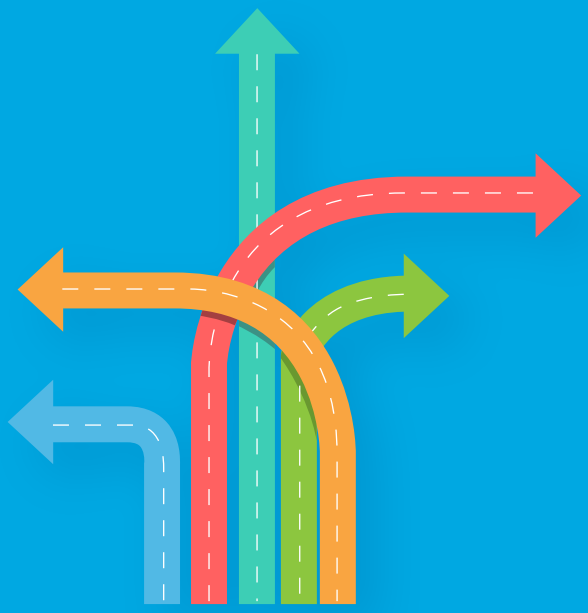
GOVERNMENT OF WESTERN AUSTRALIA

ROAD SAFETY COUNCIL

mainroads WESTERN AUSTRALIA



Trends In Driver Speed Behaviours On Rural Road Network

2000 To 2018

Syeda Sultana

March 2019

Title
Trends in Driver Speed Behaviours on Western Australian Rural Road Network 2000 to 2018

Author
Sultana S.

Performing Organisations
Road Safety Commission
151 Royal Street
EAST PERTH WA 6892

Main Roads Western Australia
Don Aitken Centre
Waterloo Crescent
EAST PERTH WA 6004

Funding Organisations
Road Safety Commission Western Australia

Abstract
Thirteen annual speed surveys were conducted in the non-metropolitan areas during the period between 2000 and 2018 to measure driver speed compliance across the network of speed limit roads ranging from 60 km/h to 110 km/h. The 2000 survey was used as the baseline year for the comparisons with all subsequent surveys from which road safety and speed performance indicators were derived as measures of driver speed behaviours over the time.

The principal objective of the surveys was to measure changes in driver speed behaviours at general locations of the road network over time and to relate those changes to the effectiveness of various speed related road safety programs implemented in the state.

In each of the twelve surveys conducted in the years 2003 to 2018 attempts were made to survey all of the sites chosen in the stratified random sample of 95 sites in the baseline 2000 survey. In all surveys, seven-day speed data was collected at each site in the sample of roads chosen across the rural network. Each of the surveys resulted in over 1 million vehicles travelling in traffic free-flowing environments.

Effectiveness of speed road safety programmes is estimated in terms of changes in speed compliance rates, proportion of drivers exceeding 10 or more km/h above the speed limit, 85th percentile and mean speeds.

The study found that under free-flowing condition over the rural network of all speed limits (excluding 50 km/h roads) in 2000, 60.6% of all vehicles travelled at or below posted speed limits. The compliance rate rose to 71.1% in 2009, 10.5% higher than in the 2000 baseline survey, followed by a further 1% increase to 72.1% in 2018, equating to approximately average annual increase of 1% since 2000

Similarly, the number of drivers travelling at high speeds, within presumed tolerance level of 10 km/h above the speed limit, decreased from 8.6% in 2000 to the average of 5.8% over the period 2003 to 2008. The trend in the reduction in the number of speeding drivers continued to the average of 5.1% over the period 2009 to 2013,

followed by some annual variations since 2013 to 4.2% in the 2018 speed survey. The number of speeding drivers recorded in 2018 was 51% less than in 2000, representing a very significant positive change in driver speed behaviours over the monitoring period.

Analysis by speed limits suggested that the poorest compliance to the speed limit in 2000 was observed on 60 km/h roads, at 48.3%, however by 2018 this compliance had increased by 24.3% to 72.6%. The compliance rate on the 70 km/h and 80 km/h roads increased over the period by 7.4% and 8.0% to 74.4% and 69.9%, respectively in 2018.

The higher speed limit roads, 90 km/h and 100 km/h, also experienced a substantial increase in the average compliance rate of 15.4%, to 71.2%, representing 28% increase in the number of drivers complying to the speed limit. The compliance rate on the 110 km/h roads showed some variability between the survey years with the average of 68.6%.

In general, drivers are more likely to travel at excessive speed during the night hours, from 7 p.m. to 7 a.m. In all surveys the least number of speeding drivers were recorded between 8 a.m. and 1 p.m., approximately 3% in 2018.

In 2018, the best speed limit compliance was found to be on week days, Monday to Friday (average 72.7%) and the least on weekends (average 70.5%).

Similarly, over most of the surveys Sunday, followed by Saturday were found to be the days with the highest percentage of drivers exceeding 10 or more km/h above the speed limit, however, these proportions significantly decreased from 2000 to 2018, from approximately 8.8% to 4.7% on average, although higher than the week day average of 4.0%.

The best performing regions over the survey years are the Mid West-Gascoyne, Great Southern and South West where the number of speeding drivers was less than 5%, whereas the worst performing regions were the Wheatbelt, Goldfields-Esperance and Pilbara, over 6%.

The results obtained from the speed data analysis in the surveys 2000 to 2018 suggest that speed enforcement strategies should incorporate consideration of differences in driver speed behaviours associated with road type, speed limit, regional and temporal factors.

TABLE OF CONTENTS

FORWARD

Iain Cameron
Chairman, Road Safety Council

Road crashes are a serious problem in rural, regional and remote Western Australia (WA), with about 61% of our crashes occurring outside the Perth metropolitan area.

A number of factors contribute to higher fatality rates in the regions, such as the consequences of crashing at higher speeds and the time it takes for medical care to arrive at a crash scene.

If regional WA had the same fatality rate as metropolitan Perth, 84 fewer people would have died on WA roads in 2018.

This report is the latest publication in series of speed surveys, which analysed data dating back to 2000, and is an important tool in understanding the effectiveness of speed related road safety programs across WA.

The results show a significant, positive change in driver speed behaviours, and when read in conjunction with our recently published paper on speed survey trends in the Perth metropolitan area, provide a fuller understanding of the speed issue.

Both support our work to further reduce dangerous driving behaviours in WA.

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES

EXECUTIVE SUMMARY

Thirteen annual speed surveys on the non-metropolitan road network have been conducted from 2000 to 2018 inclusive during the period between March and June or September to November to measure driver speed compliance. The 2000 survey was used as the baseline for comparisons against all future surveys from which road safety and speed performance indicators would be derived on annual basis in order to monitor driver speed behaviours at the road network.

The principal objective of the surveys is to measure changes in driver speed behaviours at general locations of the road network over time. Changes in driver speed behaviours are used as measures of effectiveness of speed enforcement programs and other road safety initiatives undertaken from time to time in order to slow vehicle speeds and improve safety of all road users across the entire rural road network.

The aims of the surveys are to monitor:

(1) driver speed behaviours at general locations on the road network; and

(2) changes in driver speed behaviours with respect to legal speed limits, road functionality, regional differences and traffic volumes.

A stratified random sample chosen for the 2000 baseline survey consisted of 95 sites across the rural road network, including National Highways, State Roads and Local Roads. Due to some changes in speed limits, road geometry, or road treatments over time, some of the sites were excluded in the subsequent surveys and the data analysis to maintain consistency in speed limits and road environments that otherwise could have affected the reliability of the speed indices between the surveys. The sample size in the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 survey consisted of 111, 126, 99, 122, 120, 113 and 185 sites, respectively. The sample sizes were larger than the sample sizes in the previous surveys mainly due to the introduction of the speed survey on the 50 km/h Local roads, comprised of 27, 28, 27, 31, 29, 29 and 39 sites, respectively, selected from the roads within the regional centres.
Sample sizes by the strata were based on regional and road type vehicle-kilometres-travelled estimates.

Traffic volume, speed and vehicle composition data was collected using vehicle classifiers.

Seven-day rural areas surveys resulted in excess of one million vehicles, ranging from 1.16 million in 2003 to 3.26 million in 2018, of which over one million in each of the survey years were considered to have travelled with "free" speeds (headway >= 4 sec).

The findings of this study are based only on data obtained on vehicles travelling under the free flowing traffic conditions.

(A) Compliance to Speed Limit on Rural Roads Network

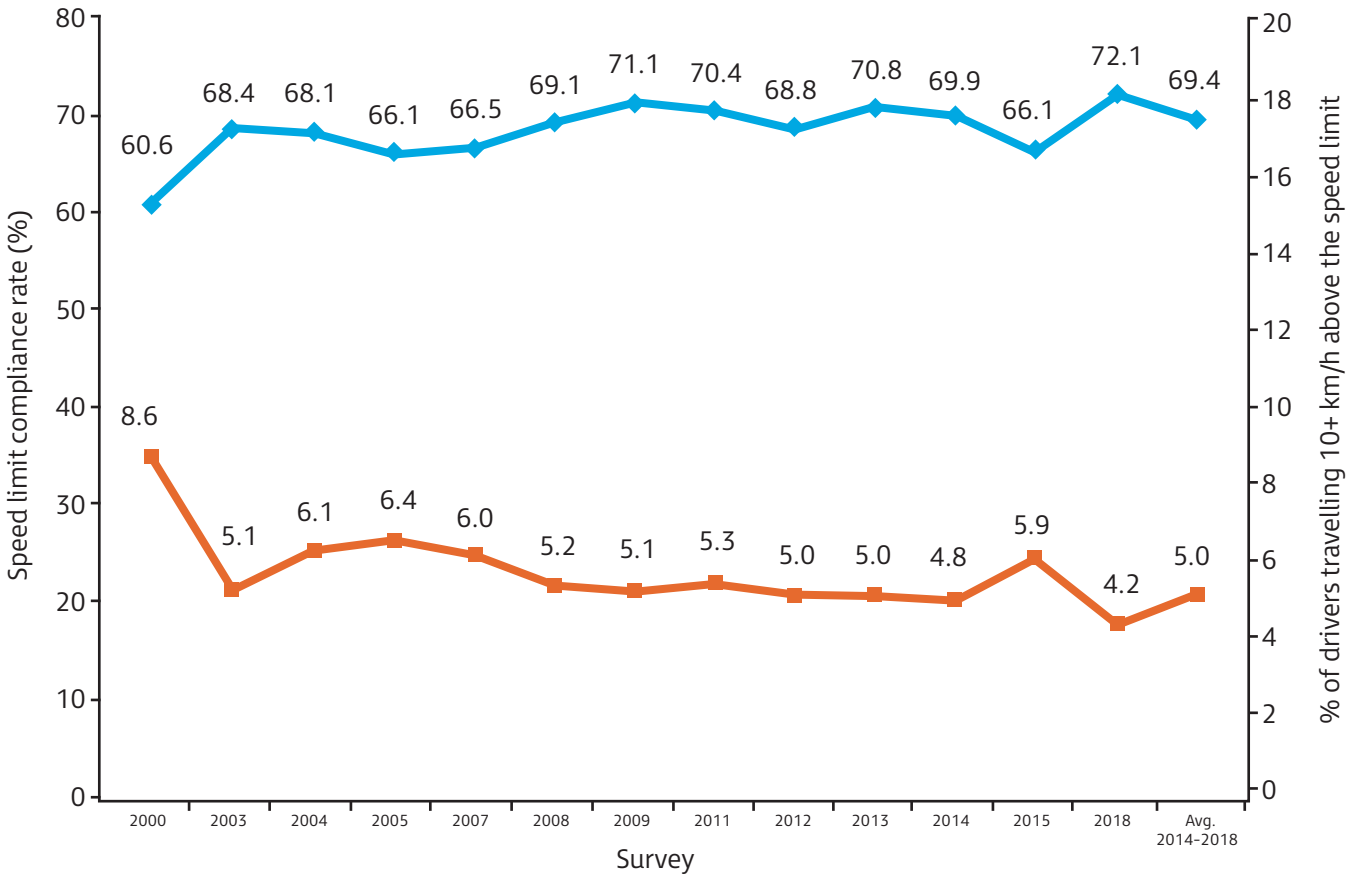
Overall Network Compliance

All Types of Vehicles

Analysis of the speed data suggested that under free-flowing traffic conditions, over the rural road network of all speed limits in 2000, 61% of all vehicles travelled at or below posted speed limits. The 2003 survey indicated that there was an increase of 7% in the compliance rate from 61% to 68%. The best network compliance rate was recorded in the most recent 2018 survey at approx. 72.1%, 6.0% higher than in 2015 survey and 11.5% higher than in the baseline speed survey. The average network compliance for most recent three surveys, over the 5 year period of 2014 to 2018, was estimated at 69.4%, 8.8% higher than in the baseline survey conducted in 2000 (ref. Summary Figure 1 and Summary Table 1).

Although over the period 2000 to 2018, the compliance rate showed some variability between the survey years, the average annual increase in the speed limit compliance was estimated at 0.4%.

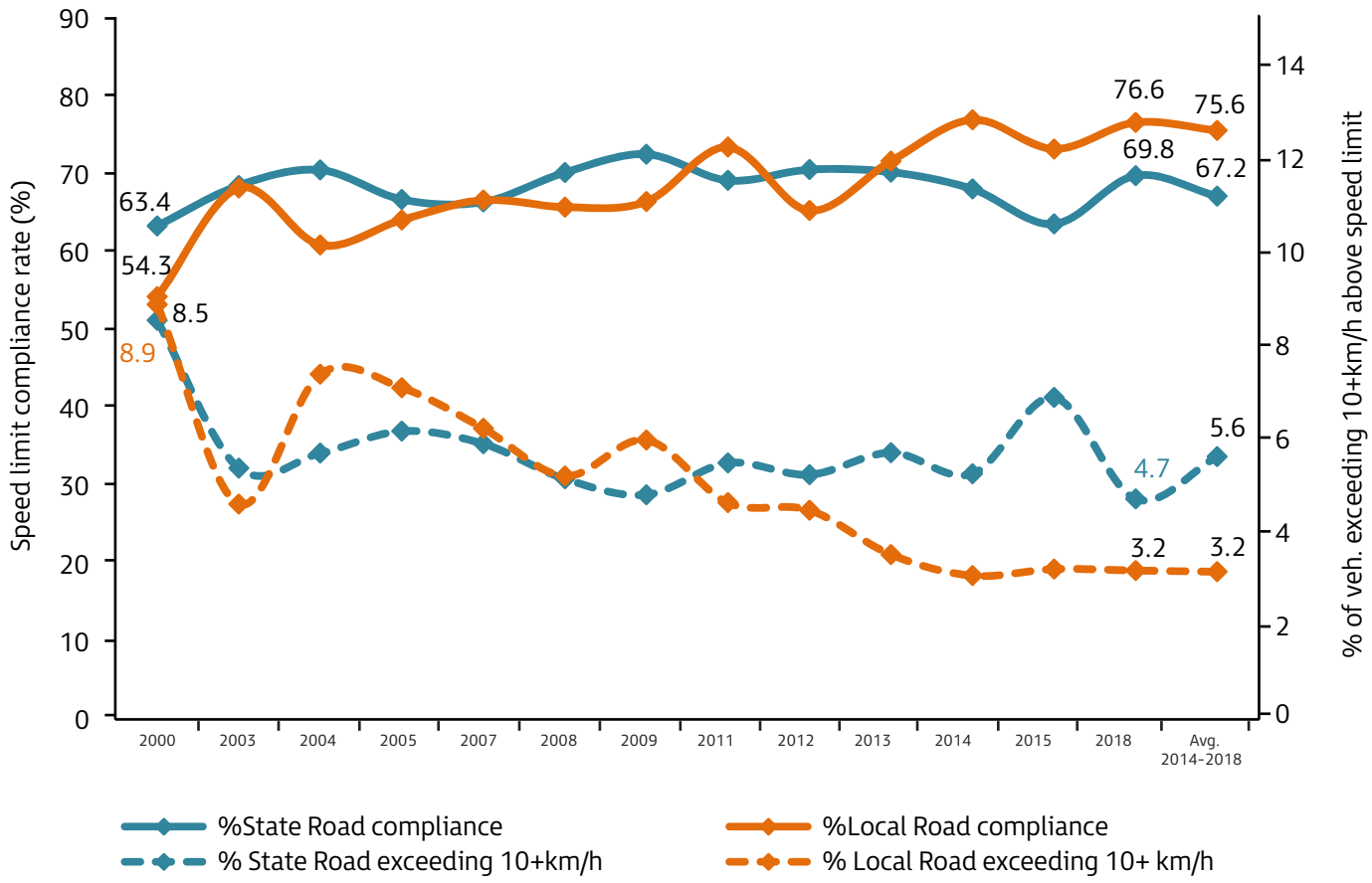
Summary Figure 1



State and Local Roads

Analysis of the speed data recorded under free-flowing conditions, over the regional state and local roads network of all speed limits in 2000 showed that 63.4% of vehicles on state roads and 54.3% of vehicles on local roads travelled at or below posted speed limits. In spite of some variations between the surveys in the increasing trend, the highest compliance rate was recorded on state road and local road in the 2018 survey, at approx. 69.8% and 76.6%, 6.5% and 22.4% higher than in 2000 survey, respectively. The average network compliance for the most recent three surveys, over the 5-year period from 2014 to 2018, on state and local roads was estimated at 67.2% and 75.6%, 3.8% and 21.3% higher than in the baseline survey conducted in 2000, respectively (ref Summary Figure 2).

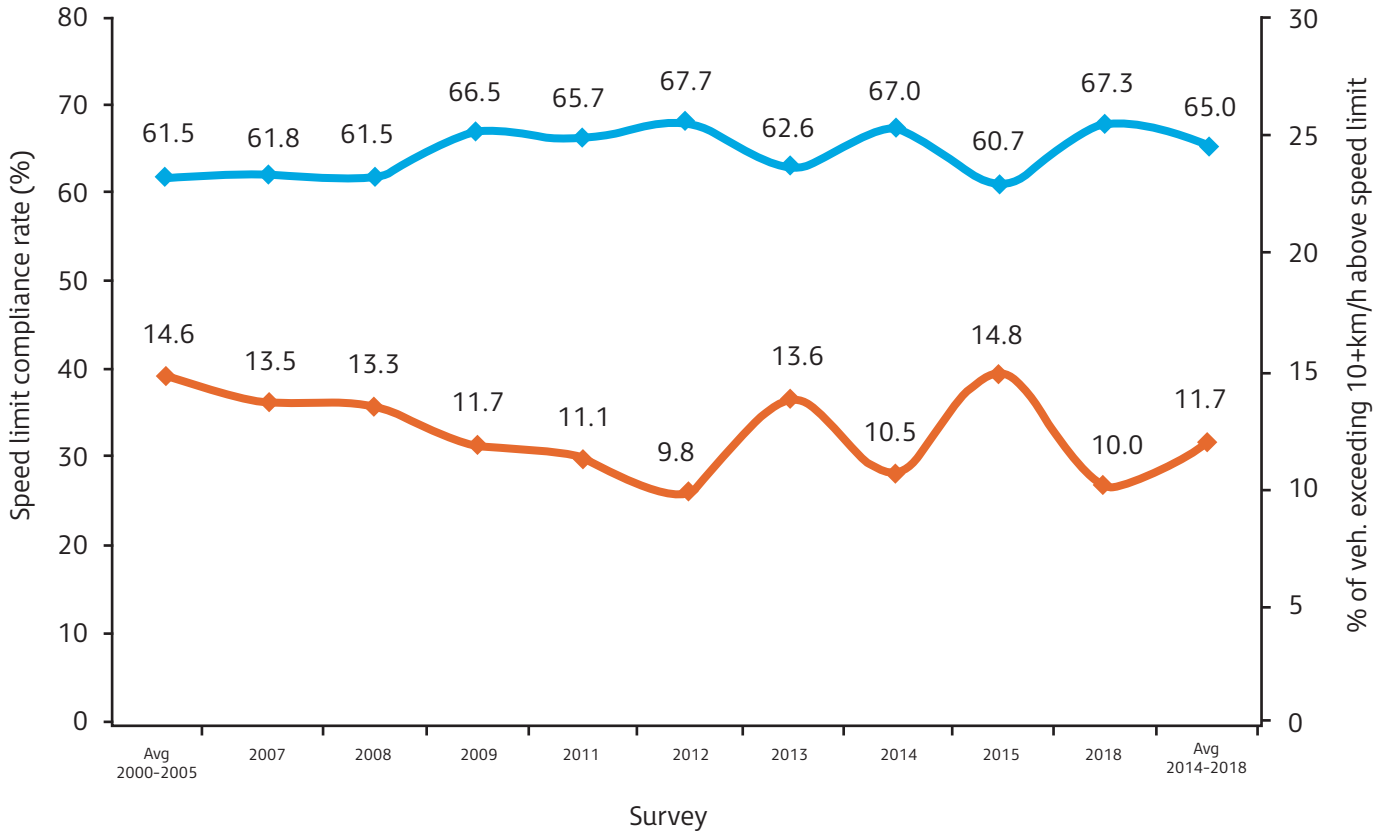
Summary Figure 2



Motorcycles

The analysis of speed data for motorcycles (not restricted to free-flowing conditions), recorded for all speed limits on the rural road network of over the period 2000 to 2005, showed that 61.5% of all motorcyclists travelled at or below posted speed limits. Apart from some variability between the surveys in the increasing compliance rate trend, the compliance rate was recorded in the 2018 survey at 67.3%, 5.9% higher than the average for the period 2000 to 2005. The average network compliance for most recent three surveys over the 5 years period 2014 to 2018 was estimated at 65.0%, 3.5% higher than the average for the period 2000 to 2005 (ref Summary Figure 3).

Summary Figure 3



Compliance by Speed Limit

The surveys from 2003 to 2018, apart from some variability between years, indicated an overall improvement in speed compliance rates when compared to the 2000 survey.

- The poorest speed limit compliance in 2000 was recorded on 60 km/h roads, at 48.3%, however, in 2018 compliance increased by 24.3% to 72.6%.
- Compared to the 2000 survey, the compliance rate on the 70 km/h and 80 km/h has increased by 7.4% and 8.0%, respectively in 2018, from 67.0% to 74.4% and 61.9% to 69.9%.
- Speed compliance on 90 km/h and 100 km/h roads has on average increased by 15.4% in 2018 when compared to the 2000 baseline survey, from 55.8% to 71.2%, while the compliance on 110 km/h roads showed some variability between the survey years with the average of 68.6% (ref. Summary Table 1).

The estimates of the compliance rates by speed limit in 2000, average compliance between 2003 and 2008, and survey years from 2009 to 2018 are as follows:

Speed Limit	2000 Survey	Average 2003 to 2008	2009 Survey	2011 Survey	2012 Survey	2013 Survey	2014 Survey	2015 Survey	2018 Survey
60 km/h	48.3	59.0	61.8	68.0	61.9	65.1	65.1	64.0	72.6
70 km/h	67.0	70.5	78.7	75.9	68.2	70.6	74.4	70.8	74.4
80 km/h	61.9	68.2	76.5	76.4	78.0	77.8	76.6	63.2	69.9
90 km/h	56.5	68.1	66.3	59.9	72.6	71.3	72.0	64.9	73.3
100 km/h	55.1	61.9	56.7	62.0	82.9	58.0	67.7	61.9	69.0
110 km/h	66.8	69.4	69.7	72.0	66.3	71.3	62.8	64.1	69.9
All speed Limits	**60.6**	**67.6**	**71.1**	**70.4**	**68.8**	**70.8**	**69.9**	**66.1**	**72.1**

Compliance by Day of Week

The surveys from 2003 to 2018 indicated that, in general, the best compliance to speed limits occurs from Monday to Friday, on average 69.3%, a little less on Saturday, on average 68.1%, followed by Sunday with the lowest compliance of 67.6%.

(B) Rural Road Network – Proportions of Drivers Travelling 10+ km/h above Speed Limit

Network Average Percentage of Drivers Travelling 10+ km/h above Speed Limit

All Roads and Speed Limits

Changes in driver speed behaviours between 2003 and 2018 compared to the driver travel speeds in 2000 were also examined with respect to the presumed "tolerance level" of 10 km/h above the speed limit.

Over the period 2003 to 2008 the average number of drivers travelling at speeds exceeding 10 km/h above the speed limit was significantly less than in 2000. The reduction in the percentage of speeding drivers was estimated at 33%, representing an absolute reduction of 2.8%, from 8.6% to 5.8%.

Some further reductions were recorded in the subsequent survey years, to 5.1% in 2009 and 4.8% in 2014, followed by an increase to 5.9% in 2015. The most recent 2018 survey recorded the ever lowest level of vehicles travelling at excessive speeds, estimated at 4.2%, 4.4% less than in the baseline 2000 survey.

State and Local Roads

In 2000, the number of speeding drivers on regional state and local road networks was recorded at 8.5% and 8.9%, respectively. However, in 2018 the percentage of speeding drivers dropped to 4.7% and 3.2% on state and local roads, representing a substantial reduction of 3.8% and 5.7%, respectively. The average number of speeding drivers over the 5 years period from 2014 to 2018 on state and local roads was estimated at 5.6% and 3.2%, 2.9% and 5.7% less than in the baseline survey conducted in 2000, respectively.

Motorcycles Travel Speed Behaviours

The speed data analysis was also conducted on all motorcycle travel speeds, not restricted to free-flowing conditions, over the regional road network of all speed limits. Over the period 2000 to 2005, 14.6% of all motorcyclists travelled with speeds exceeding 10 km/h

above the speed limit. The percentage of speeding drivers dropped to 10.0% in 2018, 4.7% less than in the period 2000 to 2005. The average percentage of speeding drivers over the 5 years period from 2014 to 2018 was estimated at 11.7%, 2.9% less than for the period 2000 to 2005.

Percentage of Drivers Travelling at High Speeds by Speed Limit

Since 2000 all speed limits showed substantial reductions in the proportions of drivers travelling at high speeds, 10 or more km/h above the speed limit. Despite some variations between the interim years, between 2000 and 2018, all roads on average recorded a reduction in the number of speeding drivers relative to the percentage recorded in the 2000 survey. The difference between 2018 and 2000 in the percentage of speeding drivers ranged from a reduction of 1.7% on 70 km/h roads to 9.8% on 100 km/h roads (ref Summary Table 1).

The percentage reduction in the proportions of speeding drivers ranged between 27.9% on 80 km/h roads to 64.6% on 100 km/h roads.

Compared to 2000, across all rural roads, the number of speeding drivers in 2018 reduced by approximately 51%.

The percentage distribution of vehicles travelling at the high speeds (10+ km/h above the speed limit) in 2000, over the period 2003 to 2008, and survey years from 2009 to 2018 was as follows:

Speed Limit	2000 Survey	Average 2003 to 2008	2009 Survey	2011 Survey	2012 Survey	2013 Survey	2014 Survey	2015 Survey	2018 Survey
60 km/h	10.9	7.2	6.6	6.8	5.6	5.2	4.8	6.6	3.9
70 km/h	4.6	3.4	1.8	2.4	4.1	3.8	4.1	4.1	2.9
80 km/h	7.1	5.6	5.9	3.7	3.1	5.2	4.4	7.7	5.1
90 km/h	12.2	6.8	7.0	8.7	6.2	5.2	4.7	6.7	4.5
100 km/h	15.1	12.2	12.3	7.0	3.8	7.9	6.1	5.8	5.3
110 km/h	7.9	6.1	5.6	5.0	6.8	5.4	5.8	7.1	5.2
All Speed Limits	8.6	5.8	5.1	5.3	5.0	5.0	4.8	5.9	4.2

Summary Table 1

Compliance/ Non-compliance	2000 (%)	2003 (%)	2004 (%)	2005 (%)	2007 (%)	2008 (%)	2009 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2018 (%)	Change in Rate 2018 vs. 2015	Change in Rate 2018 vs. 2000
Network Compliance to Speed Limit															
	60.6	*68.4*	*68.1*	*66.1*	*66.5*	*69.1*	*71.1*	*70.4*	*68.8*	*70.8*	*69.9*	*66.1*	*72.1*	*6.0*	*11.5*
Network % of drivers travelling 10+km/h above speed limit															
	8.6	*5.1*	*6.1*	*6.4*	*6.0*	*5.2*	*5.1*	*5.3*	*5.0*	*5.0*	*4.8*	*5.9*	*4.2*	*-1.7*	*-4.4*
Compliance to speed limit on:															
60 km/h roads	48.3	65.4	54.0	56.6	57.3	58.8	61.8	68.0	61.9	65.1	65.1	64.0	72.6	*8.6*	*24.3*
70 km/h roads	67.0	71.6	67.0	66.9	72.6	74.0	78.7	75.9	68.2	70.6	74.4	70.8	74.4	*3.5*	*7.4*
80 km/h roads	61.9	66.5	63.8	72.5	66.9	70.8	76.5	76.4	78.0	77.8	76.6	63.2	69.9	*6.7*	*8.0*
90 km/h roads	56.5	64.7	76.7	69.4	62.2	65.5	66.3	59.9	72.6	71.3	72.0	64.9	73.3	*8.4*	*16.8*
100 km/h roads	55.1	67.2	55.4	64.6	59.6	65.0	56.7	62.0	82.9	58.0	67.7	61.9	69.0	*7.1*	*13.9*
110 km/h roads	66.8	71.7	71.2	65.7	67.9	71.9	69.7	72.0	66.3	71.3	62.8	64.1	69.9	*5.7*	*3.0*
% of drivers travelling 10+km/h above speed limit on:															
60 km/h roads	10.9	5.2	9.6	7.5	8.7	6.3	6.2	6.8	5.6	5.2	4.8	6.6	3.9	*-2.7*	*-7.0*
70 km/h roads	4.6	3.1	4.1	4.3	2.8	2.6	1.8	2.4	4.1	3.8	4.1	4.1	2.9	*-1.2*	*-1.7*
80 km/h roads	7.1	5.5	5.9	6.0	5.5	5.3	5.7	3.7	3.1	5.2	4.4	7.7	5.1	*-2.6*	*-2.0*
90 km/h roads	12.2	6.6	5.6	6.1	8.6	7.7	7.0	8.7	6.2	5.2	4.7	6.7	4.5	*-2.2*	*-7.7*
100 km/h roads	15.1	9.1	17.3	10.6	11.6	9.0	12.3	7.0	3.8	7.9	6.1	5.8	5.3	*-0.4*	*-9.8*
110 km/h roads	7.9	5.8	6.1	7.6	6.1	4.9	5.6	5.0	6.8	5.4	5.8	7.1	5.2	*-1.8*	*-2.7*

Speeding by Day of Week

Over most of the surveys Sunday, followed by Saturday were found to be the days with the highest percentage of drivers exceeding 10 or more km/h above the speed limit, decreasing from 8.6 % on Saturday and 8.9% on Sunday in 2000, to 4.6% and 4.7% in 2018, respectively.

Across all surveys, the average week day percentage of drivers travelling at high speeds was estimated at 5.4%, compared to the average week-end percentage of 6.1%.

In the most recent 2018 survey, the percentage of speeding drivers on week days was estimated at 4.0%, compared to the week-end average of 4.7%.

The best performing days in 2018 were Monday, Wednesday and Thursday at 4.0%.Across all survey years, the highest percentage of speeding drivers, travelling 10 or more kilometres above the speed limit, would be expected on week-ends.

Speeding by Time of Day

All thirteen surveys indicated that drivers were more likely to travel at excessive speeds, 10+ km/h above speed limits during night hours, from 7 p.m. to 7 a.m. These driver speed behaviours are fairly consistent from year to year. No significant differences in the patterns were found, although the percentage magnitude varied in line with the overall driver speed behaviours in a particular year.

On average the highest travel speeds are expected to occur between 11 p.m. and 6 a.m. The percentage of speeding drivers during this period in 2018 ranged from 5% to 11%. In all surveys the least number of speeding drivers were recorded between 8 a.m. and 1 p.m., approximately 3% in 2018.

(C) Mean Travel Speeds in Rural Areas

Mean Speed by Speed Limit

Drivers on rural 60 km/h, 100 km/h and 90 km/h roads seemed to be travelling at higher average speeds, relative to the speed limits, than drivers on the other speed limit roads, such as 70 km/h, 80 km/h and 110 km/h roads. The estimates of the mean speeds across all surveys were as follows:

Speed Limit	Mean Estimate (km/h)
60 km/h	57.6
70 km/h	65.8
80 km/h	74.6
90 km/h	85.5
100 km/h	95.6
110 km/h	101.9

The mean travel speeds recorded in the 2018 survey, compared to the mean speeds in 2000, were significantly less on some roads or remained with insignificant change on the others. The observed changes in the mean speeds were as follows:

- 60 km/h - 4.7 km/h
- 70 km/h - 0.5 km/h
- 80 km/h - 3.6 km/h
- 90 km/h - 3.2 km/h, and
- 100 km/h - 4.6 km/h
- 110 km/h +0.8 km/h

Mean distribution by survey and percentage change in the mean speed in 2018 relative to 2000 are presented in the Summary Table 2, below.

Summary Table 2

Region	Mean Speed for Roads:	2000 (km/h)	2003 (km/h)	2004 (km/h)	2005 (km/h)	2007 (km/h)	2008 (km/h)	2009 (km/h)	2011 (km/h)	2012 (km/h)	2013 (km/h)	2014 (km/h)	2015 (km/h)	2018 (km/h)	2018 vs. 2015	*2018 vs. 2000* *Change*	*% Change*
Rural	**60 km/h**	59.8	57.0	58.9	58.4	58.3	58.5	57.2	56.8	58.0	57.0	55.7	57.5	55.1	-2.4	*-4.7*	*-7.8*
	70 km/h	65.9	66.1	67.0	66.6	65.8	65.6	64.8	65.0	66.4	66.4	64.9	65.4	65.4	0.0	*-0.5*	*-0.7*
	80 km/h	77.9	77.1	77.5	74.5	76.5	72.8	71.1	72.4	72.6	72.8	73.4	77.1	74.3	-2.7	*-3.6*	*-4.6*
	90 km/h	87.9	85.9	82.4	84.6	86.5	86.3	85.0	87.7	85.1	84.4	84.6	87.0	84.6	-2.4	*-3.2*	*-3.7*
	100 km/h	97.1	94.6	97.6	95.4	97.3	96.4	98.2	97.4	89.3	97.6	93.0	97.0	92.5	-4.5	*-4.6*	*-4.7*
	110 km/h	102.1	101.1	101.2	102.7	102.7	101.6	102.3	99.3	102.5	100.2	103.1	102.4	102.9	0.5	*0.8*	*0.7*

(D) Differences between Main Roads Regions

Regional Differences in Compliance to Speed Limit

Over the entire period from 2000 to 2018, the most speed limit compliant Main Roads defined region was the Mid West-Gascoyne, at 73.7% and the worst performing was Goldfields-Esperance at 57.6%. The most recent 2018 survey indicated that the most compliant regions are Kimberley at 82.7%, Great Southern at 79.4% and Mid West-Gascoyne at 74.3%, followed by Wheatbelt at 72.6%.

Regional Differences in Excessive Travel Speeds

The analysis of the proportions of vehicles travelling at excessive speeds by Main Roads region showed that all regions, on average, demonstrated significant reductions over the period 2000 to 2018. The reductions in the number of speeding drivers ranged between 31.0% in Kimberley and Goldfields-Esperance to 78.9% in Great Southern.

The worst performing regions, above the network average, in 2018 were Wheatbelt, Goldfields-Esperance

and Pilbara, where 6.4%, 6.2% and 5.1% of drivers, respectively, were found to have travelled at speeds 10+ km/h above the speed limit.

The best performing regions over the last twelve years seem to be Mid West-Gascoyne, Great Southern and South West where the number of speeding drivers was less than 5%, whereas the worst performing regions were Wheatbelt, Goldfields-Esperance and Pilbara at over 6%.

The percentage distribution of vehicles recorded as travelling at excessive speeds by region and survey periods/year is shown in the table below.

	% of vehs. exceeding speed limit by 10+ km/h								
	Survey/Period								
Region	**2000**	**Avg. 2003-2008**	**2009**	**2011**	**2012**	**2013**	**2014**	**2015**	**2018**
Great Southern	10.7	5.8	3.8	4.9	4.0	3.2	3.4	3.4	2.3
South West	7.8	4.5	4.2	4.1	3.7	5.7	5.2	6.5	3.9
Mid West-Gascoyne	6.3	4.7	3.2	3.4	3.4	3.2	2.4	4.9	3.5
Goldfields-Esp.*	9.0	6.8	6.9	10.2	8.4	5.5	4.7	-	6.2
Kimberley	5.3	6.7	3.2	3.6	5.7	4.7	4.4	6.1	3.7
Wheatbelt	10.9	7.9	6.9	5.6	7.5	7.0	4.9	7.5	6.4
Pilbara	11.1	6.9	6.1	6.5	6.4	4.3	6.7	4.4	5.1
Total	8.6	5.8	5.1	5.3	5.0	5.0	4.8	5.9	4.2

Note: * No data counted in the sample on higher speed limit roads in 2015.

(E) Speed Compliance and Mean Speeds on the 50 km/h Local Roads Rural Areas

Compliance

The compliance rate on the 50 km/h roads in regional centres in 2009 was estimated at 50.3%, followed by further increases in 2012 to 60.4%. Some variability in the compliance rate was observed over the period 2013 to 2018. The most recent, 2018, survey recorded a compliance rate of 53.3%, significantly higher than in 2006 when the compliance was only 42.6%.

Excessive Speeding

The percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated at 11.2% in 2009, followed by some variability around decreasing trend over the years to the rate of 6.9%, as recorded in the most recent survey. Although the rate is significantly higher higher speed limit roads, 60 km/h to 110 km/h, estimated at 4.2% in 2018, the number of speeding drivers on the roads is significantly less than in 2006 (by 60%), when the percentage of speeding drivers was 17.2%

Mean Speed

The mean speed on the 50 km/h roads varied from 2009 when it was 48.8 km/h, 1.2 km/h below the speed limit, to 49.1 km/h in the most recent 2018 survey , just 0.9 km/h below the speed limit (ref. Summary Table 3), however, 1.9 km/h less than in 2006.

Summary Table 3

Compliance/Non-compliance	2001* (%)	2003 (%)	2006 (%)	2009 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2018 (%)
Compliance - 50k roads	24.6	36.6	42.6	50.3	53.2	60.4	58.0	60.8	54.7	53.6
% of drivers travelling 10+ km/h above speed limit - 50k roads	34.3	17.4	17.2	11.2	9.3	6.6	6.8	6.2	8.3	6.9
Mean Speed	**2001 (km/h)**	**2003 (km/h)**	**2006 (km/h)**	**2009 (km/h)**	**2011 (km/h)**	**2012 (km/h)**	**2013 (km/h)**	**2014 (km/h)**	**2015 (km/h)**	**2018 (km/h)**
50km/h roads	55.3	52.3	51.0	48.8	48.6	47.4	47.7	47.2	48.3	49.1

Note: * When the default speed limit was 60 km/h

In summary, the in-depth analysis of speed data collected over the ten surveys since 2000 suggests that driver speed behaviours differ depending on:

- Speed limit on the road;
- Region they travel through or live in;
- Day of the week; and
- Time of day.

The speed surveys suggest that driver compliance on the rural network has significantly improved since 2000. The number of speeding drivers, travelling at speeds of 10 or more km/h above the speed limit on the rural road network in 2018 was approximately 51% less than it was the case in 2000.
Compared to 2015, the 2018 survey recorded a substantial increase in the overall compliance rate of 6.0% to 72.1%, which resulted in a relatively significant decrease of 1.7% in the percentage of speeding drivers. However, the trend since 2013 in the small annual percentage change in the number of vehicles travelling at excessive speeds or the speed compliance rate needs to be considered in the assessment of past, current and future speed management and enforcement strategies that are anticipated to maintain or improve the recently observed trend in the driver speed compliance rates.

It is recommended that findings of this study related to the road, regional and temporal factors associated with driver speed behaviours be used as components in formulation of speed enforcement or other road safety strategies aimed at reduction of travel speeds on the Western Australian rural roads network. In addition, the findings of past and future similar studies on driver speed behaviours should be utilised as the indicators against which effectiveness of the speed enforcement programs or implementations of other speed reduction strategies would be assessed.

Acknowledgements

This report was funded by the Road Trauma Trust Account and produced by Road Safety Commission on behalf of the Road Safety Council. Data collection was organised by Main Roads, WA. The author would like to acknowledge the contributions of Tony Radalj, Main Roads for his valuable suggestions, continuous support and reviewing the report.

Introduction

1

Within the domain of road safety it has been well recognised that speed is one of the most important core elements of road safety problem that affects not only the risk of being involved in a crash but more importantly the severity of the crash outcomes which could result in fatality or serious injury. The annual speed survey study design was originally intended to support and evaluate the first phase of the Coordinated Action Program: Speed Project (CAP: Speed), implemented by the WA Police Force in 1998. The main objective of CAP: Speed was to reduce speed-related crashes through the increased use of speed and red light cameras. Subsequently, the annual speed surveys have been used to support a range of speed interventions as part of the WA's state road safety strategy, *Towards Zero 2008 -2020* (Office of Road Safety, 2009), including further expansions to the automated traffic enforcement network.

Cameron (1999) proposed that the CAP: Speed program should be evaluated with respect to driver speed behaviours at general locations of the WA network rather than using travel speed behaviours recorded at speed camera sites which would be more likely biased towards lower speeds than expected on other similar non-camera road environments. For this reason it was suggested than annual speed surveys should be conducted at general locations covering most speed limit and road types, metro and rural regions. The principal objective of the surveys was to measure changes in driver speed behaviours at general locations across the entire WA road network and use the derived speed indices in the assessment of effectiveness of enforcement strategies on road safety outcomes. It was envisaged that results of the survey would also provide substantial grounds upon which future road safety and enforcement strategies could be addressed and formulated.

In the past, no systematic approach was used in acquiring a reasonable representative sample of speed data across the WA road network. The most reliable speed data that has been recorded in a systematic way comes from several CULWAY sites located on National and State roads. Although this data provides good information on trends in speeds on major highways commonly used by heavy vehicles, the data cannot be used as a substitute for a well representative speed survey covering entire road network, including National, State and Local roads, within the rural regions and the Perth metropolitan area. A representative sample of road locations was needed in order to conduct annual or other selected speed survey periods. The data collected during the surveys could be used to monitor changes in driver speed behaviours over time and evaluation of the effects of traffic safety and enforcement programs on such behaviours on general road locations across the entire road network.

The principal objective of the surveys was to measure changes in driver speed behaviours at general locations of the metropolitan road network over a period of time. Changes in driver speed behaviours may be used as one of the significant measures in the assessment of effectiveness of speed interventions, and to a lesser extent as a measure of the impacts of other safety awareness non-enforcement programs on driver traffic behaviours.

1. Monitor general driver compliance to legal speed limits;

2. Measure road/site specific speed compliance rate; and

3. Assess the need for a review of speed limits for the network of road types or specific road sections, or roads within selected regional centres.

The aims of the surveys are to:

1. Monitor driver speed behaviour at the rural network level;

2. Achieve a high level of representativeness of speed behaviours for:
   a) the rural network of roads;
   b) types of roads;
   c) regions;
   d) legal speed limits;
   e) various traffic volumes;

f) traffic composition; and
g) built up/non-built up areas.

3. Monitor speed behaviours at each of the levels stated above;

4. Monitor speed compliance rate by the categories listed above;

5. Monitor effects of traffic safety interventions or enforcement on speed behaviours;

6. Provide a baseline speed data for the development of speed performance indicators for the rural road network of Western Australia; and

7. Provide the baseline data for the assessment of the effects of change in speed behaviours on the occurrence of speed related crashes and other types of crashes not necessarily identified as speed related crashes.

SURVEY METHODOLOGY

2

Given that the Western Australian rural road network covers a vast area, ranging from roads in the dense Rural built-up area to open remote rural State Roads and National Highways, substantial care was taken in the design of the survey such that the data collected would be representative of the state's driver population.

It was proposed that the survey be conducted over the most trafficked roads across the WA rural road network being representative of each of the seven non-metropolitan Main Roads regions in terms of:

1. Amount of traffic within regions;
2. Types of roads within regions;
3. Speed limits; and
4. Traffic composition.

It was envisaged that the sample of approximately 95 sites would be sufficient in size to provide reliable representativeness of driver speed behaviour at the general road locations.

2.1 Determination of Sample Size by Strata

In order to determine the sample sizes for each of the principal factors to be investigated and monitored in future surveys three methods were investigated:

1. Exposure measured in million vehicle kilometres travelled (MVKT);
2. Estimated speed related crashes; and
3. Estimated number of speed related serious injury crashes, during the period 1994 - 1998.

The most reliable method in estimating the number of survey sites by the primary survey stratum, region, was proposed to be used in determining sample sizes for other strata in the proposed speed survey.

2.2 Determination of Sample Size by Region

Three approaches were considered in determining distribution of sample sizes by region, chosen as the principal stratum for the survey:

1. Amount of exposure measured in terms of million vehicle kilometres travelled (MVKT) estimates by region;
2. Average number of speed related serious injury crashes; and
3. Average number of speed related all severity types' crashes.

Comparison of the three methods showed no significant differences in sample sizes calculated by the region (see Table 1). The analysis suggested a strong correlation between exposure and number of speed related serious injury and all types of speed related crashes. It appears that speed related crashes were equally likely to occur in any of the regions. Occurrence of a serious crash appeared to be dependent on traffic exposure rather than state regional area. Based on the data, it was inferred that the current likelihood of drivers speeding and being involved in serious injury or other severity type crashes was very similar across the entire regional road network.

Since there was no identifiable difference in the distribution of number of sites by region between the three sample size determination methods, MVKT was thought to be a more stable denominator to be used for this purpose. The number of speed related crashes as the determinant of the sample sizes was considered to be unstable as it may change over time due to traffic safety programs implementation or speed enforcement. Therefore, in order to preserve representativeness of the state traffic speed data, the sample size for each of the two main strata, region and road type, was based on the principal determinant taken as the amount of exposure measured in terms of MVKT.

	Parameter								
	MVKT			Number of Speed Related (94-98)			Number of Speed Related Serious Inj. Crashes (94-98)		
Region	**MVKT 1996**	**% Total**	**N of Sites**	**N**	**% Total**	**No. of Sites**	**N**	**% Total**	**N of Sites**
Great Southern	581.50	3	6	230	3	6	33	2	5
South West	1682.56	9	18	767	9	18	153	11	22
Gascoyne	211.60	1	2	45	1	1	13	1	2
Mid West	609.83	3	6	234	3	6	61	4	9
Goldfields-Esp.	716.74	4	8	297	4	7	70	5	10
Kimberley	226.37	1	2	107	1	3	35	3	5
Metropolitan	12749.96	68	136	6019	73	145	854	62	124
Wheatbelt South	514.26	3	5	166	2	4	43	3	6
Wheatbelt North	905.06	5	10	292	4	7	80	6	12
Pilbara	600.16	3	6	143	2	3	36	3	5
Total	**18798**	**100**	**199**	**8300**	**100**	**200**	**1378**	**100**	**200**

Table 1. Determination of sample size based on MVKT and number of speed related Crashes

2.3 Determination of Sample Size by Road Type

It was proposed that the survey be confined to the top four types of road environment, namely, National Highways, State Highways, Main Roads and Local Roads. Since there was no readily available MVKT split between State Highways and Main Roads, estimates of sample size by road type were based on the three road types: National Highways, State Roads (comprised of State Highways and Main Roads) and Local Roads. Estimates of MVKT by road type were obtained from a MRWA model. The estimated number of survey sites by regional road types is presented in Table 2.

	National			State			Local		
Region	**MVKT**	**% Total**	**N of Sites**	**MVKT**	**% Total**	**N of Sites**	**MVKT**	**% Total**	**N of Sites**
Great Southern	0	0.00	0.00	429	0.04	4.4	177	0.02	1.8
South West	0	0.00	0.00	1452	0.15	14.9	591	0.07	6.1
Gascoyne	0	0.00	0.00	183	0.02	1.9	45	0.01	0.5
Mid West	71	0.05	0.7	437	0.04	4.5	162	0.02	1.7
Goldfields-Esp.	257	0.18	2.6	271	0.03	2.8	192	0.02	2.0
Kimberley	156	0.11	1.6	149	0.02	1.5	38	0.00	0.4
Metropolitan	442	0.30	4.5	6027	0.61	61.8	6395	0.79	65.7
Wheatbelt South	0	0.00	0.00	357	0.04	3.7	130	0.02	1.3
Wheatbelt North	412	0.28	4.2	406	0.04	4.2	208	0.03	2.1
Pilbara	124	0.08	1.3	230	0.02	2.4	136	0.02	1.4
Total	**1461**	**0.08**	**15**	**9943**	**0.51**	**102.1**	**8074**	**0.41**	**82.9**

Table 2. Estimates of number of survey sites by road type based on MVKT

Assuming that the total speed survey would be comprised of 67 survey sites across the WA rural road network then the number of estimated sites by region and road type would be proportionally distributed with respect to the exposure. A summary for the distribution of the estimated number of survey sites is presented in Figure 1.

For the purpose of comparability of data, it was proposed that the sample sizes by the initial stratification categories remain fairly constant unless there are justified reasons for change. In addition, the choice of survey locations and the speed data collection should be conducted according to the criteria described in the following sections within this report.

In the process of the survey design, careful consideration was given to the representativeness of the exposure and the road environment whilst maintaining a high degree of randomness in the selection of road sections and road geometry.

Although driver behaviour with respect to speed may vary between road sections and types of roads, depending on the road geometry, general road and traffic environments, a speed survey at any location can be considered as a random sample of vehicle speeds, representing the population driver speed behaviours for the location.

Since driver speed behaviours may depend on type of road, speed limits and the general road environment, substantial care was taken in choosing survey sites within the available number of sites allocated for each road type within each of the regions surveyed. This has been achieved through sampling stratification with respect to traffic volume, speed limit, divided/undivided road, and number of lanes.

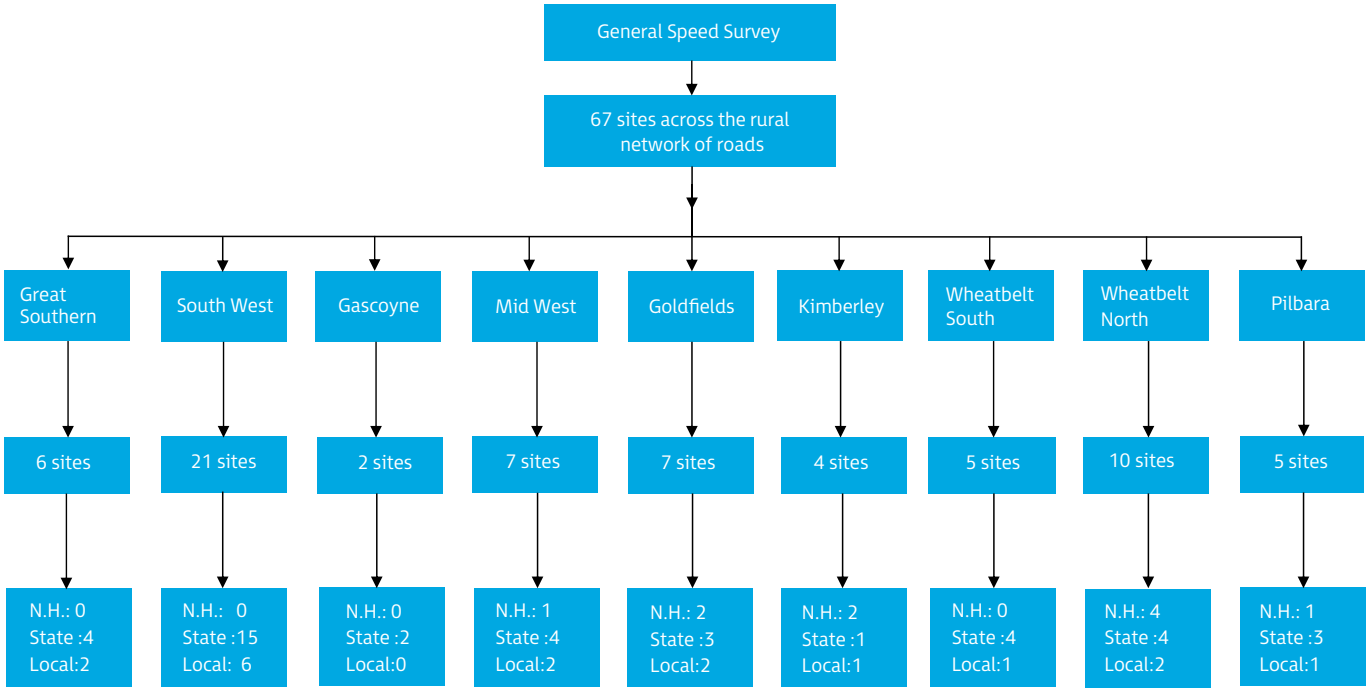


Figure 1. Distribution of survey sites by region and Road Administrative Classification and Accountability based on 98/99 MVKT

2.4 Sampling Stratification within Road Type

Traffic Volume

It was envisaged that the minimum number of vehicles surveyed per day per location should not be less than 1000, unless a suitable site could not be found on a particular road type. This may be the case in rural regions with a small number of sample sites and overall low MVKT by road type. Due to the equipment storage limitation, the highest volume at a site should not exceed 20000 vehicles per day.

Speed Limit

It was anticipated that the survey sites would be randomly distributed within each of the common legal speed limits within the constraints determined by the number of road types and the number of sites surveyed. The survey is intended to cover road sections with posted speed limits of 60 (Local roads only), 70, 80, 90, 100 and 110 km/h. In addition, the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 survey included a sample of 27, 28, 27, 31, 29, 29 and 39, respectively, of 50 km/h local roads in order to expand the future surveys to cover all most commonly used speed limits in WA.

Divided and Undivided Roads

Based on road design, it is expected that drivers are more likely to experience their free speed flows on divided multiple lane roads than on single carriageway-two lane roads. Undivided roads are more prone to slower speeds due to free flow interruptions by turning vehicles exiting or entering traffic streams. Estimates of number of survey sites on divided roads were determined on basis of traffic exposure, as a proportion of the total exposure for the road type.

Number of Lanes

It is expected that the number of lanes on divided or undivided roads plays a significant role in the provision of opportunities for drivers to experience free unimpeded speeds. This may be true for all types of roads and road environments. Therefore, the number of lanes has been

considered as an important factor in the survey sampling within the stratification parameters such as the road type, divided and undivided roads, and speed limits.

Traffic Composition

Traffic volume classifiers have been utilised in the survey for the purpose of collecting traffic volume, vehicle speed and traffic composition data. The nature of stratified random sampling is expected to result in a population representative of traffic composition data, and consequently providing sufficient information on driver speed behaviours by AUSTROADS vehicle class.

General Survey Criteria

If a series of annual speed surveys is undertaken for the purpose of evaluating whether driver population speed has been influenced by traffic safety intervention programs or the CAP: Speed, it is necessary to measure changes in speed population parameters (eg: mean, 85th percentile, standard deviations, and others). Precautions should be taken in order to control extraneous factors that may have an effect on driver speed behaviours at the survey sites.

Survey Period

One of the factors considered is the period or months of the year the survey is conducted. For the purpose of survey reliability, the data collection is undertaken during expected stable weather periods, namely, between March and June or between September and November each year, thus avoiding winter months.

Site Data Collection Time Period

It is proposed that the minimum data collection period per site should not be less than 7 days in the rural areas, in order to control for variability in speed behaviours between the days of the week. Also, the data should be continuously collected over consecutive hours in order to control for the differences between times of day.

For detailed distribution of number of sites by region and road type, refer to Figure 2.

For detailed survey criteria and data collection guidelines, refer to Appendix A.

2.5 Speed Survey Site Selection Methodology

It is proposed that selection of a physical location on a road be determined by the following six criteria:

1. Traffic volume exceeding 1000 vehicles/day and not more than 20000 vehicles per day per lane, unless sampling frame allows smaller volumes (eg. rural roads);

2. Speed limit 50 km/h or greater;

3. Must approximately satisfy distribution of number of sites as presented in Figure 1.

4. Locations should provide opportunities for uninterrupted traffic flow (eg. avoiding spots in vicinity of major intersections, changes in posted speed limits, entries to petrol stations, shopping centres etc.);

5. Sufficient representation of dual carriageway and multi-lane roads; and

6. Sufficient coverage of areas within regions.

In the site selection procedure, it was anticipated that each of the criteria would be considered in order to achieve satisfactory representation of the population with respect to the factors such as road type, speed limit, number of carriageways and number of lanes. Selection of locations would be determined by inspection rather than employing an algorithmic computerised procedures.

2.6 Minimum Sample Size Requirement

Research literature suggests that the risk of vehicle involvement in a crash increases with the increase in speed above the speed limit, or average speed (Kloeden et al., 1997). This is more pronounced for speeds in excess of 25 km/h above the limit (West and Dunn, 1971). Changes in percentiles of vehicles travelling more than 25 km/h above speed limit are proposed to be a key evaluation criteria for assessing the effectiveness of speed enforcement measures.

Research has shown that a sample size of 50000 would be needed to detect a 20% reduction in the proportion of drivers exceeding speed limits by 30 km/h (Cowley, 1987). Similarly, studies involving surveys of this sample size have proved to be sensitive in detecting changes in the 95th percentile speed as low as 2 km/h between two consecutive years (Cameron & Vulcan, 1998).

Based on the research studies, it is proposed that the minimum sample size by road type would not be less than 50000 vehicles. A sample size of this magnitude, when stratified by road type and speed zone is thought to be sufficient to detect significant changes in speed percentiles and average speed.

The sample size for the comparison of two sample means of the proposed annual surveys may be estimated by the equation:

$$N = 2 [(Z_{alpha} - Z_{beta})S/D]^2$$

where

N = required sample size

Z_{alpha} = normal deviate corresponding to the desired confidence level

Z_{beta} = normal deviate corresponding to the desired power

D = population difference of interest

A sample of speeds taken on four locations of the Western Australian rural road, network covering a range of speed limits suggests that the minimum sample size of approximately 1000 to 16000 vehicles is required to detect changes of 1 km/h in mean speed, depending on road type and speed limit (see Table 3).

							Min.Sample Size	
Region	**Road Type**	**Speed Zone**	**N**	**Mean**	**Std Dev**	**Std Err**	**Diff. In Means***	**95th Percent.**
Rural	Local	60	2993	58.78	12.557	0.230	4156	2021
	National Hwy	110	7704	98.06	14.268	0.163	5365	2610
	State	80	1873	78.17	12.215	0.282	3932	1913
	State	110	14940	85.97	24.838	0.203	16258	7908

* 95% confidence level, 95% test power and difference=1 km/h

Table 3. Minimum sample size requirement estimates

Since spot speed populations' approximate normal distributions, the minimum sample size estimates for percentiles are derived using the equation (Oppenlander et al., 1961):

$N = v^2S^2 (1+u^2)/2d^2$

where

N = minimum sample size

v = normal deviate corresponding to the desired confidence level

S = standard deviation of the sample

u = normal deviate corresponding to the percentile being estimated, and

d = permitted error in the estimate.

The required minimum sample sizes for the 95th percentiles with the 99% confidence level and error of 1 km/h are presented in Table 3. Assuming that the speed variances of the two surveys are the same, then the estimated sample size required detecting the change in the 95th percentile of 1 km/h would be approximately 2N. Therefore, the sample sizes for the strata may 16000 for country State Roads with 110 km zones. Selection of locations for spot speed surveys are based on the derived sample size criteria with respect to road type and speed zone.

2.7 Selection of Speed Survey Locations

In order to arrive at a target sample size for the rural network, according to the proposed distribution by regions and road types (presented in Figure 1), all known section traffic volumes, by legal speed limits, were extracted from MRWA Integrated Road Information System. In total, it was estimated that at least 67 sites will be surveyed across the rural road network, consisting of approximately 10 locations on National Highways, 40 on State Roads and 17 on Local Roads. In order to cover all commonly used speed limits additional 27, 28, 27, 31, 29, 29 and 39 50 km/h local roads selected within the regional centres were included in the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 surveys, respectively. Prior to 2009, the 50 km/h and 60 km/h roads were separately surveyed from the General Speed Survey which excluded the 50 km/h roads. For practical reasons it was decided that a separate survey for the local 50 km/h and 60 km/h would not be justified, and that an adequate number of 50 km/h roads added to the existing sample would provide sufficient information to estimate indices on driver speed behaviours for these road types.

In the process of selecting estimated number of sites for the baseline 2000 survey across entire network, care was taken to achieve the most feasible representation of all driver speed behaviours over all road types. For this reason, an attempt was made to survey sites on all major roads of the network at the locations that were expected to be most representative for the road. The initial estimate of 67 sites distributed over regions and road types (as shown in Figure 1) was a guide in determining the final set of locations for the survey.

The main determinant of the number of locations by road type was found to be the total number of drivers surveyed, such that it would be representative of a particular road type MVKT. The aim was to survey as many sites on a road type as it was necessary to achieve the proportional representation of drivers by road type with respect to the total regional MVKT estimate. In order to obtain a fairly representative sample by road types within the rural areas, an approximate number of sites for each road type were selected from a pool of sites that satisfied selection criteria. Subsequently, National Highways or State Roads links within each region (if there were no National Highways passing through the region) were adequately represented in the survey by selecting sufficient number of sites and number of drivers travelling on the links. In order to minimize over-representation or under-representation of drivers on the remaining road types, the number of sites is determined in such a way that the total number of drivers surveyed would be in proportion to the total number surveyed within the region. The proportion of drivers of the total surveyed in a region on a particular road would be approximately equal to the proportion of MVKT for the same road type.

The actual number of vehicles, based on Annual Average Daily Total (AADT), estimated the number of vehicles that should have been surveyed, if MVKT proportions were applied and the number of sites proposed for the survey is presented in Table 4, below. The differences between actual AADT and estimated number of vehicles based on the MVKT proportions seem to be minimal to introduce significant bias in the representation of driver behaviour by region or road type.

	Road Type							
	National		State			Local		
Region	AADT	No. of sites	AADT	Estim. Vol	No. of sites	AADT	Estim. Vol	No. of Sites
Great Southern	0	0	14720	14720	7	7300	5800	2
South West	0	0	45100	45100	17	21900	18300	6
Gascoyne	0	0	9600	9600	3	2000	2400	1
Mid West	0	0	14110	14100	5	6200	7500	2
Goldfields-Esp.	4840	4	4180	5100	5	7800	3600	2
Kimberley	1340	5	2300	1300	2	4400	300	1
Wheatbelt South	0	0	5390	5390	7	2040	2000	2
Wheatbelt North	8740	4	7930	8600	7	5800	4400	2
Pilbara	3550	3	7680	6600	5	5700	3900	3
Total	**18470**	**16**	**111010**	**110520**	**58**	**63140**	**48200**	**21**

Table 4. Distribution of actual and estimated number of vehicles based on distribution of MVKT by road type and number of sites selected for the surveys

A summary of the proposed number of survey sites and minimum survey period required by road type within each region is outlined in Figure 2.

From the list of road segments satisfying regional and road type distribution criteria, 95 traffic "free" flow sections were proposed for possible inclusion in the survey sample.

Most of the proposed sections are characterised by representative speed limits for the road type. Since one of the aims of the survey is to investigate driver speed compliance on various speed zones over all road types, some non-typical speed zone sections for a road type satisfying the selection criteria were included in the survey sample. For example, in addition to the typical 110 km/h legal speed limit sections on rural State Roads and National Highways, in some cases short sections of not less than 2 km, with lower speed limits were chosen in the sample. It is anticipated that the data obtained on the various speed limit sections will provide an insight into driver speed behaviours within and between various speed zones, as well as the effects of alternate speed zones on driver speed compliance when travelling from higher to lower zones.

Likewise, in order to achieve, a satisfactory representation of all speed zones a number of sections on Local Roads with speed zones higher than the typical 60 km zones were selected in the sample. The scope of the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 survey extended to include the 50 km/h zones. Distribution of selected survey sites for 2000 baseline survey and 2018 survey by region, road type and various speed zones is presented in Appendix B and Appendix C, respectively.

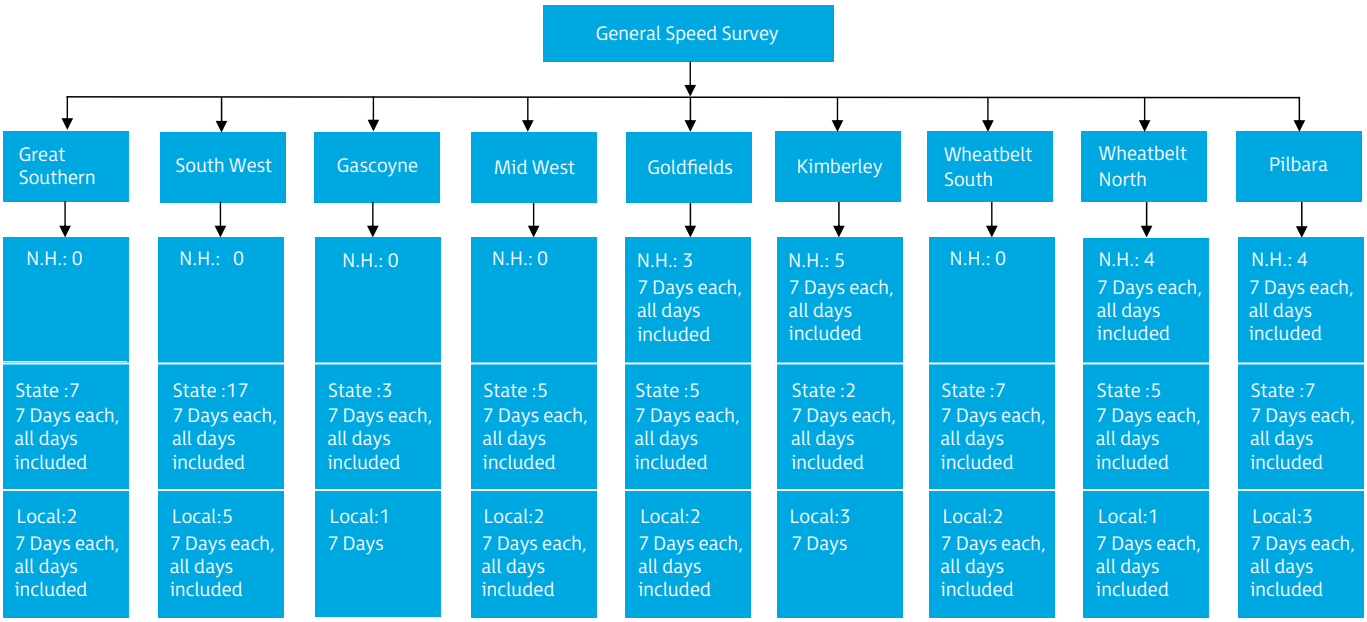


Figure 2. Proposed distribution of number of survey sites and duration in days by region and road type - proposed data collection requirement

2.8 Speed Surveys Data Analysis

It is proposed that each annual speed data is processed and analysed according to the set objectives and aims outlined in Section 2 of this study. The principal objective of the surveys is to monitor change in general speed behaviours over the network of roads. Speed behaviour measures are estimated using only vehicle speeds with headways greater or equal to four seconds. Vehicles with lower headway values are excluded from the analysis.

Traffic classifiers used to collect vehicle data in the surveys generally provide necessary information regarding speed, headway, vehicle type and time of day. Each of these parameters may be summarised by day of week and time of day, as required. The data can be arranged in a form most suitable for general and specific analyses of speed data by categories in the design of the survey.

The change in speed behaviours was measured by all factors considered in the survey, as outlined in the following sections. Driver speed behaviours in each of the strata or combination of strata were measured in terms of change in traditionally used indices like mean, 85th percentile and proportions of vehicles travelling at various speeds. In assessing the significance of changes at each level of interest, care is taken to control for any confounding factors that may be represented in the survey design. Four areas of interest in speed analysis of annual surveys were changes in:

a) Speed compliance rates,

b) The proportion of drivers exceeding 10+ km/h above posted speed limits;

c) Various speed percentiles; and

d) Mean speeds.

The change in the proportion of drivers exceeding a speed limit by 10+ km/h (10 km/h above the speed limit often considered by drivers as the enforcement speed tolerance level), was considered to be a good measure of speed enforcements on driver speed behaviours. Any speed enforcement effect that could be observed among speeding drivers may not necessarily have an effect on overall speed compliance rate or average speed; however it may have an effect on magnitude of speeds that drivers may choose to travel.

Before the first survey in 2000, no network representative speed data had ever been collected. Speed data collected in 2000 would be used as the baseline data for all subsequent surveys and for evaluation purposes of safety measures, such as those supporting the safe speeds cornerstone of the Towards Zero 2008 – 2020 road safety strategy. In broad terms, each of the surveys provides population estimates with respect the following:

1. General descriptive statistics (mean, 85th percentile, standard deviation);
2. Distribution of compliance rates by region, road type and speed limit, if sufficient data is available;
3. Distribution of proportion of drivers travelling 10+ km/h above posted speed limits, ranging from 60 km/h to 110 km/h;
4. Association between speed compliance, speeding and speed related crashes, particularly speed related serious injury crashes, depending on availability of the data.

Since the surveys have been conducted regularly depending on availability of resources, it was expected that this would result in sufficient number of indices for analysis of trends and changes in speed behaviours over time. The data could be used to assess:

1. Changes in mean speeds relative to earlier surveys and baseline surveys;
2. Changes in compliance rates relative to earlier and baseline surveys;
3. Changes in 85th percentiles;
4. Trend analysis of speed behaviour indices;
5. Changes in proportion of drivers exceeding 10+ km/h above the speed limit (or presumed speed tolerance level);
6. Differences between factor levels (region, road type, speed limit, and factor interaction);
7. Effects of speed enforcement programs on driver speed behaviour;
8. Needs for review of site specific, road or area specific speed limits; and
9. Effects of speed behaviour changes on speed related crashes.

2.9 Survey Samples

The baseline speed survey was taken over the period April to June 2000 covering various road sections on National Highways, State Roads and Local roads with posted speed limits ranging from 60 km/h to 110 km/h. The 60 km/h roads initially included in the proposed sample that were subsequently changed to the default speed limit of 50 km/h were excluded from the survey samples, and therefore from the speed data analysis presented in the following sections. Similarly, the road sections that have changed speed limits over the time were also excluded from the current and subsequent surveys. As a result of the speed limit changes over time and absence of surveys of some sites in the rural areas, the sample size varied between the surveys.

Speed data was collected at each of the proposed locations in this baseline survey sample, which was to be used in all subsequent surveys. At the time of the 2003 survey, it was found that some of the road sections in the 2000 surveys were subsequently changed to different speed limits. Some 60 km/h roads became

the 50 km/h roads while some of the higher speed road sections changed to higher or lower speed limits when compared to the speed limits that existed at the time of the baseline survey. After all associated exclusions, the proposed sample size of approximately 95 road sections in the subsequent surveys was reduced to the sample size of approximately 80 to 90 sites. The proposed distribution of sites in the baseline survey by region and road type is presented in Figure 2 above.

The final baseline survey sample consisted of 85 road sections throughout regional areas. Due to some difficulties in arranging data collection, several of the regions did not provide data in the 2003 survey, or provided data only for some of the locations that were surveyed in the 2000 survey. Therefore, the 2003 survey was reduced to 67 sections in the rural areas sample of roads or road sections. For similar reasons the number of sites surveyed in 2004 and 2005 was less than the number of sites surveyed in the 2000 survey, however, it was larger than in the 2003 survey, being 78 compared to 80 sites. The increase in the 2004 and 2005 sample was mainly associated with the surveying of the sites that were excluded in 2003 due to lack of resources. On the other hand, in 2007 the data collection procedure was successfully completed by counting 82 sites in the regions. Similarly, in 2008, 2009, 2011, 2012, 2013, 2014, 2015 and 2018 the data collection procedure was completed by counting 85, 111, 126, 99, 122, 120, 113 and 185 sites in the regions, respectively. The significant increase in the number of sites surveyed in 2009, 2011, 2012, 2013, 2014, 2015 and 2018 was due to the introduction of a sample of 27, 28, 27, 31, 29, 29 and 39, respectively local roads from regional centres with the speed limit of 50 km/h.

For the purpose of consistency in the speed data analysis and comparisons between the surveys, all sites surveyed in 2000 or any other subsequent survey that were identified as roads with changed the speed limits were excluded from the speed data analysis and determination of the major speed indices. However, separate speed indices were determined for the sample of 50 km/h roads in the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 surveys.

The distribution of road sections by speed limit and region surveyed in the baseline 2000 and the two most recently conducted surveys in 2015 and 2018 is presented in Table 5, below.

	2000							2015								2018							
Region	**60**	**70**	**80**	**90**	**100**	**110**	**Total**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**Total**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**Total**
Great Southern	1	2	1	2	0	3	9	3	1	2	1	1	0	3	11	3	2	2	2	1	0	5	15
South West	2	2	1	3	3	8	19	8	2	8	7	7	9	2	43	11	6	7	5	6	9	6	50
Midweat-Gascoyne	3	2	0	0	0	5	10	3	2	1	0	1	0	7	14	7	5	3	3	3	0	7	28
Goldfields	2	1	0	0	1	6	10	5	0	0	0	0	0	0	5	5	2	2	3	1	0	6	19
Kimberley	0	2	0	2	0	4	8	4	1	2	0	0	0	2	9	5	2	2	3	3	0	4	19
Wheatbelt	3	0	0	3	0	12	18	6	3	1	3	2	1	9	25	5	4	3	4	3	1	13	33
Pilbara	1	0	3	4	0	3	11	0	0	0	0	1	1	4	6	3	3	4	3	3	0	5	21
Total Rural	12	9	5	14	4	41	85	29	9	14	11	12	11	27	113	39	24	23	23	20	10	46	185

Table 5. Distribution of samples in the 2000, 2015 and 2018 surveys

DATA ANALYSIS AND DISCUSSION

3

Comparison between the speed indices derived from the thirteen surveys on driver speed behaviours conducted between 2000 and 2018, on a sample of roads distributed over speed limits and regions are discussed in the sections below. The driver behaviour indices measured in the surveys are based on vehicle speeds with headway greater or equal to four seconds. All other speeds that do not satisfy this criterion are excluded from derivation of estimates of the speed indices used in this study. The regional driver speed behaviour indices are determined from the vehicle speed data collected over seven days on each of the locations in the sample, for each of the sites in each of the surveys. All additional data in excess of 7 days in the regional sample locations were discarded due to possible variation in driver speed behaviours between days of the week and times of day.

3.1 Overall Network Comparison between Surveys

The surveys in regional WA recorded 1.27 million vehicles in the 2000, 1.16 million in the 2003, 1.26 million in the 2004, 1.47 million in the 2005, 1.52 million in the 2007, 1.56 million in the 2008. Since 2009 the number of vehicles recorded in the surveys increased substantially due to inclusion of 50 km/h roads in the samples, resulting in1.89 million vehicles in the 2009, 1.91 million in the 2011, 1.46 million in the 2012, 1.90 million in the 2013, 1.90 million in the 2014, 1.75 million in the 2015 and significantly higher 3.26 million in the 2018 survey.

The number of vehicles in the surveys represented by bicycles was 0.32%, 0.07%, 0.07%, 0.45%, 0.40%, 0.38%, 0.55%, 0.25%, 0.21, 0.30%, 0.32%, 0.24% and 0.51%, respectively. After excluding bicycles and all other vehicles with the headways less than 4 seconds or vehicles that did not travel under free-flowing condition (Standards Australia, 1999), the sample of vehicles used in the analysis was reduced, on average, by 24%. The number of vehicles recorded under free-flowing conditions were as follows: 1.03 million in 2000, 0.93 million in 2003, 0.99 million in 2004, 1.11 million in 2005, 1.15 million in 2007, 1.18 million in the 2008, 1.40 million in the 2009, 1.42 million in the 2011, 1.10 million in the 2012, 1.45 million in the 2013,1.44 million in the 2014, 1.31 million in the 2015 and 2.45 million in the 2018 survey.

If it was assumed that each vehicle was recorded at only one road section in the survey during the survey period and passed the survey spot twice a day, once in each direction of travel, then the estimate of number of different drivers recorded in the rural area, travelling under the traffic free-flowing condition, would be in the range of 66000 drivers as recorded in the year 2003 to 175000 recorded in the 2018 survey. Each of the drivers is assumed to be associated with unique and independent speed driver behaviour.

3.1.1 Driver Compliance to Speed Limits

(a) Overall Network Compliance

All Roads

An analysis of the speed data suggests that under free-flowing conditions over the rural network of all speed limits compliance rate varied from year to year, ranging from 61% to 72%. The compliance rates by year are presented in Table 6 below.

The compliance rate in 2003 increased by 7% to 68% from the compliance recorded in 2000. This compliance rate had been maintained until 2005 when it started to decline slightly to 66% in 2007, followed by 3% to 5% increase over the period 2008 to 2014, followed by a reduction in the rate in 2015 to 66%.The most recent 2018 survey recorded a significant increase in the compliance rate to 72%; approximately 11% higher than the one recorded in the baseline survey in 2000 (see graph in Figure 3).

From 2000 to 2015 the percentage of drivers travelling at speeds within the speed limit has increased by 5.5%, from 60.6% to 66.1%. The average network compliance for most recent three surveys over the 5 years period 2014 to 2018 was estimated at 69.4%, 8.8% higher than in the baseline survey conducted in 2000 (ref. Figure 3).

Year	Compliance Rate (%)
2000	60.6
2003	68.4
2004	68.1
2005	66.1
2007	66.5
2008	69.1
2009	71.1
2011	70.4
2012	68.8
2013	70.8
2014	69.9
2015	66.1
2018	72.1

Table 6. Driver Compliance to Speed Limits by Survey Year

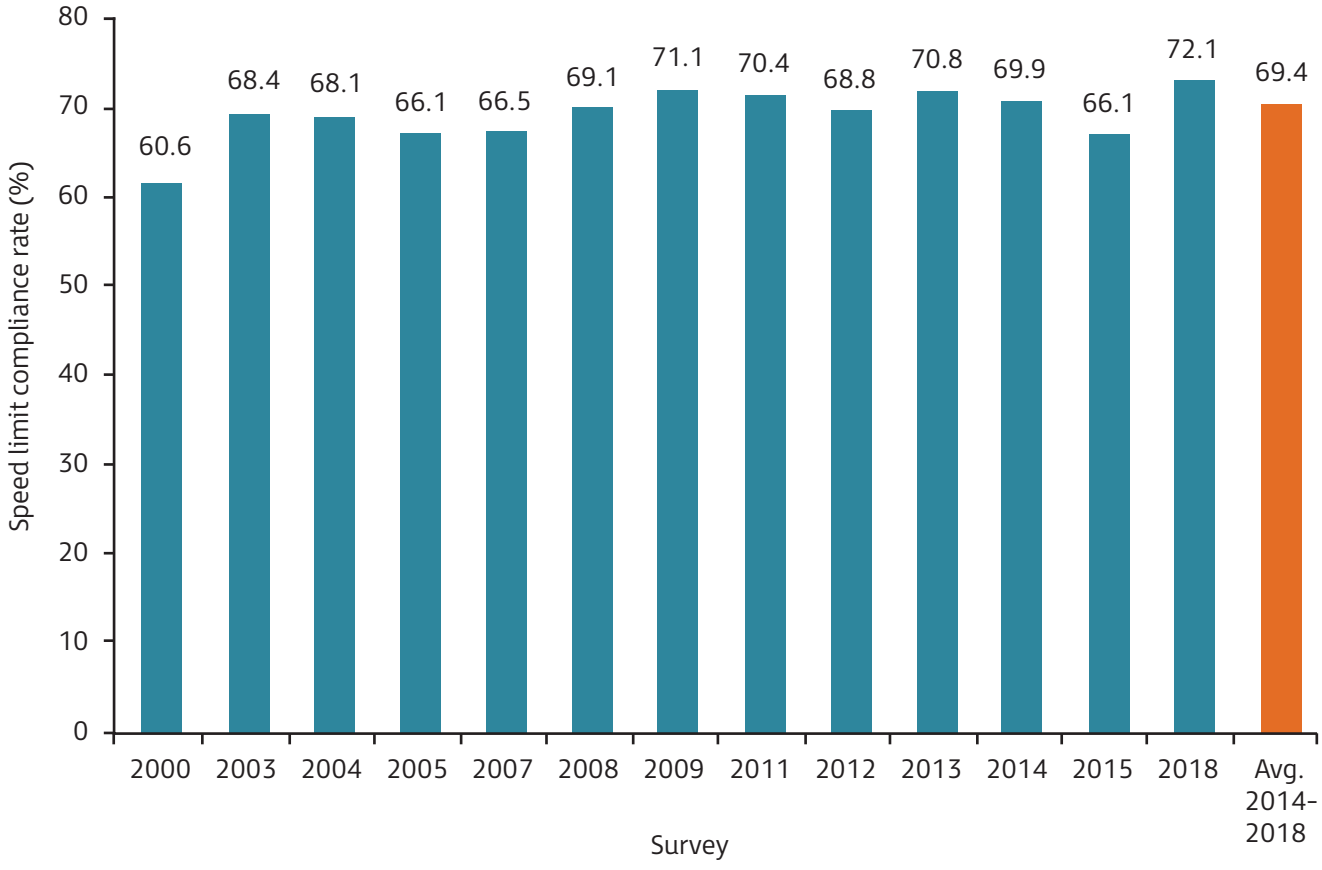


Figure 3. Driver speed compliance to speed limits across the rural road network 2000 to 2018

Compliance on State and Local Roads

The compliance rate (percentage of vehicles travelling at or below posted speed limits) on the state and local road network within all speed limits in 2000 was 63.4% on state roads and 54.3% on local roads. The compliance rate varied from 2003 to 2015, ranging from 63.6% to 72.6% on state roads and 60.9% to 77.0% on local roads. *In the most recent* 2018 survey, the compliance rates on state roads and local roads were recorded at approximately 69.8% and 76.6%, 6.5% and 22.4% higher than in 2000 survey, respectively. The average network compliance for the most recent three surveys over the 5 year period 2014 to 2018 on state road and local roads was estimated at 67.2% and 75.6%, 3.8% and 21.3% higher than in the baseline survey conducted in 2000, respectively (ref Figure 4).

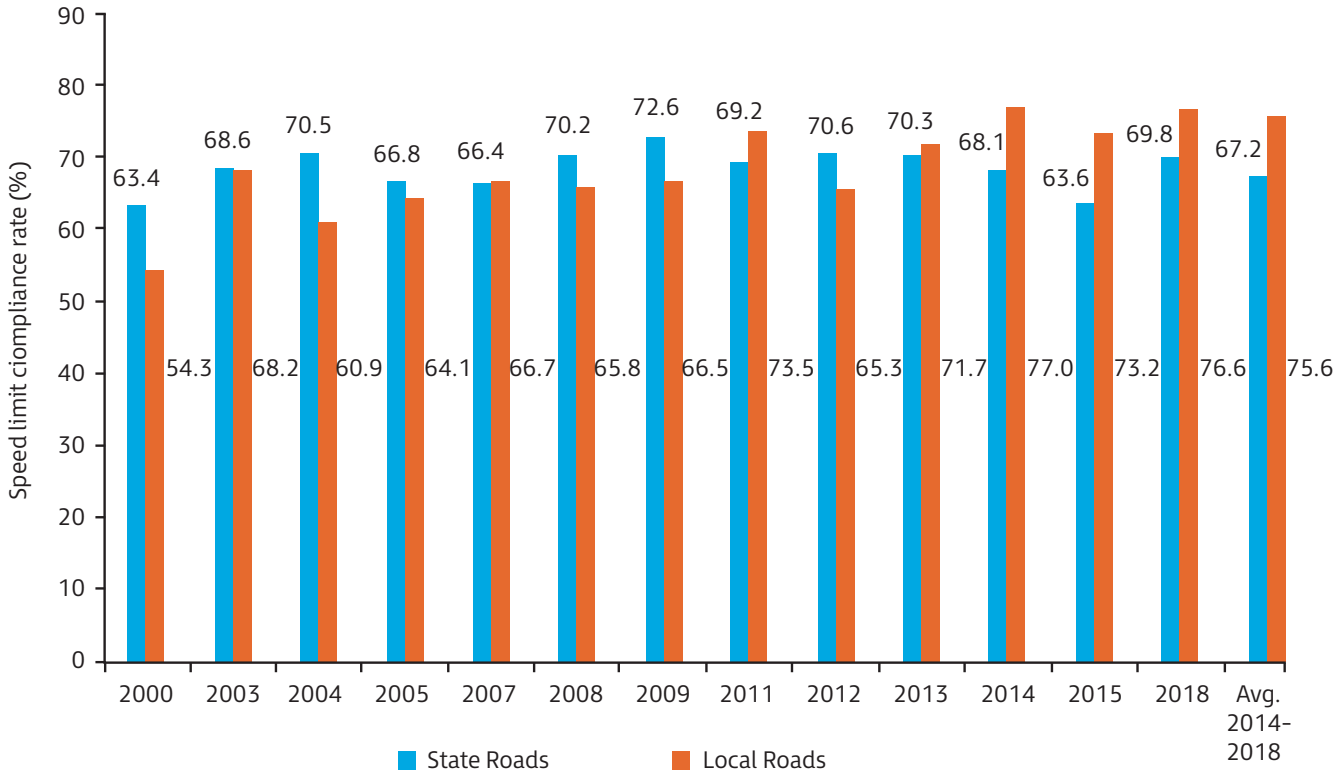


Figure 4. Driver speed compliance to speed limits across the rural state and local roads network 2000 to 2018

Motorcycle Compliance Rates

Analysis of travel speeds of motorcycles not restricted to free-flowing conditions over the period 2000 to 2005, showed that 61.5% of motorcyclists travelled at or below posted speed limits. The compliance rate varied from 2007 to 2015, ranging from 60.7% to 67.7%. The compliance rate was recorded in the 2018 survey at 67.3%, 5.9% higher than the period 2000 to 2005. The average network compliance for the most recent three surveys over the 5 years period 2014 to 2018 was estimated at 65.0%, 3.5% higher than the period 2000 to 2005 (ref Figure 5).

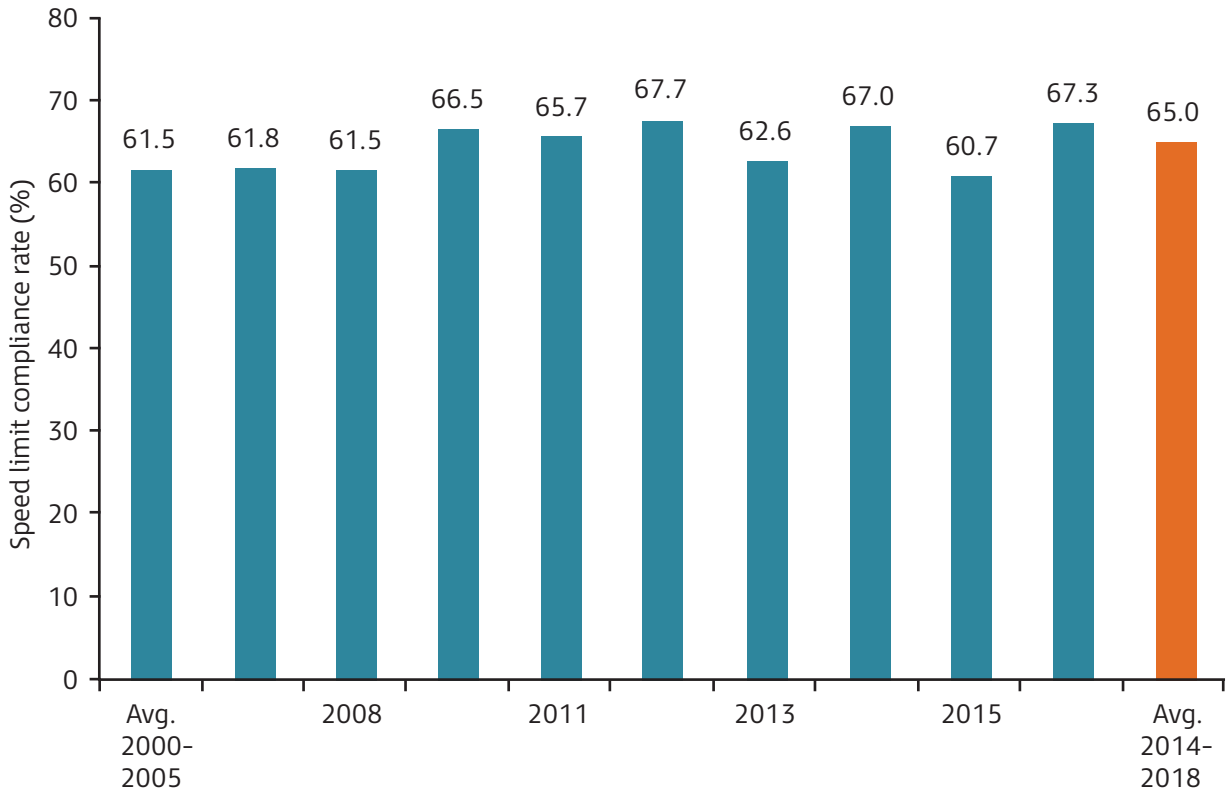


Figure 5. Motorcyclist speed compliance to speed limits across the rural road network 2000 to 2018

(b) Travelling at Speeds Greater than 10 km/h above Speed Limit

Similar to the increase in the general speed limit compliance rate, in 2003, more drivers were inclined to maintain speeds below the presumed tolerance level of 10 km/h above the speed limit than in 2000. The 2003 survey showed that there was 41% reduction in the proportion of drivers exceeding this "tolerance level", from 8.6% of all drivers observed in free-flowing traffic environments in 2000 to 5.1% in 2003 (ref. Figure 6).

The significant reduction in the number of speeding drivers in 2003 was followed by small increases in 2004, 2005 and 2007 to 6.1%, 6.4% and 6.0%, respectively.

The number of speeding drivers significantly decreased during the following eight surveys to 5.2% in 2008, 5.1% in 2009, 5.3% in 2011, 5.0% in 2012 and 2013, remained at the similar level of 4.8% in 2014, an increase of 1.1% to 5.9% in 2015 and a reduction of 1.7% to the ever lowest 4.2% in the most recent 2018 survey. This reduction in the percentage of vehicles travelling at high speeds recorded in 2018 equates to approximately a 51% reduction in the number of speeding drivers compared to the 2000.

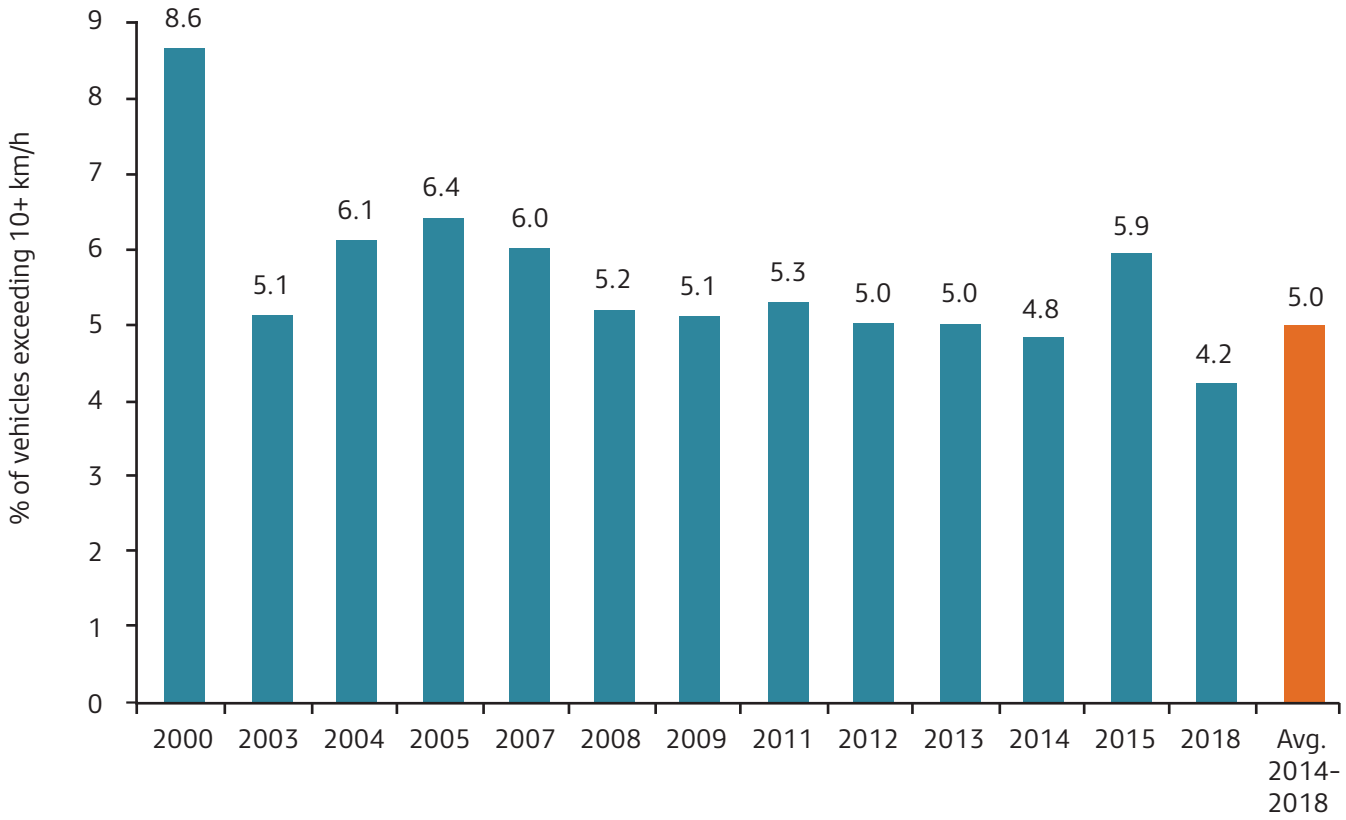


Figure 6. Percentage of drivers travelling 10+ km/h above the speed limit 2000 to 2018

Since 2000 the number of speeding drivers on the rural network has substantially reduced, ranging from 26% reduction in 2005 to 51% in 2018 (see Figure 7). The reductions in the number of speeding drivers were correlated to the overall speed compliance to the speed limit.

From 2003 the percentage of speeding drivers increased to 6.4% in 2005, representing the lowest percentage decrease of 26% recorded in the period 2003 to 2018 relative to the base year 2000.

Apart from some variability in the interim period between 2000 and 2018, overall the driver speed behaviour has significantly improved. The number of speeding drivers has significantly declined over the last 18 years, by 51%.

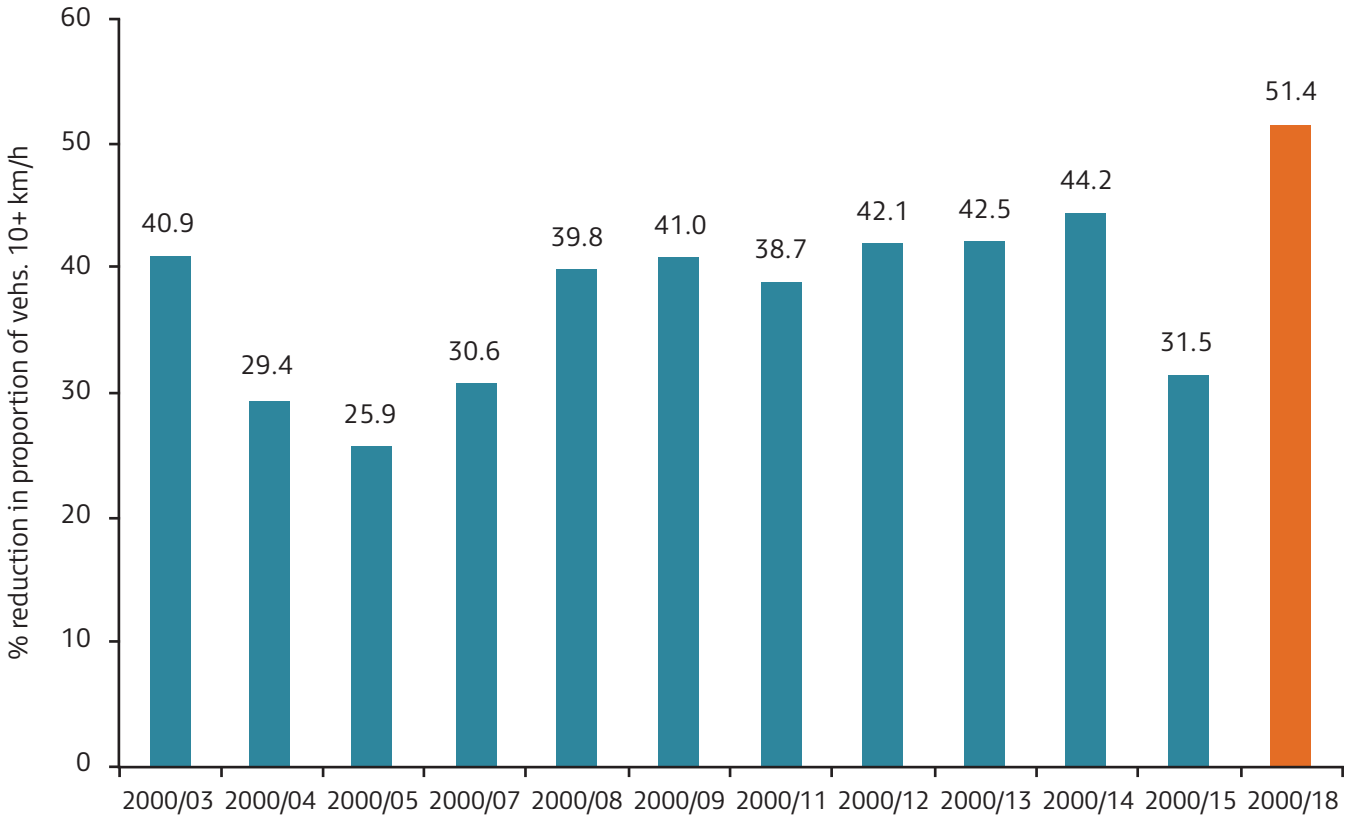


Figure 7. Percentage reduction in proportion of vehicles travelling 10+ km/h above the speed limit between 2003 and 2018 compared to 2000, rural areas

Differences between State and Local Roads in Excessive Travel Speeds

In 2000, the number of speeding drivers on the state and local roads network was recorded at 8.5% and 8.9%, respectively. The percentage of speeding drivers varied from 2003 to 2015, ranging from 4.8% to 6.9% on state road and 3.1% to 7.4% on local road. However, since then the percentage of speeding drivers dropped to 4.7% and 3.2% on state and local roads, respectively in the most recent 2018 survey, a substantial reduction of 3.8% and 5.7%, respectively when compared to the baseline 2000 survey. The average number of speeding drivers for most recent three surveys over the 5 years period 2014 to 2018 on state and local roads were estimated at 5.6% and 3.2%, 2.9% and 5.7% less than in the baseline survey conducted in 2000, respectively (see Figure 8).

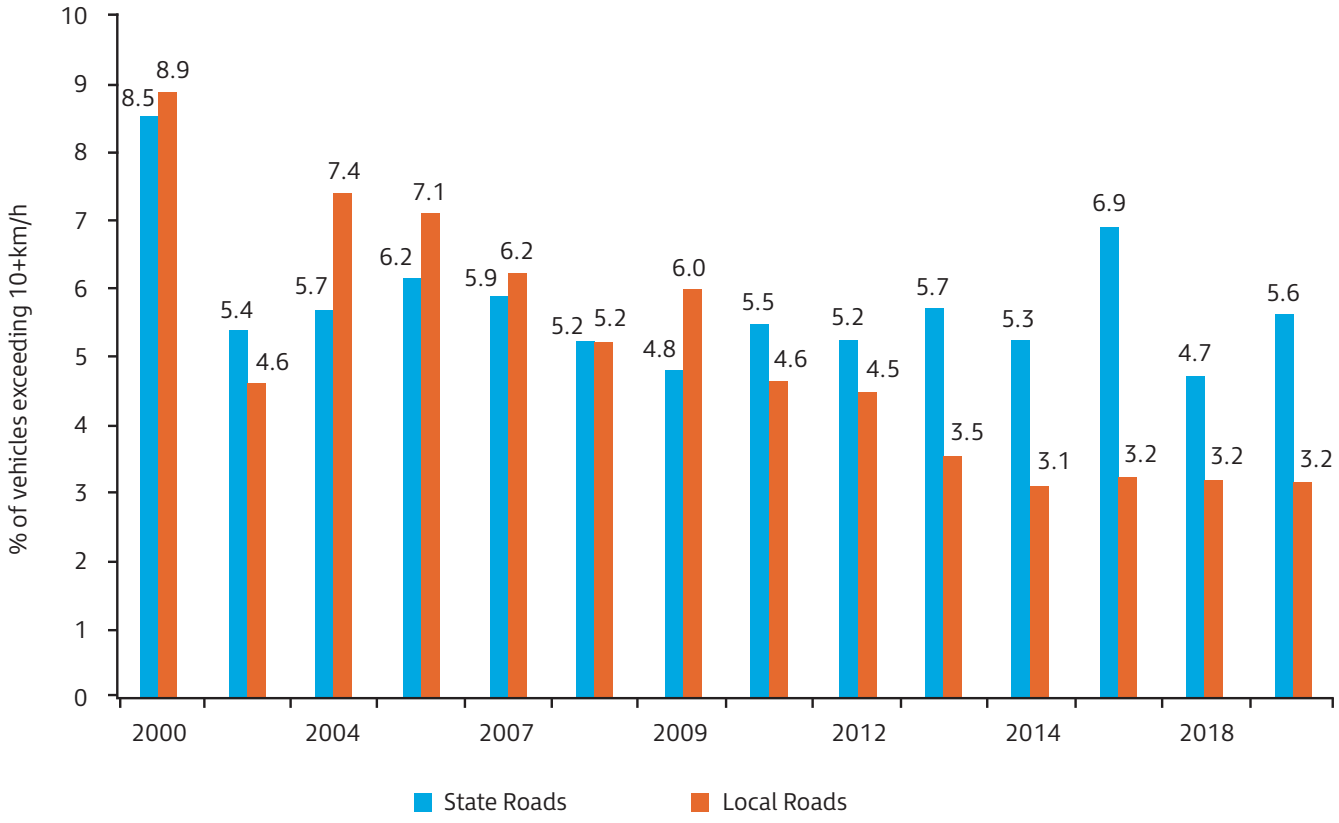


Figure 8. Percentage of drivers travelling 10+ km/h above the speed limit across the rural state and local roads network 2000 to 2018

Motorcycle Excessive Travel Speeds

Analysis of all motorcycle travel speeds, not restricted to free-flowing conditions, over the regional road network of all speed limits over the period 2000 to 2005, showed that 14.6% of all motorcyclists travelled with speeds exceeding 10 km/h above the speed limit. The percentage of speeding motorcyclists varied from 2007 to 2015, ranging from 9.8% to 14.8% across all speed limit roads. The percentage of speeding drivers dropped to 10.0% in 2018, 4.7% less than the period 2000 to 2005. The average percentage of speeding drivers for the most recent three surveys over the 5 years period 2014 to 2018 was estimated at 11.7%, 2.9% less than the period 2000 to 2005 (see Figure 9).

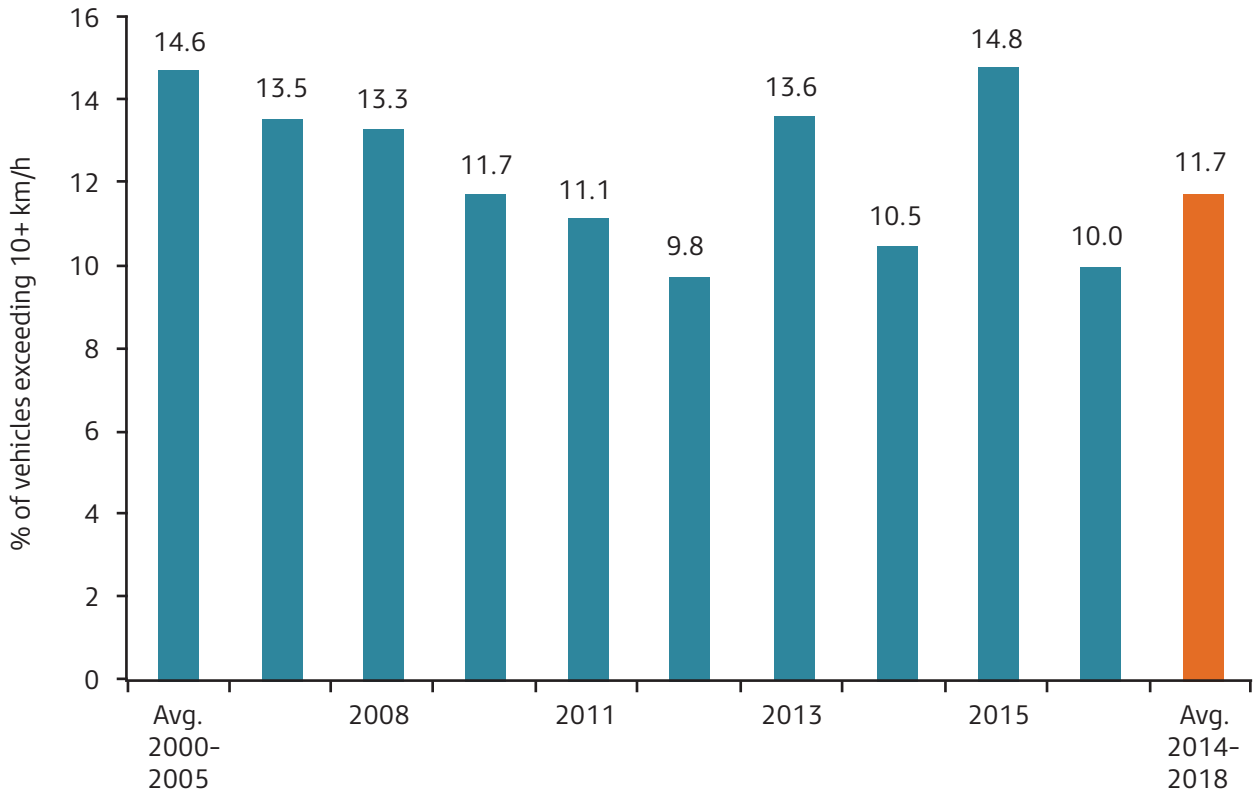


Figure 9. Percentage of motorcyclists travelling 10+ km/h above the speed limit 2000 to 2018

Further analyses, presented below, indicate that driver speed behaviour measured in terms of percentage of vehicles exceeding speed limit and presumed speed tolerance level of 10+ km/h above the speed limit varied between areas, speed limits, days of week and time of day.

(c) Compliance by Speed Limits

The surveys from 2003 to 2018, apart from some variability between the years, indicated an overall improvement in the speed compliance rates when compared to the 2000 survey.

The poorest compliance to the speed limit was observed on the ***60 km/h roads*** in 2000 at 48.3%, however, the compliance on the roads increased to 72.6% in 2018, representing the greatest increase in the compliance rate of all speed limit of 24.3% since the base year (ref. Figure 10).

The compliance rate in 70 km/h and 80 km/h roads has increased by 7.4% and 8.0%, from 67% to 74.4% and 61.9% to 69.9%, respectively in 2018 compared to the 2000 baseline survey.

The speed compliance on 90 km/h and 100 km/h roads has on average increased by 15.4% in 2018 when compared to the 2000 baseline survey, from 55.8% to 71.2%, while the compliance on the 110 km/h roads remained fairly constant over the years at approximate average of 68.6%.

The most positive finding arising from the surveys is, that despite the variability in the compliance rates over the last eighteen years, the compliance rate increased to a significantly higher level compared to the year 2000.

Compared to the 2000 survey, over the period 2003 to 2008 the overall average compliance rate increased by 7.0%, followed by a further increase of 3.5% in 2009, A

slight reduction of 0.7% occurred in 2011, followed by an increase of 1.6% in 2012 and an additional increase of 2.0% in 2013. The compliance rate was reduced by 0.9% in 2014 and by 3.7% in 2015, followed by a significant increase of 6.0% to the compliance of 72.1% in 2018, 11.5% higher than in the 2000 baseline survey.

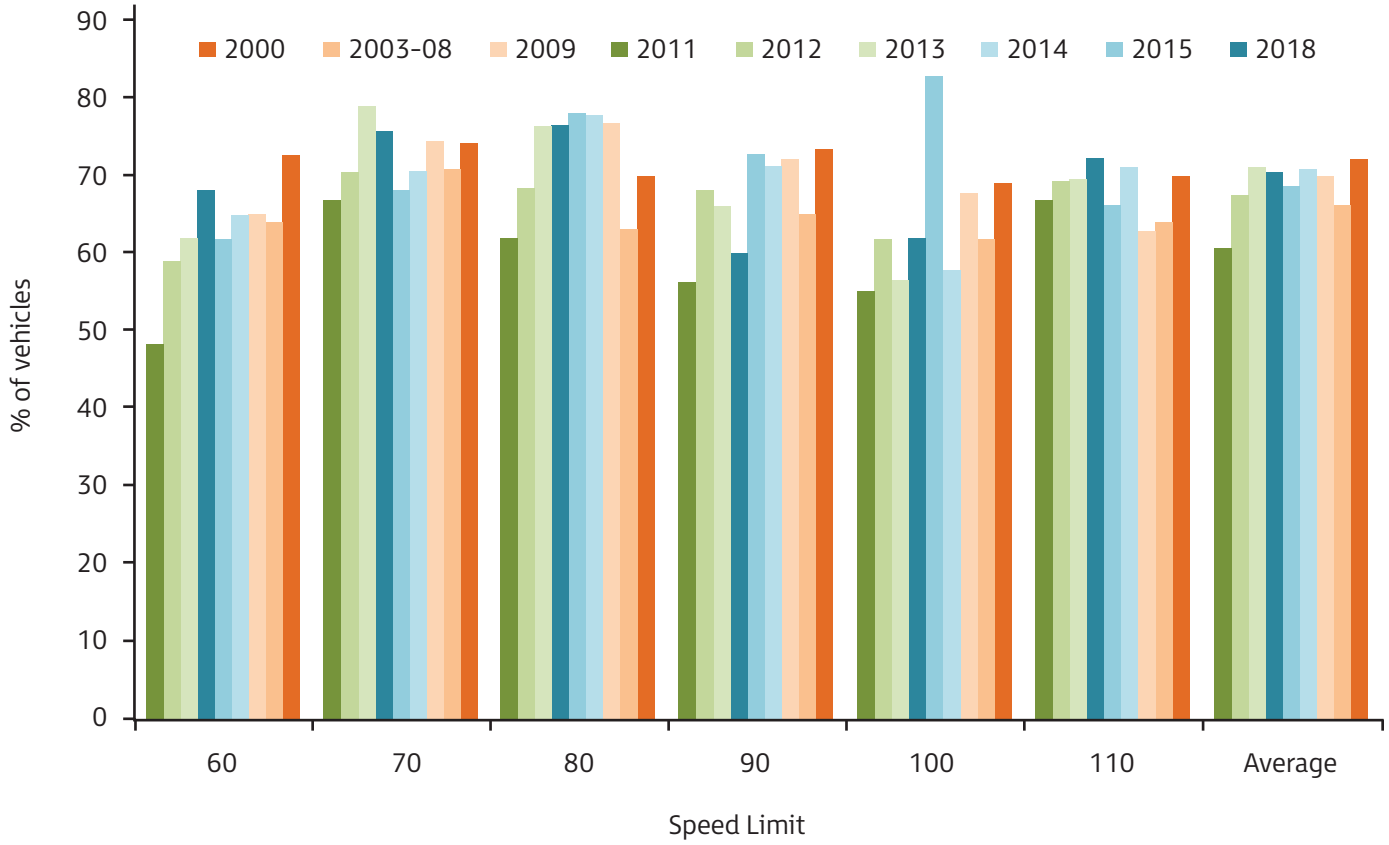


Figure 10. Compliance rate by speed limit across the rural road network

Note: Only one site counted in the sample on 100 km/h roads in 2012.

3.1.2 Vehicles Travelling at Excessive Speeds by Speed Limit

Since 2000 all speed limit roads showed substantial reductions in the proportions of drivers travelling at high speeds, being 10 or more km/h above the speed limit. Despite some variations between in the interim years between 2000 and 2018, all roads on average recorded a reduction in the number of speeding drivers relative to the percentage recorded in the 2000 survey.

The reduction in the percentage of vehicles travelling 10+ km/h above the speed limit over the period 2003 to 2008 compared to 2000 ranged from 44% on 90 km/h roads (from 12.2% to 6.8%) to the minimum of 19% on 100 km/h roads (from 15.1% to 12.2%).

The best driver speed behaviours were recorded in the most recent 2018 survey and the worst in 2005. The 2000 percentage of drivers travelling 10+ km/h above the speed limit of 8.6% reduced to the average of 5.8% over the period 2003-2008, down to 4.8% in 2014, increased to 5.9% in 2015, similar to the percentage recorded in 2007, followed by a substantial reduction to the lowest ever percentage of 4.2% in 2018. Compared to the averages by speed limit for the period 2003-2008, the 2018 survey have shown further reductions in the percentage of vehicles travelling at the excessive speeds,

ranging from 56.0% on 100 km/h roads to the minimum of 8.1% on 80 km/h roads (see Figure 11).

The average percentage of speeding drivers over the 2003 to 2008 period ranged between 3.4% on 70 km/h roads to 12.2% on 100 km/h roads.

The average percentage of vehicles travelling 10+ km/h above the speed limit has remained fairly constant over the period 2009 to 2018, except on 100 km/h speed limit roads that recorded significant reductions in the 2011 to 2018 surveys.

The reduction in the number of speeding drivers in 2018 compared to the number recorded in 2000 ranged between 28% on 80 km/h roads, 34% on 110 km/h roads, 36% on 70 km/h roads, 63% on 90 km/h roads, 64% on 60 km/h roads and 65% on 100 km/h roads.

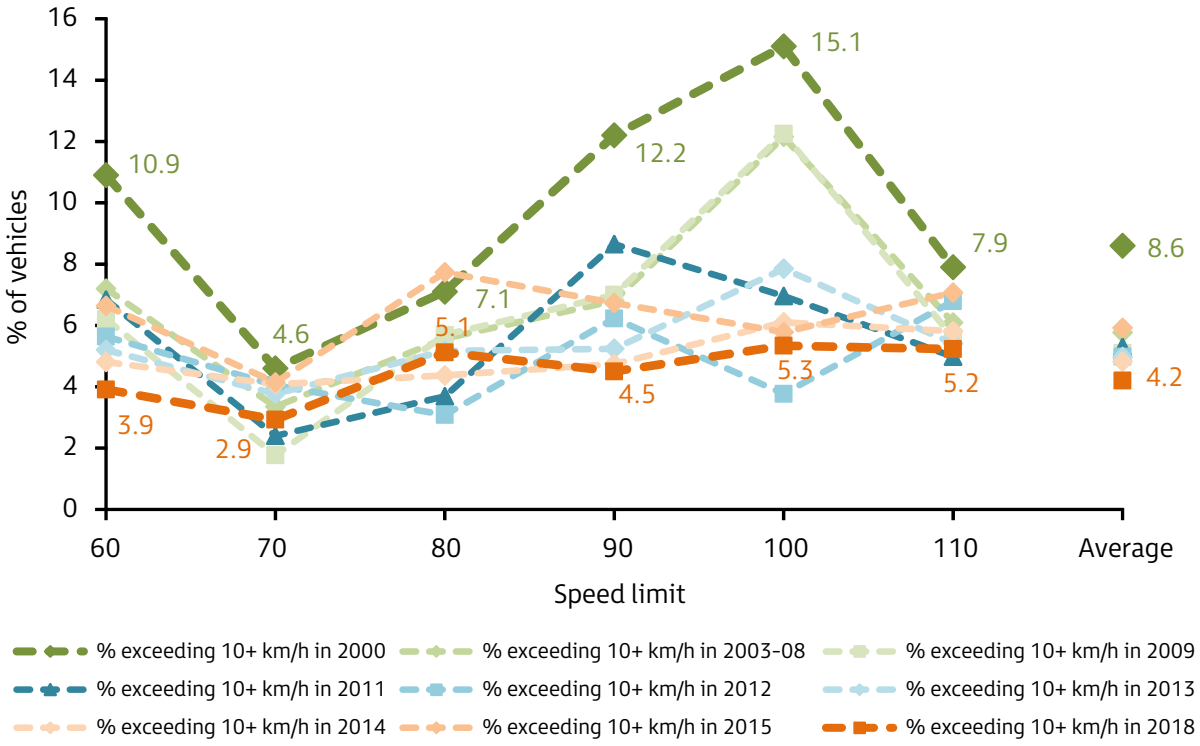


Figure 11. Non-compliance to 10+ km/h above speed limit by survey and posted speed limit, rural areas

3.1.3 Compliance to 10+ km/h above Speed Limit by Hour

As shown in Figure 12, drivers are more likely to travel at excessive speeds, 10+ km/h above speed limits during night hours, from 7 p.m. to 7 a.m. As expected, the patterns of driver speed behaviours are similar between the survey years. Apart from differences in magnitudes of proportions of drivers travelling 10+ km/h above the speed limit no significant changes in the pattern was observed in neither of the surveys.

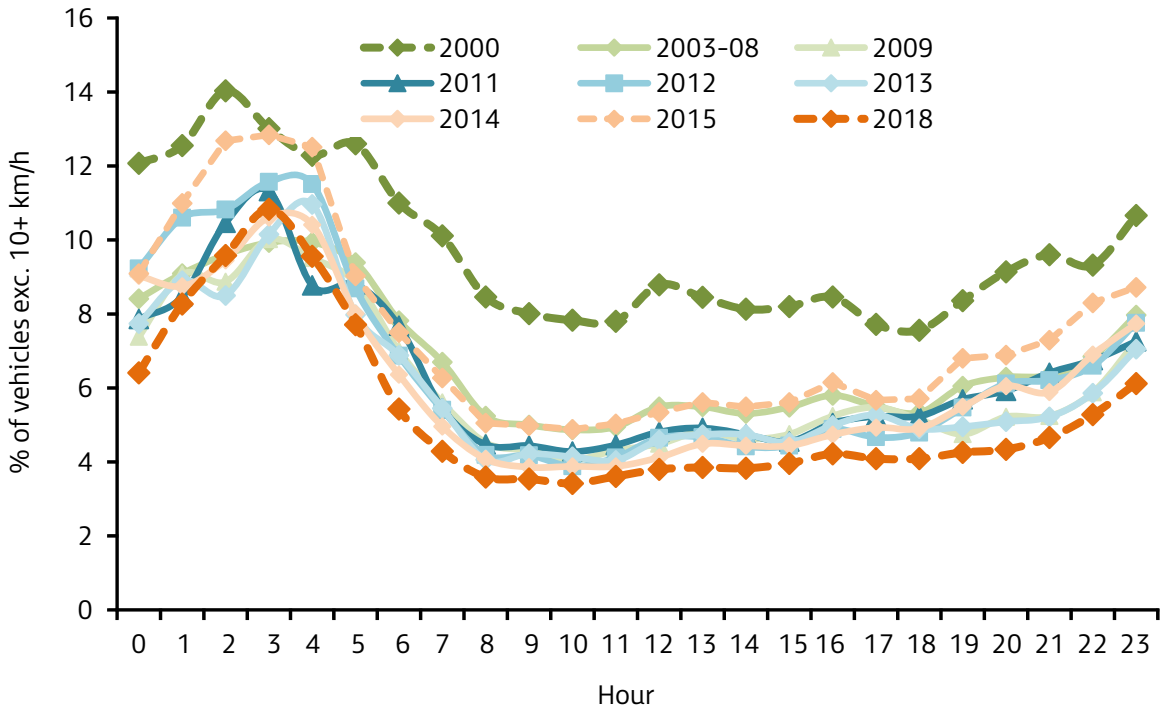


Figure 12. Non-compliance to10+ km/h above speed limit by hour of day, rural areas

The percentage change in number of drivers travelling at excessive speeds from 2003 to 2018 has been fairly consistent across all hours of the day when compared to the percentage of drivers travelling at those speeds in 2000.

On average, the highest travel speeds are expected to occur between 11 p.m. and 6 a.m. The percentage of speeding drivers during this period in 2018 ranged from 5% to 11%. In all surveys, the least number of speeding drivers were recorded between 8 a.m. and 1 p.m., approximately 4% in 2009, 2011, 2012, 2013, 2014, approximately 5% in 2015 and reduced to 3% in the most recent survey 2018.

Compared to the 2000 baseline survey, the reduction in the percentage of vehicles travelling 10+km/h above the speed limit across all hours of the day in 2018 ranged from 17% to 58%.

3.1.4 Compliance by Day of Week

Compliance to Speed Limit

The surveys from 2003 to 2018 indicated that, in general, the highest compliance to speed limits occurs from Monday to Friday, on average 69.3%, slightly less on Saturday, average of 68.1%, followed by Sunday with the lowest compliance of 67.6%. The 2018 survey indicated that the best compliance was on week days, average of 72.7% and the worst on week-ends, an average of 70.5%.

The distribution of speed limit compliance rates by day of week is presented in Figure 13, below.

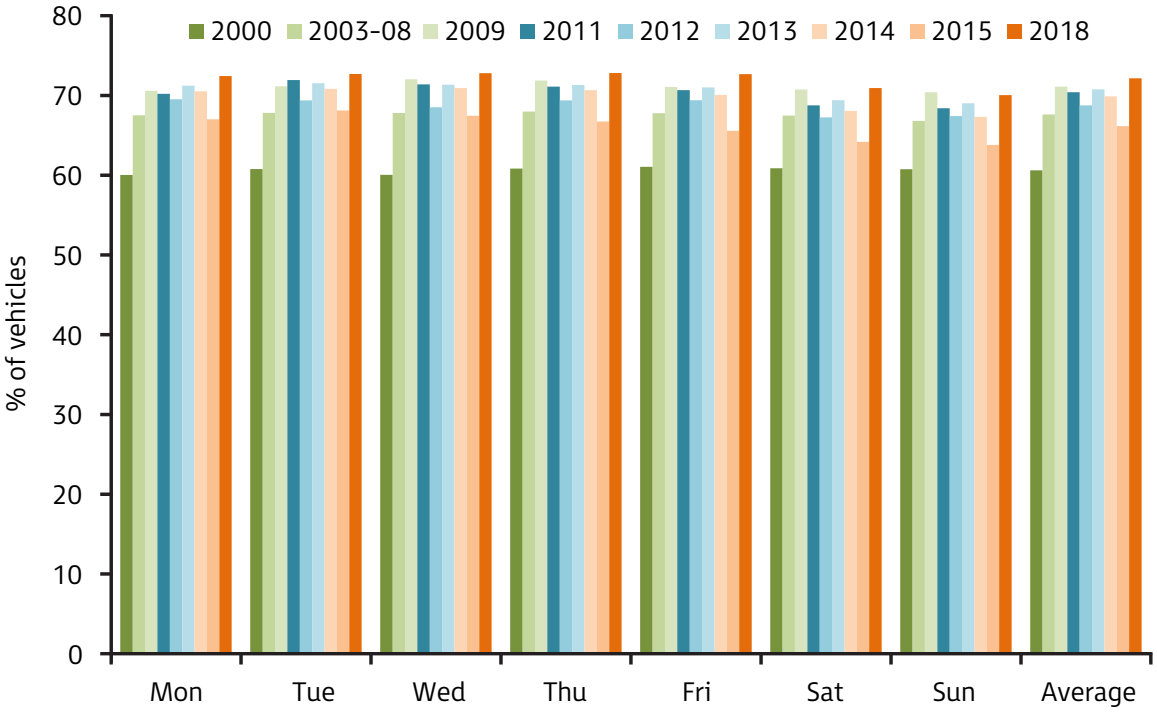


Figure 13. Compliance rate by day of the week, rural areas

Escessive Travel Speeds 10+ km/h above Speed Limit

In general, excessive travel speeds are inversely related to overall compliance to speed limits. The highest compliance to the speed limit is associated with the lowest percentage of vehicles travelling with speeds 10 or more km/h above the speed limit.

Over most of the surveys Sunday, followed by Saturday were found to be the days with the highest percentage of drivers exceeding 10 or more km/h above the speed limit, ranging from 5.2 % on Saturday in 2003 to 8.9% on Sunday in 2000, and significantly less at 4.6% and 4.7%, respectively in 2018 (see Figure 14).

Across all surveys, the average week day percentage of drivers travelling at high speeds was estimated at 5.4%, compared to the average week-end percentage of 6.1%. In the most recent 2018 survey, the percentage of speeding drivers on week days was estimated at 4.0%, compared to the week-end average of 4.7%.

The best performing days in 2018 were as Monday, Wednesday and Thursday at 4.0%.

The estimated average weekday and weekend percentage of drivers travelling 10 or more km/h above the speed limit by survey year is presented in Table 7:

Survey	Weekday %	Weekend %
2000	8.6	8.8
2003	5.0	5.4
2004	6.0	6.4
2005	6.2	6.9
2007	5.9	6.4
2008	5.1	5.4
2009	4.9	5.5
2011	5.0	6.0
2012	4.7	5.7
2013	4.7	5.7
2014	4.6	5.4
2015	5.5	7.0
2018	4.0	4.7

Table 7. Average weekday and weekend percentage of drivers travelling 10 or more km/h above the speed limit by survey year

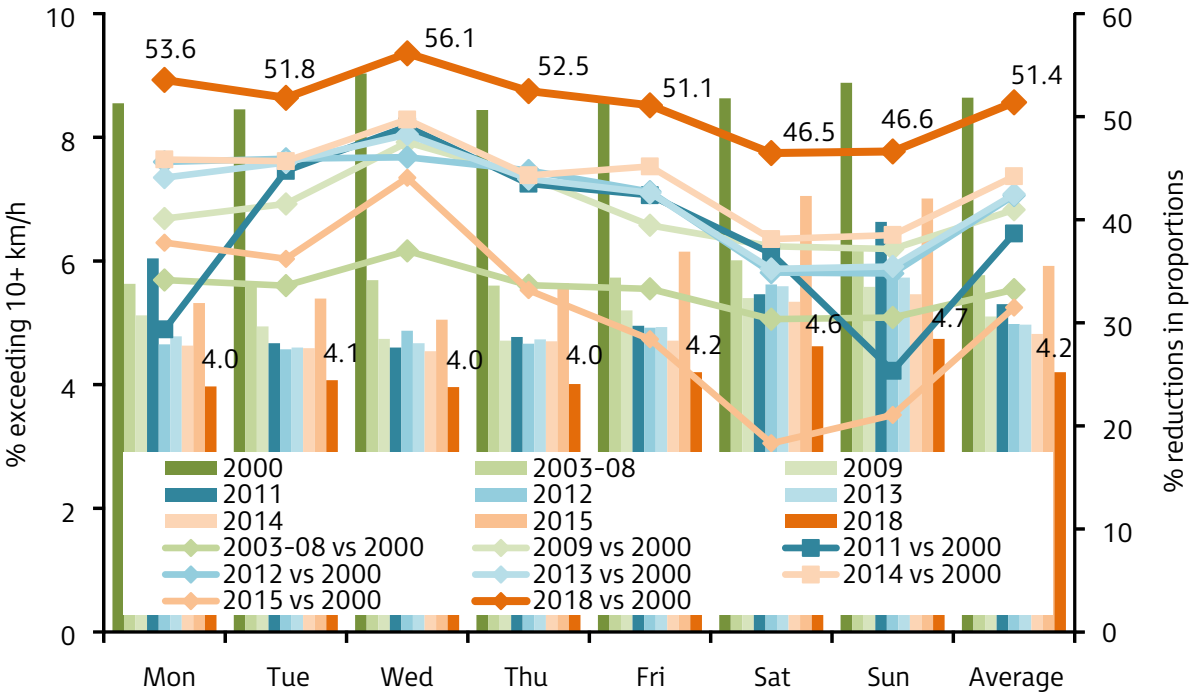


Figure 14. Percentage of vehicles exceeding 10+ km/h above speed limit by day of the week and reductions in the number of drivers travelling the high speeds vs. 2000, rural areas

In general, across all survey years, the highest percentage of speeding drivers, those travelling 10 or more kilometres above the speed limit, would be expected on week-ends.

The highest reduction in the percentage of speeding drivers in 2018 compared to 2000 was recorded on Wednesdays (approx. 56%) and the least on the week-ends (approx. 47%).

3.2 Differences in Mean Speeds and 85th Percentiles

In addition to the differences in the speed limit compliance and the percentage of speeding drivers between the survey years the study also examined the differences in other speed indices such as mean speeds and the 85th percentiles.

3.2.1 Differences in Mean Speeds

Differences in Mean Speeds between the Surveys - Rural Areas

An analysis of the mean speeds between the survey years showed that in general, mean vehicle travel speeds have not significantly changed over the survey years apart from 60 km/h and 80 km/h roads, with some reduction trend on 90 km/h roads. However, as indicated in Figure 15, there was some notable variability in mean speeds between the survey years on all speed limit roads.

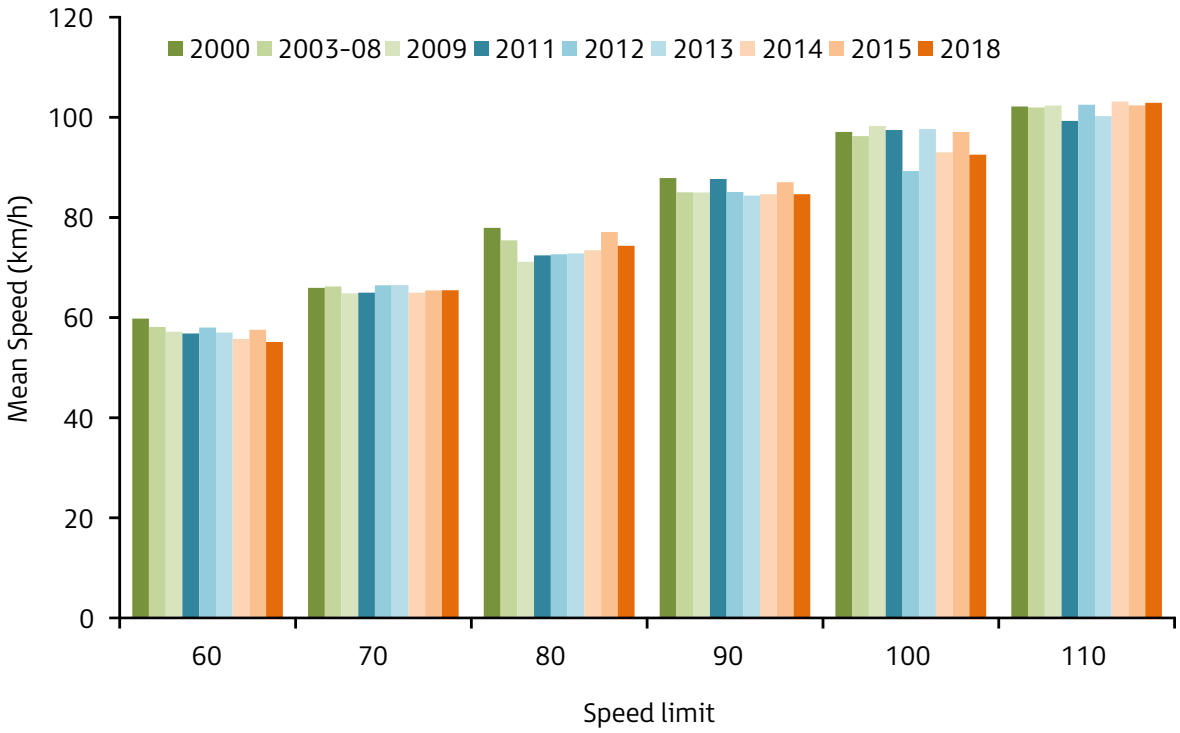


Figure 15. Mean speeds by speed limit and survey year – rural areas 60 km/h Roads

60 km/h Roads

Over the period 2003 to 2008, the mean speed on 60 km/h rural roads was reduced by 1.7 km/h in comparison to the mean of 59.8 km/h recorded in the 2000 survey. From 2003-08 period there was a steady decrease in the mean speed to 57.2 km/h in 2009 followed by a slight decrease in the mean speed to 56.8 km/h in 2011 and subsequently by an increase in the mean speed of 1.2 km/h to 58.0 km/h in 2012.

The following two years have recorded substantial reductions in the mean speeds to 57.0 km/h in 2013 and to 55.7 km/h in 2014, followed by a relatively large increase by 1.8 km/h to 57.5 km/h in 2015 and a substantial reduction of 2.4 km/h in the mean speed to a low of 55.1 km/h in 2018, however, 4.9 km/h less than the corresponding speed limit of 60 km/h, and 4.7 km/h less than the mean speed recorded in 2000 survey, representing overall reduction of 7.8%.

70 km/h to 90 km/h Roads

Average mean speeds across all surveys on 70 km/h to 90 km/h roads were less than the corresponding speed limits, ranging in the magnitude of 2 km/h to 9 km/h. Overall, drivers on these roads have seemed to travel at higher speeds relative to the speed limit than drivers on the 60 km/h roads with the mean speeds ranging between 0.2 km/h and 5 km/h below the speed limit.

Compared to the 2000 mean travel speeds, the reduction in the mean speed in 2018 was recorded on 80 km/h roads of 3.6 km/h followed by 3.2 km/h and less than 1 km/h reduction in the mean speed on 90 km/h and 70 km/h roads, representing a reduction of 4.6%, 3.7% and less than 1%, respectively.

100 km/h and 110 km/h Roads

Mean travel speeds on 100 km/h and 110 km/h roads over the survey years were at approximately 95.6 km/h and 101.9 km/h, respectively. No significant changes were observed over the years on these speed limit roads, apart from some small variations around the mean speeds for the period from 2000 to 2018. Average mean speeds across all surveys on the 100 km/h and 110 km/h roads were less than the corresponding speed limits, ranging in the magnitude of 2 km/h to 11 km/h.

The changes in mean speeds by speed limit and survey year are presented in Figures 16 and Table 8 below.

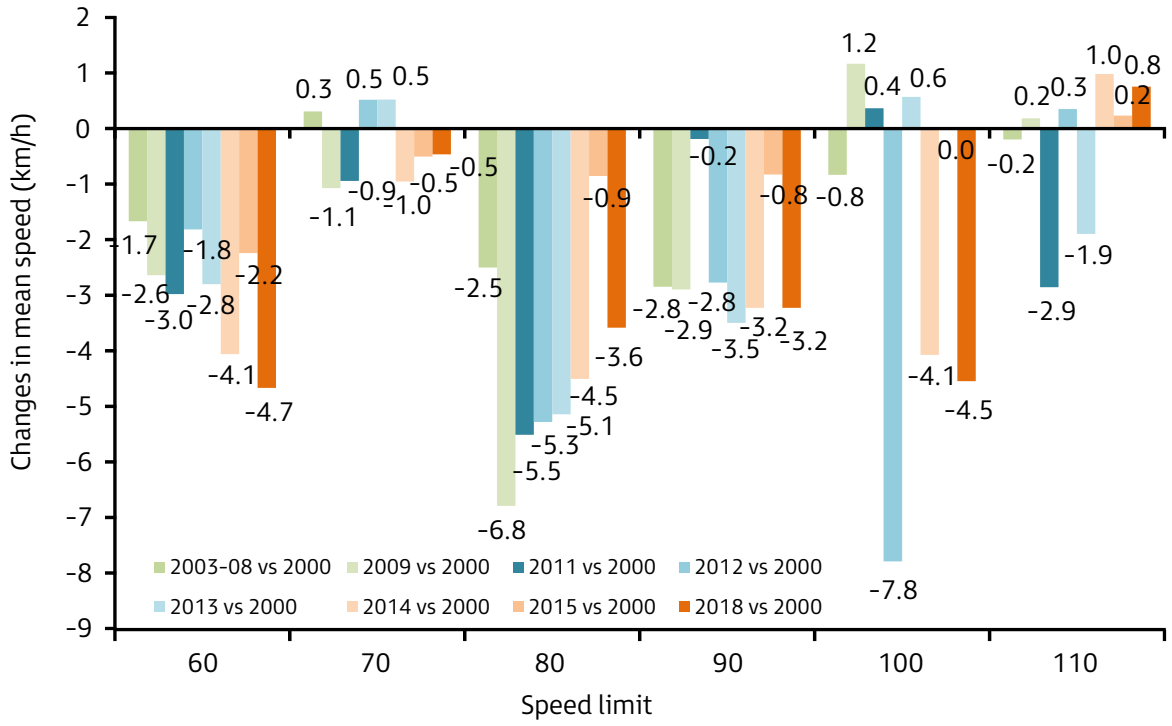


Figure 16. Differences in mean speeds between survey years on various speed limit roads, rural areas

Survey Year	Distribution characteristic	Speed limit 60	70	80	90	100	110
2000	No. of vehicle surveyed	200225	222808	90543	194227	20933	298991
	Mean speed	59.8	65.9	77.9	87.9	97.1	102.1
	Std. Dev.	9.9	9.9	9.2	12.0	14.4	14.1
	85th percentile	68.1	74.4	85.6	98.5	110.0	114.9
	% of vehicles exceeding speed limit	51.7	33.0	38.2	43.5	44.9	33.2
	% of vehicles exceeding enforcement speed limit	10.9	4.6	7.1	12.2	15.1	7.9
	Total no.exceeding 10 km/h above the speed limits	**88846 (8.6%)**					
	Total no.exceeding speed limit - all speed limits	**404779 (39.4%)**					
2003-08	No. of vehicle surveyed	797884	1260352	715134	994640	79412	1526621
	Mean speed	58.1	66.2	75.4	85.0	96.2	101.9
	Std. Dev.	9.3	8.3	10.5	11.9	13.1	13.5
	85th percentile	65.8	73.3	84.4	94.9	108.3	113.6
	% of vehicles exceeding speed limit	41.0	29.5	31.8	31.9	38.1	30.6
	% of vehicles exceeding enforcement speed limit	7.2	3.4	5.6	6.8	12.2	6.1
	Total no.exceeding 10 km/h above the speed limits	**309851 (5.8%)**					
	Total no.exceeding speed limit - all speed limits	**1740631 (32.4%)**					
2009	No. of vehicle surveyed	172935	337077	206899	262713	11898	409983
	Mean speed	57.2	64.8	71.1	85.0	98.2	102.3
	Std. Dev.	9.6	7.5	11.9	11.9	11.4	12.6
	85th percentile	65.4	71.5	83.4	95.2	108.4	113.2
	% of vehicles exceeding speed limit	38.2	21.3	23.5	33.7	43.3	30.4
	% of vehicles exceeding enforcement speed limit	6.2	1.8	5.7	7.0	12.3	5.6
	Total no.exceeding 10 km/h above the speed limits	**71285 (5.1%)**					
	Total no.exceeding speed limit - all speed limits	**404568 (28.9%)**					
2011	No. of vehicle surveyed	245832	295655	245995	245223	55867	332722
	Mean speed	56.8	65.0	72.4	87.7	97.4	99.3
	Std. Dev.	12.0	8.3	11.4	10.7	10.2	14.6
	85th percentile	64.8	72.1	82.6	96.5	105.3	112.2
	% of vehicles exceeding speed limit	32.0	24.1	23.6	40.1	38.0	28.0
	% of vehicles exceeding enforcement speed limit	6.8	2.4	3.7	8.7	7.0	5.0
	Total no.exceeding 10 km/h above the speed limits	**74658 (5.3%)**					
	Total no.exceeding speed limit - all speed limits	**420427 (29.6%)**					
2012	No. of vehicle surveyed	225369	344800	194437	108894	4320	222828
	Mean speed	58.0	66.4	72.6	85.1	89.3	102.5
	Std. Dev.	8.0	8.5	10.4	10.5	12.8	12.7
	85th percentile	65.1	73.7	81.9	93.8	101	113.5
	% of vehicles exceeding speed limit	38.2	31.8	22.0	27.4	17.1	33.7
	% of vehicles exceeding enforcement speed limit	5.6	4.1	3.1	6.2	3.8	6.8
	Total no.exceeding 10 km/h above the speed limits	**54767 (5.0%)**					
	Total no.exceeding speed limit - all speed limits	**343883 (31.24%)**					
2013	No. of vehicle surveyed	249633	353041	242384	260297	41205	308135
	Mean speed	57.0	66.4	72.8	84.4	97.6	100.2
	Std. Dev.	8.6	8.0	11.1	10.9	10.9	14.7
	85th percentile	64.8	73.2	82.5	93.9	106.1	112.6
	% of vehicles exceeding speed limit	35.0	29.4	22.2	28.7	42.0	28.7
	% of vehicles exceeding enforcement speed limit	5.2	3.8	5.2	5.2	7.9	5.4
	Total no.exceeding 10 km/h above the speed limits	**72339 (5.0%)**					
	Total no.exceeding speed limit - all speed limits	**425526 (29.3%)**					
2014	No. of vehicle surveyed	220677	404702	193461	220594	53469	343186
	Mean speed	55.7	64.9	73.4	84.6	93.0	103.1
	Std. Dev.	10.0	9.2	10.3	10.6	14.3	13.2
	85th percentile	64.6	73.0	82.6	93.4	104.7	114.0
	% of vehicles exceeding speed limit	34.9	25.6	23.4	28.0	32.4	37.3
	% of vehicles exceeding enforcement speed limit	4.8	4.1	4.4	4.7	6.1	5.8
	Total no.exceeding 10 km/h above the speed limits	**69259 (4.8%)**					
	Total no.exceeding speed limit - all speed limits	**432743 (30.1%)**					
2015	No. of vehicle surveyed	141691	449087	192742	183857	145771	195494
	Mean speed	57.5	65.4	77.1	87.0	97.0	102.4
	Std. Dev.	9.0	9.4	10.1	9.9	10.1	13.8
	85th percentile	65.2	73.5	85.7	95.1	105.0	114.3
	% of vehicles exceeding speed limit	36.0	29.2	36.8	35.1	38.1	35.9
	% of vehicles exceeding enforcement speed limit	6.6	4.1	7.7	6.7	5.8	7.1
	Total no.exceeding 10 km/h above the speed limits	**77534 (5.9%)**					
	Total no.exceeding speed limit - all speed limits	**443052 (33.9%)**					
2018	No. of vehicle surveyed	551907	653496	375287	356924	113480	400094
	Mean speed	55.1	65.4	74.3	84.6	92.5	102.9
	Std. Dev.	9.1	8.9	10.8	11.0	15.2	11.8
	85th percentile	63.3	72.5	84.1	93	104.1	112.6
	% of vehicles exceeding speed limit	27.4	25.7	30.1	26.7	31.0	30.2
	% of vehicles exceeding enforcement speed limit	3.9	2.9	5.1	4.5	5.3	5.2
	Total no.exceeding 10 km/h above the speed limits	**109282 (4.2%)**					
	Total no.exceeding speed limit - all speed limits	**682981 (27.9%)**					

Table 8. Vehicle speed characteristics by speed limit, rural areas

3.2.2 The 85th Percentile Speeds

The speed distributions by speed limits indicate that, on all types of speed limit roads, the 85th percentiles are significantly higher than the posted speed limits. In 2018, the differences ranged from 2.5 km/h on 70 km/h roads to approximately 4.1 km/h on 80 km/h and 100 km/h roads, respectively in rural areas. The differences between speed limits and the 85th percentiles follow irregular pattern across the speed limits (see Figure 17, below).

The differences between the 85th percentiles and posted speed limits were smaller in the period 2003 to 2018 than in 2000, indicating greater compliance to speed limits over the period than in the 2000 survey. The relative pattern of the differences remained fairly constant over the observation periods, supporting the hypothesis of similar effects of various road safety initiatives on driver speed behaviours across all speed limits.

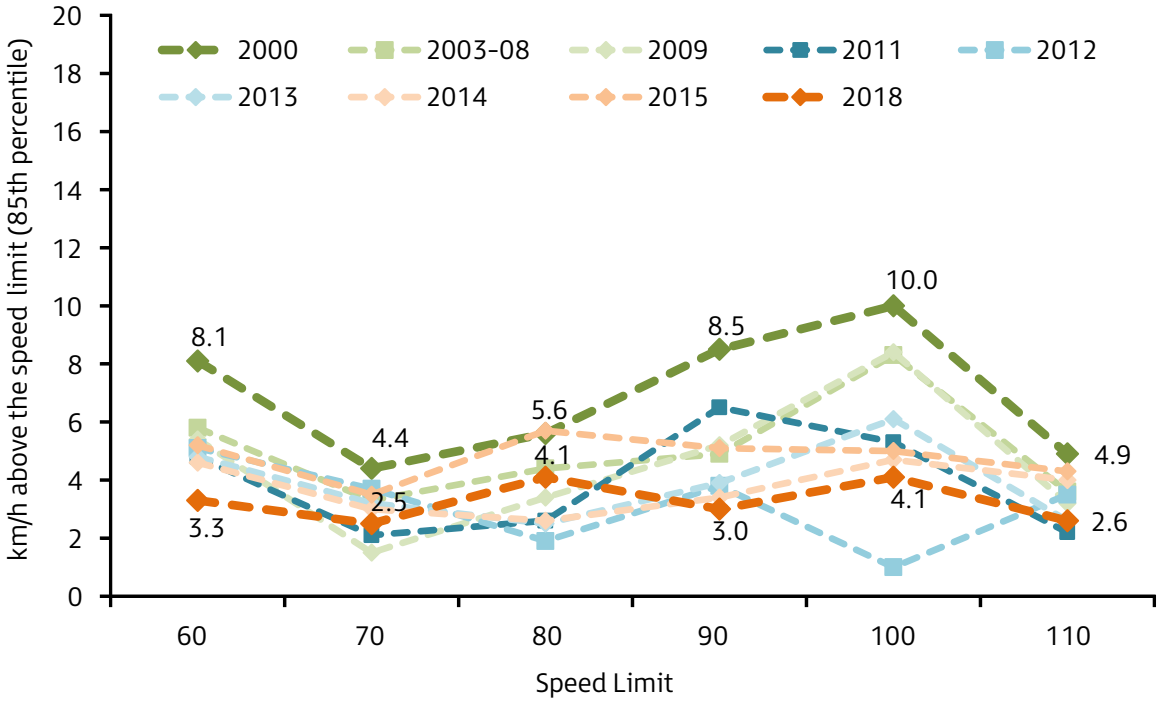


Figure 17. Differences between 85th percentiles and posted speed limits, rural areas

The distribution of the 85th percentiles by survey year and speed limit shows that there were some fluctuations in the percentiles between the surveys (ref. Figure 18), ranging from negligible changes to reductions of over 3 km/h. In the most recent 2018 survey the lowest percentile, relative to the speed limit, was recorded on the 70 km/h roads, 2.5 km/h above the speed limit, whereas the highest 85th percentile was recorded on the 80 km/h and 100 km/h roads, at 84.1 km/h and 104.1 km/h, respectively.

Examination of the 85th percentiles by speed limits and survey years for the rural areas indicated that drivers since 2000 have changed their travel speeds resulting in marginal and on some roads significant reductions in 85th percentiles. The reductions in the 2018 survey compared to the 2000 survey ranged between 1.5 km/h on 80 km/h roads to 5.9 km/h on 100 km/h roads, respectively. The reductions in the percentiles between the survey years and the baseline survey are represented in Figure 19.

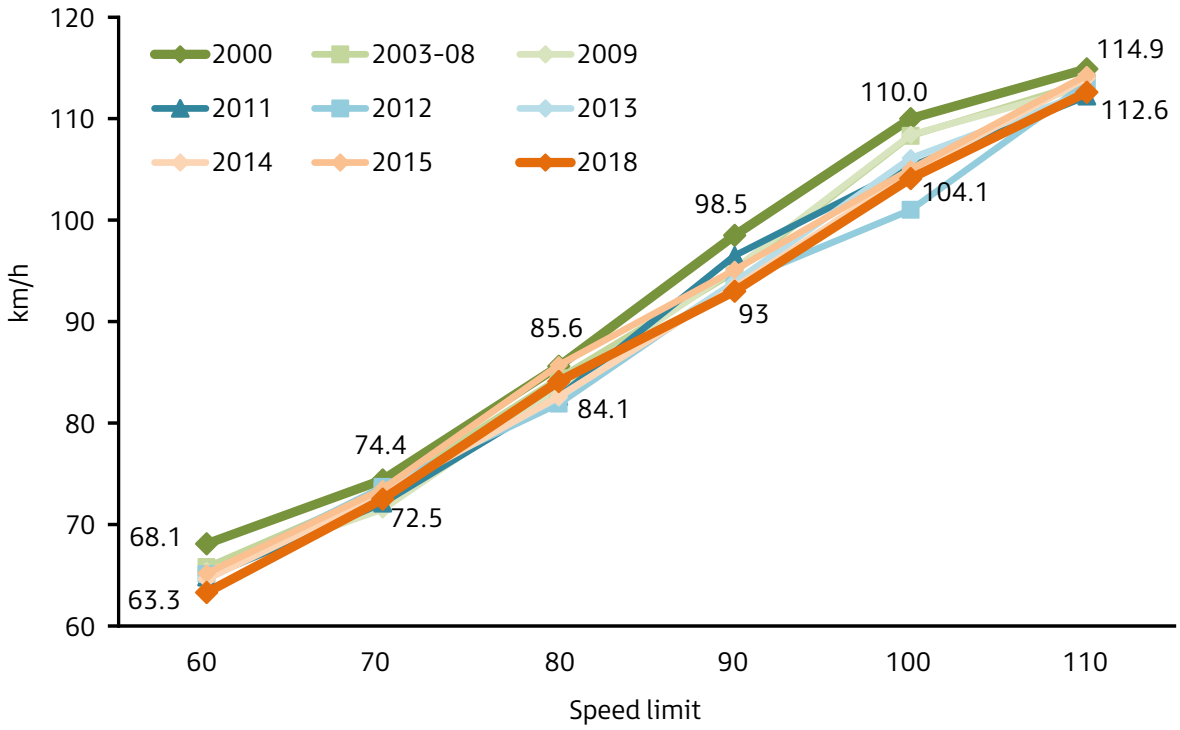


Figure 18. 85th percentiles by speed limit and survey, rural areas

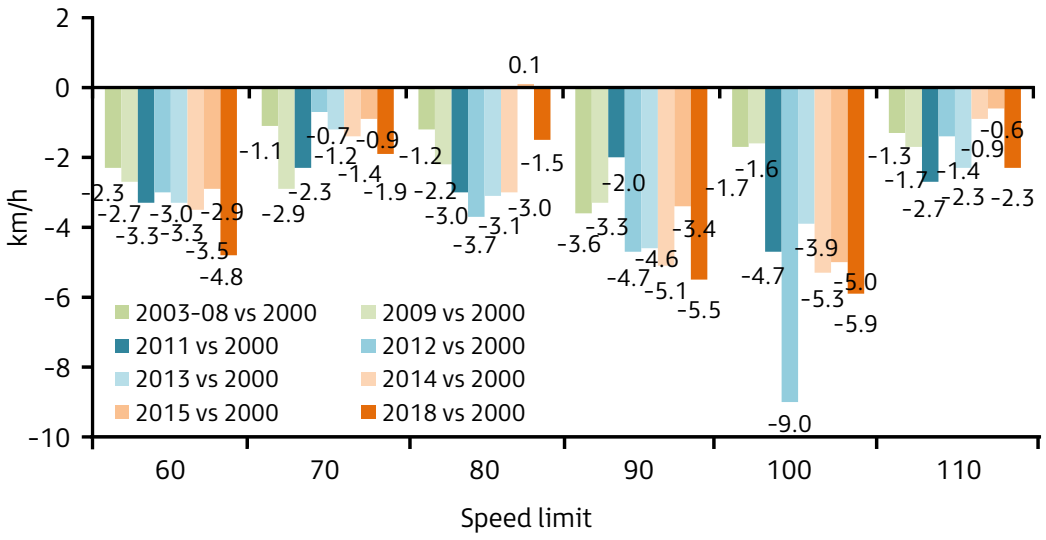
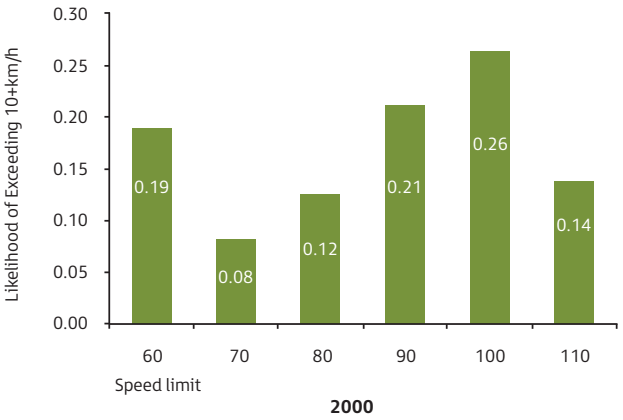
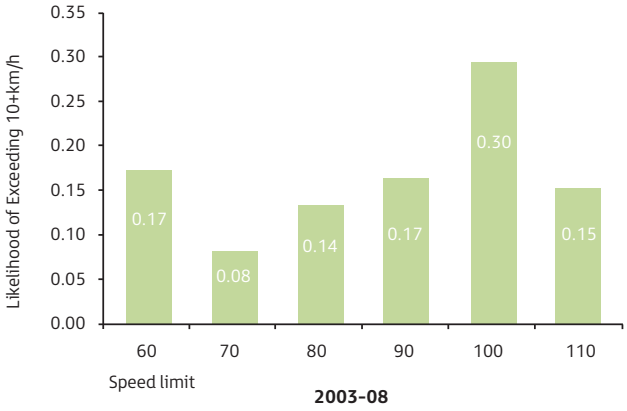


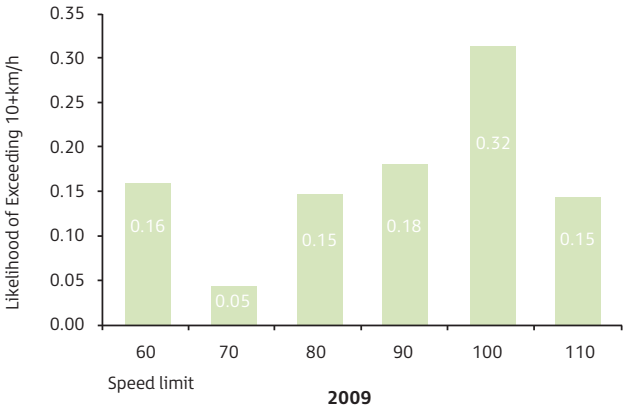
Figure 19. Differences in 85th percentiles between the surveys, rural areas

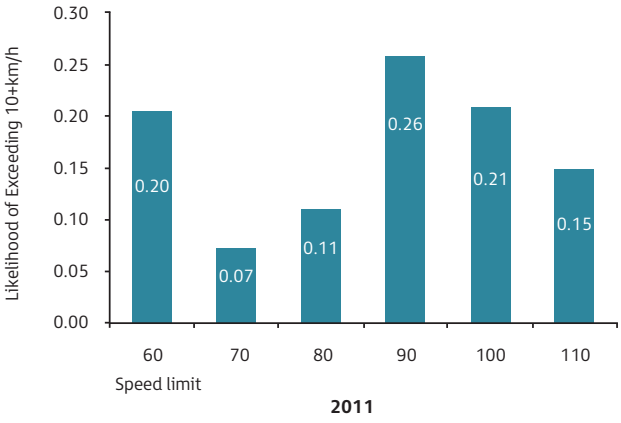
3.2.3 Likelihood of Exceeding 10+ km/h above Speed limit – Rural Areas

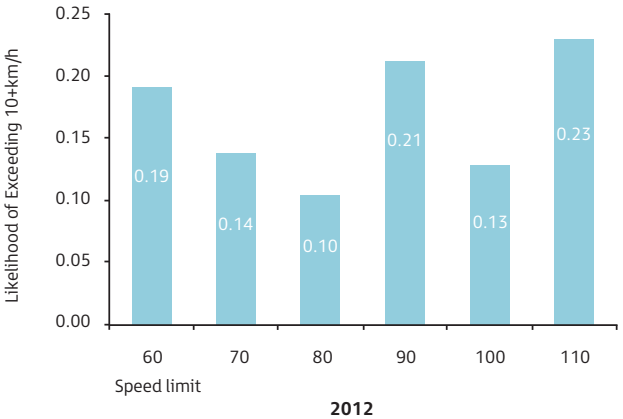
Rural areas drivers are more likely to travel at excessive speeds at the higher speed limit spectrum, such as 90 km/h and 100 km/h roads than on the lower speed limit roads (see Figure 20).

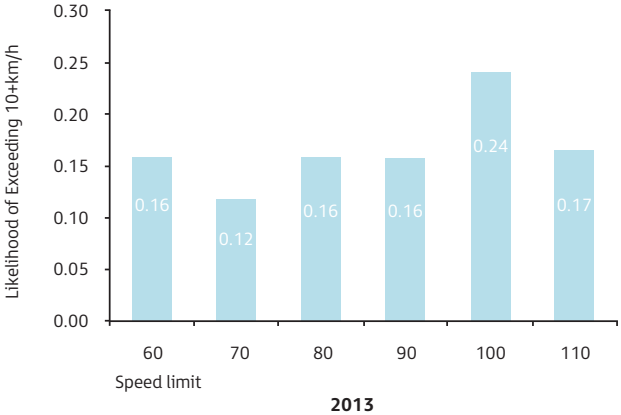












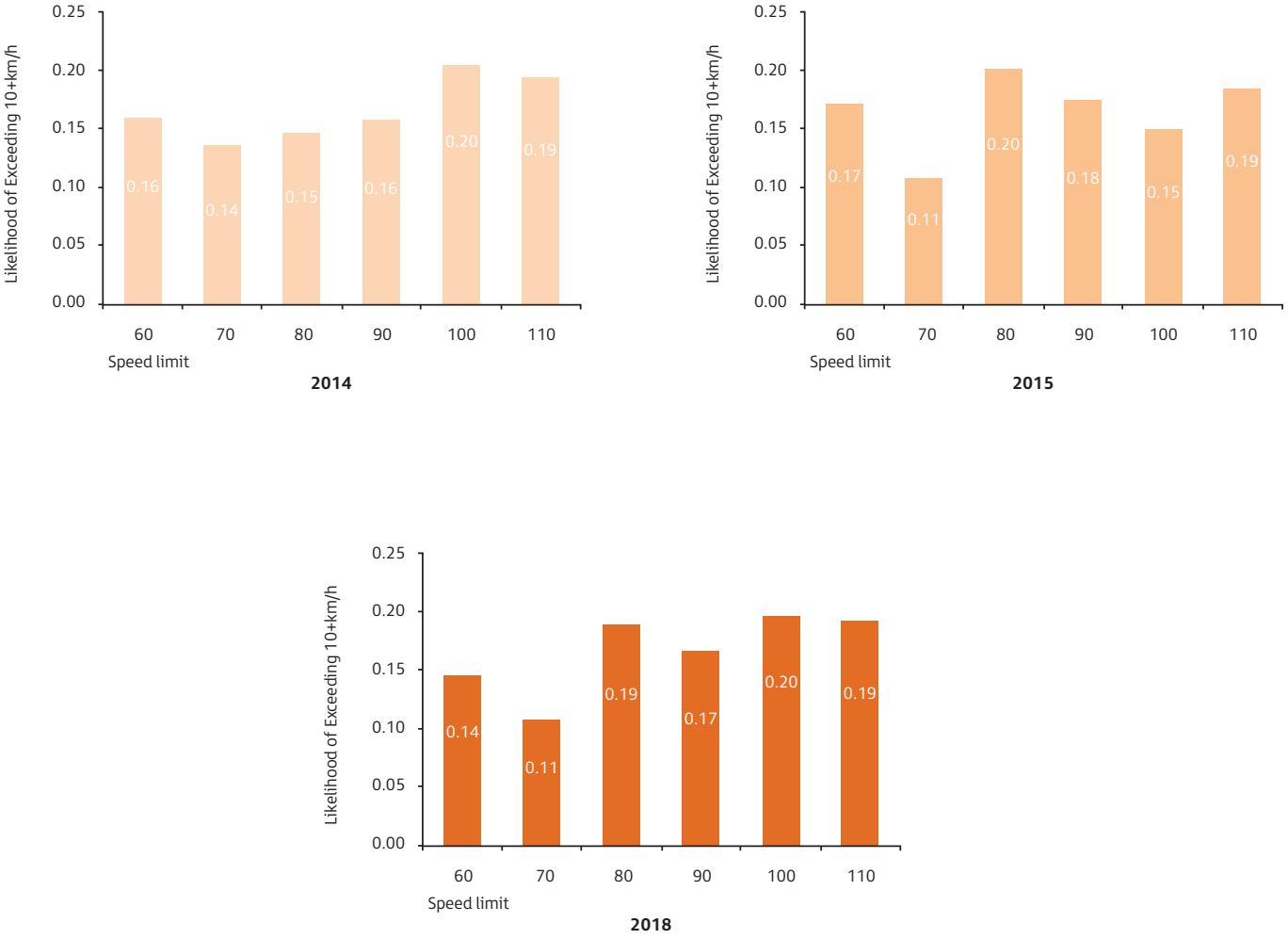


Figure 20. Relative likelihood of exceeding 10+ km/h, rural areas

In all surveys, drivers on 100 km/h roads were found to be more inclined to travel at excessive speeds than on other speed limits roads. To a lesser extent, drivers on 90 km/h and 60 km/h roads are more likely to speed than on 70 km/h or 80 km/h roads.

There were some variations observed in driver behaviour in 2018. Drivers on 100 km/h, 80 km/h and 110 km/h roads were approximately 1.8 times, 1.7 times and 1.7 times more likely to exceed speed limit by 10 km/h than on the 70 km/h, respectively. It is highly likely that for the same amount of traffic on the roads, at least 1.8 times, 1.7 times and 1.7 times more drivers would be found to be speeding on 100 km/h, 80 km/h and 110 km/h roads than on the 70 km/h roads. Similarly, drivers on 90 km/h and 60 km/h roads are more than 1.5 and 1.3 times likely to travel at the high speeds than on the 70 km/h roads, respectively.

3.2.4 Regional Differences in Speed Compliance Rate

Speed Limit Compliance Rate

Over the entire period from 2000 to 2018, the regions with the greatest speed limit compliance were shown to be Mid West-Gascoyne, at an average of approximately 73.7% and the worst performing was the Goldfields-Esperance region at 57.6%. The most recent 2018 survey indicated that the most compliant regions are Kimberley at an average of approximately 82.7%, followed by Great Southern, Mid West-Gascoyne and Wheatbelt at approximately 79.4%, 74.3% and 72.6%, respectively. Distribution of compliance rates by region is presented in Figure 21 below.

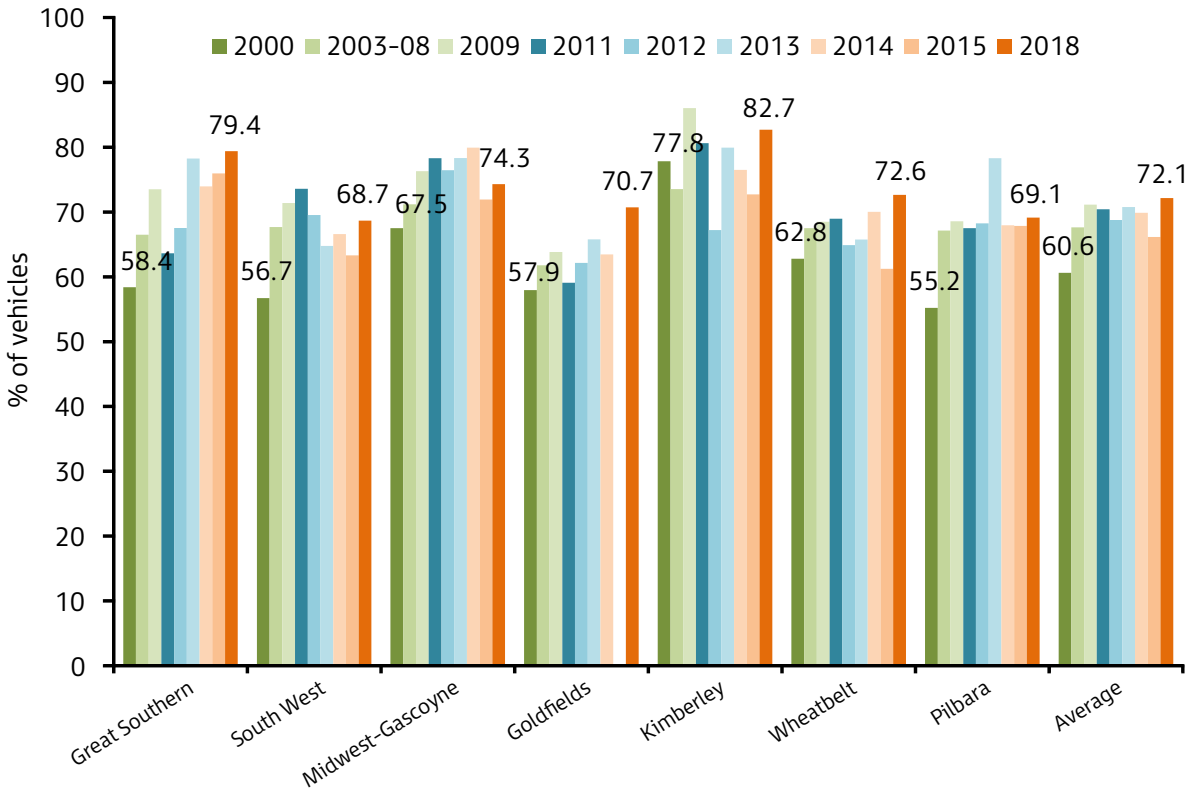


Figure 21. Compliance rate by region

Note: *Compliance rates estimates for Wheatbelt North and Kimberley regions could not be determined for 2003 due to lack of sufficient data in the survey. No data counted in the sample on higher speed limit roads in Goldfields-Esperance region in 2015.*

Regional Differences in Excessive Travel Speeds

The analysis of the percentages of vehicles travelling at excessive speeds by region showed that all regions, on average, demonstrated significant reductions in the number of speeding drivers over the period 2000 to 2018 (see Figure 22). The reductions in the number of speeding drivers ranged between 31.0% in Kimberley and Goldfields-Esperance to 78.9% in Great Southern.

The worst performing regions, above the network average, in the most recent 2018 survey were Wheatbelt, Goldfields-Esperance and Pilbara where 6.4%, 6.2% and 5.1% of drivers, respectively, were found to have travelled at speeds 10+ km/h above the speed limit.

The best performing regions over the last twelve years were the Mid West-Gascoyne, Great Southern and South West regions, where the number of speeding drivers was less than 5% The worst performing regions were the Wheatbelt, Goldfields-Esperance and Pilbara regions where the number of speeding drivers was above 6%.

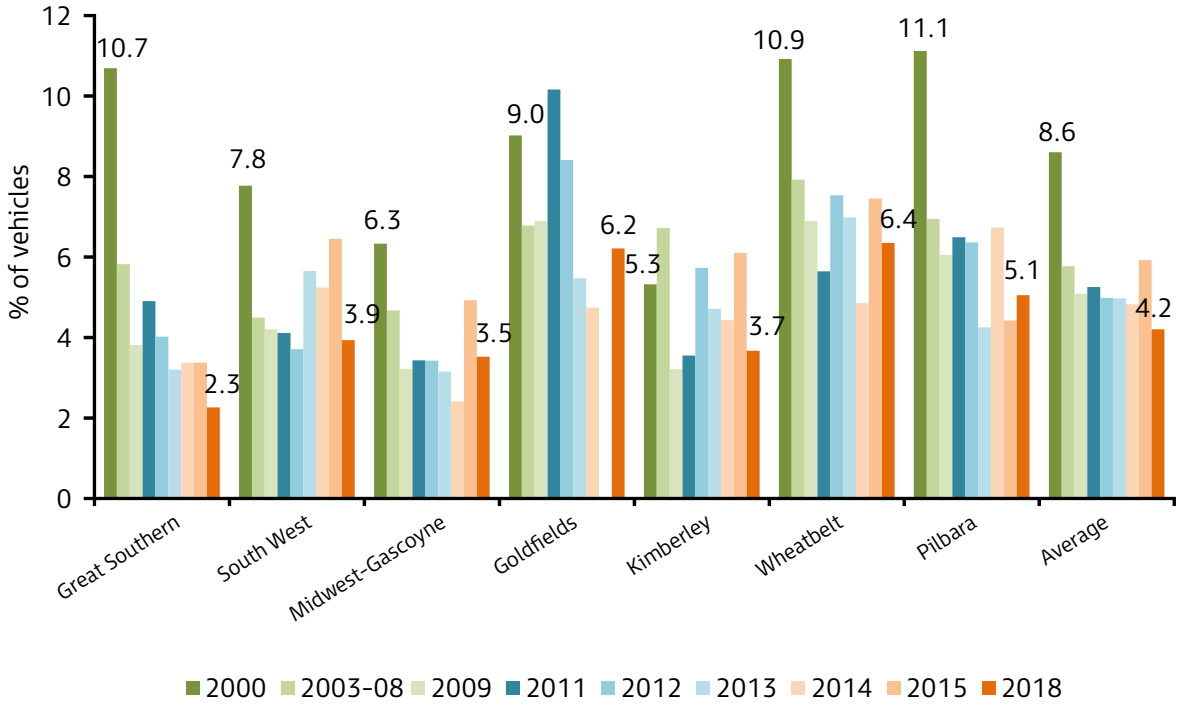


Figure 22. Percentage of drivers travelling 10+ km/h above speed limit by region and year

Note: *Compliance rate estimates could not be determined for 2003 for Wheatbelt North and Kimberley regions due to lack of sufficient data in the survey. No data counted in the sample on higher speed limit roads in Goldfields-Esperance region in 2015.*

Percentage distribution of vehicles recorded at excessive speeds by region and survey periods/year is summarised in the Table 9 below.

	% of vehs. exceeding speed limit by 10+ km/h								
	Survey/Period								
Region	**2000**	**Avg. 2003-2008**	**2009**	**2011**	**2012**	**2013**	**2014**	**2015**	**2018**
Great Southern	10.7	5.8	3.8	4.9	4.0	3.2	3.4	3.4	2.3
South West	7.8	4.5	4.2	4.1	3.7	5.7	5.2	6.5	3.9
Mid West-Gascoyne	6.3	4.7	3.2	3.4	3.4	3.2	2.4	4.9	3.5
Goldfields-Esp.*	9.0	6.8	6.9	10.2	8.4	5.5	4.7	-	6.2
Kimberley	5.3	6.7	3.2	3.6	5.7	4.7	4.4	6.1	3.7
Wheatbelt	10.9	7.9	6.9	5.6	7.5	7.0	4.9	7.5	6.4
Pilbara	11.1	6.9	6.1	6.5	6.4	4.3	6.7	4.4	5.1
Total	8.6	5.8	5.1	5.3	5.0	5.0	4.8	5.9	4.2

Table 9. Percentage distribution of vehicles recorded at excessive speeds by region and survey periods/year

Note: **No data counted in the sample on higher speed limit roads in Goldfields-Esperance region in 2015.*

3.2.5 Speed Limit Compliance and Excessive Speeding by Austroads Class – Rural Areas

Percentage distributions by Austroads vehicle class (ref. Appendix D) in the 2011 to 2018 surveys are represented in Figure 23. According to the 2018 survey, 81.2% of the vehicles in the sample were cars, followed by 8.7% 2-axle trucks or buses, 3.5% cars-towing, 2.1% double road trains, approximately 1.0% 3-axle trucks or buses and 6-axle articulated vehicles and the rest were other types.

In 2018 survey the percentage of vehicles exceeding posted speed limit/speed limit allowed for the vehicle class (eg. 100 km/h for heavy vehicles) by the Austroads class ranged between 36.7% for 3-axle articulated vehicles and 9.9% for triple road trains (see Figure 23).

The highest percentage of drivers exceeding 10+km/h above the speed limit (or allowable speed limit for a particular class) in 2018 were drivers of 3-axle articulated vehicles (9.2%), 2-axle trucks or buses (8.2%), 4-axle articulated vehicles (5.0%), cars (3.9%), cars-towing (3.7%) and B-double or heavy truck trailers (3.5%), followed by other vehicle drivers at less than 3% (see Figure 23). Compared to 2015 survey, the highest reduction recorded in the percentage of drivers exceeding 10+km/h above the allowable speed limit were cars by 2.2% in 2018 survey (from 6.1% to 3.9%). On the other hand, the highest increases were recorded for B-double or heavy truck trailers and double road trains, at 1.1%, respectively.

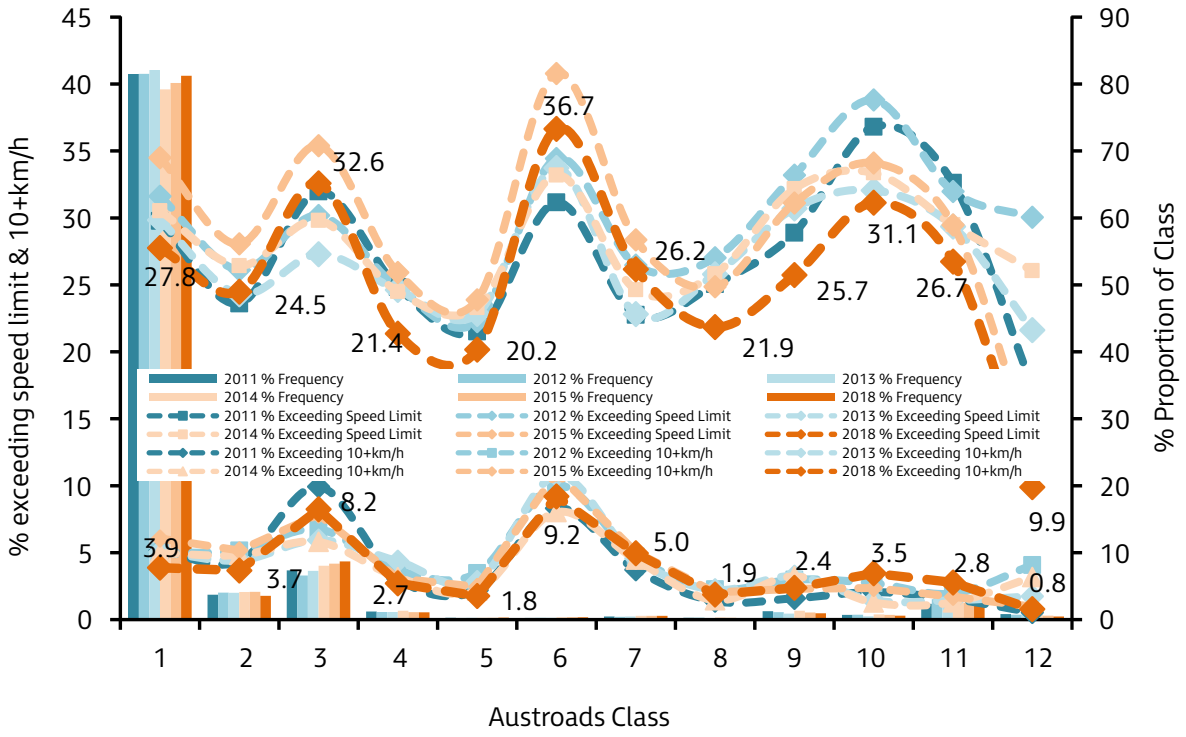


Figure 23. Austroads vehicle class distributions and percentage of vehicles exceeding posted speed limit and 10+km/h above the speed limit in 2011, 2012, 2013, 2014, 2015 and 2018, rural areas

3.2.6 Likelihood of Exceeding 10+ km/h above Speed limit vs. Class 1 – Rural Areas

Figure 24 represents the likelihood of other vehicle classes travelling 10 or more km/h above the speed limit compared to cars. For example the sample of vehicles surveyed in 2011 to 2018 shows that 3-axle articulated vehicles (Class 6) are between 1.6 times and 2.4 times more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars). Similarly 2-axle trucks or buses (Class 3) are 1.2 times to 2.1 times more likely to travel at the high speeds than the cars (Class 1). The survey also indicated that road train drivers are less likely to drive the vehicles at excessive speeds when compared to the cars (from 0.1 times to 0.8 times,), i.e. road train drivers are less likely to speed compared to the car drivers on the rural road network, mainly on 110 km/h roads.

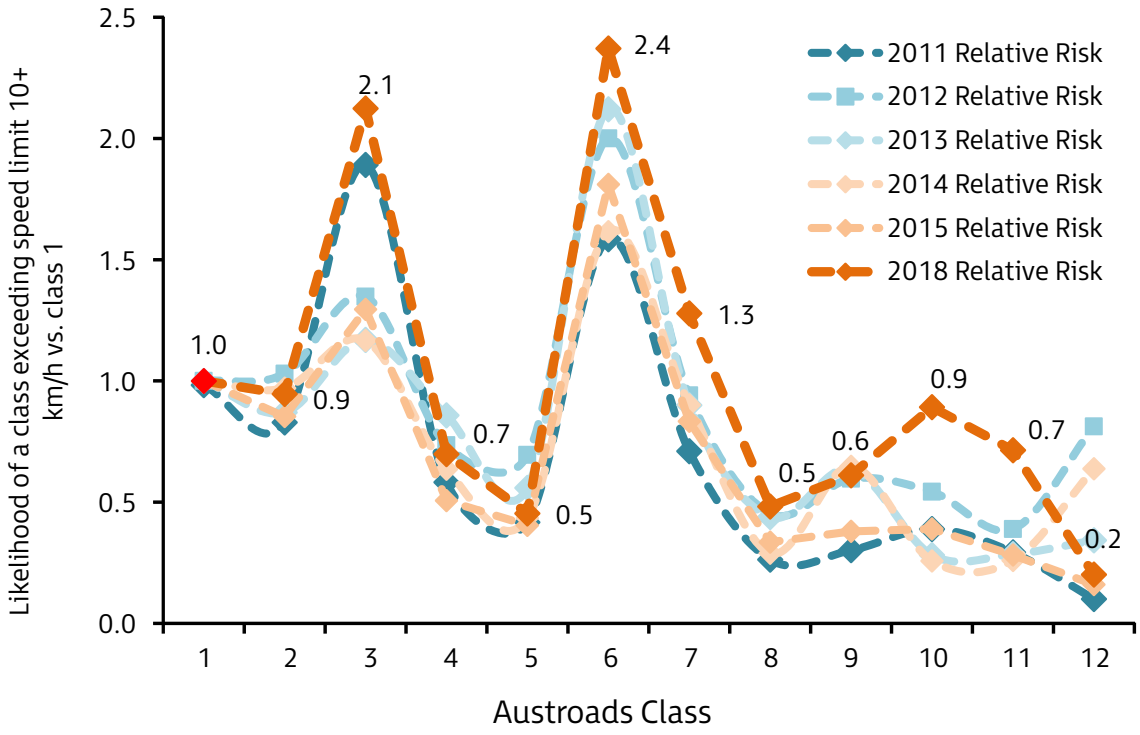


Figure 24. Relative Risk of a class exceeding 10+km/h above the speed limit vs. class 1 (cars) in 2011, 2012, 2013, 2014, 2015 and 2018, rural areas

3.3 Speed Surveys on 50 km/h Speed Limit Roads in Rural Area

In order to assess changes in driver speed behaviours on the local road network, prior to 2007, separate speed surveys were conducted on a sample of 50 km/h and 60 km/h speed limit roads within regional centres. Due to lack of resources, no such survey has been done since 2006. Consequently, no driver speed behaviours have been monitored on the 50 km/h road network during the period 2007 to 2008. In the design and implementation of the 2009 and 2011 survey, it was decided that a sample of 50 km/h roads should be incorporated into this ongoing annually conducted survey in order to assess driver speed behaviours across the entire network of roads, including the roads with the default speed limit which were excluded in the previous surveys. For this purpose the sample in the 2009, 2011, 2012, 2013, 2014, 2015 and 2018 surveys were increased by 27, 28, 27, 31, 29, 29 and 39 sites, respectively, chosen on the 50 km/h speed limit roads within regional centres, satisfying usual selection criteria for the speed surveys.

Due to previously identified unique driver speed characteristics for the local 50 km/h roads, and the established procedures in monitoring the speed indices for the 60 km/h to 110 km/h roads, it was decided that the analysis of the speed data and derivation of the speed indices for these roads be done separately. For these reasons a section in the report was created address driver speed behaviour for 50 km/h roads.

An analysis of speed data for50 km/h rural roads collected from 2009 to 2018 showed that 50.3% to 60.48% (53.3% in 2018) of drivers were travelling within the speed limit, on average approximately 10.7% higher than in 2006, and 16.7% higher than in 2003. Likewise, 11.2% to, 6.2% (6.9% in 2018) of drivers were travelling 10 or more km/h above the speed limit, compared to 17.4% and 17.2% recorded in 2003 and 2006, respectively (Radalj & Sultana, 2007).

The mean speed on 50 km/h roads in 2009, 2011, 2012, 2013, 2014, 2015 and 2018 was estimated at 48.8 km/h,

48.6 km/h, 47.4 km/h, 47.7 km/h, 47.2 km/h, 48.3 km/h and 49.1 km/h, respectively, approximately 1.9 km/h less than the mean of 51.0 km/h recorded in 2006 and 3.2 km/h less than the mean of 52.3 km/h recorded in 2003, two years after the introduction of the 50 km/h default speed limit on Local roads (see Table 10 & Figure 25).

Compliance/Non-compliance	2001* (%)	2003 (%)	2006 (%)	2009 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2018 (%)
Compliance - 50k roads	24.6	36.6	42.6	50.3	53.2	60.4	58.0	60.8	54.7	53.3
% of drivers travelling 10+ km/h above speed limit - 50k roads	34.3	17.4	17.2	11.2	9.3	6.6	6.8	6.2	8.3	6.9
Mean Speed	**2001 (km/h)**	**2003 (km/h)**	**2006 (km/h)**	**2009 (km/h)**	**2011 (km/h)**	**2012 (km/h)**	**2013 (km/h)**	**2014 (km/h)**	**2015 (km/h)**	**2018 (km/h)**
50km/h roads	55.3	52.3	51.0	48.8	48.6	47.4	47.7	47.2	48.3	49.1

Table 10. Vehicle speed characteristics on the 50 km/h speed limits roads, rural areas

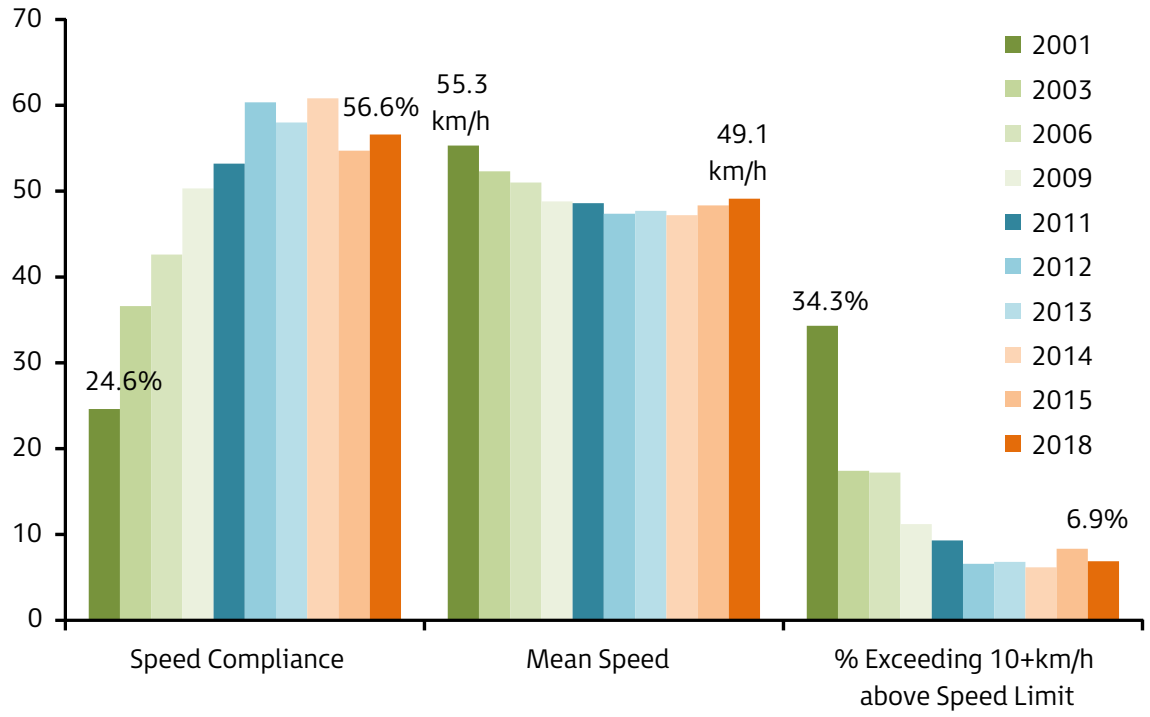


Figure 25. Speed compliance, mean speeds and % exceeding 10+ km/h above speed limit for the sample of 50 km/h rural roads in 2001 to 2018 – comparison between the surveys

SUMMARY OF FINDINGS

4

The analysis of the speed data, representing driver speed behaviour on the Western Australian rural road network, that has been collected in the thirteen surveys conducted between 2000 and 2018 may be summarised as follows:

(A) Speed Compliance on All Roads in Rural Areas

Compliance to Speed Limit

Under free-flowing conditions over the rural network in all speed limits:

- In 2000, 61% of all vehicles travelled at or below posted speed limits.
- Over the period 2003 to 2008 the compliance rate increased by 7% to 68%.
- In 2009 the compliance rate further increased by 3% to 71%.
- Since 2009 the speed limit compliance rate had annually decreased at the rate of 0.7% 66.1% as recorded in 2015.
- In the most recent 2018 survey the compliance rate increased by 6.0% to 72.1%.

Compliance to Speed Limit by Road Type

- Under free-flowing conditions, over the rural state and local road network of all speed limits in 2000, 63.4% of vehicles on state roads and 54.3% of vehicles on local roads travelled at or below posted speed limits. Apart from some variability between the surveys, the highest compliance rate was recorded on both classes of roads, in the 2018 survey at approx. 69.8% and 76.6%, 6.5% and 22.4% higher than in 2000 survey, respectively.

Motorcyclist Speed Limit Compliance

- Based on all travel speeds, not restricted to free-flowing conditions, over the period 2000 to 2005, 61.5% of all motorcyclists travelled at or below posted speed limits. Despite some variations between the surveys, the highest compliance rate was recorded in the 2018 survey, at 67.3%, 5.9% higher than the period 2000 to 2005.

Speeding in Excess of 10 km/h above Speed Limit

Similarly, comparisons of the proportions of drivers travelling at speeds in excess of 10 km/h above the speed limit showed that:

- Over the period 2003 to 2008 compared to 2000, the number of drivers travelling at these speeds was reduced by 33%, from 8.6% to 5.8%.
- In 2009 the percentage of speeding drivers further decreased to 5.1%.
- Since 2009 the percentage of speeding drivers had varied between the surveys, recording a small increase to 5.9% in 2015. The most recent 2018 survey recorded a significant reduction in the number of speeding drivers, estimated at 4.2% of all vehicles travelling under free-flowing traffic conditions.

Speeding in Excess of 10 km/h above Speed Limit by Road Type

- In 2000, the number of speeding drivers on rural state and local roads network was recorded at 8.5% and 8.9%, respectively. However, since then, as recorded in the most recent 2018 survey, the percentage of speeding drivers dropped to 4.7% and 3.2% on state and local roads, respectively, representing a substantial reduction of 3.8% and 5.7%, respectively, when compared to the baseline 2000 survey.

Speeding in Excess of 10 km/h above Speed Limit by Motorcyclists

- Over the period 2000 to 2005, 14.6% of all motorcyclists, not restricted to free-flowing conditions, over the rural road network of all speed

limits, travelled with speeds exceeding 10 km/h above the speed limit. The percentage of speeding riders dropped to 10.0% in 2018, approximately 32% of speeding drivers less than in the period 2000 to 2005.

Compliance by Speed Limit

- The surveys from 2003 to 2018, apart from some variability between years, indicated an overall improvement in the speed compliance rates when compared to the 2000 survey.

- The poorest compliance to the speed limit was observed on 60 km/h roads ranging from 48.3% in 2000 to 72.6% in 2018, however, demonstrated a significant increase of 24.3%.

- Compared to 2000, the compliance rate in 2018 has significantly increased on the 70 km/h roads by 7.4% and by 8.0% on the 80 km/h roads, from 67.0% to 74.4% and from 61.9% to 69.9%, respectively.

- The speed compliance on 90 km/h and 100 km/h roads has on average increased by 15.4% in 2018 when compared to the 2000 baseline survey, from 55.8% to 71.2%, while the compliance on the 110 km/h roads remained fairly constant over the years at approximate average of 68.6%.

Trends in Percentage of Drivers Travelling at High Speeds by Speed Limit

- Since 2000 all speed limit roads showed substantial reductions in the proportions of drivers travelling at high speeds, being 10 or more km/h above the speed limit. Despite some variations in the interim years between 2000 and 2018, all roads on average recorded a reduction in the speeding drivers relative to the percentage recorded in the 2000 survey.

- The difference between 2018 and 2000 in the percentage of speeding drivers ranged from a reduction of 1.7% on 70 km/h roads to 9.8% on 100 km/h roads.

- The percentage reduction in the proportions of speeding drivers ranged between 27.9% on 80 km/h roads and 64.6% on 100 km/h roads.

- Compared to 2000, across all rural roads, the number of speeding drivers in 2018 reduced by approximately 51%.

Compliance and excessive Speeds by Day of Week

- The surveys from 2003 to 2018 indicated that, in general, the greatest compliance to speed limits occurs from Monday to Friday, on average 69.3%, slightly less on Saturday, average of 68.1%, followed by Sunday with the lowest compliance of 67.6%.

- Over most of the surveys, Sunday, followed by Saturday were found to be the days with the highest percentage of drivers exceeding 10 or more km/h above the speed limit, ranging from 5.2 % on Saturday in 2003 to 8.9% on Sunday in 2000, however, significantly less in 2018, at 4.6% and 4.7%, respectively.

- Across all surveys, the average week day percentage of drivers travelling at high speeds was estimated at 5.4%, compared to the average week-end percentage of 6.1%.

- In the most recent 2018 survey, the percentage of speeding drivers on week days was estimated at 4.0%, compared to the week-end average of 4.7%

- The best performing days in 2018 were Monday, Wednesday and Thursday at 4.0% .

- In general, across all survey years, the highest percentage of speeding drivers, travelling 10 or more kilometres above the speed limit, would be expected on week-ends.

Speeding by Time of Day

- All thirteen surveys indicated that drivers were more likely to travel at excessive speeds, 10+ km/h above speed limits, during night hours from 7 p.m. to 7 a.m. than during other times of the day.

- These driver speed behaviours are fairly consistent from year to year. No significant differences in the patterns were found, although the percentage magnitude varied in line with the overall driver speed behaviours any given year.

- On average, the highest travel speeds are expected to occur between 11 p.m. and 6 a.m. The percentage of speeding drivers during this period ranged from 5% to 13%.

- In all surveys, the least number of speeding drivers were recorded between 8.00 a.m. and 1.00 p.m., approximately 3% in 2018.

(B) Mean Travel Speeds in Rural Areas

Mean Speed by Speed Limit

- On average, across all surveys, drivers on rural 60 km/h, 70 km/h , 90 km/h and 100 km/h roads seemed to be travelling at higher mean speeds, 57.6 km/h, 65.8 km/h, 85.5 km/h and 95.6 km/h, respectively. This is compared to drivers on the other speed limit roads, such as 80 km/h (74.6 km/h) and 110 km/h (101.9 km/h) roads.

- The mean travel speeds recorded in the 2018 survey, compared to the mean speeds in 2000, were significantly less on some roads or remained with insignificant change on the others. The highest reductions were observed on:

    - 60 km/h - 4.7 km/h
    - 70 km/h - 0.5 km/h
    - 80 km/h - 3.6 km/h
    - 90 km/h - 3.2 km/h, and
    - 100 km/h - 4.6 km/h

- The other roads have not shown a significant change (110 km/h, + 0.8 km/h).

(C) Differences in Speed Indices between Main Roads Regions

Compliance to Speed Limit

- Over the entire period from 2000 to 2018, the most speed limit compliant region was shown to be the Mid West-Gascoyne, at an average of approximately 73.7.

- The worst performing region was the Goldfields-Esperance region at 57.6%.

- The most recent 2018 survey indicated that the most compliant regions are Kimberley, Great Southern and Mid West-Gascoyne at 82.7%, 79.4% and 74.3%, respectively, followed by Wheatbelt at 72.6%.

Regional Differences in Excessive Travel Speeds

- The analysis of the percentages of vehicles travelling at excessive speeds by region showed that all regions, on average, demonstrated significant reductions in the number of speeding drivers over the period 2000 to 2018. The reductions in the number of speeding drivers ranged between 31.0% in Kimberley to 78.9% in Great Southern.

- The worst performing regions, above the network average, in 2018, were the Wheatbelt, Goldfields-Esperance and Pilbara where 6.4%, 6.2% and 5.1% of drivers, respectively, were found to have travelled at speeds 10+km/h above the speed limit.

- The best performing regions over the last twelve years were the Mid West-Gascoyne, Great Southern and South West where the number of speeding drivers was less than 5%.

- The worst performing regions were the Wheatbelt, Goldfields-Esperance and Pilbara at over 6%.

(D) Speed Limit Compliance and Excessive Speeding by Austroads Class – Rural Areas

Compliance to Speed Limit

- In the 2011 survey, the highest compliance to the speed limit was recorded at 82.6% for triple road trains (Class 12) and the lowest compliance for B doubles or heavy truck and trailers at 63.2% (Class 10).

- In 2012 survey the highest compliance to the speed limit was estimated at 77.7% for 4 or 5-axle trucks (Class 5) and the lowest for B doubles or heavy truck and trailers at 61.2% (Class 10).

- In 2013 survey the highest compliance to the speed limit was estimated at 78.4% for triple road trains (Class 12) and the lowest for 3-axle articulated vehicles and at 66.3% (Class 6).

- In 2014 survey the highest compliance to the speed limit was estimated at 76.7% for 4 or 5-axle trucks (Class 5) and the lowest for 3-axle articulated vehicles (Class 6) and B doubles or heavy truck and trailers (Class 10) at 66.8% and 66.6%, respectively.

- In 2015 the highest compliance to the speed limit was estimated at 87.4% for triple road trains (Class 12) and the lowest for 3-axle articulated vehicles (Class 6) at 59.2%.

- In the most recent survey in 2018 the highest compliance to the speed limit was estimated at 90.1% for triple road trains (Class 12) and the lowest for 3-axle articulated vehicles (Class 6) at 63.4%.

Speeding in Excess of 10 km/h above Speed Limit

- In 2011 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was recorded between 0.5% for triple road trains (Class 12) and 9.9% for 2- axle truck or buses (Class 3).

- In 2012 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated between 2.0% for double road trains (Class 11) and 10.0% for 3-axle articulated vehicles (Class 6).

- In 2013 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated between 1.4% for B doubles or heavy truck and trailers (Class 10) and 10.8% for 3-axle articulated vehicles (Class 6).

- In 2014 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated between 1.3% for B doubles or heavy truck or trailers (Class 10) and double road trains (Class 11) and 8.0% for 3-axle articulated vehicles (Class 6).

- In 2015 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated between 1.0% for triple road trains (Class 12) and 11.0% for 3-axle articulated vehicles (Class 6).

- In the most recent survey in 2018 survey the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated between 0.8% for triple road trains (Class 12) and 9.2% for 3-axle articulated vehicles (Class 6).

Likelihood of Exceeding 10+ km/h above Speed limit vs. Class 1

- The sample of vehicles surveyed in 2011 shows that 2-axle truck or buses (Class 3) were 1.9 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In 2012 the sample of vehicles surveyed shows that 3-axle articulated vehicles (Class 6) were 2.0 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In 2013 the sample of vehicles surveyed shows that 3-axle articulated vehicles (Class 6) were 2.1 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In 2014 the sample of vehicles surveyed shows that 3-axle articulated vehicles (Class 6) were 1.6 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In 2015 the sample of vehicles surveyed shows that 3-axle articulated vehicles (Class 6) were 1.8 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In the most recent survey in 2018 the sample of vehicles surveyed shows that 3-axle articulated vehicles (Class 6) were 2.4 times, more likely to exceed 10 km/h above the speed limit allowed for the vehicle classes (that is 100 km/h) than the Class 1 (cars).

- In summary, over the years, the drivers of 3-axle articulated vehicles seem to be the least compliant to speed limits.

(E) Speed Compliance and Mean Speeds on 50 km/h Local Roads Rural Areas

- The compliance rate on the 50 km/h roads in regional centres in 2009 was estimated at 50.3%, followed by a small increase of 2.9% in 2011 to 53.2%, a significant increase of 4.8% in 2013 to 58.0%, a further small increase of 2.8% in 2014 to 60.8%, a significant decrease of 6.1% in 2015 to 54.7% and a small decrease of 1.4% in the most recent survey in 2018 to 53.3%; 10.7% higher than in 2006 when the compliance was only 42.6%.

- In 2009, the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, was estimated at 11.2%, followed by variable changes in the percentage to 8.3% in 2015, followed by a small decrease of 1.5% in the most recent survey in 2018 to 6.9%.

- The percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit on the 50 km/h roads, estimated at 6.9% in 2018 was significantly higher than on the higher speed limit roads, 60 km/h to 110 km/h, estimated at average of 4.2%. However, the percentage of speeding drivers in 2018 was significantly less than in 2006 when it was recorded at 17.2%.

- The mean speed on the 50 km/h roads in 2009 was 48.8 km/h, 1.2 km/h below the speed limit, The mean speed varied between 2009 and 2018 between 0.9 to 2.8 km/h below the speed limit, in the most recent 2018 survey estimated at 49.1 km/h, , 1.9 km/h less than in 2006.

CONCLUSIONS AND RECOMMENDATIONS

5

Driver speed behaviours in a free flowing traffic environments are dependent on a number of factors associated with road environment; whether it is open or built up, the speed limit, vehicle type, road type, region, time of day and day of week.

Under free-flowing conditions over the rural network across all speed limits, the thirteen surveys conducted over the period 2003 to 2018 suggest that more drivers complied with speed limits than in 2000. The magnitude of compliance varied between 2003 and 2018, being low in 2005, 2007 and 2015, although more than 5% higher than in 2000, at approx. 66%, 2% less than in 2003 when the compliance rate was quite high at 68.4%.

The highest compliance rate over the period 2000 to 2015 of 71% was recorded in 2009, followed by a significant increase of 6.0% since 2015 to 72.1% in the most recent survey in 2018.

Similarly, the number of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, has significantly reduced over the time period, from 8.6% in 2000 to the average of 6.2% between 2004 and 2007, followed by small variations to 5.9% in 2015, followed by a reduction of 1.7% to 4.2% in 2018 survey.

The compliance rate on the 50 km/h roads in regional centres has increased over the time period from 50.3% in 2009 to 53.3% in 2018; 10.7% significantly higher than in 2006 when the compliance was only 42.6%.

Similarly, the percentage of drivers travelling at excessive speeds, 10 or more km/h above the speed limit, estimated at 11.2% in 2009 has reduced over the time period to 6.9% in 2018, significantly less than in 2006 when the percentage of speeding drivers was 17.2%.

Likewise, the mean speed on the 50 km/h roads reduced from 48.8 km/h in 2009 to 49.1 km/h in 2018, 0.9 km/h below the speed limit; however, 1.9 km/h less than in 2006.

It is recommended that the speed indices derived from the speed data collected over the period between 2000 and 2018 be used as indicative measures of effectiveness of road safety initiatives undertaken in order to reduce travel speeds on the rural network, as well as measures of effectiveness of speed enforcement strategies implemented over the study period, or used in the formulation of the new strategies to improve driver speed behaviour.

Furthermore, these indices can be used as benchmarks in the assessment of effectiveness of new traffic safety strategies, particularly in assessment of strategies related to speed enforcement on the Western Australian rural road network, and for the purpose of monitoring of driver speed behaviours over time.

The results of the study provide substantial evidence on patterns and characteristics of driver speed behaviours on the rural road network and indicative effects of the factors that are likely to influence driver speed behaviours. The study suggests that any formulation of speed enforcement strategies should incorporate regional, road type, speed limit and temporal factors.

Further studies would be required to investigate relationship between speed compliance, speed enforcement initiatives and road safety in terms of number and severity of crashes considering the factors associated with driver speed behaviours as identified in this study.

References

Cameron, M. (1999) *Methodology for evaluation of the enhanced traffic enforcement program in Western Australia*. Report to Office of Road Safety Department of Transport Western Australia, October 1999.

Cameron, M.H., and Vulcan, A.P. (1998) *Evaluation review of the Supplementary Road Safety Package and its outcomes during the first two years*. Report to Land Transport Safety Authority, New Zealand, July 1998.

Cowley, J.E. (1987) *An evaluation of increased penalties for exceeding a speed limit by 30 km/h or more*. Report No. RN 87/4, Road Traffic Authority, Victoria, March.

Kloeden, C.N., McLean, A.J., Moore, V.M., and Ponte, G. (1997) *Travelling speed and the risk of crash involvement*. Report CR 172, Federal Office of Road Safety, Department of Transport and Regional Development, Canberra, November.

Oppenlander, J.C., Bunte, W.F., and Kadakia, P.L. (1960) "Sample Size Requirement for Vehicular Speed Studies". In: *Traffic Volume and Speed Studies*, Highway Research Board Bulletin 281, Washington, D.C., 1961.

Radalj, T. & Sultana, S. (2007) *Changes in driver speed behaviours on the Western Australian local road network (Rural) since the introduction of the 50 km/h speed limit*. MRWA, July 2007.

Standards Australia (1999). *Manual of uniform traffic control*. Part 4: Speed controls. AS 1742.4-1999. Homebush, NSW, 1999.

West, L.B., and Dunn, J.W. (1971) "Accidents, speed deviation and speed limits". *Traffic Engineering*, Vol.41, No.10.

Appendix A
Survey Criteria And Data Collection Guidelines

General instructions and criteria for speed surveys

Objectives of the Survey

The principal objective of the surveys is to measure changes in driver speed behaviours at general locations of the road network over time.

Changes in driver speed behaviours may be used as one of the significant measures in assessment of effectiveness of Coordinated Action Program: Speed Project (CAP: Speed), and to a lesser extent as a measure of impacts of other safety awareness non-enforcement programs on driver traffic behaviours.

Other objectives of the survey implied in the driver speed behaviour areas are as follows:

4. To monitor general driver compliance to legal speed limits.

5. To measure road/site specific speed compliance rate.

6. To assess effects of change in speed behaviours on occurrence of speed related crashes.

Survey Sample Size

Achievement of the above objectives would be measured by speed indices determined from the speed data collected over the road network, covering all regions, road types and various legal speed limits.

In order to get a representative sample from the Western Australian population of drivers, it is intended to collect the data from a number of strata based on road types and speed limits across all the MRWA regions. It is estimated that speed data collected at approximately 200 locations over the network would be sufficient to provide reliable statistical indices of the population driver speed behaviours.

In order to preserve representativeness of the state traffic speed data, the sample size for each the two main strata, region and road type, was based on the principal determinant taken as amount of exposure measured in terms of MVKT. The number of survey sites by region and road type is calculated as follows:

No. of Sites (Region) = 200 x MVKT(Region) / MVKT(State)

No. of Sites (Road Type) = No. of Sites (Region) x MVKT(Road Type) / MVKT(Region)

Frequency of surveys

The speed surveys would be conducted *annually* according to specific guidelines outlined below.

Survey Period

Annual surveys would be conducted over the same period each year. The surveys should be completed over the period of four months, March to June.

School holiday periods should be avoided.

Physical Locations of Spot Road Surveys

For the purpose of consistency and reliability of data, annual surveys would be conducted at the same physical locations each year, unless there were reasons for change due to equipment installation difficulties, road works, road closures, road modifications, or some other justified reasons. In such a case, an alternative similar location would be found either on the same road or another road of the same type within the region.

Since the aim of a spot speed survey is to measure speeds of vehicles in a “free” flowing traffic it is necessary to choose a location on a road which will provide such conditions for vehicular movements. Such conditions should prevail over the whole time period assigned to the location survey. In placing speed survey equipment the following guidelines should be observed:

1. Equipment to be installed at a location determined by the start and SLK or referenced intersecting roads, within the specified speed zone (refer to the Location Table).

2. For a short speed zone section, the speed measuring equipment should be installed approximately at the mid-point of the section.

3. The survey spot should be located at a traffic "free" flowing section of a road.

4. The spot must be chosen at a road section such that no factors within the "free" flowing section could cause changes in vehicular speeds other than the changes voluntarily induced by the drivers (eg. speed limit signs, major intersections, road works, etc.).

5. No installation should take place within a "school zone".

6. Road features such as bridges, culverts, railway level crossings, and floodways should be avoided.

7. Equipment should not be installed at sections of roads with overtaking lanes.

8. Whenever it is possible, the equipment should be installed at a mid-block rather than at a close distance to an intersection.

Installation of Speed Survey Equipment (Classifier)

The survey equipment (classifier) should be installed at a suitable location within the section of a road defined in the Location Tables, satisfying the speed zone criterion.

Single carriageway (one lane in each direction) sections should be surveyed in both directions (tubes to be placed over both lanes).

Single multiple lane carriageways should be surveyed only on the kerb lane, in which case two classifiers are required, one for each direction.

Dual carriageways (separated by a median strip) should be surveyed on the kerb lanes and median lanes whenever it is feasible, otherwise, one direction the kerb lane and other direction the median lane.

At the *time of installation* the following items should be checked and/or recorded:

1. Speed limit at the classifier installation location.

2. Carriageway (Single, Left or Right).

3. Number of lanes at the chosen location.

4. Lane(s) surveyed (eg. kerb lane, centre lane, median lane, both left and right directions).

5. Exact description of location with respect to chosen intersecting road, road feature and/or unique objects in the road nature strip.

Duration of a Road Location Survey

In general, each location should be surveyed over seven days, each day of the week included.

In a case when sufficient number of classifiers is not available to complete the survey within a region, then the survey should be conducted according to the specification outlined in the Figure 2 of the survey design. That is, each day of the week will be represented within the sample of each of the road types. Minimum number of days surveyed may range between 2 and 7 days, depending on the number of locations on the same road type.

Road and Weather Conditions

In general, the surveys should be conducted on fine days.

Appendix B

List Of Proposed 2000 Baseline Survey Locations

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)			
					SLK	From Road	SLK	To Road
Great Southern (1)	State	H040	Princess Royal Dr	70	2.18	Frenchman Bay Rd	3.03	Festing St
		H008	Sth Coast Hwy	80	8.26	Millbrook Rd	9.27	Bonaccord Rd
		H009	Sth Western Hwy	90	449.83	William Bay Rd	455.83	Lights Rd
		M021	Kojonup-Pingrup	90	18.57	Marron Pool Rd	24.27	Washington Rd
		H001	Albany Hwy	110	365.03	Watermans Rd	390.88	Hazzard Rd
		M024	Muirs	110	149.33	Denmark-Mt Barker Rd	156.36	Quangellup Rd
		M001	Albany-Lake Grace	110	27.64	Mt Barker-Porongorup Rd	31.15	Spring Rd
	Local	3020294	Collingwood Rd	60	0.41	Angove Rd	2.12	Lower King Rd
		3020608	Frenchman Bay Rd	70	0.59	Woolstores Pl	1.84	Seawold Rd

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
South West (2)	State	H043	Old Bussell Hwy	70	SLK: 54.92 E of Lockhart St
		M008	Vasse Hwy	80	SLK: 133.21 E of Conte Rd 132.98 Slk
		M023	Pinjarra Rd	90	Slow lane No.1 E of Ronlyn Rd Kerb side lane.
		M043	Caves Rd	90	SLK: 21.35 W of Dunsborough Lakes Rd, E of Yungarra Dr
		M043	Caves Rd	90	SLK: 64.79 S of Garthowen Rd 63.53 Slk
		H002	Bunbury Hwy - Old Coast Rd	90	72.92 S of ESTUARY RD Kerb side
		M046	Collie-Mumballup	100	SLK: 9.82 S of Ealing Rd
		M006	Bridgetown-Boyup Brook Rd	100	SLK: 14.0 E of Jayes Rd 13.08 Slk
		M053	Pinjarra-Williams Rd	100	SLK: 9.71 E of Napier Rd 8.81 Slk
		H002	Bunbury Hwy	110	SLK 126.38, slow, N of Finn Rd
		H009	South Western Hwy	110	S of Blakes Rd 73.84 Slk
		H043	Bussell Hwy	110	201 0241 S of Darch Rd 102.7 Slk
		M008	Vasse Hwy	110	SLK: 19.92 N of Scott Rd (west end)
		H045	Coalfields Hwy	110	SLK: 10.96Coalfields Hwy
		H001	Albany Hwy	110	SLK: 107.87, Bannister-Marradong Rd - Sth Crossman Rd
		H009	South Western Hwy	110	248.89 Slk N of Glentulloch Rd -203 0072 Press Rd
		M037	Collie-Lake Kings	110	SLK: 44.092 E of Shotts St
	Local	2040018	Parade Rd	60	204 0017 Adam Rd, Slow Lane 1 Kerb Side
		2050206	Marine Tce	60	W of Armitage Dr
		2120137	Anstruther Rd	60	Lane 2 S of Mandurah Tce
		2110535	Old Coast Rd	60	0.86 km S of Lisa Rd, N of Luce Victoria Ave
		2040008	Ocean Dr	70	200 m S of Hudson

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Gascoyne (3)	State	H044	Robinson St	70	Between Marmion and Wise St
		H007	Nrth West Coastal Hwy	110	SLK:416, Bet. Bush Bay t/o & Edagee t/o
		H007	Nrth West Coastal Hwy	110	N of Boologooro T/O
	Local	8030031	Babbage Island Rd	60	SLK: 0.75, Bet. Nelson & David Brand

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Midwest (4)	State	H050	Geraldton-Mt Magnet	70	SLK: 2.00 E of Blencowe Rd
		H004	Brand Hwy	110	20m S of SLK 348 PEG
		H050	Geraldton-Mt Magnet	110	SLK: 28.0 Kojarena Locality Sign
		H007	North West Coastal Hwy	110	SLK: 28.5 N of Olsen RD (NR Sign)
		M028	Midlands Rd	110	SLK Peg 240
	Local	5050005	Shenton St	60	30 m W of Gregory St
		5050128	Anderson St	60	SLK: 1.3 outside King's Bodyworks

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Goldfields (5)	National	H003	Eyre Hwy	110	SLK: 48.95 E of Mt Monger South Rd
		H005	G.E.H.	110	H005_West_Ryans_Find_Road_
		H010	Coolgardie-Esperance	110	54.092 slk Kambalda intersection 300m SLK: 54.08
	State	H005	G.E.H.	70	SLK: 588:50 200 m W of Gatacre St
		H049	Goldfields Hwy	100	118m north of railway crossing SLK: 22.5
		H010	Coolgardie-Esperance	110	SLK: 163.94
		H049	Goldfields Hwy	110	H049_South_Broard-Arrow-Ora_Branda_Road_ SLK: 112.73
		H041	Anzac Drive	110	3km_West_H049 SLK: 4.11
	Local	6052046	Maxwell St	60	Beston St - Hampden St
		6051002	Piccadilly St	60	109m_West_Bound_ Parsons St - Woodman St

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Kimberley (6)	National	H011	Victoria Hwy	70	Between Pruinosa St & Weaber Plain Rd
		H006	G.N.H.	110	SLK.2260.100 Jowlaenga Rd - Gee-Gully Rd
		H006	G.N.H.	110	SLK.2340.20 W of Camballin Rd FC 180 Post
		H006	G.N.H.	110	SLK: 3031.38 Bet. Lissadell Rd and Glen Hill Rd
		H011	Victoria Hwy	110	SLK: 65.490 Fish Farm Rd - Lake Argyle Rd
	State	H047	Derby Hwy	90	SLK: 38.200 Russ St - Fitzroy St
		H042	Broome Rd	90	SLK: 29.7 Fairway Dr - Crab Creek Rd
	Local	001 0061	Pembroke St, Broome	60	001 0086 Gregory to 001 0027 Dickson
		001 0154	Reid Rd, Broome	60	001 0185 Woods to 001 0156 Rahman
		001 0222	Cable Beach Rd, Broome	70	Bet. Charles St and Gabinge Rd

Region	Road Type	Road No.	Road Name	Zone	Location of Classifier (From/To/At)			
					SLK	From Road	SLK	To Road
Wheatbelt South (9)	State	M038	Narrogin-Kondinin	90	68.86	Wickepin	68.91	Henry St
		M017	Gorge Rock-Lake Grace	90	33.03	Notley Rd	36.64	Tarin Rock Nth Rd
		H052	Brookton Hwy	110	93.14	York-Williams Rd	97.34	Jellobine Rd
		H053	Williams-Narrogin Hwy	110	13.34	Cornwall Rd	17.63	Hardie St
		M031	Northam Cranbrook	110	185.12	Whimbin Rock Rd	189.27	Boothey Rd
		M037	Collie-Lake King	110	169.33	Gundaring South	170.18	Gundaring Nth Rd
		H001	Albany Hwy	110	171.55	Hurley Rd	178.07	Tarwonga East Rd
	Local	4180047	Clayton Rd	60	2.22		2.65	50 m E of Wiese Rd
		4180012	Felspar St	60	0.68		1.07	50 m W of Floreat St

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Wheatbelt North (10)	National	H006	G.N.H	90	North of Tee Tree Rd, Bindoon
		H005	G.E.H.	110	SLK: 77.72, W of Clackline
		H005	G.E.H.	110	SLK: 268.48 Boonar site
		H006	G.N.H.	110	SLK: 120.48 South Yerecoin
	State	M033	Northam-Toodyay	90	SLK: 21.40
		H004	Brand Hwy	110	SLK: 16.30 Gingin Shire
		M026	Toodyay	110	SLK: 22.10 Toodyay Shire
		M016	Goomalling-Merredin	110	SLK: 10.69
		M041	York-Merredin	110	SLK: 9.80 York Shire
	Local	4140213	Gamenya Ave	60	SLK: 0.5 Merredin Shire

Region	Road Type	Road No.	Road Name	Speed Zone	Location of Classifier (From/To/At)
Pilbara (11)	National	H006	G.N.H.	90	SLK 1614.09 S of Madigan Rd
		H006	G.N.H.	90	SLK: 1607.75 N of Cemetery Rd Access
		H006	G.N.H.	90	SLK: 1607.75 N of Cemetery Rd Access
		H006	G.N.H.	110	South of NWCH 1573.87 slk SLK: 1569.74 S of N W C H
	State	H046	Dampier Rd	80	Bet. Broadhurst and Blinco Rd
		H046	Dampier Rd	80	Bet. Broadhurst and Blinco Rd
		H051	Port Hedland Rd	90	East of Cooke Point Drive SLK: 4.05
		H051	Port Hedland Rd	90	SLK: 4.05 E of Cooke Point Dr
		M035	Point Samson-Roebourne	90	70m West of Honeymoon Cove Rd
		H007	North West Coastal	110	East of Dampier Rd 1109.85 slk
		M030	Marble Bar	110	SLK:424.23 Bet. Lalla Rookh Acc and GNH
	Local	8140075	Mooligunn Rd	60	308 m W of Lambden Rd, bet Chiratta and Lambden
		8130140	Cooke Point Dr	80	S of McGregor St, bet. Styles Rd and Mcgregor Rd
		8140103	Balmoral Rd	80	230 m W of Gawthorne Dr, bet. Gawthorne and Nichol

Appendix C

List Of 2018 Survey Locations

Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
Great Southern (01)	State	H040	Albany Port Rd	70	[15457] Albany Port Rd - South of Frenchman Bay Rd [70]
		H008	South Coast Hwy	80	[19180] South Coast Hwy - North of Millbrook Rd [80]
		H001	Albany Hwy	80	[52411] Albany Hwy at 400.63 slk [80]
		H009	South Western Hwy	90	[15391] South Western Hwy - East of William Bay Rd [90]
		M031	Northam Cranbrook	110	[52412] Northam - Cranbrook - South of Stronach Rd [110]
		M021	Kojonup - Pingrup Rd	110	[19125] Kojonuo- Pingrup - West of Washington Rd [110]
		M001	Albany - Lake Grace Rd	110	[15438] Chester Pass Rd - North of Mt Barker Porongorup Rd [110]
		H001	Albany Hwy	110	[00120] Albany Hwy - N of Milllbrook Rd [110]
	Local	3021069	Angove Rd	50	[19372] Angove Rd - 170m East of Ulster Rd [50]
		3020455	Le Grande Ave	50	[50615] Le Grande Ave - 240m East of Salvado Rd [50]
		3020212	Balston Rd	50	[50616] Balston Rd - 320 m South of South Coast Hwy [50]
		3020294	Collingwood Rd	60	[16520] Collingwood Rd - 20 m South of Loftie St [60]
		3020285	Bayonet Head Rd	60	[52409] Bayonet Head Rd - South of Purdie St [60]
		3020608	Frenchman Bay Rd	70	[15464] Frenchman Bay - 40 m South of Wool Store Pl [70]
		3120019	Manjimup - Mt Barker Rd	110	[15425] Manjimup- Mt Barker - East of Denmark- Mt Barker [110]
South West (2)	State	H009	South Western Hwy	50	[15241] SOUTH WESTERN HWY - S OF BRIDGE ST <50>
		H009	South Western Hwy	60	[51774] SOUTH WESTERN HWY - N OF PENN <70>
		M042	Goodwood Rd	60	[15230] MARMION ST - S OF SOUTH WESTERN HWY <60>
		H009	South Western Hwy	70	[50581] SOUTH WESTERN HWY - E OF VITTORIA RD <70>
		H043	Bussell Hwy	70	[19465] BUSSELTON BYPA - W OF CAUSEWAY RD <70>
		M043	Caves Rd	70	[51054] CAVES RD - S OF CONTO RD <70>
		H009	South Western Hwy	80	[15192] SOUTH WESTERN HWY - E OF IRISHTOWN RD <80>
		M008	Vasse Hwy	80	[19129] VASSE HWY - E OF CONTE RD <80>
		M023	Pinjarra Road	80	[51759] PINJARRA RD - E OF FURNISSDALE RD <80>
		H009	South Western Hwy	90	[8309] SOUTH WESTERN HWY - S OF ALCOA RD<90>
		H059	Willinge Dr	90	[51567] WILLINGE DR - N OF BUNBURY OUTER RING RD 6.48 <90>
		M024	Muir	90	[15316] MUIR HWY - E OF FRANKLIN ST <90>
		M043	Caves Rd	90	[51133] CAVES RD - S OF SIESTA PARK RD <90>
		M046	Collie - Mumballup Road	90	[51055] COLLIE PRESTON RD - S OF MCALINDEN RD <90>
		M074	Lakelands-Lake Clifton	90	[51675] OLD COAST RD - N OF PRINCETON DR <90>
		M053	Pinjarra - Williams Road	100	[51757] PINJARRA WILLIAMS RD - E OF IRWIN RD <100>
		H045	Coalfields Hwy	100	[50866] Coalfields Rd - E of South Western Hwy <100>
		H058	Bunbury Outer Ring Road	100	[51565] BUNBURY OUTER RING RD - W OF MOORE RD 1.85 <100>
		H061	Australind Roelands Link	100	[51098] RAYMOND RD - W OF TREENDALE RD (EAST) <100>
		M006	Bridgetown Boyup Rd	100	[19133] BRIDGETOWN BOYUP BROOK RD - E OF JAYES RD <100>
		M046	Collie - Mumballup Road	100	[15205] COLLIE PRESTON RD - N OF DONNYBROOK KOJONUP RD <110>
		M053	Pinjarra - Williams Road	100	[19134] PINJARRA WILLIAMS RD - E OF NAPIER RD <100>
		M066	Collie-Williams Rd	100	[15224] COLLIE WILLIAMS RD - S OF NORM RD <100>
		M074	Lakelands-Lake Clifton	100	[50661] OLD COAST RD - N OF LAKE CLIFTON RTY <100>
		H002	Perth Bunbury Hwy	110	[15147] FORREST HWY - N OF HARVEY MYALUP RD <110>
		H009	South Western Hwy	110	South Western Hwy - N of Glentulloch Rd <110>
		H009	South Western Hwy	110	[52006] South Western Hwy, South of Coolup <110>
		H043	Bussell Hwy	110	Bussell Hwy - S of Margaret River SLK 102.94 <110>
		M008	Vasse Hwy	110	[19130] VASSE HWY - W OF ABBA RD <110>
		M037	Collie Lake - King Road	110	Collie Lake - King Road - W of Varis Rd <110>
South West (2)	Local	2040011	Minninup Rd	50	[19350] MINNINUP RD - S OF ADAM RD <50>
		2040175	Frankel St	50	[19355] FRANKEL ST - E OF GIBBS ST <50>
		2040358	Hayes St	50	[19353] HAYES ST - W OF ALBERT RD <50>
		2050206	Marine Tce	50	[19364] MARINE TCE - E OF FORD RD <50>
		2080076	Pratt Rd	50	[51762] PRATT RD - E OF GRAHAM ST <50>
		2110543	Kingston Dr	50	[51698] KINGSTON DR - N OF LEISURE DR <50>

Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
South West (2)	Local	2120203	Elizabeth St	50	[19420] ELIZABETH ST - E OF FRANCE ST <50>
		2120690	Murdoch Dr	50	[52416] MURDOCH DR - W OF HAKEA ENT <50>
		2120876	Reynolds Av	50	[52417] REYNOLDS AV - N OF RUBIDA CL <50>
		2170003	Collins St	50	[50770] COLLINS ST - N OF MARMION ST <50>
		2120137	Anstruther Rd	60	[6553] ANSTRUTHER RD - N OF LEFROY RD <60>
		2120616	Mandurah Tce	60	[6538] MANDURAH TCE - S OF ANSTRUTHER RD <60>
		2120703	Pinjarra Rd	60	[52418] PINJARRA RD - E OF FRANCE ST <60>
		2140001	Crossman Rd	60	[16986] CROSSMAN RD - E OF BANNISTER MARRADONG RD <60>
		2040020	Vittoria Rd	70	[50773] VITTORIA RD - S OF ERICA ENT <70>
		2110193	Cathedral Ave	70	[51775] CATHEDRAL AV - N OF ELINOR BELL RD <70>
		2120397	Gordon Rd East	70	[16191] GORDON RD - W OF LAKES RD <70>
		2120616	Mandurah Tce	70	[51756] MANDURAH TCE - S OF TINDALE ST <70>
		2080024	Moore Rd	80	[51132] MOORE RD - S OF BUNBURY OUTER RING RD <80>
		2110535	Old Caost Rd	80	[50902] OLD COAST RD - N OF CATHEDRAL AV <80>
Goldfields (5)	National	H005	Great Eastern Hwy	60	[17869] H005 - 552.6 slk E of Lyon St <60>
		H010	Coolgardie-Esperance Hwy	80	[52420] H010 - 74.6 slk South of Kingston St <80>
		H003	Eyre Hwy	110	[19147] H003 - 40.69 slk East of Mt Monger Sth Rd <110>
		H005	Great Eastern Hwy	110	[19375] H005 - 462.51 slk West of Ryans Find Rd <110>
		H010	Coolgardie-Esperance Hwy	110	H010 - 4.7 km N of Goldfields Hwy (110)
		H010	Coolgardie-Esperance Hwy	110	H010 - 16 km N of Eyre Hwy (110)
	State	H049	Goldfields Hwy	70	[52419] H049 - 69.3 slk North of Mt Monger Rd <70>
		H005	Great Eastern Hwy	70	[16193] H005 - 587.97 slk East of Atbara St <70>
		H049	Goldfields Hwy	80	[52421] H049 - 18.75 slk W of Tip Rd <80>
		H010	Coolgardie-Esperance Hwy	80	[18207] H010 - 288.95 slk North of Tom Starcevich V.C Rd <80>
		H049	Goldfields Hwy	90	[16200] H049 - 21.80 slk North of Durkin Rd <90>
		H049	Goldfields Hwy	110	[19149] H049 - 112.9 slk South of Broadarrow Ora Banda Rd <110>
		H041	Anzac Drive	110	[19151] H041 - 4.00 slk West of Goldfields Hwy <110>
	Local	6054008	Dwyer St	50	[50604]!DWYER ST - BETWN BROOKMAN-LANE [50]
		6053017	Johnston St	50	[19428]!JOHNSTON ST - BETWEEN MAXWELL-GATACRE <50>
		6052046	Maxwell St	50	[19152]!MAXWELL ST - BETWEEN HAMPDEN-SHEED <50>
		6052003	Forrest St	50	[50606]!FORREST ST - BETWEEN NETHERCOTT & LIONEL <50>
		6052002	Egan St	50	[50605]!EGAN ST - BETWEEN LANE-WILSON <50>
		6051002	Piccadilly St	60	[19153] !PICCADILLY ST - BETWEEN WOODMAN-CHAPPLE < 60>
Kimberley (06)	National	H006	Great Northern Hwy	110	Great Northern Hwy - W of Gee Gully Rd <110>
		H006	Great Northern Hwy	110	Great Northern Hwy - W of Camballin Rd <110>
		H006	Great Northern Hwy	110	Great Northern Hwy - S of Lissadell Rd <110>
	State	H042	Broome Hwy	70	[50630]!Gubbinge Rd - South of Ganthium Pt <70>
		H042	Port Drive Broome	80	[16835]!Port Dr - South of Kavite Rd <80>
		M012	Derby GIBB River Rd	90	[52427]!SITE 52427 GIBB RIVER ROAD - WEST OF ADCOCK ROAD <90>
		H047	Derby Hwy	90	[19157]!DERBY HIGHWAY - SOUTH OF RUSS ST <90>
		H042	Broome Hwy	90	[19155]!Broome Hwy - South of Fairway Drive <90>
		H042	Broome Hwy	110	Broome Hwy - E of Broome Cape Leveque Rd <110>
	Local	0030146	Stanley St	50	[50611]!Stanley St - Near Town Oval <50>
		0030036	Marmion Street	50	[50613]!Marmion Street Derby - North of Archer <50>
		0010154	Reid Rd	50	[50614]!Reid Rd - West of Port Dr <50>
		0010061	Pembroke Rd	50	[50612]!Pembroke Road - Broome <50>
		0010037	Frederick St	50	[52423]!Frederick Street - West of Herbet Street <50>
		0030056	Ashley St	60	[19187]!ASHLEY STREET - SOUTH OF ALFONSAS STREET <60>
		0010002	Guy St	60	[18040]!Guy St - East of Port Dr <60>
		0010222	Cable Beach Rd East	70	[19156]!CABLE BEACH ROAD EAST OF CHARLES ST <70>
		0010319	Port Dr	80	[16833]!Port Drive - North of Broome Hwy <80>
		0010248	Lullfitz Dr	80	[52464]!Millington St - Broome <80>

Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
Wheatbelt (08)	State	M031	Northam - Cranbrook	60	[15939]!Northam - Cranbrook - S of River St <60>
		M031	Northam - Cranbrook	70	[50595] !!Northam Cranbrook - South of Radnor Rd <70>
		H005	Great Eastern Hwy	70	[6995] !!Gt Eastern Hwy - East of Berry Brow <70>
		M038	Narrogin Kondinin Rd	80	[17487]!Narrogin Kondinin Rd - West of Pingelly Wickepin Rd <80>
		H053	Williams Narrogin Hwy	80	[17509]!Williams Narrogin Hwy - East of Glenfield Rd <80>
	Local	H005	Great Eastern Hwy	80	[16997] !Great Eastern Hwy, Meckering <80>
		M033	Northam-Toodyay Rd	90	[15963] !Northam-Toodyay Rd - East of Nardie Rd <90>
		M031	Northam Cranbrook Rd	90	[16922]!Northam Cranbrook Rd - South of McNeil St <90>
		H006	Great Northern Hwy	90	[19166]!GNH - North of Tee Tree Rd <90>
		H006	Great Northern Hwy	100	[15993]!GNH - North of Settlement Rd SLK 66.0 <100>
		M041	York - Merredin Road	110	[52474]!York (Quairadin) Merredin Rd - East of Osborn Rd <110>
		M038	Narrogin Kondinin Rd	110	Narrogin Kondinin Rd - W of Tarin Rock Rd North - NPS 6105 <110>
		M037	Collie Lake King Rd	110	Collie Lake King Rd - E of Kulin Dumbleyung Rd - NPS 6095 <110>
		M031	Northam Cranbrook Rd	110	[17369]!Northam Cranbrook Rd - South of Whimbin Rock Rd Slk 184.73 <110>
		M026	Toodyay Road	110	[51981] Toodyay Rd - W of Fernie Rd <110>
		M016	Goomalling-Merredin Road	110	[07023] Goomalling-Merredin Road - E of Tammin Wyalkatchem Rd <110>
		M002	Bindoon - Moora Rd	110	[17798]!Bindoon Moora Rd - N of Mogumbur Rd at 110km sign <110>
		H053	Williams Kondinin Rd	110	[50330]!East of Cornwall Rd <110>
		H052	Brookton Hwy	110	Brookton Hwy - E of York-Williams Rd - NPS 6037 <110>
		H006	Great Northern Hwy	110	[50719]!West of Gatti Rd SLK 206.4 <110>
		H005	Great Eastern Hwy	110	[19165]!GEH - East of Booran North Rd <110>
		H004	Brand Hwy	110	[19168] Brand Hwy <110>
		H001	Albany Hwy	110	[17516]!Albany Hwy - North of Tarwonga Rd Slk 177.31 <110>
		4212015	Stirling St	50	[50593]!Stirling St - South of Bryant St, Northam <50>
		4212009	Chidlow St west	50	[17740]!Chidlow St - East - W of Gordon St <50>
		4212001	Wellington St	50	[17730]!Wellington St - South of Gairdner St, Northam <50>
		4180016	Bannister St	50	[19371]!Bannister St - West of Goldsmith Rd <50>
		4180012	Falspar St	50	[19163]!Falspar St - East of Floreat St, Narrogin <50>
		4212224	Newcastle Rd	60	[17720]!Newcastle St - Northam <60>
		4180112	Narrakine Rd	60	[51032]!Narrakine Rd - South of Quigley St <60>
		4180047	Clayton Rd	60	[19162]!Clayton Rd - West of Narrakine Rd <50>
		4212116	Withers St	70	[52430]!Withers St - East of Goomalling <70>
		4211020	Spencers Brook Rd	80	[52473]!Spencers Brook Rd - West of Muresk Rd <80>

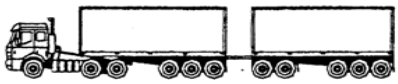
Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
Pilbara (11)	National State	H006	Great Northern Hwy	110	[8564] Great Northern Hwy - S of Karijini Dr <110Km>
		M035	Point Samson Roebourne Rd	60	[16304] Point Sampson Road - N of Nwch Slk 18.93 <60Km>
		H046	Dampier Rd	70	[19176] Dampier Hwy - West of Balmoral Rd <70Km>
		H051	Port Headland Rd/ Wilson St	70	[16460] Port Hedland Road - W of Short Street Slk 9.18 <70Km>
		M035	Point Samson Roebourne Rd	80	[16449] !Point Sampson Road - W of Honemoone Cove Slk 1.2 <80Km>
		M035	Point Sampson Roebourne Rd	90	[50537] Point Sampson Road - N of Wickam Drive Slk 8 <90Km>
		H051	Port Headland Rd	90	[50076] Port Headland Rd - N of Great Northern Hwy - Nps <90Km>
		M062	Karijini Drive	110	[50543] Karijini Drive - W of Great Northern Hwy - Nps <110Km>
		M030	Marble Bar Rd	110	[50544] Marble Bar Rd - N of Great Northern Hwy- Nps <110Km>
		H007	North West Coastal Hwy	110	[8048] North West Coastal Hwy - E of Dampier Rd - Nps <110Km>
		H007	North West Coastal Hwy	110	[08546] North West Coastal Hwy - W of Great Northern Hwy <110Km>
		8140363	Nickol Rd Karratha	50	[50603] Nickol Rd Karratha - S of Balmoral Rd <Slk1.2> <50Km>
		8130114	Parker St	50	[19328] Parker St - S of North Circular Rd <50Km>
		8130016	Moore St Port Headland	50	[19437] Moore St - E of Thompson Cooke Point Slk 0.1 <50Km>
		8140075	Mooligunn Rd	60	[19179] L.i.a Krratha - E of Chiratta Rd <Slk 0.75> <60>
		8130106	Hamilton Rd	60	[19323] Hamilton Road - S of North Circular<60Km>

Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
Pilbara (11)	State	8140074	Mystery Rd	70	[52433] Mystery Rd - E Of Maitland Rd Slk <0.9> <70Km>
		8130148	Murdoch Dr	70	[52334] Murdoch Dr - E Of Demarchi Road Slk 0.53 <70Km>
		8140103	Balmoral Rd	80	[50626] Balmoral Rd - E Of Bathgate <Slk 3.7 > <80Km>
		8130140	Cooke Point Drv	80	[19370] Cooke Point Dr - N Of Wilson St <Slk 0.13 > <80Km>
		8130231	Butt Weld Rd	90	[50527] Port Hedland - S Of Gnh (Slk 0.7) <90 Km>

Region	Road Type	Road No	Road Name	Speed Zone	Location of Classifier (From/To/At) 2018
Mid West-Gascoyne (14)	State	H007	North West Coastal Hwy	60	[51821] North West Coastal Hwy - 4.47 SLK North of Mark St [60]
		H044	Carnarvon Rd	70	[19366] Carnarvon Rd - 2.15 SLK - Oposite Gateway Motel - [70]
		H004	Brand Hwy	70	[18136] Brand Highway - 366.72 SLK, South of Elva St [70]
		H050	Geraldton Mt Magnet Rd	80	[18650] Geraldton-Mt Magnet Rd - 93.1slk 750m East of Mingenew Mullewa Rd [80]
		H007	Nrth West Coastal Hwy	80	[16623] North West Coastal Highway - 484.95 SLK - 140m South of North River Rd [80]
		M028	Midlands	90	[18668] Midlands Rd - 180.80slk South of Arrino West Rd (90)
		H050	Geraldton Mt Magnet Rd	90	[18715] Geraldton-Mt Magnet Rd 8.66 SLK - 660m East of Airport Rd [90]
		M028	Midlands Rd	110	[18390] Midlands Rd (M028) - S of Mingenew 211.82SLK [110]
		H050	Geraldton Mt Magnet Rd	110	Geraldton Mt Magnet Rd - E of Yanget Rd (110)
		H007	North West Coastal Hwy	110	North West Coastal Hwy - S of Shark Bay Rd SLK 273.89 (110)
		H007	North West Coastal Hwy	110	North West Coastal Hwy - N of Blowholes Rd SLK 496.44 (110)
		H007	Nrth West Coastal Hwy	110	[51044] North West Coastal Hwy - North of Nerren Neren - 228.8 SLK [110]
		H007	North West Coastal Hwy	110	North West Coastal Hwy - N of Olsen Rd (110)
		H004	Brand Hwy	110	Brand Hwy - 23km N of Site#50653 <110>
	Local	8030020	Whitlock St	50	[52414] !Whitlock St 0.25 SLK - North of Quince St [50]
		8030010	West St	50	[52413] !West St - 0.22 SLK - East of Richardson St [50]
		8030001	Olivia Terrace	50	[50167] Olivia Terrace - 0.50 SLK - South of Johnston St [50]
		5130053	Elliot Rd	50	[51692] !Eliot St 0.49 SLK, East of Maylley Place [50]
		5050240	Highbury St	50	[52415] Highbury St 1.05slk East of Verita Rd (50)
		5050009	Willcock Dr	50	[51183] Willcock Drive 1.55 SLK North of Olive St [50]
		5050008	Chapman Rd	60	[18674] ChapMan Rd - North of Snowdon St - 0.67 SLK [60]
		5050005	Shenton St	50	[19145] Shenton St - East of Francis St (50)
		8030031	Babbage Island Rd	60	[19368] Babbage Island Rd - 0.66 SLK East of Nelson St [60]
		5050128	Anderson St	60	[19146] Anderson St -125 SLK - South of Webberton Rd [60]
		5050002	Eastward St	60	[18146] Eastward Rd 0.40slk East of Cypress St (60)
		5050499	Utakarra Rd	70	[19369] Utakarra Rd 1.41 SLK - East of Blencowe Rd [70]
		5050498	Edward Rd	80	[18663] Edward Road 2.31 SLK, North of Ross Ariti Rd [80]
		5050008	Chapman Rd	90	[51776] Chapman Rd - 7.08 SLK - North of Sail Bvd [90]

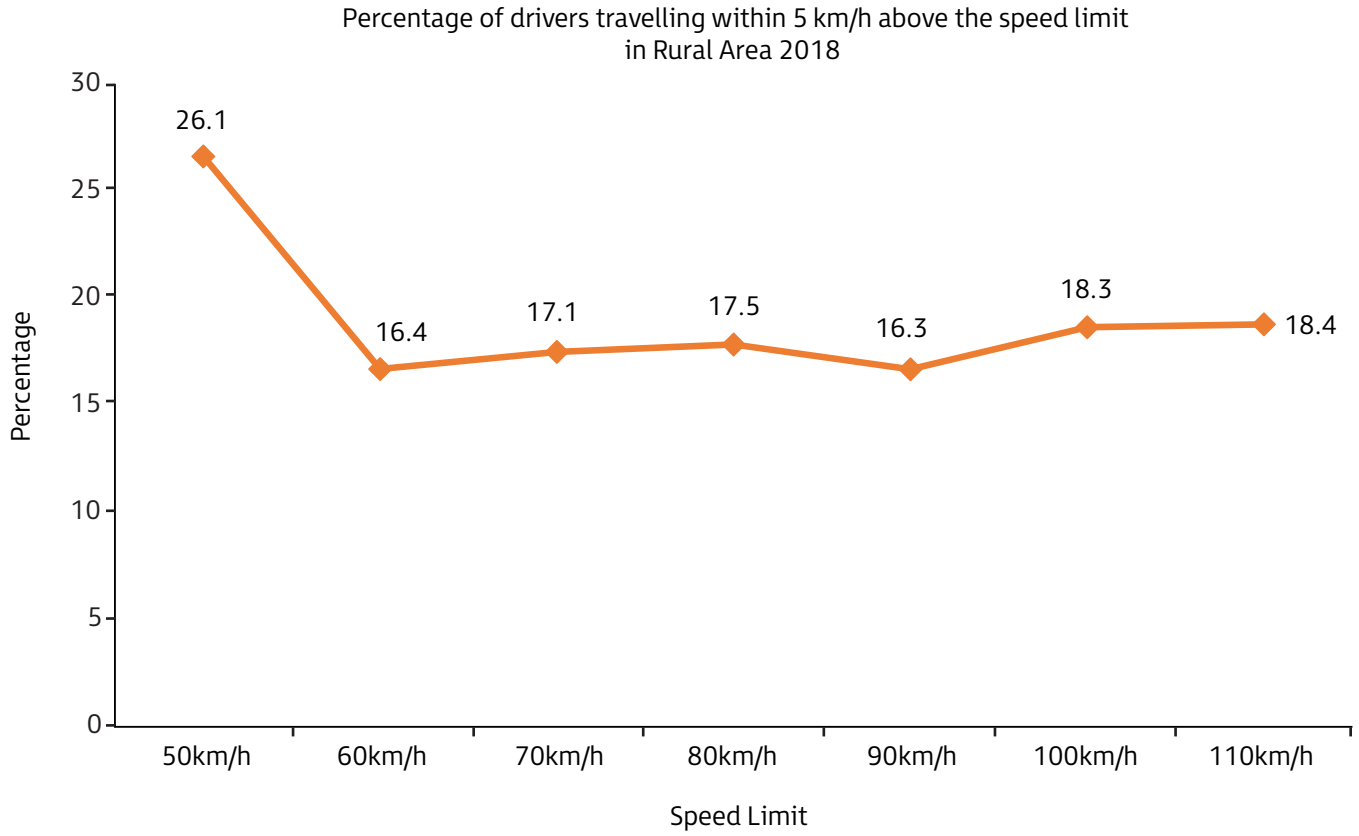
Appendix D

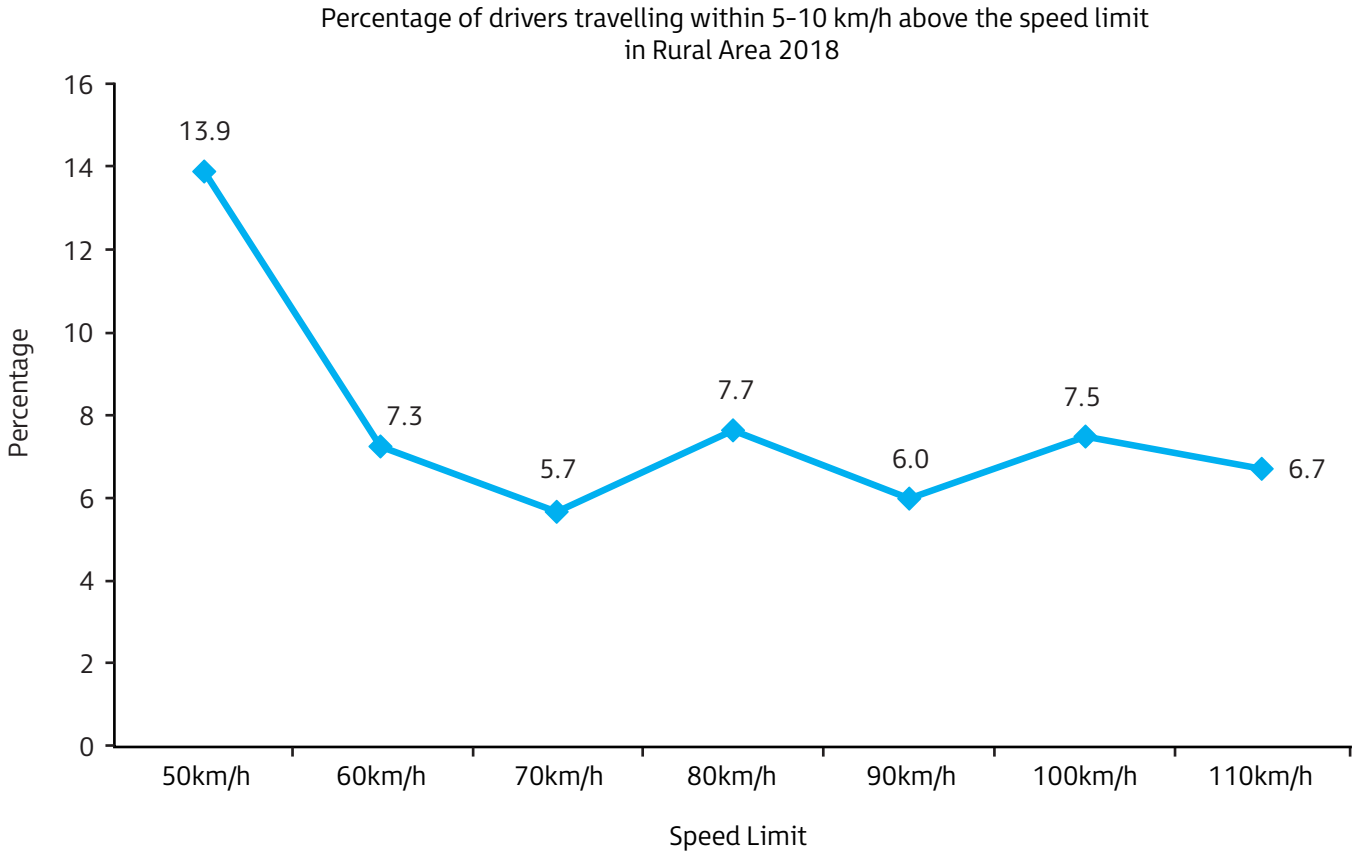
Austroads Vehicle Classes

CLASS	LIGHT VEHICLES	
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle	
2	SHORT – TOWING Trailer, Caravan, Boat	
	HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS * 2 axles	
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups	
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups	
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups	
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups	
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups	
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups	
	LONG VEHICLES AND ROAD TRAINS	
10	B DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups	
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups	
12	TRIPLE ROAD TRAIN *7+ axles, 7+ axle groups	

Appendix E

2018 Rural Speed Distribution by Speed Limit Group





RURAL

Exceeding by up to 5km/h	%	Exceeding by up to 10km/h	%
50km/h	26.1	50km/h	13.9
60km/h	16.4	60km/h	7.3
70km/h	17.1	70km/h	5.7
80km/h	17.5	80km/h	7.7
90km/h	16.3	90km/h	6.0
100km/h	18.3	100km/h	7.5
110km/h	18.4	110km/h	6.7