Fixed, Digital Speed Cameras in NSW: Impacts on Vehicle Speeds and Crashes

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Biography

Don's work toward his honours degree and doctorate in psychology during the 1970's and early 80s was in the area of driving skills.

He subsequently worked in Road Safety Branch of the Roads and Traffic Authority in NSW, as a Behavioural Scientist working mainly on countermeasures to driving under the influence of alcohol and other drugs.

Between 1991 and 2001, Don was Manager of Licensing Policy in the RTA. In this role, he led the RTA's work on diverse projects including its Graduated Licensing Scheme and on prevention measures for heavy vehicle driver fatigue.

Currently, he is working in the Road Safety Strategy Branch of the RTA in the role of Manager, Speed Management. His role includes leadership of policy development for fixed speed cameras, red-light cameras and the promotion of the use of occupant restraints and rider helmets.

Abstract

The RTA began to install fixed digital speed cameras in NSW in late 1999. The policy for fixed speed camera installation in NSW calls for cameras to be located only at sites meeting speed and crash history criteria or hazardous sites such as road tunnels, and for those sites to be clearly marked by prominent advisory signage. In mid-2000, the RTA initiated a comprehensive three-year evaluation program of the cameras. The conduct of the evaluation program was contracted to a respected transport research company.

The evaluation consisted of a number of major components: measured speeds pre-installation and at specified time intervals post-installation; crash records three years pre-installation and two years post-installation; four waves of community questionnaire survey on knowledge, attitudes, beliefs and reported behaviours of drivers in relation to the fixed speed cameras and speeding. A representative sub-set of the sites was selected for the speed and crash evaluation components.

This paper deals with the results of the speed surveys and crash data. A separate paper in this session will deal with the results of the community questionnaire surveys.

The evaluation was completed in September 2003. This paper will talk about the design of the speed survey and crash data components of the evaluation program and the major road safety outcomes.

INTRODUCTION

It is well known and accepted in the road safety community that excessive speed is a major contributor to crashes, particularly severe crashes. There are several reasons for this: higher speeds give drivers less opportunity to react to developing hazardous situations; there is greater likelihood of loss of control; stopping distances are greatly increased; other road users are more likely to underestimate the vehicle's speed, higher impact speeds mean much greater likelihood of injury or death.

Because of the prominent role of excessive speed in crash causation and crash severity, the State's road safety strategy, *Road Safety 2010*, places a strong emphasis on reducing excessive speed.

Automated enforcement technology has some advantages over relying completely on Police on-road enforcement. Camera enforcement technology can operate 24 hours a day 365 days a year and is not hampered by occupational health and safety considerations in relation to working on a hazardous section of road (which is often the very place that speed enforcement is needed).

Promising road safety outcomes reported by some European countries and Great Britain gave the RTA confidence to implement a fixed, digital speed camera program in NSW.

Based on the experience in Europe and Great Britain, the policy decision was made early on to adopt strict criteria for the installation of the cameras. This would mean that cameras would be installed at blacklengths of road with a demonstrated speed and crash problem. It was also decided that all cameras would be clearly signposted to maximise the speed compliance through the blacklengths. The only exception to these criteria was for road tunnels, where a high-speed crash could cause major problems for emergency services access.

It was hoped, of course that the cameras would create a halo effect, but the strategy was to improve the safety of a well-defined length of road that satisfied the criteria.

The first fixed, digital speed cameras were installed in NSW in late 1999.

Recently, the State's fixed speed camera program has been expanded to include a trial school zone speed cameras at 10 primary schools. These are the subject of a separate evaluation and are not discussed further in this paper.

The RTA made the decision early on that a comprehensive, long-term evaluation was needed. In July 2000, ARRB Transport Research was appointed to conduct the evaluation, which consisted of several distinct components: measured speeds pre-installation and at specified time intervals post-installation; crash records three years pre-installation and two years post-installation; four waves of community questionnaire survey on knowledge, attitudes, beliefs and reported behaviours of drivers in relation to the fixed speed cameras and speeding. A separate paper covers the outcomes of the community questionnaire surveys.

METHOD

Camera site selection and configuration

Camera sites are selected according to strictly applied speed and crash criteria. That is, camera sites are speed and crash blacklengths (see Appendix 1).

All cameras were in operation full-time, except for breakdowns and servicing. That is, there was no rotation of camera modules around a larger number of sites as is done in some jurisdictions.

All cameras operated uni-directionally (ie they monitored only traffic travelling away from the camera position) and all sites had very prominent camera warning signs that also displayed the prevailing limit (see Appendix 2).

Camera sites included in the evaluation

A representative sub-set of 28 sites was selected for the speed and crash evaluation components. Sites included in the evaluation included roads with diverse configurations (number of lane, divided/undivided etc), speed limits, traffic volumes and roadside development.

The sites ranged across the following speed limits:

- 60 km/h............17 sites
- 70 km/h............2 sites
- 80 km/h............2 sites
- 90 km/h............3 sites
- 100 km/h..........3 sites
- 110 km/h..........1 site

No variable speed limit sites were included in the evaluation.

Speed surveys

Pre-installation and post-installation speed surveys were conducted at 20 camera sites, within the camera-length. Annual RTA speed survey data were used for 33 control sites. The purpose of the control sites was to estimate the general trends in speeds during the evaluation period.

These speed surveys were 24 hours a day 7 day surveys using automatic traffic counters. Post-installation surveys were conducted at 6, 12 and 24-month intervals after camera commissioning.

Statistics were derived for both directions at each site and summarised across all sites with a given speed limit.

- 60 km/h............12 sites
- 70 km/h............2 sites
- 80 km/h............2 sites
- 90 km/h............1 site
- 100 km/h..........3 sites

The details of the analysis method for the speed and crash data were developed and undertaken by Camcomp Partners Pty Ltd.

A log-normal modelling analysis was used to assess changes in mean speed. The model compared the pre-surveys with the 12 months post-surveys; the pre-surveys with the 24 months post-surveys; camera with control sites; and the interaction between camera and control sites. The latter interaction measures whether the change in mean speeds at the camera sites were greater than at the control sites. The net change measures the effect of the speed cameras on the speed parameter. A test of statistical significance of the net change was performed to indicate whether the observed change was a real change in speed distribution. The key output was the estimated reduction in mean speed at the camera sites relative to the control sites.

An analysis was also conducted of proportion of vehicles exceeding the speed limit and those exceeding the limit more than 10, 20 and 30 km/h. A Poisson regression model was used for this analysis. The factors used in the model were the same as for the analysis of mean speed. The key output was the estimated percentage net reduction in the speed distribution parameter at the camera sites relative to the control sites.

Crash data analysis

Data were prepared for recorded crashes in the camera length for the three years before camera installation. This was compared with recorded crashes during the two years after camera installation. ‘Recorded crashes’ includes any crash where a vehicle was towed-away or a person was injured or killed.

As the installation of the cameras in the evaluation was staggered over a 22-month period, the three-year pre-period and two-year post-periods were differed across camera sites.

Control sites were selected for the camera sites. For cameras located in the Sydney region, crashes occurring elsewhere in the same local government area (LGA) were used as controls. Where a camera was on the border of two LGAs, crashes in both were used as controls.

For cameras located outside of the Sydney region, the control crashes were those on specific control lengths chosen by the RTA as having the same speed zoning and other relevant characteristics as the camera length.

Crashes were analysed by severity. The categories are ‘towaway’, ‘injury’, ‘fatality’, ‘casualty’ (injury and fatality) and ‘all crashes’ (towaway, injury and fatality crashes).

A log-linear regression model was applied to a quasi-experimental design. It was assumed that the crashes had a Poisson-type statistical distribution. The natural logarithms of crashes in each period are treated as a linear function of a constant depending on whether they were a camera or control site, a step function at the beginning of camera operation and an interaction term. The latter indicates whether the steps differ between the camera and control sites.

The difference between the steps estimated for the camera and control sites in the post-installation period indicates the effect of the cameras on crashes. The result is expressed as a percentage reduction in crashes. The statistical significance value of the interaction term indicates whether the measured reduction is likely to be real or a chance result.

The relatively small number of fatality crashes means that the percentage reduction values are more tentative than for other crash types.

RESULTS

The final analysis was not available at the time of preparation of this paper.

DISCUSSION

As the final analysis was not available at the time of preparation of this paper, only broad outcomes are referred to here. The conference presentation will contain the supporting detail.

Vehicle speeds

The cameras have been very effective in reducing vehicle speeds and reducing the variability of speeds.

Crashes

The focus of this evaluation is, of course, whether the cameras have been successful in reducing crashes, personal trauma and suffering, and crash-related financial costs to the community.

The results show that the cameras have been very effective in reducing crashes, particularly injury and fatality crashes.

CONCLUSIONS

Fixed, digital speed cameras have been employed in NSW as a blacklength treatment. That is, they have been installed at blacklengths according to strict speed and crash criteria. Their presence has been clearly signposted and otherwise advertised with the aim of deterring speeding over specific lengths and therefore improving the safety of road users along those lengths.

The results of the comprehensive evaluation reported here show that they have been very effective in NSW in terms of speed reduction and speed variability and, most importantly in terms of crash reduction. Moreover, the greatest crash reductions were achieved for the more severe casualty crashes.

APPENDIX 1

General criteria
The lengths of road within which a camera site should be considered must demonstrate the characteristics of Criteria 1, 2 and 3a or 3b. These are typically 1 to 2 km long. The crash data used for site selection relate to the previous 3 years. The speed data used for site selection were 24 hours a day 7 day surveys using automatic traffic counters.

Crash rates

Road Type	**Criterion 1** Crash rate (per hundred million vehicle kilometres)	**Criterion 2** Injury crashes per kilometre per year
Rural	>40	>0.5
Urban	>80	>0.5
Divided (Freeway / Motorway) *	>25	>0.5

Speed

Criterion 3a — Speed profiles which show 85th percentile speeds are in excess of 10% above the posted speed
OR
Criterion 3b — mean speeds are in excess of the posted speed.

Supplementary rural criteria

Rural crash rates

Road Type	**Criterion 1** Crash rate (per hundred million vehicle kilometres)	**Criterion 2** Injury crashes per kilometre per year
Rural	>40	>0.5

Note: Minimum AADT of 2000 vehicle per day

Speed

Criterion 3a — The 95th percentile speed is in excess of the speed limit plus 10%
OR
Criterion 3b — The 85th percentile speed is greater than the posted speed limit

Site alignment criteria

The blacklength is to comprise a curve or a series of curves of a radius that warrants advisory speed signs with enhanced delineation and advisory speed signs displayed.

APPENDIX 2


SPEED CAMERA
24 HOURS
60


SPEED CAMERA
AHEAD
60


HEAVY FINES
LOSS OF LICENCE
60