The power of social influence will perhaps become a key influencer of driving speeds only when speeding is overwhelmingly considered to be very unacceptable, as is the case with driving with a Blood Alcohol Concentration (BAC) of 0.1%.

Notes

[1] This package of measures included expansion of the covert speed camera program, a lowering of the cameras' speed detection threshold, increased camera operating hours, the introduction of a 50 km/h general urban speed limit and a large public education campaign *Wipe off 5*. It has been evaluated [3] as having led to a statistically significant reduction in casualty crashes.

References

1. Goldstein N, Cialdini R, Griskevicius R. A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. Journal of Consumer Research 35, (2008), 472-482.

2. Nieuwesteeg M and Lowery R. 2011. Making speeding socially unacceptable: measuring community attitudes. Paper presented at the 2011 Road Safety Research, Policing and Education Conference, Perth, Australia.

3. D'Elia A, Newstead S, and Cameron M. (2007). Overall Impact During 2001-2004 of Victorian Speed-Related Package. Melbourne, Victoria: Monash University Accident Research Centre.

Methods for measuring motorcycle speeds and their implications for understanding 'safe speeds'

by Darren Walton, Director - Research and Evaluation, Health Promotion Agency, Wellington, New Zealand; Senior Adjunct Fellow, University of Canterbury, NZ

Introduction

New Zealand traffic accident data show that motorcycles account for 13% of road crash fatalities [1] but that motorcyclists undertake only around 0.5% of travel time or trips [2]. From these statistics, it is determined that motorcyclists are around 16-23 times more likely to be involved in a fatal or injury crash than car drivers [1]. The high relative crash risk for motorcycles is replicated in every country; only the magnitude of the estimate varies, as motorcycles are always the most dangerous form of travel. One report estimates that motorcycles have a relative crash risk as high as 34 times that of cars [3].

Based on vehicle registrations, the number of motorcycles may seem insignificant: they constitute only 3.47% of the NZ vehicle fleet. However, motorcycle registrations have grown to over 100,000 in recent years, with the largest increase occurring between 2004 and 2008 [4]. The popularity of the motorcycle comes and goes but the recent rise in registrations coincides with increased rates of crashes resulting in death or injury [1]. Stephan et al [5] reviewed fatal motorcycle accident files from 115 Australian coroners' cases and found the rider was travelling too fast for the conditions in over 70% of cases. This conclusion is made notwithstanding that forensic techniques used for estimating a motorcycle's speed from crash scene evidence are far less accurate than those available for cars [6-7].

The main concern here is to consider the relative speeds of motorcycles and cars implied by reported statistics available from New Zealand, Australia, the United Kingdom and elsewhere. The argument developed in this paper is that our routine monitoring of vehicle speeds is not sophisticated enough to reveal the actual speed profile of motorcycles and is confounded by the classification of motorcycles in a group with scooters and mopeds. Recent work in New Zealand reveals how misleading our reported statistics are concerning motorcycle speeds.

The category that is referred to as 'motorcycles' formally includes motorcycles, motor scooters, mopeds, motor-powered bicycles and three-wheeled motorcycles [8]. The category can be referred to as 'powered two-wheelers' to avoid misclassification of the range of vehicle types, but this will simply mask the fact that scooters and motorcycles are used by different demographics for different trip purposes, implying different speed profiles and crash rates. To further complicate the issue, modern scooters can be more powerful than small motorcycles. The wide range in vehicle power associated with 'motorcycles' places the researcher in a position akin to classifying light trucks with family sedans and expecting speed monitoring to fit within a single distribution.

Annual speed surveys

In New Zealand, an annual vehicle speeds survey is conducted by the Ministry of Transport to provide key monitoring statistics on all vehicle speeds based on vehicle classifications [9]. The survey is central to all performance criteria established by other agencies (as it is in Australia, see for example [10]). It is usual practice to report mean speeds, 'excessive speeds' (defined as the percentage of vehicles travelling in excess of the speed limit) [11], and the 85% percentile of the distribution of observed speeds.

The methodology used in New Zealand relies on roadside observers and is sophisticated enough to accurately measure the speeds of different truck and trailer configurations. However, notably absent from what is otherwise best practice is the recorded speed of motorcycles, or 'motorcycles, scooters and mopeds'.

New Zealand is not unique. Australian states report annual vehicle speed monitoring but do not attempt motorcycles [12-13]. Similarly, of the six states in America reporting annual speed survey results on the web (following OECD [11]), none provides estimates of the speeds for motorcycles. The US Department of Transport acknowledges the importance of particularly monitoring motorcycle behaviours because of their different behavioural patterns and the need to determine exposure rates from travel patterns to account for the fact that 'motorcycles are the most dangerous motor vehicles for both operators and passengers of any age' [8].

Relatively rare among jurisdictions is the United Kingdom (UK), which reports monitoring motorcycle speeds (see Table 1). In the UK, speed monitoring is conducted using a network of embedded automatic monitoring units (Figure 1). The UK statistics show motorcycles travelling around the speed of cars in all years from 2006 to 2011. Note that the percentage of motorcycles exceeding the speed limit is about 50%, but the percentage exceeding the speed limit by more than 5 mph is significantly more than that of cars (between 4-8% greater than that observed for cars).

Even when limiting their concern to simply count motorcycles, the US Federal Highway Authority (FHA) recognises five problems with automated systems [8]. Motorcycles (i) are lightweight, (ii) have low metal mass, (iii) have a narrow footprint, (iv) travel in parallel or in staggered formations, and (v) are easily confused with other vehicle types (especially truck and trailer units). The range of equipment marketed as automatic counters for motorcycles includes side looking radar, inductive loops, video capture, quadruple loops, road tubes, infrared beams and magnetometers. Recently emerging techniques include GPS monitoring and point-to-point speed data [15].

Table 1. Free flow vehicle speeds on built-up roads in 30 mph speed zones in the United Kingdom (Annual figures from 2006 to 2011, reported by the UK Department of Transport [14])

30 mph limit (50 km/h)	2006	2007	2008	2009	2010	2011
Number of sites	26	26	26	26	25	25
Observations (thousands)	73,464	87,330	66,491	67,124	64,176	64,348
Average car speed (mph)	48.3	48.3	48.3	48.3	48.3	48.3
% exceeding limit	49	49	49	48	46	47
% exceeding limit by more than 5 mph	19	19	18	18	16	16
Average motorcycle speed (mph)	48.3	49.9	49.9	49.9	46.7	48.3
% exceeding limit	51	51	53	50	45	50
% exceeding limit by more than 5 mph	25	26	26	24	20	23
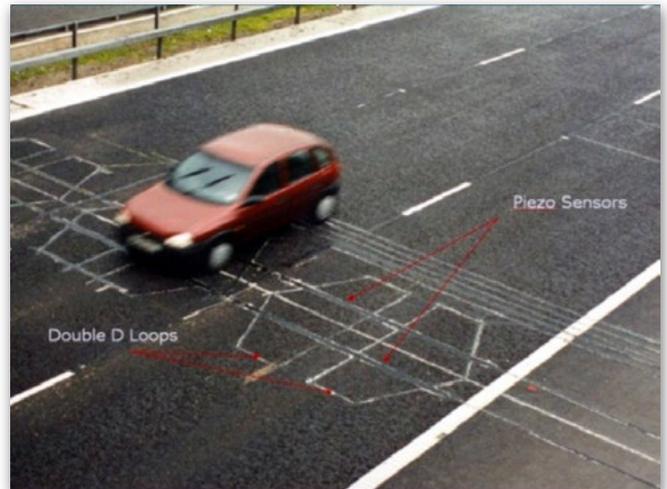
Figure 1. The UK Department of Transport monitors vehicle counts and speeds using a network of around 180 sites with embedded sensors configured as Double D inductive loop arrays

There is a wide range of technical apparatus which, when claiming to monitor motorcycle speeds, purports to overcome five major technical hurdles:

- false positives – when other vehicle types are recorded as motorcycles, especially bicycles in urban areas or trailers on truck units on highways

- false negatives – failure to detect a motorcycle because they are masked by other traffic, missed in groups, travel too fast or too slow, miss the inductive loops, fail to trigger the magnetometer, or trigger the wrong mechanism

- classification problems – failure to distinguish the different distributions of speeds for mopeds, scooters and motorcycles; typical equipment for monitoring traffic speeds can fail to detect motorcycles or incorrectly classify bicycles as scooters or motorcycles but it is now recognised that scooters and mopeds travel at slower speeds than motorcycles [16], so combining them together distorts the value of the reported mean speeds and the variation

- accuracy of the speed estimate – the identification of the target vehicle can be successful but the measurement of speed is in error; road tube systems are notorious for coming loose, loop detectors need to be calibrated to a sensitivity that detects motorcycles but not a truck in the adjacent lane

- the error rate is not random across the range of speeds recorded (i.e. fast motorcycles are inaccurately measured). In summary, no system is perfectly suited to monitoring all traffic types, and none is especially good at detecting motorcycles.

Despite the significant technical challenges involved in attempting to accurately estimate the distribution of speeds of motorcycles, it is occasionally done within dedicated research. Reported methods for undertaking the more difficult task of monitoring motorcycle speeds include automated traffic monitoring [17], video camera surveillance [18-19] and equipment- supported roadside observation [16-17].

Comparing results from different surveys

Table 2 combines the available statistics from the UK [4], Australia [17] and NZ [3, 16] to report six sets of free speeds (headways of four seconds or more) for cars and motorcycles. Walton and Buchanan [16] had the aim of measuring motorcycle speeds using a portable TIRTL traffic monitoring system (a system developed, and used widely, in Australia) across five sites and two matched weeks of weekday observations. The system uses infrared beams to detect 'wheel configurations' based on algorithms that evaluate the size of the wheel base and the size of the wheels. Despite its technical sophistication, the system was found to confuse bicycles with motorcycles and could not distinguish between scooters and motorcycles (no current system can). Roadside observers were used to record 'bicycle events' and type of motorcycle (classifying scooters based on training). Results of this investigation are reported in Table 3. These results, among others, led to the conclusion that 'motorcycle and scooter riders travel with an increased likelihood of exceeding the speed limit, around 3.4 times more likely than other traffic' [16].

Baldock et al. [17] used 'Metrocount' hardware [20]. As Baldock et al. were examining highway speeds, they could be confident not to encounter the full range of difficulties concerning misclassifications (e.g. bicycles and mopeds). In addition, they used roadside observers to report other characteristics of the motorcyclist such as the use of high-visibility gear and to classify 'motorcycle' type, although they do not report separate estimates of mean speeds for motorcycles and scooters.

It is common to observe around 40-50% of traffic travelling at 'excessive speeds' with variation according to time of day [11]. So, at first sight, the UK results (50%) seem radically different to the results of Walton and Buchanan [16] (with only 20.6%) and also those in highway speeds in Australia (67%). It is clear in Table 2 that the mean speeds for motorcycles are significantly lower in the urban environments monitored in NZ, and also that a difference is observed when comparing the mean speeds across vehicle types, and this does not appear to be the case in the UK. Some of these differences are due to the site locations in NZ observations, resulting in lower mean scores and average speeds well below the speed limits. It is usual for annual speed surveys to record speeds at midblock sections of the road and maximise the opportunity for free speeds to

Table 2. Reported mean free speeds for cars and motorcycles from samples drawn in the UK, NZ, Australia and France

	UK [14]	UK [14]	NZ [3]	NZ [16]	France [21]	Australia [17]
Year	2011	2011	2011	2011	2006	2009
Number of Vehicles (N)	64348	56892		49136		
Limit	50 km/h	65 km/h	50km/h	50 km/h	90 km/h	100 km/h
Average car speed (km/h)	48.3	56.2	52.0	35.7	84	100.1
% exceeding limit	47%	23%	59%	6.2%	48%	53.1
% exceeding limit by 5mph or 10 km/h	16%	8%	-	-	20%	8.45%
Average motorcycle speed	48.3	37	-	40.3	96	103.8
% exceeding limit	50%	35%	-	20.6%	60%	67%
% exceeding limit by 5mph or 10 km/h	23%	17%	-	-	40%	27.3%

Table 3. Average speed by vehicle type in five inner urban locations with 50 km/h limits in Wellington, NZ as reported by Walton and Buchanan [16]

	Number of Vehicles (n)	Average free speed (km/h)	SD	% travelling in excess of 50 km/h
Cars	48761	35.68	9.24	6.18
Trucks	4207	32.48	9.74	3.67
Motorcycles	375	40.31	11.78	20.61
Scooters	551	37.22	9.8	9.68

reduce error in the observations. Baldock et al. follow the pattern of NZ, showing significantly higher mean speeds for motorcycles compared to cars.

It is also important to consider the removal of bicycles and other sources of error in the research data of Walton and Buchanan, along with the division of motorcycles and scooters for separate considerations. Importantly, in NZ there are higher observed average speeds for motorcycles and scooters compared to cars, a finding that held consistent across each of five sites in inner city Wellington.

Despite appearances, the UK results and others are not radically different. The important consideration is not the mean speeds (which can been shown to vary between sites) but the variation in speed for motorcycles, and particularly the variation in motorcycle speeds compared to that observed for cars. This standard deviation of the samples can be calculated from the point estimates of the mean and the portion travelling above the speed limit. This backward estimation of the variation relies on the assumption that the speed distribution is approximately normal in both cases and the point estimates are determined with a sufficient sample. For example, the estimated standard deviation for the distributions in the UK (30 mph) samples for cars and motorcycles are 7.96 km/h for cars and 10.73 km/h for motorcycles. These calculated estimates of variation can be expressed as the proportion of motorcycles exceeding a notional limit (i.e a 50 km/h speed limit, 5 mph above the 30 mph limit in the UK or 10 km/h above the speed limits in France and Australia) relative to cars exceeding the same limit. These are then presented in Table 4 as the relative odds of motorcycles travelling faster than cars.

Table 4. The relative odds of motorcycles exceeding the speeds of cars measured from speed surveys in different countries

	UK (30 mph)	UK (40 mph)	NZ	France	Australia
Reference speed	35 mph	45 mph	50 km/h	100 km/h	110 km/h
Motorcyclist relative odds of exceeding speed compared to cars	1.4	2.1	3.3	2.0	3.2

Discussion

Motorcycles are seen to travel significantly faster than other traffic in urban areas only when an effort is made to distinguish them from other traffic. That effort might seem unnecessary based on the small volumes of motorcycles, unless it is also recognised that their speeds are significantly in excess of the surrounding traffic [16]. Travelling significantly faster than the surrounding traffic is theorised to significantly elevate crash risk (Solomon [25]) but little research has assessed this theory, and none specifically for motorcycles. Instead, jurisdictions do not separately consider motorcycle speeds or they use automated methods with unknown sources of error. The resulting estimates of average speeds and violations of speed limits tend to mask the issues that would allow us to relate motorcycle speeds to crash risk.

Baldock et al. [17] investigated motorcycle speeds in highway conditions around Melbourne without heavy traffic. They found that motorcycles travel significantly faster than cars and the likelihood of motorcyclists exceeding the speed limit is around 3.3 times more than car drivers, a finding similar to those observed in urban areas in New Zealand. When comparing the variation (as opposed to the mean speed) it is clear that motorcycles are more likely to travel in excess of the speeds of other traffic such as cars. There is a substantial amount of literature that examines the relationship between vehicle speed and crash risk (for an Australian example, see [22]) but it has little to report specifically about motorcycle speeds (for a general review see [23]). Nilsson [24] established the relationship between average speeds and crash outcomes but it was Solomon [25] who first related the concept of deviation from median fleet speed to elevated crash risk. Again, however, Solomon just considers cars. For cars in urban speed zones, the risk of an accident increases exponentially as speed increases above the speed limit [26].

According to these investigations, the relative risk of a car crash increases to 15 times that of others when travelling around 16 km/h above the speed limit in a 60 km zone, or 30% above the speed limit. The relative risk is still around ten times higher when travelling just 8 km/h above the speed limit (or around 13% above the speed limit). This relative change in risk is generally higher than the relative change in risk reported for 100 km/h roads (see also [20]). Aarts and van Schagen [23] question whether individual relative speed may further elevate crash risk but find a basic lack of evidence to fully investigate the possibility.

The Australian National Road Safety Strategy 2011-2020 [27] requires a systems approach to safe speeds and it does so with the recognition of an aim to improve compliance with speed limits, and particularly for motorcycles (Step 8c of 'First Steps'). The problem is that the basic information required to support a systems approach to motorcycle speeds is obscured by our approach of classifying and monitoring speeds. The reasons countries monitor vehicle speeds should apply to motorcycles as with any other vehicle type. There is little justification for not measuring motorcycle speeds, except that it is exceptionally difficult to achieve with the level of accuracy required to support policy. What has been missed in our more general approach to monitoring vehicle speeds is an opportunity to understand the contribution the rider's speed has to the well-recognised elevated crash risk for motorcycles. The recognition that motorcycles can and do travel relatively faster than surrounding traffic is important, even if that speed is not in excess of the posted speed limit [16] because higher 'relative speed' contributes to the nexus of causation in which crashes occur.

The implications of these considerations for safe speeds for motorcycles are clear. The safer motorcyclist would maintain the speed of the surrounding traffic and resist the temptation to use the capability of the machine and the opportunity given by road design to travel faster. That it is an everyday occurrence to observe motorcyclists doing otherwise should not be seen to normalise this behaviour and give it licence, but ought to prompt the question as to whether the 'system' design fails because it allows the opportunity to elevate the crash risk by design.
One rule that could be applied is a 'one lane, one vehicle' regulation to prevent the circumstances of under-passing and passing within the lane. Other opportunities exist within rider training and rider awareness, along with the idea of raising the awareness of all other vehicle drivers that motorcycles are currently more often travelling faster than surrounding traffic.

Limitations

At least one limitation to the current argument is that speed monitoring regimes are not intended to be as accurate as is implied. Rather, the intention of an annual free speed survey is to monitor vehicle speeds *over time*, and particularly *changes in speeds* over time. Any error in the speed measurement is consistent when efforts are made to choose the same sites, equipment, days and times of observation

and so on. However, this argument is flawed when considering motorcycles for the reasons alluded to at the outset: motorcycle registrations are increasing, motorcycle power is increasing [11], and the purposes of the trips that are undertaken are altering along with the reasons for the waxing and waning of motorcycle popularity. As a consequence, the use of time as an independent variable is fraught with the difficulty that significant sources of error in the dependent measure (speed) are not evenly distributed across the independent variable (time).

Conclusions

Inadequate technology, poor quality data and poor assessment of the available data mean issues concerning the relationship between speed and crash risk for motorcycles are masked in the statistics we monitor and report, usually on an annual basis. It is exceptionally difficult to accurately determine true mean speeds for motorcycles; a dedicated sampling effort is probably necessary to remove sources of error that otherwise show that motorcycles are no more likely to travel faster than cars. Motorcycles do travel faster than surrounding traffic and this is rarely considered from the perspective of their elevated risk for crashes or from the perspective of examining the system that creates this opportunity.

Acknowledgements

References

1. Ministry of Transport, NZ. Motorcyclists: crash statistics for the year ending 31 December 2010: Crash Factsheet: Wellington: Research and Statistics, Ministry of Transport, 2011.

2. Ministry of Transport, NZ. Motorcyclists: New Zealand household Travel survey 2003 2009. Wellington: Research and Statistics, Ministry of Transport , 2010.

3. Lin , Mau-Roung and Kraus, Jess F. A review of risk factors and patterns of motorcycle injuries. Accident Analysis & Prevention 2009; 41 (4) 710–722.

4. Ministry of Transport, NZ. The New Zealand vehicle fleet: annual fleet statistics, 2011. Wellington: Research and Statistics, Ministry of Transport, 2011.

5. Stephan, Karen., Symmons, Mark., Hillard, H., Bohensky, M. Muir, C and Lenne. Michael. Characteristics of fatal motorcycle crashes involving excessive speed and/or inappropriate speed, 2009. Viewed October 17 2011 http://www.arrivealive.vic.gov.au/print/node/248.

6. Wood, D. P., Alliot, R., Glynn, C., Simms., C. K. and Walsh, D. G. Confidence limits for motorcycle speed from slide distances. Proceedings of the Institutes of Mechanical Engineers: Part D Automobile Engineering, 222, 1349-1360, 2009.

7. Wood, D. P., Glynn, C. & Walsh, D. Motorcycle-to-car and scooter-to-car collisions: speed estimation from permanent deformation. Proceedings of the Institution of Mechanical Engineers Part D: Automobile Engineering, 223 (6) 737-756, 2009.

8. Federal Highways Administration (2008). Traffic Monitoring Guide Supplement. US Department of Transportation, Federal Highway Administration. Viewed February 7, 2011. www.fhwa.dot.gov/ohim/tmguide/pdf/tmgsupp.pdf

9. Ministry of Transport, NZ. 2010 Speed survey: results summary. Wellington: Research and Statistics, Ministry of Transport , 2011.

10. Small M, Norman P, and Fedojuk T. Stronger road safety performance monitoring in South Australia 2009. Australasian Road Safety Research, Policing and Education Conference 10 -13 November 2009, Sydney, New South Wales, 2009.

11. Organisation for the Economic Cooperation and Development (OECD) Speed management. Paris: Organisation for the Economic Cooperation and Development. viewed, 10 July 2012, http://www.internationaltransportforum.org/Pub/pdf/06Speed.pdf

12. Road and Traffic Authority of New South Wales, Sydeny. How widespread a problem is speeding. Viewed 10 July 2012: http://www.rta.nsw.gov.au/saferroadsnsw/speeding-risks.pdf

13. Kloeden CN and Woolley JE. Vehicle speeds in South Australia. CASR Report Series: Adelaide: University of Adelaide, 2012.

14. Department of Transport, UK. Index of free flow traffic speeds. Viewed July 1, 2012. http://www.dft.gov.uk/statistics/series/speeds/

15. RTA (2011). Annual Speed and traffic volume data in Sydney http://www.rta.nsw.gov.au/publicationsstatisticsforms/downloads/annual_speed_and_traffic_volume_data_2009-2010.pdf

16. Walton D and Buchanan J. Motorcycle and scooter speeds approaching urban intersections. Accident Analysis and Prevention; (48) 335-340, 2012.

17. Baldock MRJ, Kloeden, CN, Lydon M, Ponte G, Raftery S. Motorcycling in Victoria: preliminary findings of the evaluation of the community education and policy project. The Australasian Road Safety Research, Policing and Education Conference, 2010.

18. Kanhere, N. K., Birchfield, S. T., Sarasua, W. A. and Khoeini, S. Traffic monitoring of motorcycles during special events using video detection. Transportation Research Board TRB Paper Number: #10-3933, TRB Annual Meeting, Washington, 2009.

19. Minh, C.C., Sano, K., and Matsumoto, S. The speed, flow and headway analyses of motorcycle traffic. Journal of Eastern Asia Society for Transportation Studies (6) 1496-1508, 2005.

20. Metrocount (2012). Metrocount 5600 series vehicle classifier system. Viewed 10 July 2012, http://www.metrocount.com/products/mc5600/

21. Observatoire National Interministériel de la Sécurité Routière (ONISR) Bilan de l'année 2004, Ministère des Transports, Paris, 2005.

22. Kloeden, C. N., Ponte, G., Mclean, A. J. Travelling speed and the rate of crash involvement on rural roads. Report No CR 204. Canberra: Australian Transport Safety Bureau. 2001.

23. Aarts, L & van Schagen, I. Driving speed and the risk of road crashes: a review. Accident Analysis and Prevention; (38) 215-224, 2006.

24. Nilsson G. Traffic safety dimensions and the Power Model to describe the effect of speed on safety, Lund Institute of Technology and Society, Traffic Engineering, 2004.

25. Solomon, David. Accidents on main rural highways related to speed, driver, and vehicle. Technical report, U.S. Department of Commerce/Bureau of Public Roads (precursor to Federal Highway Administration), 1974.

26. Fildes, B.N., Rumbold, G., Leening, A. Speed behaviour and drivers' attitude to speeding. General Report No. 16: VIC Roads, Hawthorn, Vic, 1991.

27. Australian Transport Council. Australian National Road Safety Strategy 2011-2020 viewed 6 July 2012. http://www.atcouncil.gov.au/documents/files/NRSS_2011_2020_15Aug11.pdf

Literature Review

Recent reports reviewed by Andrew Scarce and Deborah Banks

Victorian study supports use of combined speed and red light cameras to reduce crashes at intersections

A study conducted by researchers at Monash University Accident Research Centre (MUARC) has demonstrated the crash-reduction benefits of combining fixed digital speed and red light cameras. The study evaluated the crash effects of 87 fixed digital speed and red light (FDSRL) cameras and accompanying warning signs at 77 signalised intersections in Victoria over a ten-year period.

The combination of speed and red light fixed cameras is not common and had not been tested previously. Analysis of crash statistics at the 77 sites provided evidence that the use of FDSRL cameras and associated signage significantly reduced the number of casualty crashes. Results showed a 26% drop in all casualty crashes, and a 47% reduction when focusing only on vehicles travelling from the intersection leg where the camera was installed.

MUARC placed the equipment over a large population of signalised intersections in the Greater Melbourne area, with others in regional Victoria including three FDSRL cameras in Geelong, one in Echuca and another in Bendigo.

The study was conducted against a backdrop of entrenched research showing the association between red light running and speed and severe injury/fatalities. In Victoria, speeding has been identified as the main cause of 20% of fatalities and serious injury collisions, while another 20% of casualty crashes at major intersections in metropolitan Melbourne are caused by red light-running.

Currently more than 150 speed cameras and 83 red light cameras are used in Victoria, with an average 2.8 million vehicles speed-checked per month.

The study noted that the benefit of red light cameras 'may be off-set by increases in rear-end crashes'. MUARC reported that while FDSRL cameras had their highest deterrence effect on the intersection leg where the camera was located, accompanying signage warning of the presence of cameras had a further deterrent effect on other lanes. 'While the use of FDSRL cameras was associated with a reduction in overall casualty crash risk, there was no evidence of a reduction in relative crash severity', MUARC said.

In contrast to public perceptions that cameras are installed as revenue-raising devices, the research found strong evidence that this automated technology has been associated with significant reductions in casualty crashes and associated costs to the community from road trauma. Across the 77 intersections studied, it was estimated that 17 crashes causing serious injuries or fatalities, and 39 minor injury crashes, would be prevented each year, representing cost savings to the community of over $8 million.

Monash University Accident Research Centre - Report #307 [2011]: ***Evaluation of the crash effects of Victoria's Fixed Digital Speed and Red Light Cameras*** *(Authors: Budd L, Scully J and Newstead S)* is available at http://www.monash.edu.au/miri/research/reports/muarc307.html.

Factors that influence driving speed

Another MUARC study, published in June, looked at factors that influence driving speeds, including driver (or rider) characteristics, motivational and attitudinal