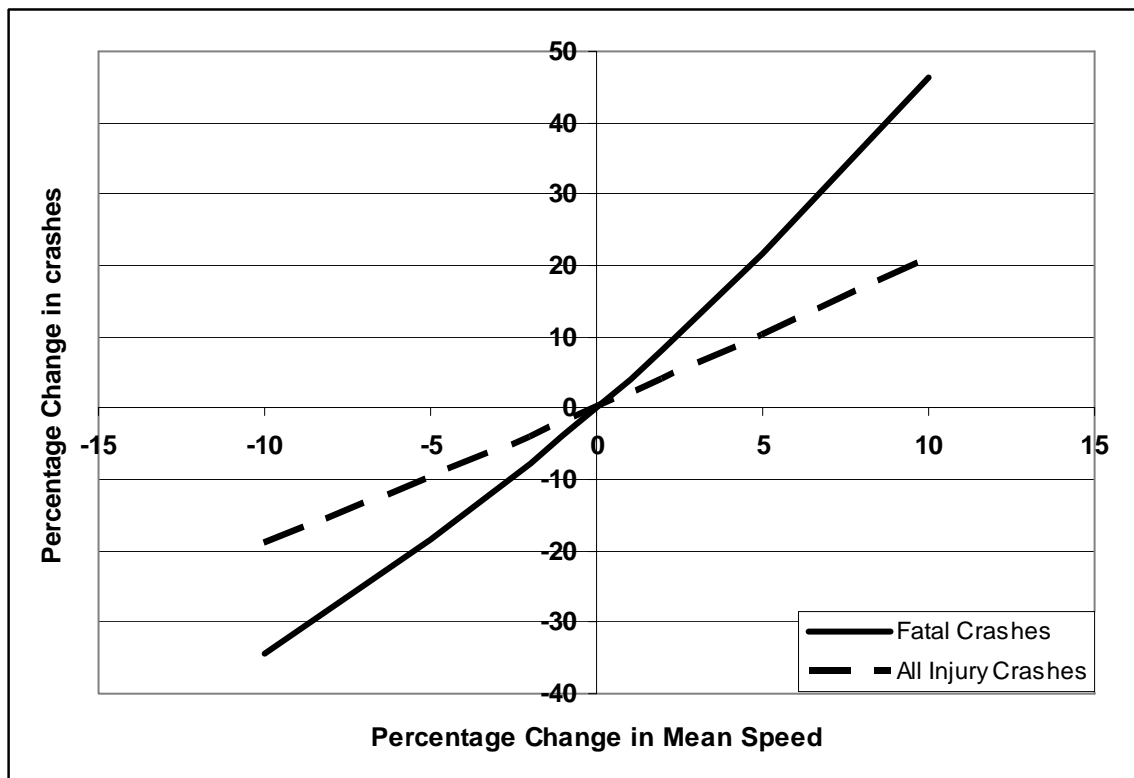


Figure 4. Effects of Changes in Mean Speed on All Injury and Fatal Crashes (after Nilsson 2004, Based on Meta-data Presented by Elvik *et al.* 1997)

In the United Kingdom, Taylor *et al.* (2001) also found that accident frequency rises rapidly with the mean traffic speed on rural single carriageway roads. This relationship was consistent across four different road groups reflecting low to high quality roads.

Many other studies have observed reductions in crashes when speed limits have been lowered including: Nilsson (1990), Engel (1990), Peltola (1991), Sliogeris (1992), Scharping (1994) Newstead and Mullan (1996) and Parker (1997). Other studies have also shown increases in crashes or marginal gains when speed limits have been increased. FHWA (1998) contains a synthesis of research related to speed and speed limits and the reader is directed to this for further information.



In summary, there is ample international evidence to suggest that even small reductions in travelling speeds will lead to significant reductions in crashes.

### 3. IMPLEMENTATION

The Australian Road Rules state that *“If a speed-limit sign does not apply to a length of road and the length of road is not in a speed-limited area, school zone or shared zone, the speed-limit applying to a driver for the length of road is the default speed-limit.”* (ARR, 1999, 3.25) In other words, a driver must assume that the speed limit is the default speed limit unless there is sign indicating another speed limit. Between 1997 and 2003 the default speed limit was reduced from 60km/h to 50km/h in all Australian States.

The Australian road network typically consists of motorways, arterials, collectors (or distributors) and local roads (residential streets). The new 50km/h limit as introduced applied to some collector roads and all local roads. All other roads were signposted at 60km/h or above. Figure 5 shows an example of the road network in Adelaide, South Australia.

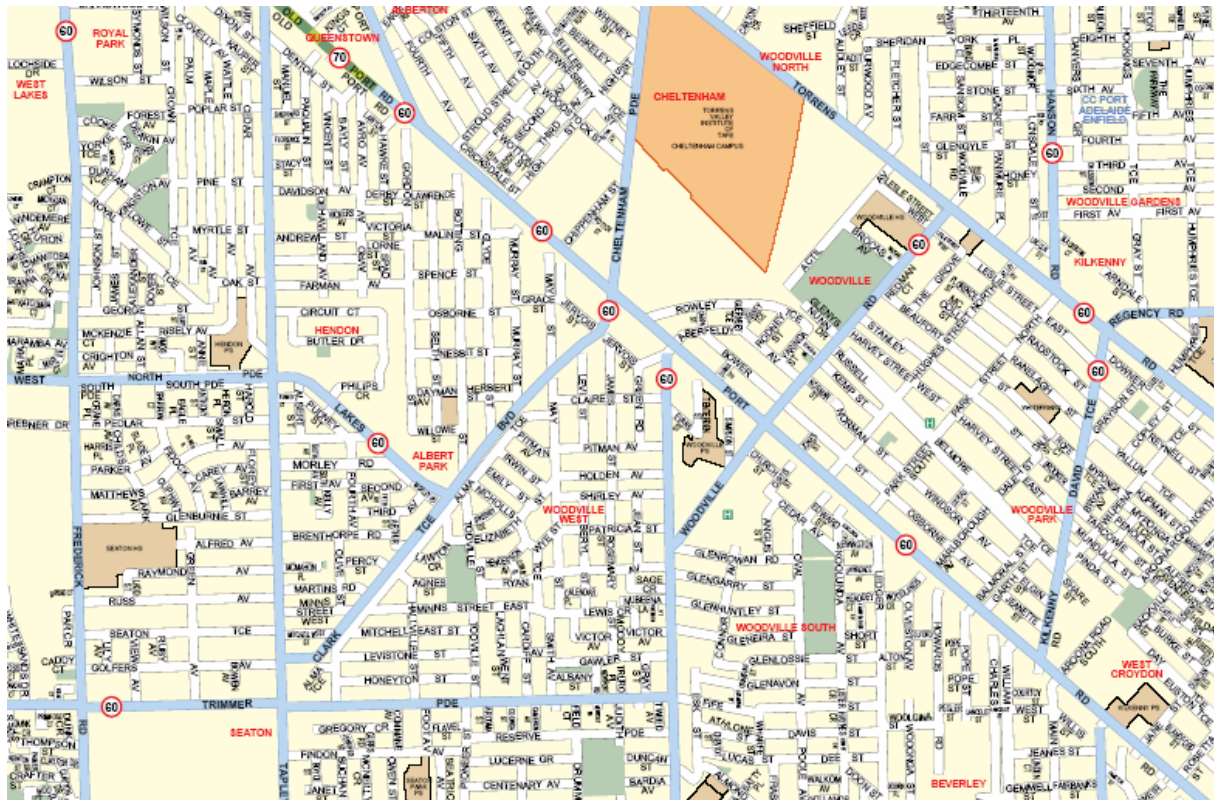


Figure 5. Example of a Road Network in Adelaide; Major 60km/h Roads are Shaded and Shown with the ‘60’ Symbols, Unshaded Local Roads are 50km/h. (Source Transport SA)

This has some implications which need explanation. Firstly, although local roads make up a considerable amount of the road network, it is estimated that on average only 15% of journeys are spent on local roads. Secondly, around 15 to 20% of crashes occur on local roads. Therefore reducing the speed limit on such roads is only going to have small impact on the overall road safety situation. Enormous gains can still be obtained by lower speed limits on busier arterial roads where the bulk of crashes occur.

Initial attempts were made in 1994 to discuss the prospect of a lower national urban speed limit however the issue was contentious and all states could not agree to the proposal. More work was needed to convince the community and politicians of the merit of a lower speed limit. Some key influential studies were released during this time including the Haworth *et al.* (2001) report into a lower speed limit for Australia, AUSTROADS (1996) report into lower speed limits, the Kloeden *et al.* (1997) crash risk model, Cameron (2001) looking at optimal speed limits, the MASTER framework from Europe (Kallberg and Toivanen, 1997) and the work of various Parliamentary Committees in several states.

It was decided in 1996 that a national speed limit reduction would not be made but each state could pursue a lower speed limit independently. In 1997 New South Wales trialled a 50km/h speed limit and this was soon followed by Queensland and eventually all other states. By 2003 all of Australia effectively had a 50km/h default urban speed limit with the exception of the Northern Territory.

### **3.1 Published Evaluations**

There have been several publications documenting the impacts of the new speed limit on measured speeds and crashes. Many of these studies were performed not long after the new limits were introduced and so must be considered preliminary however results tend to agree between states. Further publications are expected as time goes on.

#### **New South Wales (NSW)**

The RTA (2000) used a complicated trend term analysis to predict expected crash frequencies based on projection of the trend term from when the sample of roads had their original 60km/h speed limit. The study, based on data up to 21 months after implementation, found that on 50km/h streets there was a 25.3% reduction in risk of a reported accident corresponding to 262 fewer crashes. Vulnerable road users such as pedestrians and pedal cyclists were found to benefit most from the reductions. Based on 615 sites, mean travelling speeds on 50km/h roads were observed to drop 0.94km/h. Community support for the lower limit remained high (n=6814) with up to 75% approval.

#### **Queensland**

Walsh and Smith (1999) reported on some outcomes from their studies. Community surveys (sample >1600) revealed that support for lower speed limits had increased over time from 66 to 73% in South Eastern Queensland and 61 to 78% in Brisbane. Reductions in casualties in the order of 8% overall and 18% in fatalities were reported with mean travelling speeds dropping by approximately 5km/h. However, these results were obtained only a short period after the introduction of the new speed limit and should be treated with some caution.

#### **Victoria**

Newstead *et al.* (2002) reported on results five months after the introduction of the new speed limit. Analysis was performed relative to 60km/h zones and relative to all other speed zones. Statistically significant estimated crash reductions in 50km/h zones, relative to changes observed in similar crash groups in all other speed zones, were found in the following:

- 12% for all casualty crashes
- 58.7% for fatal crashes
- 11.5% for serious injury crashes
- 11.8% for other injury crashes
- 40% in death and serious injury for pedestrian-involved crashes
- 19% in all casualty crashes involving young drivers.
- reductions amongst older drivers were not yet statistically significant

The report suggests that vulnerable road users are the main benefactors from the change but the results can only be treated as preliminary given the short time over which the observations were made.

### **Australian Capital Territory (ACT)**

Green *et al.* (2003) reported on a study based on the first two years after implementation. Crashes were observed to reduce from 23.7 to 21.6 per month however the reductions were not statistically significant. Overall mean travelling speeds (based largely on 24 collector road sites) reduced by 2km/h on 50km/h streets; this reduction was also observed on unchanged 60km/h streets. Community support for the scheme remained high at 70%.

### **Western Australia (WA)**

Kidd and Radalj (2003) conducted a study of speeds at 124 sites one year after the change to the lower speed limit. They found that mean speeds dropped by 1.3km/h with a 24% reduction in the number of drivers exceeding the 50km/h speed limit by more than 10km/h. Reductions of 1.09km/h were also observed on unchanged 60km/h roads with 6% reduction in the number of drivers exceeding the 60km/h speed limit.

### **Tasmania**

Tasmania has not conducted a formal analysis of their change however there were 89 fewer casualty crashes reported one year after the introduction of the new speed limit.

### **South Australia (SA)**

A study involving the author (Kloeden *et al.* 2004) concluded that the introduction of the 50km/h was largely responsible for a 19.8% drop in casualty crashes. The analysis was based on data a year prior to and after the introduction of the new limit. Speed measurements conducted at 52 sites also revealed a 2.2km/h drop in overall mean travelling speeds. Coinciding with this was a 4.6% drop in casualty crashes on arterial roads where the speed limit remained unchanged (at 60km/h) and a 0.7km/h reduction in overall mean travelling speeds.

Speed distributions were observed to narrow slightly and shift to the left (ie towards lower speeds). An assessment was performed matching the percentile speeds from before and after the introduction of the new speed limit as shown in Figure 6.



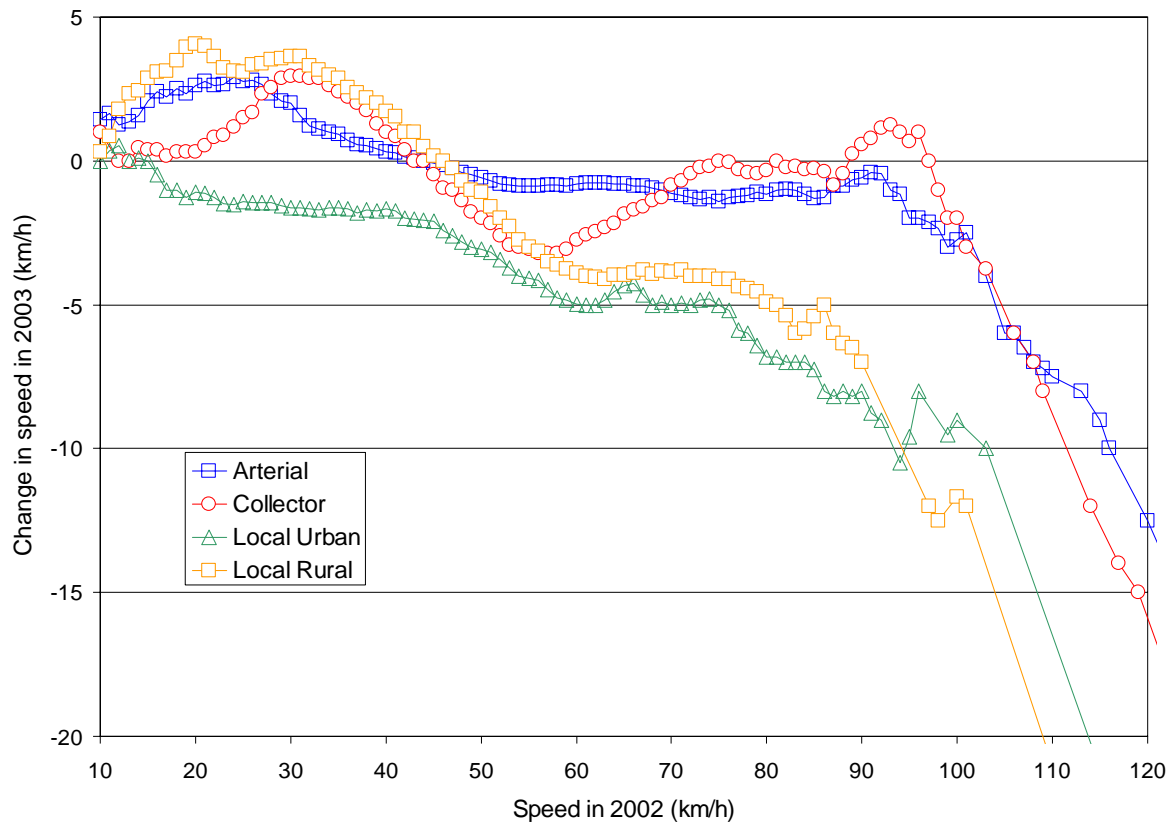


Figure 6. Change in Speed in 2003 by Speed in 2002 by Road Type

What is interesting is that an intervention aimed at the general driving population also seemed to have considerable impact on those drivers at the extreme end of the scale with very high travelling speeds. Some low speeds were also observed to increase but the bulk of the reductions were for drivers travelling between 50 and 70km/h prior to the introduction of the new speed limit.

### 3.2 Summary

Although different crash databases and analysis methods makes a direct comparison of the states and territories difficult, all results appear consistent in indicating reductions of up to 20% in casualty crashes. Vulnerable road users appear to be gaining the most benefit from the reductions. Many of the studies are in their infancy and more time is needed to confirm the final magnitude of savings. It is interesting to note that WA, the ACT and SA also reported a lowering of speeds on their unchanged 60km/h roads. Whether this reduction is sustained over time remains to be seen but it is a welcome by-product at this point in time.

#### 4. CONCLUSIONS

Simply lowering the speed limit is unlikely to result in any significant change unless it is backed up with suitable levels of enforcement and publicity. Preceding this in the Australian context was the need for community support and the consequent understanding of politicians. In Australia, the community is sensitive to high levels of speed enforcement and there is a fine balancing line between strong enforcement and losing community support. What is needed is a gradual change in culture towards speeding; lower speed limits is one way to slowly get that change occurring. The Australian experience, backed by international research, has shown that significant crash reductions can be obtained with small reductions in overall mean travelling speed. Furthermore, vulnerable road users such as pedestrians and pedal cyclists benefit significantly from lower vehicle speeds.

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