

Two Decades of Impacts of Road Safety Strategies on Driver Travel Speed Behaviours on WA Road Network

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Abstract

Thirteen annual speed surveys were conducted on the Western Australian road network over the period 2000 to 2018 to measure impacts of road safety strategies, in particular speed enforcement strategies, on driver speed behaviours on speed limit roads ranging from 50 km/h to 110 km/h. Effectiveness of speed road safety programmes was estimated in terms of changes in speed data indices (speed compliance rates, excessive speeding, 85th percentile and mean speed). When compared to the 2000 survey, the number of speeding drivers recorded in 2018 was reduced up to 73.3% in the Perth metropolitan area, and similarly but to lesser extent in the rural areas. Over the same period WA fatality crash rates have reduced by 47% from 1.07 in 2000 to 0.54 fatalities/100MVKT in 2018.

Background

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 increase 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 state road safety strategy, *Towards Zero 2008 -2020* (Office of Road Safety, 2009), including further expansions of 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 on the WA network rather than using travel speed behaviours recorded at speed camera sites which would be more likely biased towards lower speeds. For this reason it was suggested that 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 and use the derived speed indices in the assessment of effectiveness of the enforcement strategies on safety outcomes in terms of reductions in number of fatalities and serious injuries over the years. 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.

Methodology

Given that the WA road network covers a vast area, substantial care was taken in the design of the survey such that the data collected would be representative of the state's driver population and their behaviours on these type of roads with varying speed limits ranging from the default 50 km/h speed limit to 110 km/h on rural open area roads. This has been achieved through sampling stratification with respect to: traffic volume, speed limit, divided/undivided road, and number of lanes.

It was envisaged that the sample of approximately 140 sites in each of the regions, the Perth metropolitan and rural regions, would be sufficient in size to provide reliable representativeness of driver speed behaviour at the general road locations of the road network. Based on research studies, it was proposed that the minimum sample size by road type would not be less than 50000 vehicles. The distribution of survey sites by region, road and wherever possible by speed limit stratum was based on the estimates of traffic exposures measured in million vehicle kilometres travelled (MVKT). The minimum sample size estimates for percentiles were derived using the equation as stated by Oppenlander et al. (1961) by which sample size requirement was estimated at 16000 vehicles per strata. For the purpose of consistency in the speed data analysis and comparisons between the surveys an attempt was made to maintain all the sites surveyed in the baseline survey 2000 in all other subsequent surveys. The duration of the Perth metropolitan survey per site was at least two days while the rural speed survey was conducted over at least 7 days resulting in each of the surveys excess of one million vehicles travelling with “free” speeds (headway ≥ 4 sec) upon which the findings of this study are based on.

Analysis

The changes in driver speed behaviours were assessed by monitoring changes in speed indices such as: compliance rates by road type, days of the week and time of days, compliance by speed limit, proportion of drivers travelling 10+ km/h above posted speed limits, mean speeds relative to earlier surveys and the baseline survey, the 85th percentiles, trends in speed indices. Effectiveness of road safety strategies, especially speed enforcement strategies since 2000 has been demonstrated by the study surrogate measures of reductions in mean speeds across most of the speed limit roads in both regions, and especially in reduction in the number of speeding drivers, travelling at speeds in excess of 10 km/h above the speed limit (ref. Table 1).

Table 1. Distribution of mean speeds and percentage of speeding drivers by speed limit and year

Speed Limit (km/h)	Metro						Rural					
	Mean (km/h)		Reduc.	%	% exc.10+ km/h		Mean (km/h)		Reduc.	%	% exc.10+ km/h	
	2000	2018	(km/h)	Reduc.	2000	2018	2000	2015	(km/h)	Reduc.	2000	2015
50	52.3	48.9	-3.4	-6.5	22.4	8.9	52.3	48.3	-4.0	-7.6	17.4	8.3
60	60.6	55.9	-4.7	-7.8	14.9	2.9	59.8	57.5	-2.3	-3.8	10.9	6.6
70	69.4	66.5	-2.9	-4.2	11.8	4.5	65.9	65.4	-0.5	-0.8	4.6	4.1
80	77.2	73	-4.2	-5.4	11.0	3.5	77.9	77.1	-0.8	-1.0	7.1	7.7
90	82.6	85.3	2.7	3.3	6.7	2.2	87.9	87	-0.9	-1.0	12.2	6.7
100	91.2	96.2	5	5.5	4.0	2.1	97.1	97	-0.1	-0.1	15.1	5.8
110							102	102.4	0.3	0.3	7.9	7.1
Total					12.6	3.4					8.6	5.9

Compared to 2000, the number of speeding drivers in the metropolitan area in 2018 has reduced by 73%, significantly less but substantially large in the rural regions by approximately 31% (ref. Figure 1.). Similarly, over the same period, WA fatality crash rates have reduced by 47% from 1.07 in 2000 to 0.54 fatalities/100MVKT in 2018. This is not to say that the reduction in the fatality rates could be solely attributed to the reduction in the number of “speeding” drivers, changes in driver speed behaviours, or reduction in overall travel speeds that could be solely attributed to the WA police enforcement strategies, but to overall road safety strategies, in particular to the *Towards Zero* 2008 – 2020. Nevertheless, the data suggests a quite significant correlation between the fatality rates and percentage of drivers travelling at excessive speeds.

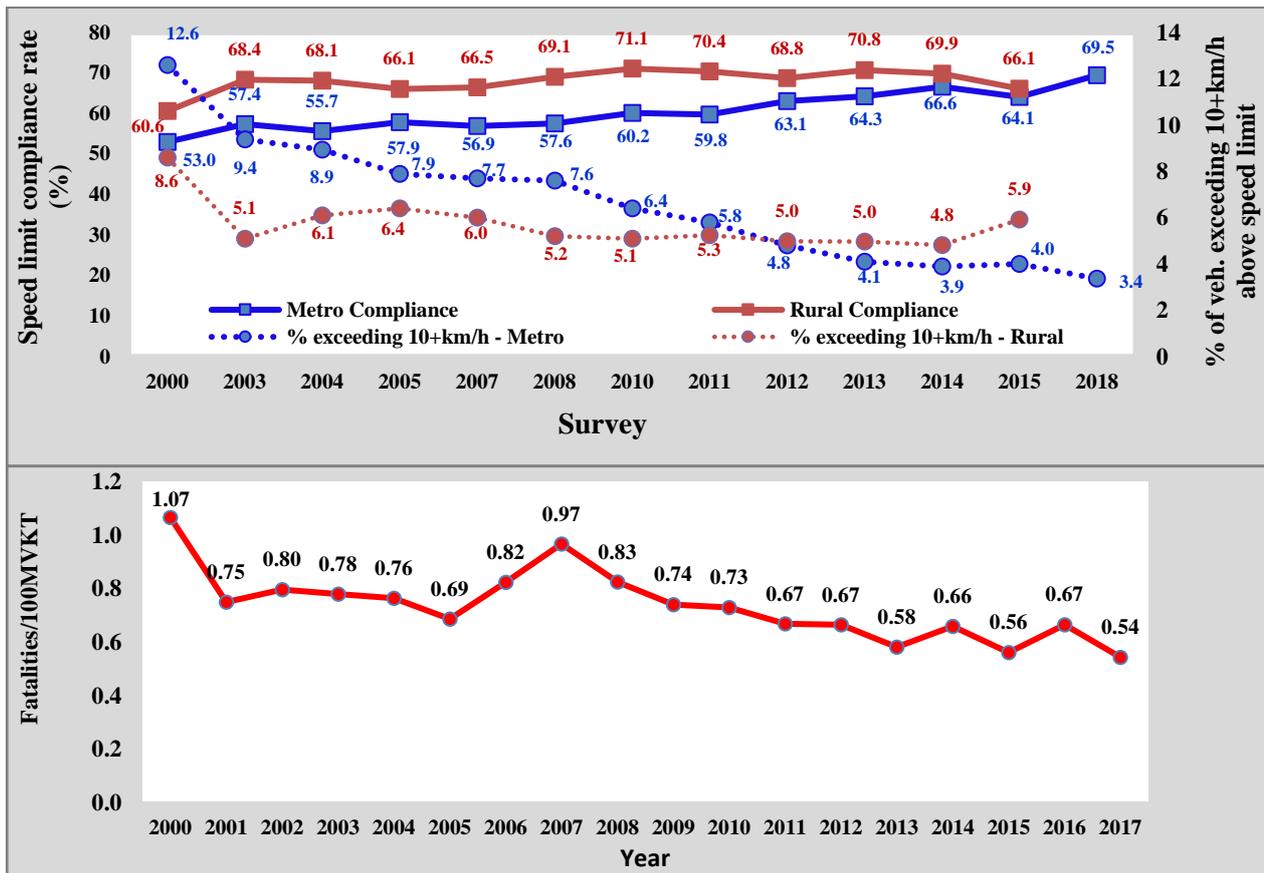


Figure 1. Speed limit compliance on WA network and fatality crash rates, WA 2000 to 2018

Conclusions

The study demonstrated a significant changes in WA driver speed behaviours expressed in in overall reduction in the travel speed, higher compliance to speed limit and reduction in excessive speeding over the two decades. In-depth analysis of speed data collected over thirteen surveys from 2000 to 2018 suggests that driver speed behaviours do differ depending on: speed limit on the road, day of the week and time of day. It can be fairly confidently said that the changes in driver speed behaviours were one of the major contributors in the reduction of fatality and serious injury rates in the state. It is recommended that findings of this study related to the road type and temporal factors be used as components in formulation of speed enforcement and other road safety strategies aimed at reduction of travel speeds. It should be also recognized that monitoring of future driver speed limit compliance would be of high importance in order to assess effectiveness of previously implemented and proposed future speed management and enforcement strategies.

References

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