Centre for
Automotive Safety Research

Further evaluation of the South Australian default 50 km/h speed limit

CN Kloeden, JE Woolley, AJ McLean

CASR REPORT SERIES
CASR034
December 2006

THE UNIVERSITY
OF ADELAIDE
AUSTRALIA

Report documentation

REPORT NO.	DATE	PAGES	ISBN	ISSN
CASR034	December 2006	36	978 1 920947 33 0	1449-2237

TITLE

Further evaluation of the South Australian default 50 km/h speed limit

AUTHORS

CN Kloeden, JE Woolley, AJ McLean

PERFORMING ORGANISATION

Centre for Automotive Safety Research
The University of Adelaide
South Australia 5005
AUSTRALIA

SPONSORED BY

Department for Transport, Energy and Infrastructure
Post Office Box 1
Walkerville SA 5081
AUSTRALIA

AVAILABLE FROM

Centre for Automotive Safety Research
http://casr.adelaide.edu.au/reports

ABSTRACT

On 1 March 2003 the default urban speed limit in South Australia was reduced from 60 km/h to 50 km/h. On-road speeds just before the default limit was introduced were compared with speeds one and three years later. The numbers of casualty crashes and casualties in the three years before the default limit was introduced were compared with the corresponding numbers in the three years after the default limit came into effect. On roads where the speed limit was reduced from 60 km/h to 50 km/h, average vehicle speeds decreased by 3.8 km/h after three years and casualty crashes fell by 23 per cent. On roads where the speed limit remained at 60 km/h, average vehicle speeds decreased by 2.1 km/h after three years and casualty crashes fell by 16 per cent.

KEYWORDS

speed limit, legislation, accident rate, before and after study

Summary

On 1 March 2003 the default urban speed limit in South Australia was reduced from 60 km/h to 50 km/h. On-road speeds just before the default limit was introduced were compared with speeds one and three years later. The number of casualty crashes and casualties in the three years before the default limit was introduced was compared with those in the first three years that the default limit was in effect.

On roads where the speed limit was reduced from 60 km/h to 50 km/h:

- The average travelling speed fell by 2.3 km/h in the first year and by an additional 1.5 km/h in the third year (there was no survey done in the second year)
- The number of casualty crashes fell by 23% (401 fewer casualty crashes per year)
- The number of people injured in crashes fell by 26% (556 fewer casualties per year)
- The number of people needing treatment by a private doctor fell by 28% (190 fewer cases per year)
- The number of people needing treatment at a hospital fell by 25% (291 fewer cases per year)
- The number of people needing admission to hospital fell by 23% (69 fewer cases per year)
- The number of people fatally injured fell by 37% (5 fewer cases per year)
- This reduction in casualties is estimated to have saved the South Australian community at least $129 million over the first 3 years ($43 million per year)
- Casualties and casualty crashes are continuing to decline

On roads where the speed limit remained at 60 km/h:

- The average travelling speed fell by 0.9 km/h in the first year and by an additional 1.2 km/h in the third year (there was no survey done in the second year)
- The number of casualty crashes fell by 16% (622 fewer casualty crashes per year)
- The number of people injured in crashes fell by 18% (895 fewer casualties per year)
- The number of people needing treatment by a private doctor fell by 20% (401 fewer cases per year)
- The number of people needing treatment at a hospital fell by 16% (376 fewer cases per year)
- The number of people needing admission to hospital fell by 22% (110 fewer cases per year)
- The number of people fatally injured fell by 19% (8 fewer cases per year)
- This reduction in casualties is estimated to have saved the South Australian community at least $204 million over the first 3 years ($68 million per year)
- Casualties and casualty crashes are continuing to decline

In before and after evaluations such as these it is not justifiable to attribute all of the magnitude of the above changes to the introduction of the default 50 km/h speed limit. However, similar outcomes have also been observed in other states and territories in Australia. Therefore it appears reasonable to conclude that the reduction in the speed limit was the major factor in the observed reductions in travelling speeds, crashes and casualties on the affected roads and that the reductions on other roads derived at least in part from the accompanying emphasis on speed reduction.

Contents

1 Introduction

On 1 March 2003 the default urban speed limit in South Australia was reduced from 60 km/h to 50 km/h. This resulted in a large number of local and collector roads having their speed limit lowered.

In 2004, the Centre for Automotive Safety Research was commissioned by the Department for Transport, Energy and Infrastructure (DTEI) to conduct an evaluation of the new 50 km/h default urban speed limit in terms of changes in vehicle travelling speeds and casualty crash numbers. The resultant study found reductions in both vehicle travelling speeds and casualty crashes on roads where the speed limit was reduced (Kloeden, Woolley, McLean 2004). On roads where the speed limit remained at 60 km/h there was a smaller speed reduction but a similar reduction in the number of casualty crashes because most casualty crashes happen on roads that remained at 60 km/h.

The present study expands on the previous study with a new set of speed measurements two years on and an additional two years of casualty crash data.

2 Changes in vehicle speeds

This Section examines the changes in vehicle travelling speeds over the time period from 2002 to 2005.

2.1 Methodology

The Department for Transport, Energy and Infrastructure arranged for speeds to be measured at 52 randomly selected sites across the state at the end of 2002, prior to 1 March 2003 when the 50 km/h default urban speed limit was introduced. These measurements were then repeated one year later in 2003 and again in 2005. The sites consisted of the following road types:

- 10 main roads (arterials) which retained their 60 km/h speed limit
- 12 major residential roads (collectors) which were changed to the 50 km/h speed limit
- 18 residential streets in the metropolitan area (urban local) which were changed to the 50 km/h speed limit
- 12 residential streets in rural townships (rural local) which were changed to the 50 km/h speed limit

Data were recorded using traffic counters consisting of a pair of pneumatic tubes laid across the carriageway. Surveys were conducted so that a minimum of 24 hours of traffic data was obtained during weekdays at each site. Measurement points were at straight mid-block sections located in such a manner to ensure that drivers could adopt their chosen speed without significant influence from the road alignment or junctions.

The speeds of all vehicles in both directions of travel at each site for a full 24 hour period in each survey were used for analysis. A Wednesday was used where available or another week day if there was no Wednesday data or if the data for Wednesday appeared abnormal. The local road numbers for 2002 in this report are very slightly different from the previous report due to stricter data selection to match the newer data. The individual sites and the number of vehicle speeds recorded (ie: the traffic volume) for the three years of data collection are shown in Tables 2.1 to 2.4.

Table 2.1
Number of speed measurements on arterial roads
which retained a 60 km/h speed limit

Road	Suburb	2002 measurements	2003 measurements	2005 measurements
Prospect Road	Blair Athol	15,954	16,576	15,225
Tapleys Hill Road	Fullham Gardens	16,858	16,938	18,822
Montacute Road	Newton	5,723	5,211	5,212
Goodwood Road	Cumberland Park	19,576	20,417	17,907
Greenhill Road	Burnside	7,027	5,590	7,569
Kenihans Road	Happy Valley	9,527	13,156	10,284
Springbank Road	Clapham	21,896	22,617	22,124
Fullarton Road	Kent Town	21,441	21,858	21,667
North East Road	Manningham	19,262	18,473	18,557
Burbridge Road	Brooklyn Park	11,871	12,541	12,420
Total		149,135	153,377	149,787

Table 2.2
Number of speed measurements on collector roads which changed to a 50 km/h speed limit

Road	Suburb	2002 measurements	2003 measurements	2005 measurements
Claremont Avenue	Netherby	1,405	1,507	1,737
Blair Park Drive	Craigmore	3,723	3,927	4,384
Seaview Road	West Beach	3,527	4,585	4,889
Barcelona Road	Noarlunga Downs	3,158	3,357	3,291
Milan Terrace	Stirling	2,059	2,097	2,124
Jetty Road	Largs Bay	1,756	1,817	1,908
Perry Barr Road	Hallett Cove	1,844	1,738	2,024
Scenic Way	Hackham	1,081	1,041	905
Valetta Street	Kidman Park	9,665	9,053	8,737
Sydenham Road	Norwood	4,581	4,465	4,424
Sixth Avenue	St Peters	1,416	1,238	1,244
Bonython Avenue	Novar Gardens	2,513	2,564	2,756
Total		36,728	37,389	38,423

Table 2.3
Number of speed measurements on urban local roads which changed to a 50 km/h speed limit

Road	Suburb	2002 measurements	2003 measurements	2005 measurements
Bowyer Street	Rosewater	511	458	465
Charles Road	Beverly	525	515	577
Adelaide Street	Maylands	436	469	480
Hambledon Road	Campbelltown	2,146	1,963	2,021
Gilbertson Road	Seacliff Park	485	490	551
Northcote Street	Kilburn	1,002	961	994
Vincent Road	Smithfield Plains	287	259	299
Andrew Avenue	Salisbury East	204	183	184
Esplanade	Glenelg North	1,293	1,691	2,046
Olive Avenue	Broadview	366	327	388
Commercial Street	Marleston	893	895	895
Bermudez Crescent	Paralowie	1,492	2,645	1,226
London Drive	Salisbury East	1,036	1,156	1,462
Farrell Street	Glenelg South	307	351	326
Main Street	Beverly	871	860	786
George Street	Adelaide	998	1,039	1,020
Archer Street	North Adelaide	1,965	2,258	2,151
Coorara Avenue	Payneham South	2,831	2,693	2,643
Total		17,648	19,213	18,514

Table 2.4
Number of speed measurements on rural local roads which changed to a 50 km/h speed limit

Road	Town	2002 measurements	2003 measurements	2005 measurements
Conroe Drive	Mount Gambier	2559	3405	3116
Reginald Street	Mount Gambier	279	257	275
Stratford Street	Millicent	117	99	73
Cedar Avenue	Naracoorte	1699	1901	1901
Hobbs Street	Berri	185	176	196
Fiedler Street	Berri	1388	1303	1659
Meander Avenue	Renmark	258	313	249
Bruce Road	Barmera	1032	925	1026
Parham Crescent	Port Augusta	216	216	188
Woodford Street	Port Augusta	411	426	530
Bowman Street	Crystal Brook	488	525	472
Thomas Street	Wallaroo	46	47	35
Total		8678	9593	9720

2.2 All vehicle speeds

The speeds of all vehicles at each site were averaged in each of the three years. These results are shown in Table 2.5.

Out of the 52 sites: 11 (21%) had higher mean speeds in 2003 compared to 2002; 11 (21%) had higher mean speeds in 2005 compared to 2003; and 5 (10%) had higher mean speeds in 2005 compared to 2002.

Overall and within each road type, the mean speed of vehicles is clearly trending down over time.

Table 2.5
Mean speeds on the measured roads by year of survey

Road type	Road name	Mean speed 2002 (km/h)	Mean speed 2003 (km/h)	Mean speed 2005 (km/h)
Arterial	Prospect Road	58.8	56.2	54.5
Arterial	Tapleys Hill Road	62.1	60.6	60.0
Arterial	Montacute Road	58.9	59.2	59.0
Arterial	Goodwood Road	51.8	52.6	50.8
Arterial	Greenhill Road	55.2	51.8	52.2
Arterial	Kenihans Road	56.5	54.6	55.4
Arterial	Springbank Road	60.1	59.0	58.0
Arterial	Fullarton Road	51.9	51.1	51.7
Arterial	North East Road	60.6	61.1	60.1
Arterial	Burbridge Road	62.9	62.9	54.2
Collector	Claremont Avenue	50.2	49.3	48.1
Collector	Blair Park Drive	61.4	61.5	59.0
Collector	Seaview Road	43.5	47.7	45.8
Collector	Barcelona Road	59.8	54.1	52.8
Collector	Milan Terrace	59.1	57.7	54.2
Collector	Jetty Road	52.4	50.1	49.1
Collector	Perry Barr Road	57.3	52.7	50.3
Collector	Scenic Way	58.6	55.2	55.4
Collector	Valetta Street	55.2	51.8	49.4
Collector	Sydenham Road	48.8	47.2	46.3
Collector	Sixth Avenue	51.7	51.0	49.7
Collector	Bonython Avenue	54.1	52.2	51.9
Urban local	Bowyer Street	40.1	37.3	37.1
Urban local	Charles Road	46.2	44.1	45.1
Urban local	Adelaide Street	41.6	36.2	40.7
Urban local	Hambledon Road	52.9	48.3	50.2
Urban local	Gilbertson Road	55.6	52.8	52.5
Urban local	Northcote Street	50.4	48.5	44.6
Urban local	Vincent Road	49.8	49.6	47.1
Urban local	Andrew Avenue	37.1	36.0	33.5
Urban local	Esplanade	44.2	42.1	38.3
Urban local	Olive Avenue	40.0	41.1	37.4
Urban local	Commercial Street	43.3	40.6	37.6
Urban local	Bermudez Crescent	48.4	46.3	48.3
Urban local	London Drive	42.4	39.3	37.6
Urban local	Farrell Street	36.3	36.5	35.7
Urban local	Main Street	52.8	50.7	47.7
Urban local	George Street	33.3	29.6	30.3
Urban local	Archer Street	45.4	44.7	43.0
Urban local	Coorara Avenue	57.8	51.9	51.6
Rural local	Conroe Drive	50.2	50.0	47.6
Rural local	Reginald Street	44.5	43.8	42.5
Rural local	Stratford Street	29.1	33.6	24.2
Rural local	Cedar Avenue	56.4	52.7	50.7
Rural local	Hobbs Street	31.1	31.6	31.8
Rural local	Fiedler Street	48.7	47.7	47.0
Rural local	Meander Avenue	36.1	40.7	39.0
Rural local	Bruce Road	62.9	57.6	56.1
Rural local	Parham Crescent	45.8	46.4	45.3
Rural local	Woodford Street	32.4	32.4	31.8
Rural local	Bowman Street	41.4	41.2	40.1
Rural local	Thomas Street	30.6	29.6	32.0

The overall mean speeds were calculated by taking the mean of all speeds measured on roads of the given road type in a given year (Table 2.6). The effect of this is to bias the overall mean speeds towards the sites with high traffic volumes. This is desirable for two reasons: it limits the effect of sites with small numbers of measurements which are subject to larger random variation, and it is biased towards sites with higher exposure and hence higher expected crash numbers. The number of speeds measured in each of the road types where the speed limit was reduced was also found to be roughly in proportion to the incidence of crashes on those road types so it is reasonable to combine all the speed data from those roads to get an overall speed estimate.

Table 2.6
Overall mean speeds by year

Road type	2002 mean speed (km/h)	2003 mean speed (km/h)	2005 mean speed (km/h)
Arterial*	57.69	56.84	55.63
Collector	54.18	52.25	50.54
Urban local	47.90	44.77	43.62
Rural local	49.85	48.52	46.82
All roads changed to 50 km/h	51.82	49.54	48.08

* Arterial roads retained a 60 km/h speed limit

The changes in overall mean speeds between the years for the given road types are shown in Table 2.7. Clear reductions in mean speeds are seen on all road types in the year following the introduction of the 50 km/h default limit. Smaller (given the two year gap), but continued, speed reductions were seen in the 2005 survey. Overall, the speed reductions observed when comparing 2005 to 2002 were relatively large, especially on roads where the speed limit was reduced.

Table 2.7
Overall relative reductions in mean speeds

Road type	Reduction in mean speed (km/h) in 2003 from 2002	Reduction in mean speed (km/h) in 2005 from 2003	Reduction in mean speed (km/h) in 2005 from 2002
Arterial*	0.85	1.21	2.07
Collector	1.92	1.71	3.63
Urban local	3.12	1.15	4.28
Rural local	1.33	1.71	3.04
All roads changed to 50 km/h	2.28	1.47	3.75

* Arterial roads retained a 60 km/h speed limit

The distributions of speeds from the 2002, 2003 and 2005 surveys are compared for each road type in Figures 2.1 to 2.4.

Figure 2.1
Distribution of speeds on arterial roads over time
(arterial roads retained a 60 km/h speed limit)

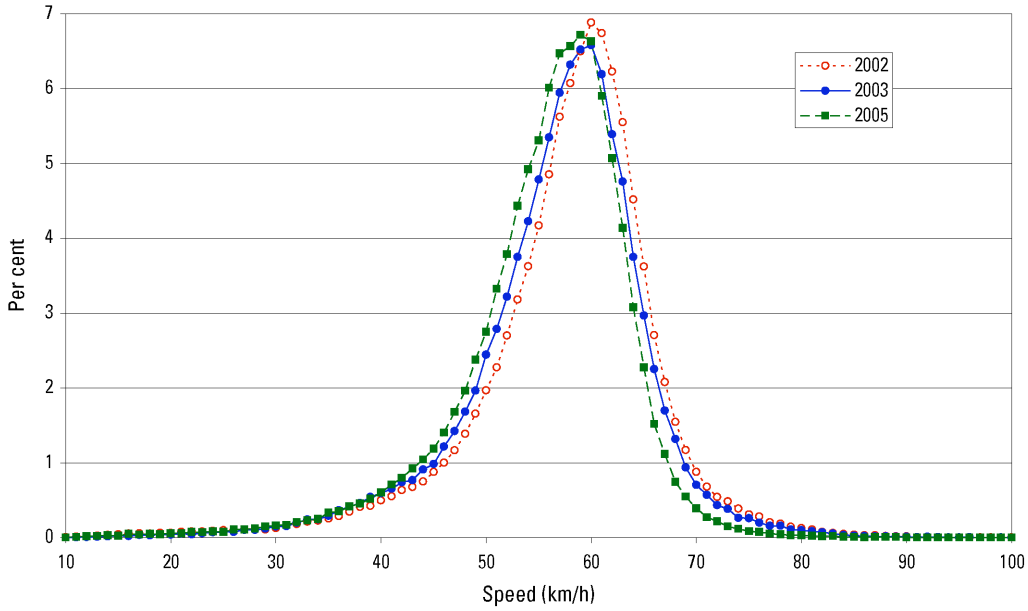


Figure 2.2
Distribution of speeds on collector roads over time

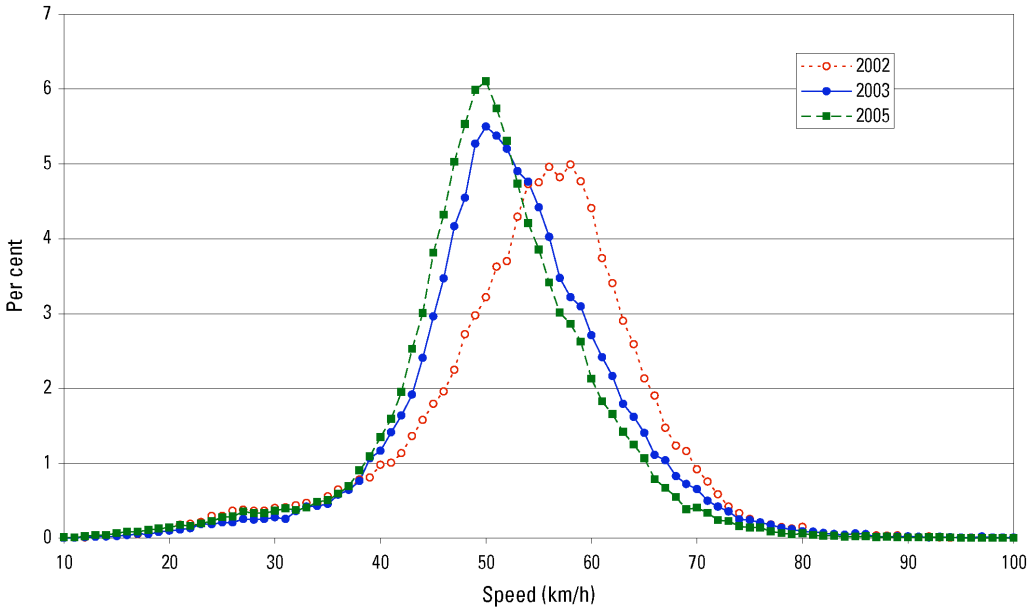


Figure 2.3
Distribution of speeds on urban local roads over time

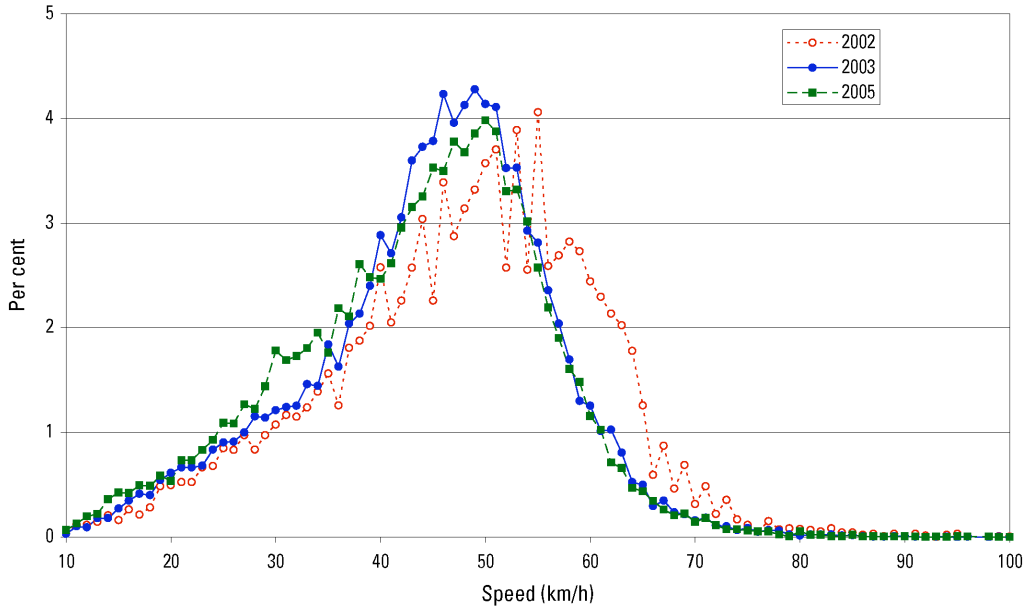
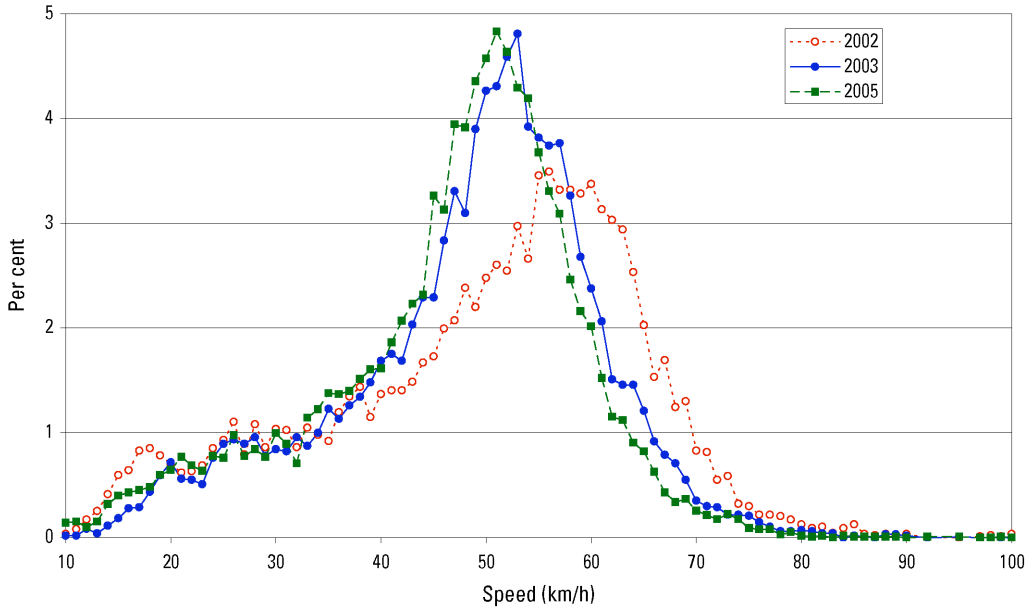


Figure 2.4
Distribution of speeds on rural local roads over time



The speed distributions for all road types can be seen to decrease (shift to the left) over time.

However, it is not clear from these Figures what was happening at individual speeds. In other words, did drivers who were travelling at, say, 60 km/h in 2002 reduce their travelling speed in 2003 by the same amount as drivers who had travelled at 55 km/h in 2002?

A method was developed to explore this further. For a given road type, the observed speeds were rounded to the nearest integer and ranked separately for two survey years. Then, for each distinct speed in the earlier year, the corresponding percentile speeds in the later year were averaged to get a corresponding speed.

For example, suppose that in 2002 58 per cent of vehicles were travelling at or above 60 km/h and 47 per cent were travelling at or below 60 km/h. This means that vehicles travelling at 60 km/h occupied the percentile range from 42 (100 - 58) to 47 per cent of all speeds measured in 2002. This percentile range was then applied to the 2003 speed distribution and the average of all speeds in that range was calculated. The 2002 speed was then subtracted from the average of the 2003 speeds in that percentile range.

The results for each individual km/h of speed are shown in: Figure 2.5 comparing 2003 with 2002; Figure 2.6 comparing 2005 with 2003; and Figure 2.7 comparing 2005 with 2002.

Figure 2.5
Change in speed in 2003 by speed in 2002 on the different road types

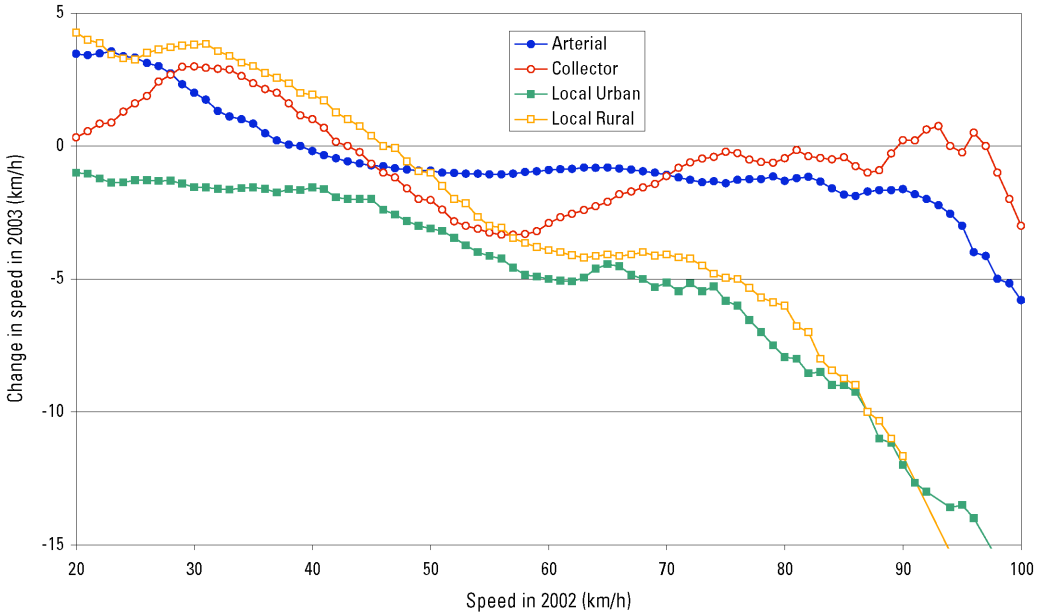


Figure 2.6
Change in speed in 2005 by speed in 2003 on the different road types

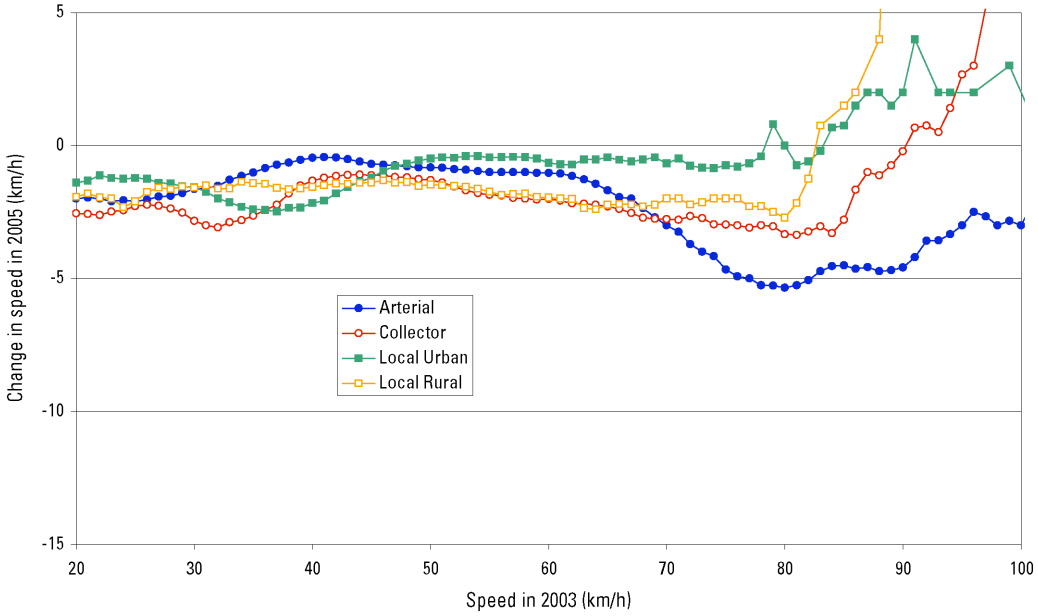
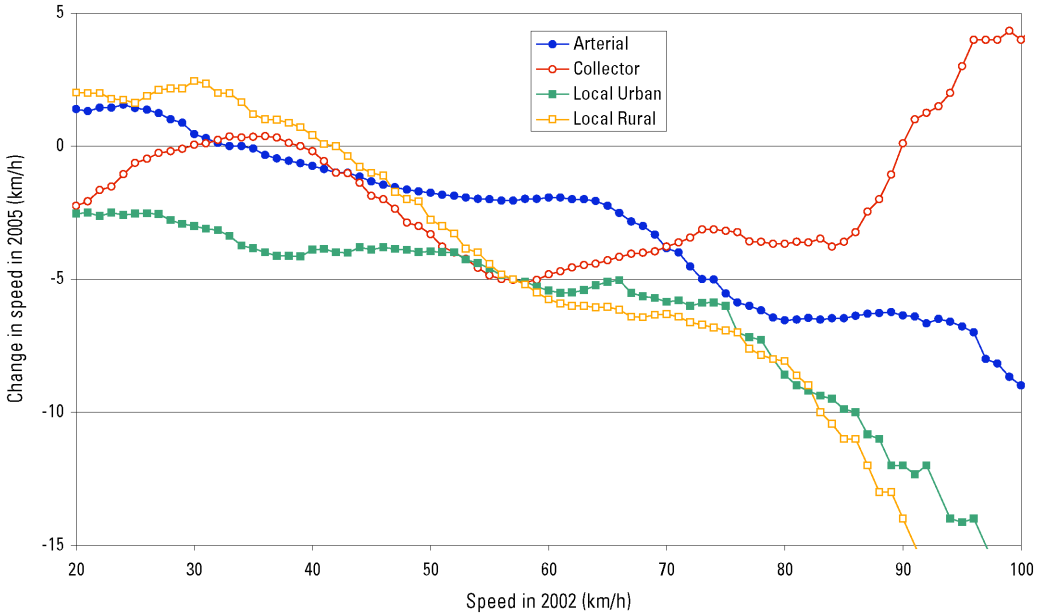


Figure 2.7
Change in speed in 2005 by speed in 2002 on the different road types



If we hypothetically assume that the same group of drivers travelled along each section of road in 2002, 2003 and 2005 and that they all maintained their rank in travelling speed relative to each other, then Figures 2.5 to 2.7 give their change in speed in the later year based on their speed in the earlier year. The following changes then become apparent:

- Very fast drivers (80 km/h and above) on all road types (except for collector roads) in 2002 slowed down the most in 2005 (although the small numbers of vehicles at high speeds means that chance variation can have a large effect on these results).
- Drivers on arterial roads at speeds above 65 km/h, slowed down more in 2005 compared to 2003, than in 2003 compared to 2002.
- On collector roads, drivers travelling just below 60 km/h in 2002 slowed down the most in 2003.
- On local streets in both urban and rural areas, the higher the travelling speed in 2002 the greater the reduction in speed in 2003 although this was somewhat reversed in 2005 compared to 2003.
- Very slow drivers (below about 45 km/h) on most road types in 2002 tended to speed up in 2003 and slow down in 2005 (although, once again, the small numbers of vehicles at low speeds means that chance variation can have a large effect on the results).

2.3 Free travelling speeds

While the speeds of all vehicles are the most relevant to crash causation in general, they do not capture the influence on drivers' freely chosen speeds under different conditions. This is because drivers in the middle of a platoon of traffic are limited to the speed of the vehicle in front of them and thus do not really have a free choice of travelling speed.

In order to assess changes to drivers' choice of speed it is preferable to restrict the analysis to free travelling speeds. Free travelling speeds are commonly defined here and elsewhere as the speeds of vehicles that are travelling at least 4 seconds behind the vehicle in front of them. The assumption is that if these drivers wished to travel faster they could, given the large gap in front of them.

Table 2.8 shows the percentage of vehicles that had a free travelling speed by road type and year of survey. On all road types, the percentage of vehicles with a free travelling speed dropped in 2003 and went up again in 2005. The local roads had higher proportions of vehicles travelling at a free speed as would be expected given their lower traffic volumes.

Table 2.8
Per cent of vehicles with a free travelling speed by year of survey

Road type	Per cent of vehicles with a free travelling speed 2002	Per cent of vehicles with a free travelling speed 2003	Per cent of vehicles with a free travelling speed 2005
Arterial*	49.5	48.1	49.5
Collector	85.4	82.5	86.1
Urban local	93.6	91.3	94.4
Rural local	93.1	89.0	94.2

* Arterial roads retained a 60 km/h speed limit

The free travelling speeds of all vehicles at each site were averaged in each of the three years. These results are shown in Table 2.9.

Out of the 52 sites: 11 (21%) had higher mean free travelling speeds in 2003 compared to 2002; 11 (21%) had higher mean free travelling speeds in 2005 compared to 2003; 5 (10%) had higher mean free travelling speeds in 2005 compared to 2002.

Overall and within each road type, the mean free travelling speed of vehicles is clearly trending down over time.

Table 2.9
Mean free travelling speeds on the measured roads by year of survey

Road type	Road name	Mean free travelling speed 2002 (km/h)	Mean free travelling speed 2003 (km/h)	Mean free travelling speed 2005 (km/h)
Arterial	Prospect Road	58.6	56.3	54.7
Arterial	Tapleys Hill Road	63.0	61.6	61.0
Arterial	Montacute Road	58.8	59.3	59.0
Arterial	Goodwood Road	53.5	54.6	52.2
Arterial	Greenhill Road	55.7	52.3	52.7
Arterial	Kenihans Road	57.7	56.2	56.5
Arterial	Springbank Road	61.1	60.6	59.6
Arterial	Fullarton Road	52.4	51.9	52.2
Arterial	North East Road	61.9	62.5	61.2
Arterial	Burbridge Road	63.5	63.1	54.5
Collector	Claremont Avenue	50.2	49.4	48.2
Collector	Blair Park Drive	61.7	61.6	59.2
Collector	Seaview Road	43.7	47.9	46.1
Collector	Barcelona Road	59.9	54.1	52.8
Collector	Milan Terrace	59.1	57.9	54.4
Collector	Jetty Road	52.4	50.2	49.1
Collector	Perry Barr Road	57.3	53.0	50.7
Collector	Scenic Way	58.5	55.3	55.4
Collector	Valetta Street	55.7	52.2	49.6
Collector	Sydenham Road	49.0	47.4	46.5
Collector	Sixth Avenue	51.8	51.1	49.8
Collector	Bonython Avenue	54.0	52.4	51.9
Urban local	Bowyer Street	40.1	37.1	37.1
Urban local	Charles Road	46.2	44.1	45.3
Urban local	Adelaide Street	41.6	36.2	40.8
Urban local	Hambledon Road	53.0	48.5	50.4
Urban local	Gilbertson Road	55.6	52.7	52.5
Urban local	Northcote Street	50.2	48.5	44.5
Urban local	Vincent Road	49.7	49.6	47.1
Urban local	Andrew Avenue	37.1	36.0	33.6
Urban local	Esplanade	44.3	42.1	38.5
Urban local	Olive Avenue	40.1	41.1	37.5
Urban local	Commercial Street	43.2	40.8	37.6
Urban local	Bermudez Crescent	48.6	46.4	48.4
Urban local	London Drive	44.0	40.7	38.5
Urban local	Farrell Street	36.3	36.5	35.7
Urban local	Main Street	52.8	50.7	47.8
Urban local	George Street	33.5	29.7	30.4
Urban local	Archer Street	45.0	44.9	43.0
Urban local	Coorara Avenue	57.7	52.1	51.9
Rural local	Conroe Drive	49.8	50.5	47.9
Rural local	Reginald Street	44.2	43.8	42.7
Rural local	Stratford Street	29.0	33.6	24.2
Rural local	Cedar Avenue	56.5	52.6	50.7
Rural local	Hobbs Street	31.1	31.6	32.0
Rural local	Fiedler Street	48.8	47.7	47.1
Rural local	Meander Avenue	36.3	40.8	39.0
Rural local	Bruce Road	63.1	57.7	56.2
Rural local	Parham Crescent	45.8	46.4	45.4
Rural local	Woodford Street	32.8	32.6	32.2
Rural local	Bowman Street	41.4	41.3	40.2
Rural local	Thomas Street	30.6	29.6	32.0

The overall mean free travelling speeds were calculated by taking the mean of all free travelling speeds measured on roads of the given road type in a given year (Table 2.10).

Table 2.10
Overall mean free travelling speeds by year

Road type	2002 mean free travelling speed (km/h)	2003 mean free travelling speed (km/h)	2005 mean free travelling speed (km/h)
Arterial*	58.50	57.78	56.21
Collector	54.33	52.56	50.80
Urban local	47.91	44.84	43.75
Rural local	49.67	48.50	46.93
All roads changed to 50 km/h	51.76	49.58	48.14

* Arterial roads retained a 60 km/h speed limit

The changes in overall mean free travelling speeds between the years for the given road types are shown in Table 2.11. Clear reductions in mean free travelling speeds are seen on all road types in the year following the introduction of the 50 km/h default limit. Smaller (given the two year gap), but continued, speed reductions were seen in the 2005 survey (although free travelling speed reductions per year for arterial roads seems relatively constant). Overall, the free travelling speed reductions observed when comparing 2005 to 2002 were relatively large, especially on roads where the speed limit was reduced.

Table 2.11
Overall relative reductions in mean free travelling speeds

Road type	Reduction in mean free travelling speed (km/h) in 2003 from 2002	Reduction in mean free travelling speed (km/h) in 2005 from 2003	Reduction in mean free travelling speed (km/h) in 2005 from 2002
Arterial*	0.72	1.57	2.29
Collector	1.77	1.76	3.53
Urban local	3.07	1.09	4.16
Rural local	1.17	1.57	2.74
All roads changed to 50 km/h	2.19	1.43	3.62

* Arterial roads retained a 60 km/h speed limit

The distributions of free travelling speeds from the 2002, 2003 and 2005 surveys are compared for each road type in Figures 2.8 to 2.11.

Figure 2.8
Distribution of free travelling speeds on arterial roads over time
(arterial roads retained a 60 km/h speed limit)

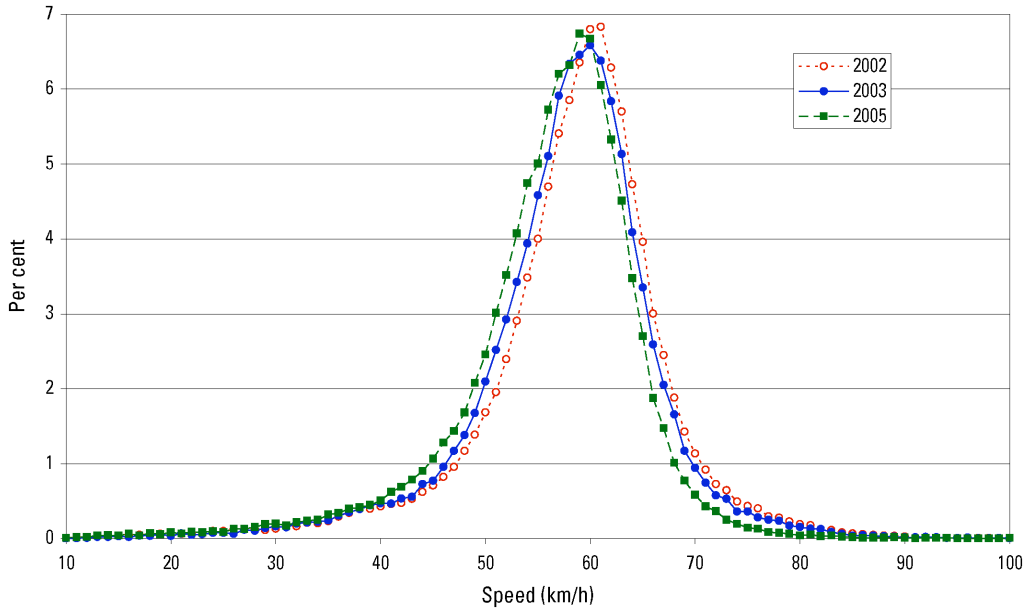


Figure 2.9
Distribution of free travelling speeds on collector roads over time

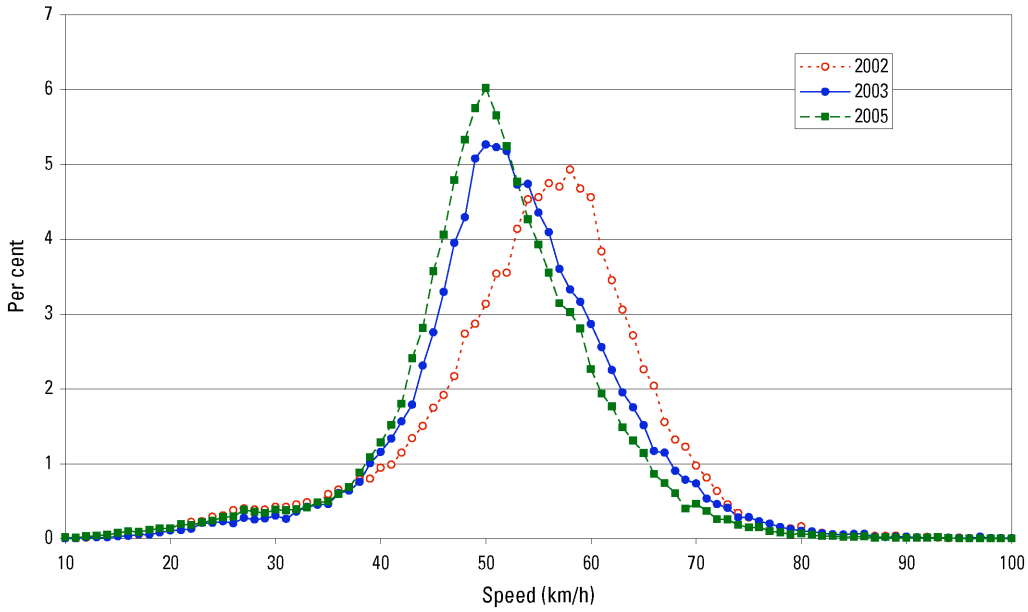


Figure 2.10
Distribution of free travelling speeds on urban local roads over time

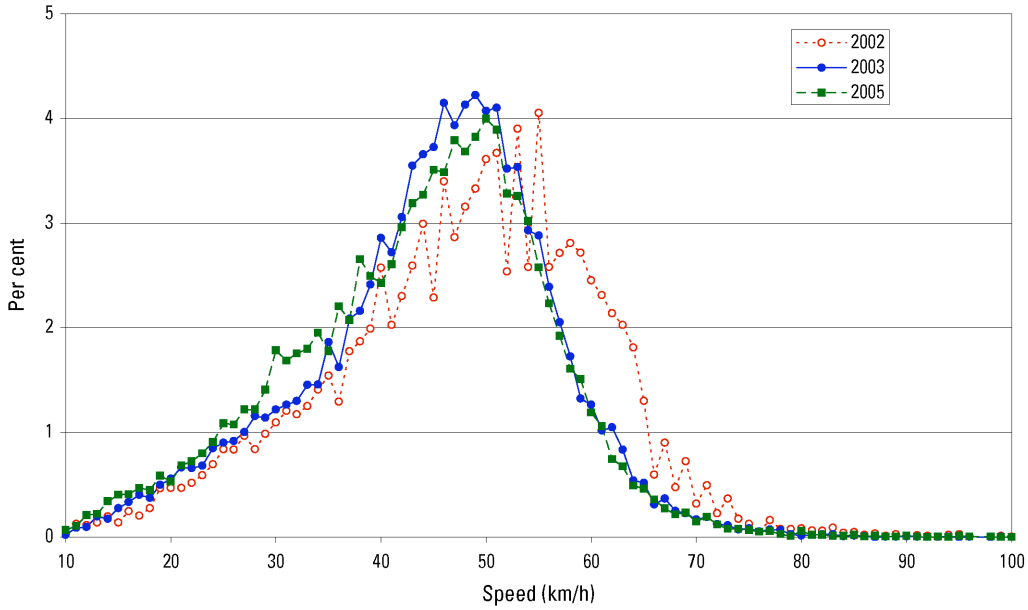
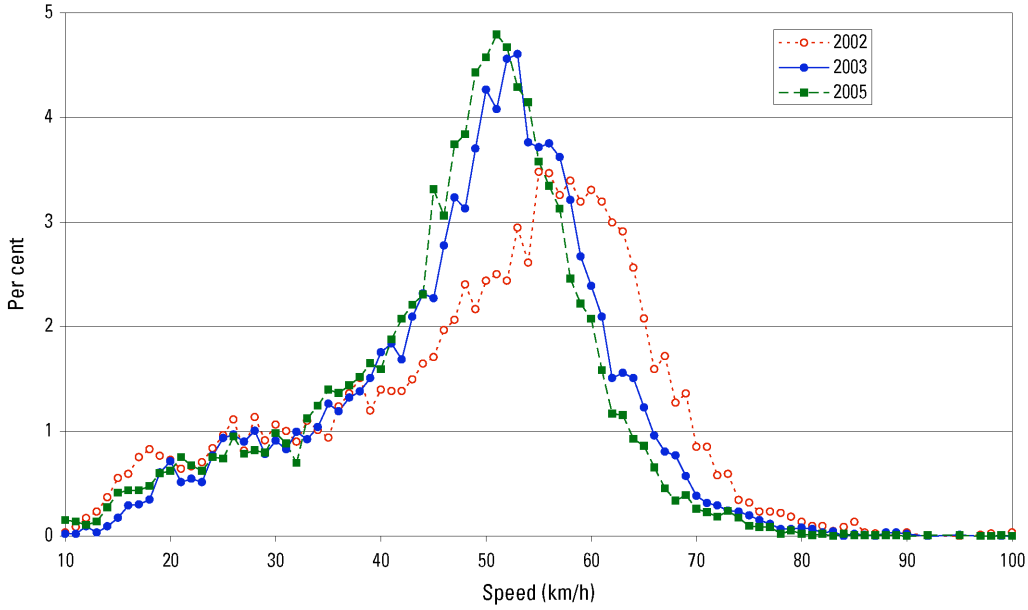


Figure 2.11
Distribution of free travelling speeds on rural local roads over time



The free travelling speed distributions for all road types can be seen to shift to the left over time.

However, it is not clear from these Figures what was happening at individual free travelling speeds. As described earlier in this Report, a method was developed to explore this further.

The change in free travelling speed for each individual km/h of speed are shown in: Figure 2.12 comparing 2003 with 2002; Figure 2.13 comparing 2005 with 2003; and Figure 2.14 comparing 2005 with 2002.

The resultant Figures are very similar to those for all vehicles speeds (Figures 2.5 to 2.7) and the same general observations apply.

Figure 2.12
Change in free travelling speed in 2003 by free travelling speed in 2002 on the different road types

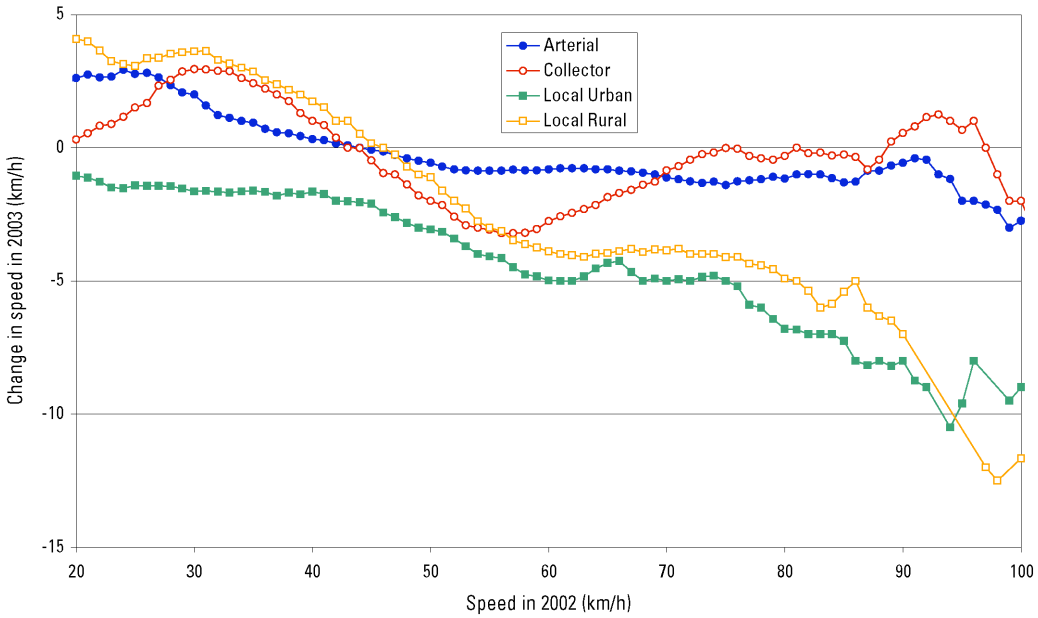


Figure 2.13
Change in free travelling speed in 2005 by free travelling speed in 2003 on the different road types

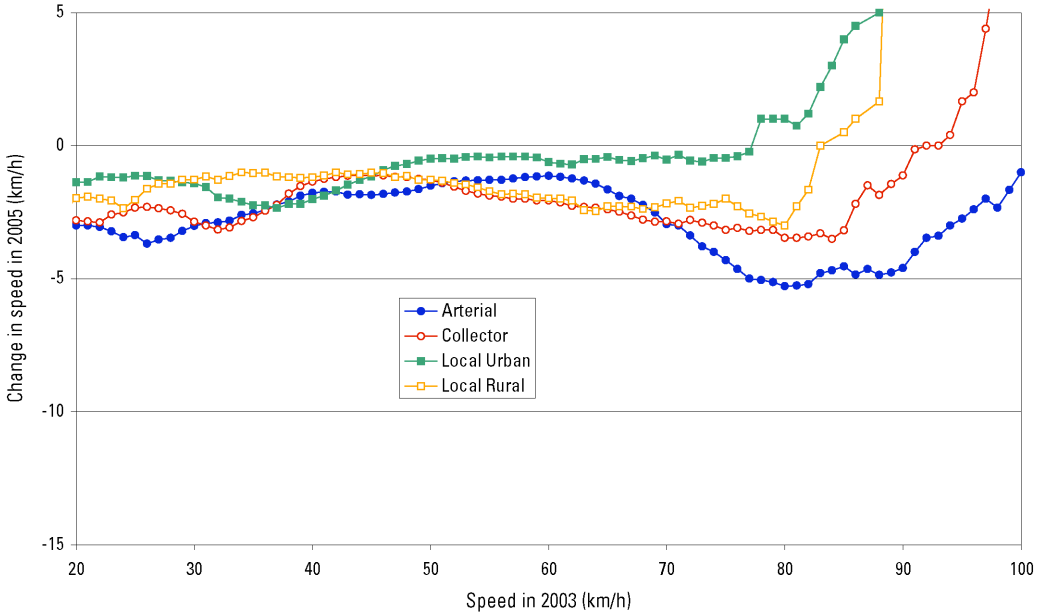
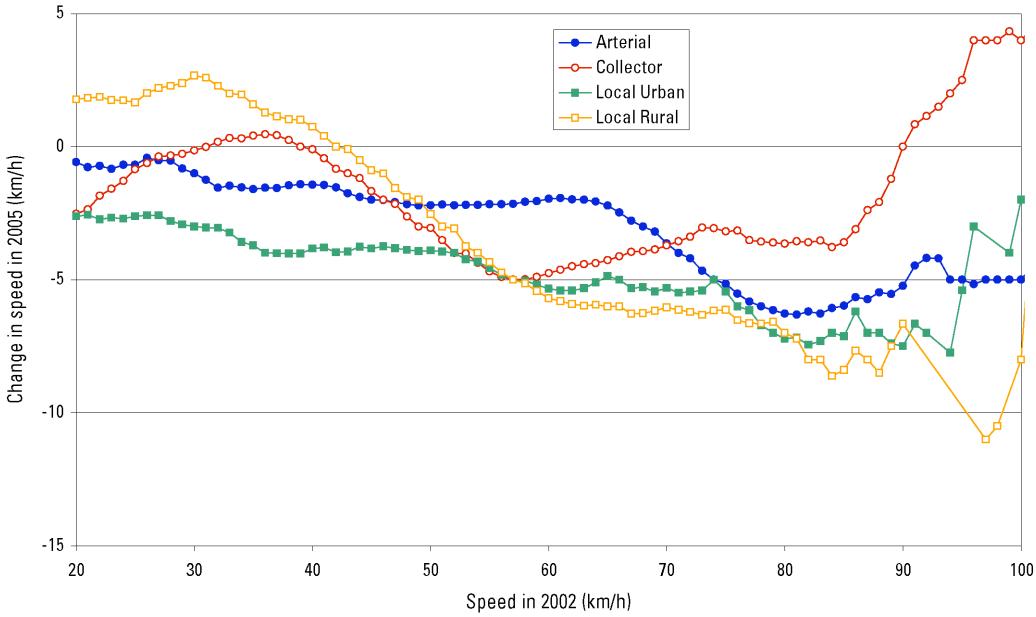


Figure 2.14
Change in free travelling speed in 2005 by free travelling speed in 2002 on the different road types



3 Changes in casualty and casualty crash numbers

This Section examines the changes in casualty and casualty crash numbers over time both on roads that had their speed limit reduced from 60 km/h to 50 km/h and on roads that remained at 60 km/h.

3.1 Methodology

Casualty crashes in South Australia are recorded by the police on a per report basis in their vehicle collision computer database system. This data is then further processed by the Department for Transport, Energy and Infrastructure (DTEI) into the traffic accident reporting system database (TARS). A copy of this database current as at November 2006 for the time period March 1994 to February 2006 was analysed for this Report.

In order to analyse the crash numbers over time on roads that changed from 60 km/h to 50 km/h for the previous evaluation it was necessary to identify those roads as coded by the TARS database. Since no such identification existed, it was necessary to obtain lists of roads remaining at 60 km/h from DTEI and local councils and to create a list of 60 km/h roads that did not change, along with their TARS road number.

The following logic was used to classify crashes as being on one of three road types: those roads that changed from 60 to 50 km/h; those roads that remained at 60; or those roads with some other limit:

- If the police-recorded speed limit was 50 or 60 km/h and the crash occurred on a road on our list of 60 roads or at an intersection where at least one of the roads was on our list of 60 roads then the crash was classified as being on a road that remained at 60
- If the police-recorded speed limit was 50 or 60 km/h and the crash occurred on a road not on our list of 60 roads or at an intersection where neither of the roads was on our list of 60 roads then the crash was classified as being on a road that changed from 60 to 50
- In all other cases the crash was classified as being on an "other limit" road
- In addition, in all cases where the crash was recorded as happening in a car park, it was classified as being on an "other limit" road even if it matched the above criteria.

While this was not an infallible method for classifying the crashes, it was the best method we could use given the available data and should approximate the real situation very closely.

This same process was used in the current analysis. The few roads that had changed speed limit since the initial evaluation were not taken into account due to the difficulty in identifying them, the problem of how to treat them and ultimately the very small effect they would have on the results.

3.2 Casualty crashes on roads going from 60 km/h to 50 km/h

Since the 50 km/h default limit was introduced on 1 March 2003, casualty crash numbers from March in a given year to February in the following year inclusive were compared for given years ranging from 1994 to 2005.

Figure 3.1 shows the number of casualty crashes (March to December for that year plus the January to February numbers for the following year) for 1994-2005 on the set of roads that had their speed limit reduced from 60 km/h to 50 km/h on 1 March 2003. A slight upward trend is apparent until 2002 with a big reduction in the year after the change of speed limit and continued smaller reductions after that.

Figure 3.1
Number of casualty crashes (March to December for the given year plus the January to February numbers for the following year) on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003 by year (source: TARS data)

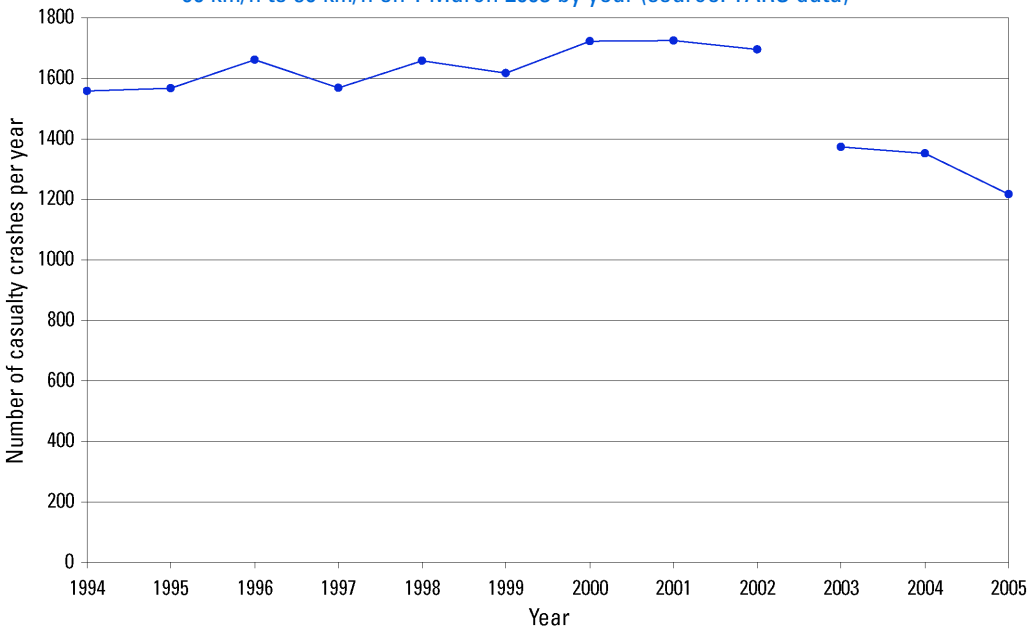


Figure 3.2 shows the number of casualties (people injured in road crashes) over the same time period and using the same methods as for Figure 3.1. The results are, not surprisingly, of a very similar form to casualty crashes.

Figure 3.2
Number of casualties (March to December for the given year plus the January to February numbers for the following year) on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003 by year (source: TARS data)

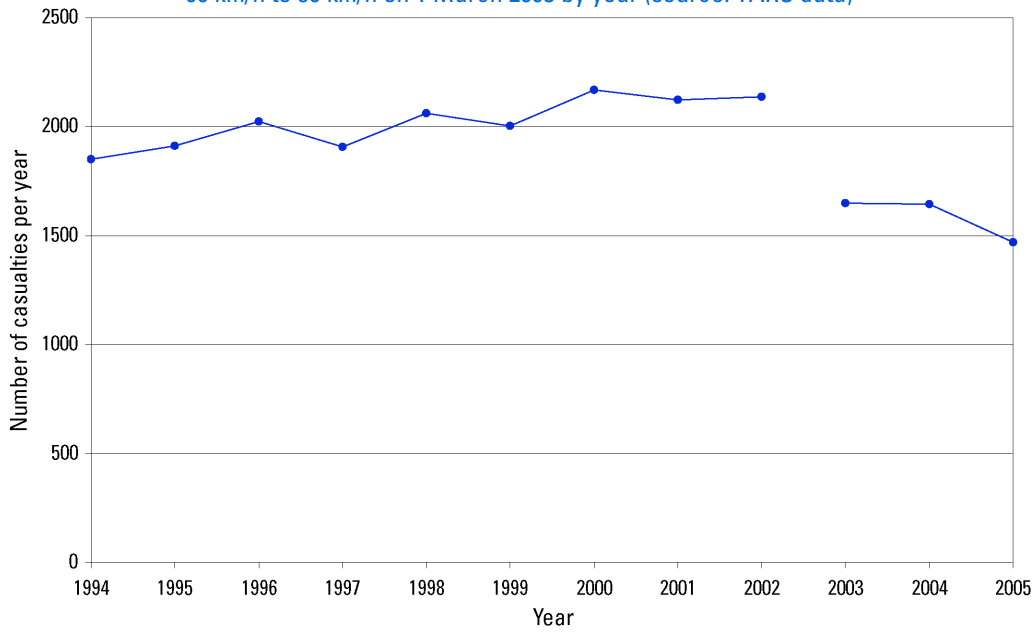


Table 3.1 breaks down the number of casualty crashes by the injury severity of the most severely injured person involved in the crash, as indicted mainly by the type of treatment, for three years before the change in speed limit compared to three years after. The number of cases in each category of injury severity fell by a statistically significant amount after the speed limit was reduced (as indicated by the 95% confidence intervals not including zero).

Table 3.1
Number of casualty crashes on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003 by crash severity and time period (source: TARS data)

Crash injury severity	Mar 2000 - Feb 2003 60 km/h limit	Mar 2003 - Feb 2006 50 km/h limit	Per cent reduction	95% confidence limits of % reduction
Private doctor	1686	1255	25.6	19.3, 31.9
Hospital treated	2659	2053	22.8	17.7, 27.9
Hospital admitted	759	610	19.6	10.1, 29.2
Fatal	40	24	40.0	0.8, 79.2
Total casualty crashes	5144	3942	23.4	19.7, 27.0

Table 3.2 examines casualty numbers by the severity of the injury to the casualty and compares the three years after the default speed limit was reduced to the three years before. The number of cases in all levels of injury severity fell after the speed limit was reduced and all groups apart from fatals showed statistically significant reductions (as indicated by the 95% confidence interval not including zero). The percentage reduction in the overall number of casualties (25.9%) was greater than for the corresponding percentage reduction in the overall number of casualty crashes indicating that, on average, fewer people were as severely injured per crash following the speed limit reduction.

Table 3.2
Number of casualties on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003 by casualty severity and time period (source: TARS data)

Casualty severity	Mar 2000 - Feb 2003 60 km/h limit	Mar 2003 - Feb 2006 50 km/h limit	Per cent reduction	95% confidence limits of % reduction
Private doctor	2012	1441	28.4	22.7, 34.1
Hospital treated	3485	2612	25.1	20.7, 29.4
Hospital admitted	891	683	23.3	14.6, 32.1
Fatal	41	26	36.6	-2.5, 75.7
Total casualties	6429	4762	25.9	22.7, 29.2

The average reductions in casualty crashes and casualties per year comparing the three year period after the default limit was introduced to the three year period before are presented in Table 3.3.

Table 3.3
Average yearly reductions on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003

Measure	Average reduction per year
Total number of casualty crashes	401
Number of private doctor crashes	144
Number of hospital treatment crashes	202
Number of hospital admission crashes	50
Number of fatal crashes	5
Total number of casualties	556
Number of private doctor casualties	190
Number of hospital treated casualties	291
Number of hospital admissions	69
Number of fatalities	5

The observed reductions in casualties were then converted into a dollar saving to the South Australian community using the Bureau of Transport Economics (2000) human capital method updated to 2004 dollars (Australian Bureau of Statistics, 2004). The results are shown in Table 3.4.

Table 3.4
Casualty dollar savings on those South Australian roads where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003

Casualty severity	Number of casualties saved in first 3 years	Cost per casualty in 2004 dollars	Total savings
Minor casualties	1444	$14,434	$20,842,696
Serious casualties	208	$390,922	$81,311,776
Fatalities	15	$1,804,257	$27,063,855
Total	1667		$129,218,327
Savings per year			$43,072,776

The Bureau of Transport Economics method takes into account the following costs: lost labour in the workplace, household and community; hospital and other medical; long term care; legal; workplace disruption; vehicle damage; emergency services; property damage; travel delays; and quality of life. While the quality of life factor does try to capture some of the intangible costs of injuries and deaths, it does so only partially. Willingness-to-pay methods, which attempt to include all intangible costs, typically give somewhat higher costs for injuries and double or triple the cost for a fatality. Some aspects of the willingness-to-pay method are used by all transport agencies of the United States Government, including the National Highway Traffic Safety Administration.

Table 3.5 shows the crash types and compares the three years after the default limit was reduced to the three years before. All crash types except "other" showed reductions with several of them being statistically significant in their own right. It is interesting to note that the three crash types with the largest reductions all involve the detection of other vehicles and judgements about their speeds.

Table 3.5
Number of casualty crashes on those South Australian roads
where the speed limit was reduced from 60 km/h to 50 km/h on 1 March 2003
by type of crash and time period (source: TARS data)

Crash type	Mar 2000 - Feb 2003 60 km/h limit	Mar 2003 - Feb 2006 50 km/h limit	Per cent reduction	Statistical significance*
Right turn	322	180	44.1	significant
Right angle	1346	926	31.2	significant
Rear end	928	647	30.3	significant
Left road - out of control	31	23	25.8	-
Hit parked vehicle	272	205	24.6	significant
Hit object on road	14	11	21.4	-
Hit pedestrian	573	455	20.6	significant
Side swipe	349	291	16.6	significant
Head on	155	135	12.9	-
Hit animal	8	7	12.5	-
Roll over	141	126	10.6	-
Hit fixed object	921	852	7.5	-
Other	84	84	0.0	-
Total	5144	3942	23.4	significant

* $p < 0.05$

3.3 Casualty crashes on roads remaining at 60 km/h

Since the 50 km/h default limit was introduced on 1 March 2003, casualty crash numbers from March in a given year to February in the following year inclusive were compared for given years ranging from 1994 to 2005.

Figure 3.3 shows the number of casualty crashes (March to December for that year plus the January to February numbers for the following year) for 1994-2005 on the set of roads that remained at 60 km/h on 1 March 2003. An upward trend is apparent from 1997 to 2001 with a continuing reduction from 2002 onwards.

Figure 3.3
Number of casualty crashes (March to December for the given year plus the January to February numbers for the following year) on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003 by year (source: TARS data)

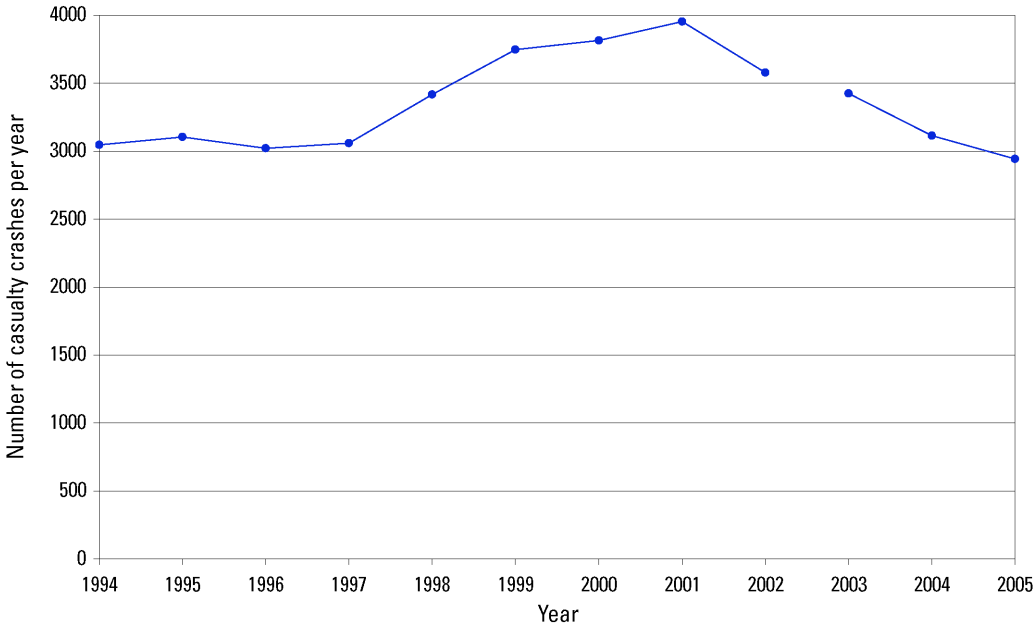
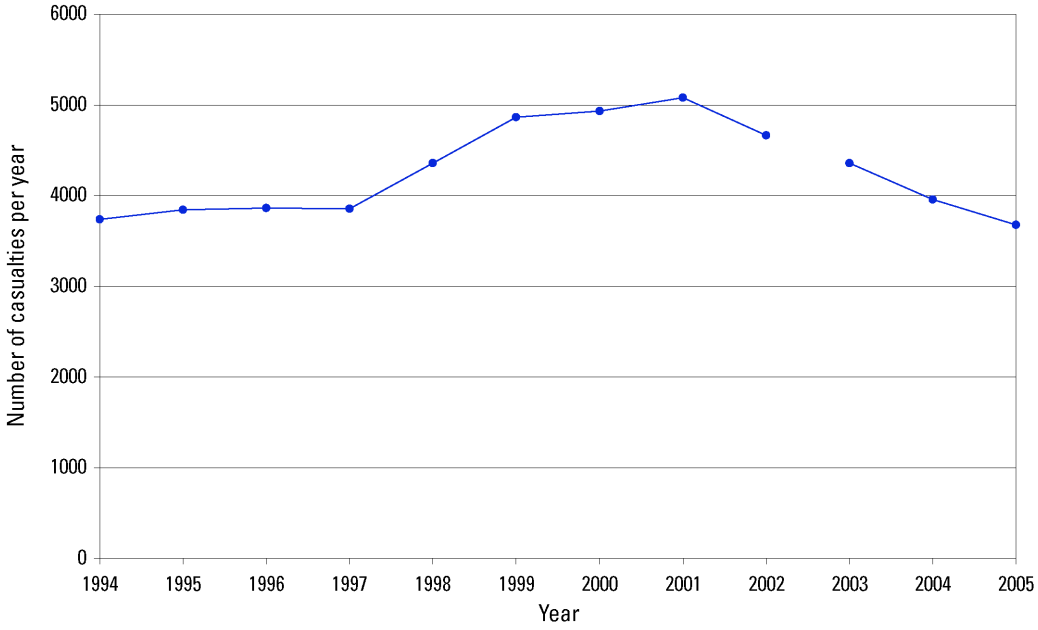


Figure 3.4 shows the number of casualties (people injured in road crashes) over the same time period and using the same methods as for Figure 3.3. The results are, not surprisingly, of a very similar form to casualty crashes.

Figure 3.4
Number of casualties (March to December for the given year plus the January to February numbers for the following year) on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003 by year (source: TARS data)



It is not clear why there was a reduction from 2001 to 2002. It may have been due to lower speeds on main roads due to publicity surrounding the impending reduction in the default 50 km/h speed limit but we have not direct data to back this up.

Table 3.6 breaks down the number of casualty crashes by the injury severity of the most severely injured person involved in the crash and compares the three years after the default 50 km/h limit was introduced to the three years before. The number of cases in each category of injury severity, except fatals, fell by a statistically significant amount after the default 50 km/h limit was introduced (as indicated by the 95% confidence intervals not including zero).

Table 3.6
Number of casualty crashes on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003 by crash severity and time period (source: TARS data)

Crash injury severity	Mar 2000 - Feb 2003	Mar 2003 - Feb 2006	Per cent reduction	95% confidence limits of % reduction
Private doctor	4885	3959	19.0	15.2, 22.7
Hospital treated	5158	4471	13.3	9.6, 17.0
Hospital admitted	1199	962	19.8	12.2, 27.4
Fatal	110	93	15.5	-9.9, 40.8
Total casualty crashes	11352	9485	16.4	14.0, 18.9

Table 3.7 examines casualty numbers by the severity of the injury to the casualty and compares the three years after the default 50 km/h limit was introduced to the three years before. The number of cases in all levels of injury severity fell after the speed limit was reduced and all groups apart from fatals showed statistically significant reductions (as indicated by the 95% confidence interval not including zero). The percentage reduction in the overall number of casualties (18.3%) was greater than for the corresponding percentage reduction in the overall number of casualty crashes indicating that, on average, fewer people were as severely injured per crash following the introduction of the default 50 km/h limit.

Table 3.7
Number of casualties on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003 by casualty severity and time period (source: TARS data)

Casualty severity	Mar 2000 - Feb 2003	Mar 2003 - Feb 2006	Per cent reduction	95% confidence limits of % reduction
Private doctor	5937	4733	20.3	16.9, 23.7
Hospital treated	7138	6009	15.8	12.7, 19.0
Hospital admitted	1486	1157	22.1	15.4, 28.9
Fatal	120	97	19.2	-4.9, 43.2
Total casualties	14681	11996	18.3	16.1, 20.5

The average reductions in casualty crashes and casualties per year comparing the three year period after the default 50 km/h limit was introduced to the three year period before are presented in Table 3.8.

Table 3.8
Average yearly reductions on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003

Measure	Average reduction per year
Total number of casualty crashes	622
Number of private doctor crashes	309
Number of hospital treatment crashes	229
Number of hospital admission crashes	79
Number of fatal crashes	6
Total number of casualties	895
Number of private doctor casualties	401
Number of hospital treated casualties	376
Number of hospital admissions	110
Number of fatalities	8

The observed reductions in casualties were then converted into a dollar saving to the South Australian community using the Bureau of Transport Economics (2000) human capital method updated to 2004 dollars (Australian Bureau of Statistics, 2004). The results are shown in Table 3.9.

Table 3.9
Casualty dollar savings on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003

Casualty severity	Number of casualties saved in first 3 years	Cost per casualty in 2004 dollars	Total savings
Minor casualties	2333	$14,434	$33,674,522
Serious casualties	329	$390,922	$128,613,338
Fatalities	23	$1,804,257	$41,497,911
Total	2685		$203,785,771
Savings per year			$67,928,590

As noted above, the Bureau of Transport Economics method takes into account the following costs: lost labour in the workplace, household and community; hospital and other medical; long term care; legal; workplace disruption; vehicle damage; emergency services; property damage; travel delays; and quality of life. Willingness-to-pay methods, which attempt to include all intangible costs, typically give somewhat higher costs for injuries and double or triple the cost for a fatality.

Table 3.10 shows the crash types and compares the three years after the default 50 km/h limit was introduced to the three years before. All crash types except "other" and "hit object on road" showed reductions with a number being statistically significant in their own right.

Table 3.10
Number of casualty crashes on those South Australian roads where the speed limit remained at 60 km/h on 1 March 2003 by type of crash and time period (source: TARS data)

Crash type	Mar 2000 - Feb 2003 60 km/h limit	Mar 2003 - Feb 2006 50 km/h limit	Per cent reduction*	Statistical significance**
Hit animal	9	3	66.7	-
Left road - out of control	29	13	55.2	significant
Hit parked vehicle	272	192	29.4	significant
Rear end	4849	3882	19.9	significant
Side swipe	687	553	19.5	significant
Hit pedestrian	657	540	17.8	significant
Right angle	2147	1836	14.5	significant
Right turn	1380	1186	14.1	significant
Roll over	129	118	8.5	-
Head on	190	179	5.8	-
Hit fixed object	929	891	4.1	-
Other	65	79	-21.5	-
Hit object on road	9	13	-44.4	-
Total	11352	9485	16.4	significant

* negative reduction means that crash type increased

** $p < 0.05$

4 Discussion

4.1 Reductions on roads going from 60 km/h to 50 km/h

4.1.1 Speed reductions

The average speed of vehicles on roads where the speed limit was reduced from 60 km/h to 50 km/h was observed to drop by 2.3 km/h from just before the introduction of the default 50 km/h speed limit to a year later and by a further 1.5 km/h two years after that.

One possible factor for lower vehicle speeds unrelated to the default 50 km/h speed limit is greater traffic congestion leading to lower average vehicle speeds. Indeed a 5.0 per cent increase in traffic volume was observed on these roads in 2003 compared to 2002 along with a corresponding reduction from 88.7 to 86.0 in the percentage of vehicles travelling at a free speed (ie those vehicles with a four second or greater gap to the vehicle in front of them).

However, analysis of just the free speed vehicles from these surveys found a 2.2 km/h drop in average vehicle free speed. The closeness of this figure to that for all vehicles along with the relatively high percentage of vehicles travelling at free speeds on these roads suggests that the great majority of reduction in vehicle speeds can be attributed to changed driver behaviour as opposed to increased traffic congestion.

Comparing 2005 with 2003 indicated that traffic volume increased again but only by 0.7 per cent and the percentage of vehicles travelling at a free speed increased to 89.6 per cent. Analysis of just the free speed vehicles from these surveys found a 1.4 km/h drop in average vehicle free speed which is slightly less than that for all vehicles.

Unfortunately, historical data is not available to indicate any underlying trends in vehicle speeds on these roads so we cannot ascertain if speeds were trending down before the default 50 km/h speed limit was introduced nor how speeds changed between the three surveys.

Evaluations in other Australian states where the default 50 km/h speed limit was introduced also found similar initial reductions in vehicle speeds (Kidd, Radalj, 2003; Green, Gunatillake, Styles, 2003; RTA, 2000).

Overall, it appears reasonable to attribute the observed speed reductions primarily to the introduction of the default 50 km/h speed limit with a relatively large initial effect and smaller ongoing speed reductions.

4.1.2 Casualty crash reductions

The number of casualty crashes on roads where the speed limit was reduced from 60 km/h to 50 km/h decreased by 23.4 per cent in the three years after the introduction of the default 50 km/h speed limit compared to the three years before. The 95 per cent confidence limits on this percentage reduction were 19.7 and 27.0 per cent indicating that it was extremely unlikely to have occurred due to chance alone and that the likely real effect is greater than 20 per cent.

The annual number of casualty crashes in the nine years preceding the speed limit being reduced from 60 km/h to 50 km/h shows little variation and a slight upward trend. There is a considerable drop in the first year after the speed limit was reduced from 60 km/h to 50 km/h and some indication of a downward trend thereafter.

We are not aware of any factors other than the reduction in speed limit that could be expected to have changed casualty crash frequency on these roads around the time of the introduction of the default 50 km/h speed limit.

There are also sound physical (ie: stopping distance and crash energy both increase with the square of speed) and epidemiological (eg: Kloeden, McLean, Glonek, 2002) reasons for believing that small reductions in vehicle speeds will lead to large reductions in casualty crash frequency.

Furthermore, evaluations in other Australian states where the default 50 km/h speed limit has been introduced also found similar initial reductions in casualty crash numbers as well as in vehicle travelling speeds (Kidd, Radalj, 2003; Green, Gunatillake, Styles, 2003; RTA, 2000; Newstead, Hoareau, Cameron, 2002).

It therefore also appears reasonable to attribute the observed casualty crash reductions primarily to the speed reductions following the introduction of the default 50 km/h speed limit.

The hypothesis that the change in the default limit caused drivers to reduce their speeds, which in turn caused a reduction in casualty crash numbers, is thus strongly supported.

The casualty cost savings on the 1,667 casualties apparently avoided in the first three years by the reduction of speeds from 60 km/h to 50 km/h on these roads is estimated to be around $129 million.

4.2 Reductions on roads remaining at 60 km/h

4.2.1 Speed reductions

The average speed of vehicles on roads where the speed limit remained at 60 km/h was observed to drop by 0.9 km/h from just before the introduction of the default 50 km/h speed limit to a year later and by a further 1.2 km/h two years after that.

This is curious given that the speed limit on these roads did not change but this has been observed in other Australian states and territories (Kidd, Radalj, 2003; Green, Gunatillake, Styles, 2003) and may be related to a general higher awareness of speed and speed limits surrounding the introduction of the default 50 km/h speed limit.

Greater traffic congestion leading to lower average vehicle speeds may also play a role. A 2.8 per cent increase in traffic volume was observed on these roads in 2003 compared to 2002 along with a corresponding reduction from 49.5 to 48.1 in the percentage of vehicles travelling at a free speed (4 second or greater headway).

Analysis of just the free speed vehicles from these surveys found a 0.7 km/h drop in average vehicle free speed. The relatively large reduction in this figure from that for all vehicles, along with the relatively low percentage of vehicles travelling at free speeds on these roads, suggests that the lowering of all vehicle speeds can be attributed to both increased traffic congestion and changed driver behaviour.

However, comparing 2005 with 2003 indicated that traffic volume decreased by 2.3 per cent and the percentage of vehicles travelling at a free speed increased back to 49.5 per cent. Analysis of just the free speed vehicles from these surveys found a 1.6 km/h drop in average vehicle free speed which is greater than that for all vehicles.

Unfortunately, historical data is not available to indicate any underlying trends in vehicle speeds on these roads so we cannot ascertain if speeds were trending down before the default 50 km/h speed limit was introduced nor how speeds changed between the surveys. Nevertheless, it appears reasonable to attribute some of the observed speed reductions directly to a behavioural side effect of the introduction of the default 50 km/h speed limit.

4.2.2 Casualty crash reductions

The number of casualty crashes on roads where the speed limit remained at 60 km/h decreased by 16.4 per cent in the three years after the introduction of the default 50 km/h speed limit compared to the three years before. The 95 per cent confidence limits on this percentage were 14.0 and 18.9 indicating that a reduction of the observed size was extremely unlikely to have occurred by chance alone.

The annual number of casualty crashes in the nine years preceding the speed limit being reduced from 60 km/h to 50 km/h shows an upward trend from 1997 to 2001 and a trend downward thereafter.

The lack of historical speed data prevents us from determining if the observed downward trend in casualty crashes was associated with a continuing reduction in vehicle speeds. However, we are not aware of any factors other than speed reductions that could be expected to have contributed substantially to the observed reduction in casualty crash frequency on these roads.

The sound physical and epidemiological evidence for believing that small reductions in vehicle speeds will lead to large reductions in casualty crash frequency is consistent with the reduction in casualty crashes being due primarily to lower vehicle speeds.

So, while the size and context of the observed reduction in vehicle speeds and casualty crash numbers on roads that remained at 60 km/h make any conclusions tentative, it does seem reasonable to conclude that at least some of the observed reductions were due to a positive side effect of the default 50 km/h speed limit.

Acknowledgements

This study was funded by the South Australian Department for Transport, Energy and Infrastructure (DTEI) through a Project Grant to the Centre for Automotive Safety Research. The DTEI Project Manager was Colin Anderson.

The Centre for Automotive Safety Research receives core funding from both DTEI and the South Australian Motor Accident Commission.

The views expressed in this report are those of the authors and do not necessarily represent those of the University of Adelaide or the sponsoring organisations.

References

Australian Bureau of Statistics. 2004. Consumer Price Index, Australia (ABS Catalogue No. 6401.0). Canberra, ACT: Australian Bureau of Statistics.

Bureau of Transport Economics. 2000. Road Crash Costs in Australia (Report 102). Canberra, ACT: Bureau of Transport Economics.

Green F, Gunatillake T, Styles T. 2003. Evaluation of the 50km/h residential speed limit in the ACT. Report prepared for the Department of Urban Services by ARRB Transport Research, Report RC 1847.

Kidd B, Radalj T. 2003. Post 50km/h implementation driver speed compliance WA experience in the metropolitan area. Proceedings of the 2003 Road safety research, policing and education conference, from research to action, 24 to 26 September 2003, Sydney, New South Wales, Vol 1 peer reviewed papers, pp156-163.

Kloeden CN, McLean AJ, Glonek G. 2002. Reanalysis of travelling speed and the risk of crash involvement in Adelaide South Australia. CR 207. Federal Office of Road Safety. Canberra, Australia.

Kloeden CN, Woolley JE, McLean AJ. 2004. Evaluation of the South Australian default 50 km/h speed limit. Adelaide: Centre for Automotive Safety Research (CASR005).

Newstead S, Hoareau E, Cameron M. 2002. Evaluation of 50 km/h Speed Limits in Victoria - Summary of interim analysis of all crashes and crashes involving pedestrians. Monash University Accident Research Centre, March 2002.

RTA. 2000. 50km/h Urban Speed Limit Evaluation - Summary Report. Roads and Traffic Authority, Sydney, September.