



# Journal of the Australasian College of Road Safety

Formerly RoadWise — Australia's First Road Safety Journal



## In this edition —

### Contributed articles:

- Stay Safe Rangers initiative
- Keys2Drive — Helping Learner Drivers become Safer Drivers
- Road Safety on the Asian Highway

### Peer-reviewed papers:

- Teaching old dogs new tricks?: training and older motorcyclists
- Characteristics of Rollover Crashes
- Why do older drivers have a high rate of involvement in casualty accidents per distance driven?



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**Managing editor:** Geoff Horne, PO Box 198, Mawson ACT 2607, Australia;  
tel: +61 (0)2 6290 2509; fax: +61 (0)2 6290 0914; email: [journaleditor@acrs.org.au](mailto:journaleditor@acrs.org.au)

**Contributed articles editor:** Colin Grigg, PO Box 1213, Armidale NSW 2350;  
tel/fax: +61 (0)2 6772 3943; email: [cgrigg@ozemail.com.au](mailto:cgrigg@ozemail.com.au)

**Peer-reviewed papers editor:** A/Prof. Raphael Grzebieta, Dept of Civil Engineering, PO Box 60,  
Monash University VIC 3800; tel: +61 (0)3 9905 4970; fax: +61 (0)3 9905 4944; email:  
[raphael.grzebieta@eng.monash.edu.au](mailto:raphael.grzebieta@eng.monash.edu.au)

**Peer-reviewed papers Editorial Board**

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*Cover photo:* Stay Safe Rangers, a model “kiss-and drop” program, established at Balgowlah Heights Public School, is described in this edition of the Journal.

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## From the President



### Dear ACRS Members,

It has been an interesting lead up to the election. It has also been a disappointing one from the aspect that road safety did not appear on the radar either in terms of media questions or in any party's policy statements during the campaign. Nevertheless, it was pleasing to see commitments made

in terms of road upgrades and improvements to hospitals by the major parties, which should assist in reducing the effects of road trauma albeit indirectly. Let's hope the promises are kept.

I would like to highlight an observation I made when attending the 2007 Australasian Road Safety Research, Policing and Education Conference. It was pleasing to delegates treated to a key presentation from Nick Senior, Managing Director of Subaru Australia proudly showing their impressive vehicle range offered in Australia that are all now ANCAP five (5) star rated and 4 star pedestrian rated. What is remarkable is that the Impreza can be purchased at under \$25,000, still with a 5 star rating and comes with stability control! Subaru have set a safety benchmark that demonstrates world's best occupant safety can be achieved at a price range that is affordable to consumers. Subaru have no doubt advanced vehicle occupant safety to new levels. Let's hope this challenge is taken up by Australian manufacturers who have yet to achieve a five (5) star ANCAP rating at all in any of their Australian designed and manufactured vehicles.

An interesting related issue concerning crashworthiness passive safety systems that continually arises is the de-specification of active and passive safety systems from vehicles imported into Australia. I have also lately heard the term "non-specification" used in regards to local manufacturers ignoring adoption of passive safety systems in the vehicle design process. For example, Electronic Stability Control and Side Curtain airbags are standard in most SUV and sedan vehicles sold in Europe and in the US. However, in Australia these features are sold either as a more expensive safety package option or simply not designed into some Australian sold products.

It is clear when viewing the rolling 12 month road fatalities together with the trend for vehicle occupant fatalities, the two curves are very closely related. Any improvements we make

to vehicle design to help reduce fatalities and serious injuries will have a direct effect on road trauma. It is imperative that efforts are continued to improve the active and passive safety of vehicles if we have any chance of reducing the currently stalled road fatality rate.

The above issues in regards to making vehicle active and passive safety systems available in all vehicles were also presented and discussed at the recent ACRS Canberra one day conference on Road Crash Investigations and Intelligent Transport Systems. The Chairman of the US National Transportation Safety Board, Mark Rosenker, spoke about the urgent need to introduce active and passive safety systems into the vehicle fleet to help reduce the number of road fatalities and serious injuries. He acknowledged that the USA's position in regards to now having the worst road safety record of all the OECD countries was a concern. He indicated that their hope to reduce road trauma in the US lay with smart in-vehicle active safety technology such as collision avoidance systems, lane control, vehicle to vehicle communication, night vision head up display, Electronic Stability Control and Brake Assist. Fortunately, our Australian counterparts ATSB together with road safety stakeholders, realised decades ago the urgent need to reducing road trauma cannot simply rely on technology alone and hence have been and are very proactive in all aspects of the problem, i.e. human behaviour, the vehicle, and road environment.

Finally, I would like to take this opportunity to thank all ACRS members for their strong support over the past year. It is encouraging and warms my heart to see everyone working and pulling together as a team, very committed to improving road safety. Indeed, Jorg Beckmann, Executive Director of the European Transport Safety Council (ETSC), the Keynote Speaker for this year's Australasian Road Safety Research, Policing and Education Conference, collared me and expressed admiration for what ACRS has achieved in terms of its formation and operation. He voiced a desire for Europeans to form a similar organisation. It is not the first time I have been told that ACRS is unique in terms of bringing people of diverse professions together to work on such a united and noble objective. The success of the College is a direct result of your hard work and we (road users) thank you for it. In this regard I would like to encourage your support for the College's current 'Campaign Priorities' regarding Fatigue and Daylight Running Lights, as shown on page 48.

On behalf of the College I would like to wish all ACRS members and their families and friends a very pleasant, restful and above all safe Christmas and New Year break. See you in 2008.

**Raphael Grzebieta**  
President

# Quarterly News

## Chapter News

### Australian Capital Territory and Region

The Chapter hosted a national ACRS-ATSB seminar in Canberra on 30th October 2007 on 'Lessons in Investigating Road Crashes' and 'Intelligent Transport Systems Developments'. The main speaker was Mr Mark V Rosenker, head of the US National Transport Safety Board. Other speakers were Prof. Brian Fildes, Prof. Raphael Grzebieta, Mr Jim Oulett, Mr Peter Bentley and Mr Peter Robertson. Sessions were chaired by Chapter members Robin Anderson and Ken Smith. The Chapter is expecting to meet before Christmas to review the Strategic Plan and is planning to hold a seminar on Safer Vehicles in 2008.

### South Australia

The Chapter plans to hold the national series seminar on 'Older Drivers' in Adelaide from 12.30pm to 3pm on Thursday 22nd November. Robin Anderson will be the keynote speaker and the other speakers will be Angela Berndt, an occupational therapist with the University of South Australia and Dr Matthew Baldock, a psychologist working in the Centre for Automotive Safety Research at the University of Adelaide.

### Victoria

A seminar is planned to be conducted at the offices of the TAC on 28 November between 4pm and 5.30pm. The focus of the seminar is "Young Driver Safety" and will include presentations by Antonietta Cavallo of VicRoads, Manager

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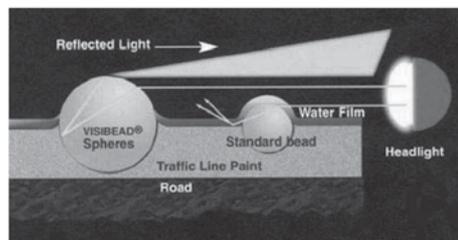
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[ Photographs taken at Potters demonstration site at Jerrabomberra Road, Canberra. Rain simulation by water-cart ]

Road User Behaviour, who will provide a description of Victoria's new Graduated Licensing Scheme together with a range of support programs. The second presenter is Teresa Senserrick of Monash University Accident Research Centre who will provide an overview of her research undertakings focusing on young driver safety while on secondment in the U.S. The first seminar for 2008 is planned for Thursday, 21 February 2008 with a focus on the issue of Speed.

## Western Australia

A number of Chapter members will be participating in the WA's 3rd International Road Safety Conference 29-30th November in Perth. The Chapter has several seminars planned for 2008. These are expected to cover the following issues: Fleet Safety, Power to Weight Ratio and Crash Risk and The Use of Child Car Restraints. The Chapter is also working on a paper relating to The Use of Motorised Scooters (gophers) and Wheelchairs. These vehicles have become an issue in the West in relating to crash risk and injury. The foci include constraints, regulations, legislation, design and crash risk. One other area we are evaluating is Crash Risk in Vulnerable Populations. It has been a busy year for our Chapter and it looks like the new year will be just as exciting.

## Australian News

### ACRS Register of Road Safety Professionals – Announcement

The ACRS Executive Committee congratulates the following Associate Fellows of the College on being added to the Register of Road Safety Professionals: Professor Raphael Grzebieta (Engineering and Road Crash Reconstruction) and Debra Swadling (Psychology).

To be listed on the Register, applicants must already be an Associate Fellow of the College and satisfy a panel of experts that they have acquired a high level of academic qualifications and experience applicable to their particular discipline. Application forms and minimum qualifications and experience details may be downloaded from the ACRS website – [www.acrs.org.au](http://www.acrs.org.au).

### Dual Device Reduces Crash Fire Risk

John Quee, of Nyngan, New South Wales, has invented a device that could greatly benefit crash victims by reducing the risk of fuel fires after a vehicle crash. The device has two components: a fuel shutoff valve (FSV) and a battery isolation unit (BIU), which are both activated by crash sensor technology. The aim of these components is to neutralise the two elements necessary to cause a fire – leaking fuel and an ignition source. "In an accident, if you can eliminate either one, then you have successfully prevented a vehicle fire and

saved lives," Mr Quee said. "For years, manufacturers have focused their attention on preventing fuel from leaking in a crash but they haven't addressed the ignition source with as much concern. The VSS is the first to greatly reduce the risk of impact-related fire because it addresses both components." Within milliseconds after an impact, the FSV will be activated. This blocks fuel from coming out of the petrol pump, reduces to zero the normally high fuel pressure in the delivery pipe to the motor and instantaneously converts the delivery pipe from a pressure to a vacuum pipe. If the fuel pipe is ruptured, the valve prevents highly volatile fuel from spraying everywhere. Milliseconds later, the BIU is activated to sever the power supply from the battery and the vehicle's ignition system. A US provisional patent application has been granted. In the USA it is estimated that some 2,000 people die annually in motor vehicle fires and a further 10,000 receive serious burns. Prototypes of the two Vehicle Safety Shutdown devices have been manufactured and tested. Consultation with motor vehicle manufacturers and governing safety authorities has commenced.

(Source: <http://www.ausinnovation.org/News/NewsArticles/Pages/Inventionreducescrashfires.aspx>)

### Australia's Transport Ministers Approve PBS

A key element of the Council of Australian Governments' (COAG) national reform agenda for transport, Performance Based Standards (PBS), has been approved by Australia's Transport Ministers. With the land freight task forecast to double by 2020, coordination of productivity, safety, pricing and planning reform across all modes of transport will be vital.

The approval of PBS gives the road freight industry more flexibility to meet future challenges by building safer and more productive heavy vehicles. Under the national PBS reform, an operator can apply for access to the road network based on the vehicle's ability to stop, turn and travel safely without damaging roads or bridges. Current prescriptive regulations concern what a vehicle looks like, which is a fairly loose proxy for safety. PBS focuses on what a SMART\* truck or bus can do.

Applications will be considered by a national PBS Review Panel. The National Transport Commission (NTC) has appointed former DaimlerChrysler Product Engineer Marcus Coleman to act as the Senior Technical Advisor to the PRP. NTC Chief Executive Nick Dimopoulos said a two year trial of an interim PBS scheme has refined the standards and process. The NTC is committed to a further review of the scheme in 2008 to ensure the reform reaches its full productivity potential.

"PBS is now open for business. I'd like to thank the innovators from industry and government who have championed this reform over the years. We need to continue working together cooperatively to take this reform to another level," Mr Dimopoulos said.

(Source: *NTC Media Release October 2007*)

\* SMART = Safer Management of Australian Road Transport

## Highway Speed Trial

The Queensland Minister for Transport and Main Roads, Paul Lucas, has announced a new approach to discourage speeding on the Cunningham Highway using a trial of real-time interactive warnings. It is expected that the trial will provide an insight into driver behaviour. Motorists driving above the speed limit will be flashed with a real-time warning message on an overhead electronic board. A series of sensors has been embedded in the highway south of the Barclay Street overpass at New Chum. The first set of sensors measures the pace of eastbound vehicles and triggers a warning on an electronic message board 400 metres down the highway. Additional sensors at and after the message board then detect if the driver has reduced their speed.

The message board will warn individual motorists of the size of the fine and the number of demerit points they would lose if caught by police.

Mr Lucas said, “The trial will tell us if an immediate and prominent reminder about penalties makes speeding drivers slow down. Yet, unlike other systems in other states, speeding motorists won’t be told exactly how fast they are going. Experience elsewhere shows some drivers compete with their mates to see who can trigger the highest speed on the message board.”

The trial will run for three months and cost \$300,000. At the end of the trial, the data will be independently analysed to judge its success in slowing drivers and to make a decision on whether to use the technology on other Queensland roads.

*(Source: Minister of Transport, Queensland Government, September 2007)*

## New Zealand News

### Improved Road Safety Strategy for Schools

‘RoadSense’, now in redeveloped format, is now being used in 158 schools around New Zealand. RoadSense is an educational resource to help primary and intermediate schools integrate road safety lessons into the existing curriculum. The goal of the program is to reduce the number of children killed and injured on New Zealand roads. RoadSense is a partnership between Land Transport NZ and the NZ Police, delivered by facilitators contracted by Educating NZ. RoadSense focuses on teaching practical road safety lessons through the health and physical education curriculum. For further information visit [www.roadsense.govt.nz](http://www.roadsense.govt.nz).

*(Source: Land Transport NZ News Sept 07)*

## European News

### Sweden Promotes Road Safety in India and Russia

Countries that have experienced rapid increases in recent years in the number of vehicles on their roads welcome expertise from countries that have built up considerable know-how in road safety measures. Two such examples are India and Russia, where European Transport Safety Council (ETSC) experts were invited to speak at seminars organised by the Swedish Trade Council and the Volvo Group. At the Delhi seminar on 10 September the speakers presented best practice from Europe as well as an update on in-vehicle safety technologies such as seat-belt reminders and alcolocks. On 25 September ETSC staff attended a Swedish-Russian road safety seminar in Moscow. Whilst this seminar focussed on improving road safety in both countries, ETSC presented a broader European experience as well as the results of its own research in the area.

*(Source: ETSC Safety Monitor No.70, October 07)*

### New EU Proposal Weakens Pedestrian Protection

In 2003 a Directive was issued regulating the safety of pedestrians and other vulnerable road users before and in the event of a collision with a motor vehicle. This Directive allowed for certain standards of pedestrian protection to be integrated into cars, progressively increasing the minimum pedestrian safety standards. However, on 3 October 2007 the European Commission adopted a proposal for a Regulation to replace the 2003 Directive. The latest proposal sets up new test requirements for pedestrian safety equipment to be applied to new vehicle types from 2010. The ETSC has complained that if the current version of the proposal is adopted, the new pedestrian safety requirements will be weakened compared to those laid down in 2003. Jörg Beckmann, ETSC Executive Director, writes: “This seems to be out of tune with the objective of halving the number of road victims by 2010 set by the European Commission’s 3rd Road Safety Yearly Action Programme (2003-2010). By way of example, ETSC experts think the technologies identified in the proposal are too limited and insufficient to provide the protection levels described in the former Directive. The introduction of the brake assistance systems as a norm in all new cars, proposed by the Commission, will be done at the expense of lowering the impact test requirements contained in the proposal. This means a trade-off between increased active and decreased passive safety features, which should not be the case if we want to continue enhancing pedestrian safety rather than replacing some of its elements with others.”

*(Source: ETSC Safety Monitor No.07 October 07)*

## Road Deaths in Europe Increase in 2007

European road safety experts have been surprised by an unexpected rise in road deaths in most EU countries in the first half of 2007, according to a survey by the Fédération Internationale de l'Automobile (FIA). The increases vary between 40% in Denmark and 8% in Germany. Road deaths climbed by 14% both in Poland and in the Czech Republic, and by almost 10% in Cyprus and in the EU candidate Croatia. The UK saw a 13% increase in the number of killed and seriously injured in the early part of this year. However, a few countries, such as Spain and Italy, have reported reductions. The survey also showed that vulnerable road users, in particular motorcyclists, have fared worst. The FIA suggests that one possible reason for the rise is last year's mild winter in Europe, leading to increased road traffic.

(Source: ETSC Safety Monitor No.70, October 07)

## European Union's Road Safety Target Lagging

In 2005 there were 41,600 deaths and 1.7 million injured in road accidents on Europe's roads. This is 4,000 more deaths than the EU's transport policy objective set in 2001, according to which the number of road deaths must be reduced by half by 2010. The Commission plans to step up its road safety efforts by introducing electronic stability control (ESC) as quickly as possible in small to medium cars. The Commission believes that this alone could save 4,000 lives per year in the EU. Brake assistance and crash avoidance systems are also being considered as mandatory safety features for all cars, which could reduce rear-end collisions by 60%.

(Source: ETSC Safety Monitor No.70, October 07)

## eCall Adoption Could Save 2,500 Lives

Car manufacturers will soon be approached by the European Commission to negotiate the introduction of the eCall system as standard equipment in all new cars sold in Europe from 2010. The eCall system is based on the European emergency number, 112, called automatically in case of an accident. In this system, the closest emergency services are immediately warned. This reduces the arrival time for emergency aid and could save up to 2,500 lives, according to Commission estimates.

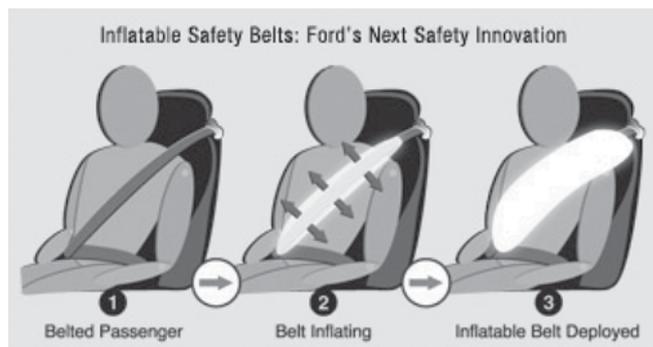
In September the Commission warned that it may have to regulate if too few EU countries sign its memorandum of understanding before the end of 2007. In addition to 50 companies, the MoU has been signed by Austria, Germany, the Czech Republic, Cyprus, Finland, Greece, Italy, Lithuania, Portugal, Slovenia, Spain, Sweden and non-EU Switzerland, Norway and Iceland. The Netherlands is expected to sign soon.

(Source: ETSC Safety Monitor No.70, October 07)

## United States News

### Inflatable Seat Belts

The Ford Motor Company has released information about an experimental inflatable safety belt that provides a broader contact area with the potential to spread impact forces across the chest, further reducing the chances of injury. The small, tubular-shaped inflatable bag deploys inside the shoulder belt in the event of a crash.



(Source: Ford Media Release)

## International News

### The Make Roads Safe website

If you haven't visited the Make Roads Safe website yet, you may find it interesting to have a look (see <http://www.makeroadssafe.org>). Make Roads Safe is an international campaign to put global road traffic injuries on the G8 and UN sustainability agendas.

Building on the work of the Commission for Global Road Safety, the Make Roads Safe campaign aims to raise public and political awareness of a global road traffic injury epidemic that kills at least 3000 people, and 500 children, every day.

#### The campaign objectives:

- Recognition by the G8 and the international community that global road traffic injuries represent an urgent public health emergency and a major development challenge.

#### Action by the United Nations, G8 and major aid donors to:

- Fund a global Action Plan to improve road safety in developing countries
- Ensure that at least 10% of road budgets provided by the World Bank and other major lenders is devoted to road safety
- Organise a UN summit to agree high level political commitment to action on global road traffic injuries.

# Contributed Articles

## Stay Safe Rangers Initiative at Balgowlah Heights Public School: A model “kiss-and-drop” program

By Michael Paine (Vehicle Design and Research),  
Kathryn Henderson (Kids with a Voice) and Ian Faulks (Safety and Policy Analysis International)

### Introduction

#### Background

Stay Safe Rangers is a school-based initiative developed in 2005 by Kathryn Henderson, a parent at Balgowlah Heights Public School (BHPS). This is a government-operated primary school in Northern Sydney. Planning for the project was undertaken during 2006, including a review by the New South Wales Department of Education and Training (DET) and development of a risk assessment plan. A trial scheme commenced at BHPS in the first term of 2007.

The objectives of the initiative are:

- To improve “kiss and drop” zone safety for children in Primary Schools, particularly at home time
- To modify and improve driver behaviour in the vicinity of the school
- To streamline traffic flow and improve local amenity

- Integrated with the current Primary School Leadership Curriculum, to allow senior Primary School Students to observe and make recommendations on their findings, relating to road safety for themselves and their younger peers
- To provide a forum at which these School Leaders can discuss issues and broadcast their findings and recommendations in the School Newsletter and through other appropriate channels.
- To prepare years 5 and 6 students for further road safety education such as the young drivers programs offered in High School

This article is based on a review, conducted in May 2007, after some nine weeks of operation of the trial scheme. The review was commissioned and funded by NRMA Motoring & Services.



Gate and sign used for SSR operations.

## Methodology

Pre-trial and in-trial observations of the Kiss and Drop zone in operation were conducted by Mr Paine. Ms Henderson facilitated the initial training of Stay Safe Rangers. Mr Paine discussed the operation of the scheme with participants and other observers, such as Council Rangers, Police and Department of Education managers.

International research (primarily in the USA) was reviewed to establish best practice. The operation of other Kiss and Drop schemes in New South Wales was also reviewed.

## Kiss and Drop Zones

“Kiss and Drop” zones are parking areas near the school gates that have a maximum two minute parking. The intention is that drivers do not wait in these zones and that they stay in the vehicle so that throughput is streamlined and traffic queues are minimised. In reality it only takes a few inconsiderate drivers to overstay in these zones and the system breaks down leading to frustration and traffic delays.

There are a variety of alternative names for Kiss and Drop zones including “Kiss and Ride” zones and “Drop-off and Pick-up” areas. Also, the term “parent” is used for simplicity and includes carers.

A Kiss and Drop zone is considered to be a passive intervention, where individuals are not required to undertake any action to be protected. Passive intervention strategies have been shown to be more effective than active measures, which require continued effort from individuals (1). Passive interventions such as a Kiss and Drop zone are particularly suitable in situations involving children.

Wigmore and Baas (2) noted that Kiss and Drop zones are found to be effective where there has been a comprehensive treatment of the school frontage, including access to internal car parks, indented bus bays and passenger drop-off zones. This finding supports the conclusion drawn in STAYS SAFE 53 (3) that the traffic management of the areas outside schools should be holistically addressed as ‘precincts’ (or where there are adjacent schools, as ‘cluster precincts’).

More recently, researchers at the Center for Transportation Research and Education, University of Iowa (4, 5, 6) have reviewed safety on school grounds and public streets adjacent to elementary and middle schools in Iowa, and have produced a comprehensive guide to assessing the road safety issues and a toolbox for potential measures to reduce risk and improve safety during school travel. Again, this work complements STAYS SAFE 53 (3) approach.

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*“Kiss and Drop” zones are parking areas near the school gates that have a maximum two minute parking.*

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The traffic environment around schools is one of the most complex road transport environments normally encountered by the majority of motorists, and is easily the most complex traffic environment normally encountered by children. For periods of 30 minutes or more during the morning traffic peak, and for a very intense 10-15 minutes in the mid-afternoon, the immediate frontages of schools experience traffic volumes and a diversity of road use that is only seen in busy commercial and shopping centres or associated with mass movements of people to sports and other large community events.

It is perhaps the complexity and ephemeral nature of the traffic environment around schools that has tended to hide the significant risks posed by this environment to all road users, but particularly to school children seeking to travel from home to school and return.

There has been, as found by STAYS SAFE 53 (3), a systemic inability to deal effectively with the risk of harm associated with school travel, as opposed to the actual occurrence of road injury. Simply put, countermeasures that are based on death or serious injury to a child as a criterion for ranking of priority are not an acceptable benchmark for achieving better road safety around schools. A broader and more forward reaching approach to ensuring a safer environment around schools and communities must also include an assessment of risk without the necessary occurrence of road crashes. This reflects an increased risk-management approach within the school environment where, for example, schools are required to develop risk management plans for excursions. In the case of BHPS, such plans have been applied to the Stay Safe Rangers initiative, as described in section 2.7.

## NSW practices

The current approach to very short stay “drop off” and “pick up” zones outside schools is to designate such zones as 2-minute parking areas, or passenger set down or pick up areas. Kiss and Drop zones have been well supported by local councils and schools and, in concept, by parents. However, as drivers, parents have tended to be less co-operative, particularly in the afternoon.

Kiss and Drop zones evidently work very well in the mornings. The arrival time of vehicles is staggered, children usually exit the vehicle quickly and move into the school grounds and the driver is then able to move off. There are rarely traffic queues and children do not usually wait at the footpath.

In the afternoon the situation at most schools is quite different. Nearly all children arrive at the Kiss and Drop zone at the same time, as do vehicles and the streets are blocked with traffic. The footpath area is a mix of children waiting for vehicles to arrive, parents who are waiting to pick up children and walk to home or car and children hanging around in social groups. There is general confusion and many distractions for the children – who should instead be looking for the arrival of their vehicle. Drivers, too, are distracted looking for children amongst the throng and may be impatient due to traffic delays.

In the afternoon the proximity of distracted, excited children to moving vehicles is a particularly serious safety concern.

To address these home-time problems a series of countermeasures needs to be considered that incorporates the following elements:

- Organised grouping of children waiting to be picked up
- Targeted release of children whose vehicle has arrived
- Improvements to the road environment – avoiding vehicle/pedestrian conflicts, improved signage, traffic flow measures.
- Changing driver attitudes – more patience, awareness of safety issues and consideration of others

In effect, the simplest way to do this would be to create similar conditions at home-time to those that exist during the morning arrival – staggered vehicle arrival and prompt, efficient movement of children from the school grounds to the vehicle.

The focus of the Stay Safe Ranger initiative has therefore been to improve safety at home-time.

## Stay Safe Rangers Concept

There are two main components of the Stay Safe Rangers concept:

- The creation of a group of students, known as Stay Safe Rangers, who will observe the operation of the Kiss and Drop Zone in the afternoon, identify potential road safety situations and discuss possible solutions in SSR forums
- Revising the operation of the Kiss and Drop zone to improve safety and streamline traffic flow

The School Principal and a teacher, together with Ms Henderson, organised the Stay Safe Rangers.

A review of the Kiss and Drop Zone operation was undertaken by a small team that included school staff, Manly Council and DET representatives.

## Risk analysis

The School Principal and staff from the DET developed a comprehensive risk management plan. Key measures identified during this process included:

- Seeking parent permission for SSR activities
- Specific training for SSRs and adult volunteers
- SSRs and adult volunteers to *remain on school grounds* (behind the fence) at all times
- Children waiting to be picked up are to wait in an orderly fashion behind the fence (on school grounds). When they see their vehicle they should raise their hand and the adult volunteer will tell them to move to their vehicle when it is safely parked.
- SSRs to wear highly visible clothing to indicate that observations are taking place
- SSRs are not to give instructions or directions to any person and are not to engage in conversations with drivers

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*Kiss and Drop zones evidently work very well in the mornings. The arrival time of vehicles is staggered, children usually exit the vehicle quickly and move into the school grounds and the driver is then able to move off.*

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- Adult volunteers will manage the release of students and support SSR observations. Adult volunteers should not engage in conversation with drivers and *should not assist children getting into vehicles*
- No number plate or other identifying information is to be recorded by SSRs
- Widespread publicity for the new arrangements

## Implementation of pilot scheme

The pilot scheme at BHPS commenced on 2 April 2007. The initiative was strongly supported by the School Principal, who took part in early planning work and then oversaw the implementation of the scheme. He had the responsibility of ensuring that the underlying objectives of the scheme fitted comfortably with existing school policies. It was paramount that the initial emphasis on student empowerment was not forgotten.

The scheme was presented to teaching staff as part of the existing Student Welfare and Leadership Program and this was supported. An Assistant Principal at the school took on the role of Support Teacher, responsible, in conjunction with Ms Henderson, for many of the project tasks.

## Student participation

A total of 55 SSRs were appointed and it was evident that the scheme was popular with Year 5 students. Rosters were drawn up with the aim of having at least three SSRs on duty each afternoon. An SSR Committee was elected by the Rangers. The Student Committee ran the forum and ensured that rangers turned up for duties.

## Adult participation

Adult volunteers are crucial to the success of the scheme. The home-time collection of students can proceed without SSR present, as they are there to make observations only. The adult needs to arrive just before the home-time bell and control the students being picked for a maximum of 30 minutes. As with most school activities, recruitment of adult volunteers did prove to be difficult and only a few adults were available at the start of the trial. This improved as other adults saw the duties involved.



SSR T-shirts and banner

## Uniforms

NRMA Motoring and Services provided bright yellow t-shirt for the SSRs to wear on duty. These were popular with the children. A prominent banner was also provided with the words “Stay Safe Ranger Patrol Area”

## Pre-pilot observations

Pre-trial observations revealed that the street often grid-locked at home-time. Several inconsiderate motorists arrived early at the Kiss and Drop zone and waited, usually well in excess of two minutes until their child arrived. Meanwhile other motorists waiting to pick-up children queued up and blocked the northbound traffic flow. The school bus was often stuck in this traffic and it was not unusual to see the queue extending around the corner, some 200m away. This meant that drivers became impatient and U-turns were frequent.

Children waiting to be picked up gathered on the footpath or, worse still, on the grass between the footpath and road. They mixed with students who were not necessarily waiting to be picked up. The proximity of distracted children to moving vehicles was highly undesirable. The students were often not looking for their lift and the parents often did not see the student amongst the crowd so there was general confusion.

## Publicity

Once the procedures had been worked out a description of the scheme and a set of tips for parents and students was published in the school newsletter. Students were also told of the arrangements during assembly.

The local paper was interested in the initiative and ran several articles about the scheme. This helped to alert non-parent motorists and local residents of the new arrangements.

## Commencement of pilot

On the first day there was an after-school activity that meant there was a reduced number of students waiting to be picked up and reduced traffic. This was not intended but proved useful for refining the procedures. On the second day about 50 students were picked within about 15 minutes of the home-time bell. Traffic was noticeably smoother than pre-trial and the queue built up to no more than about 5 vehicles.

A minor difficulty that was not anticipated is that young children do not always recognise their parent’s vehicle. They are also easily distracted and do not notice the vehicle arrive. Since most children are regular participants the adult volunteers got to know them and this difficulty was soon overcome. It was evident that the practice at some schools of placing a surname card on the vehicle was unnecessary.

Drivers picking up children appeared to be less stressed and less frustrated. Many delayed their arrival at the school by several minutes in the knowledge that their child would be waiting on the school grounds and traffic would have cleared.

Traffic queues were rare. Neighbours have expressed their appreciation of the major improvement in traffic flow at home-time. Council rangers and Police have also expressed support for the scheme.



After 10 minutes only about ten children are remaining to be picked up

## SSR Forum and student solutions

SSR Forums are run by the students along the same lines as Student Representative Council meeting. SSRs are given the opportunity to describe their observations and recommend solutions to safety problems. These are prioritised and the SSRs present vote on action to be taken. SSRs are assigned responsibilities of these actions.

School newsletter articles describe the outcomes of the meetings.

## Conclusions and Recommendations

The Stay Safe Ranger pilot at Balgowlah Heights Public School has met its major objectives and has successfully improved student safety and traffic conditions without being an undue burden on school resources or the community. It has also made the participating senior students more aware of road safety issues. Through their well-publicised observations they have also subtly but noticeably changed the behaviour of adult drivers.

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## Acknowledgements

The SSR concept was conceived and developed by Kathryn Henderson. BHPS Principal Craig Davis and Assistant Principal Denise Paine implemented the pilot in consultation with Ms Henderson, DET, NSW Police and the author. Anne Morphett and Mark Wolstenholme from NRMA Motoring & Services provided advice and resources. Michael Griffiths from Road Safety Solutions also provided advice for the project.

The trial would not have been a success without the enthusiasm and diligence of the Stay Safe Rangers and the adult volunteers.

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# Keys2drive – Helping Learner Drivers Become Safer Drivers

by Sharon Hanlon, General Manager Public Affairs, RAASA  
and Greg Smith, Research Manager, AAA

*This article was contributed  
by the SaferRoads Program  
and previously appeared in  
'Motoring Directions Election 07'*



## Introduction

Getting a driver's licence is an exciting time for most young Australians. The freedom to drive gives them independence, providing new opportunities for work, study and socialising. In many ways, it is an important step on the journey from a teenager to adulthood.

But many, AAA among them, believe that the elevated crash rate of young drivers means this freedom comes at too high a cost. We believe more should be done to help significantly reduce the crash risk for young people without negating their ability to travel.

AAA is developing a program – *keys2drive* – which is designed to help Learner drivers get more real-world, on-road supervised driving experience before they go solo. *keys2drive* would also give supervising drivers, who are often the Learner's parents, a chance to brush up on their own skills.

## Astonishing numbers

In 2006, 1,601 people were killed on Australian roads – on average nearly five every day. Young people aged 16 to 25 accounted for nearly one third of these deaths, despite representing less than 15% of the population.<sup>1</sup>

As drivers, 17 to 20 year olds are three times more likely to be involved in a serious crash than drivers aged 21 years, and more than 11 times more likely to be killed than drivers aged 40 to 44 years.<sup>2</sup>

As well as leaving permanent physical and mental scars on the individuals, friends and families, road crashes are also an extraordinary drain on the Australian economy, costing some \$17 billion a year in terms of hospital care, emergency services, legal fees and lost productivity. That's equivalent to 2.5% of Gross Domestic Product.<sup>3</sup>

1 ATSB Fatal Road Crash Database; ABS Population Statistics

2 ATSB, 2004. "Road Safety in Australia: A Publication Commemorating World Health Day 2004."

3 Connelly, L.B. and Supangan, R., 2006. "The economic costs of road crashes: Australia, States and Territories." *Accident Analysis and Prevention*, Vol. 38 No. 6.

## An issue of national importance

The importance placed on driver education and training is almost universal. AAA's national surveys show that 84% of respondents rate driver education and training as either an "extremely" or "very" important way of reducing road deaths and injuries. Road safety statistics show that young drivers are at exceptionally high risk of being involved in a crash regardless of the State or Territory they live in.

Driver safety is clearly a national issue and a case exists that a national approach to aspects of driver training and education would be beneficial.

The high levels of young driver risk result principally from factors of inexperience, age, and gender. This risk is aggravated by the circumstances under which many young people drive.

Young people, especially males, are over-represented in crashes:

- at high speed;
- at night;
- with similarly aged passengers;
- involving alcohol; and
- when not wearing seatbelts.

In an attempt to address some of the underlying attitudinal and behavioural causes of young driver risk, the Commonwealth Government initiated the Novice Driver Education Trial. The trial is being conducted in partnership with the NSW and Victorian Governments and industry, including RACV. It targets provisional licence holders – that is, those able to drive solo. Unfortunately the trial will not be complete before 2010, meaning implementation of any resultant national program would not be able to occur until after that time.

There is scope for the Commonwealth Government to support a program that complements the National Driver Education Trial, targeting drivers at the Learner permit stage — before they begin solo driving. The aim of such an approach would be to "knock the top off" the spike in risk that novice drivers face when they first begin driving solo (see Figure 1).

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*In an attempt to address some of  
the underlying attitudinal and behavioural  
causes of young driver risk, the  
Commonwealth Government initiated  
the Novice Driver Education Trial.*

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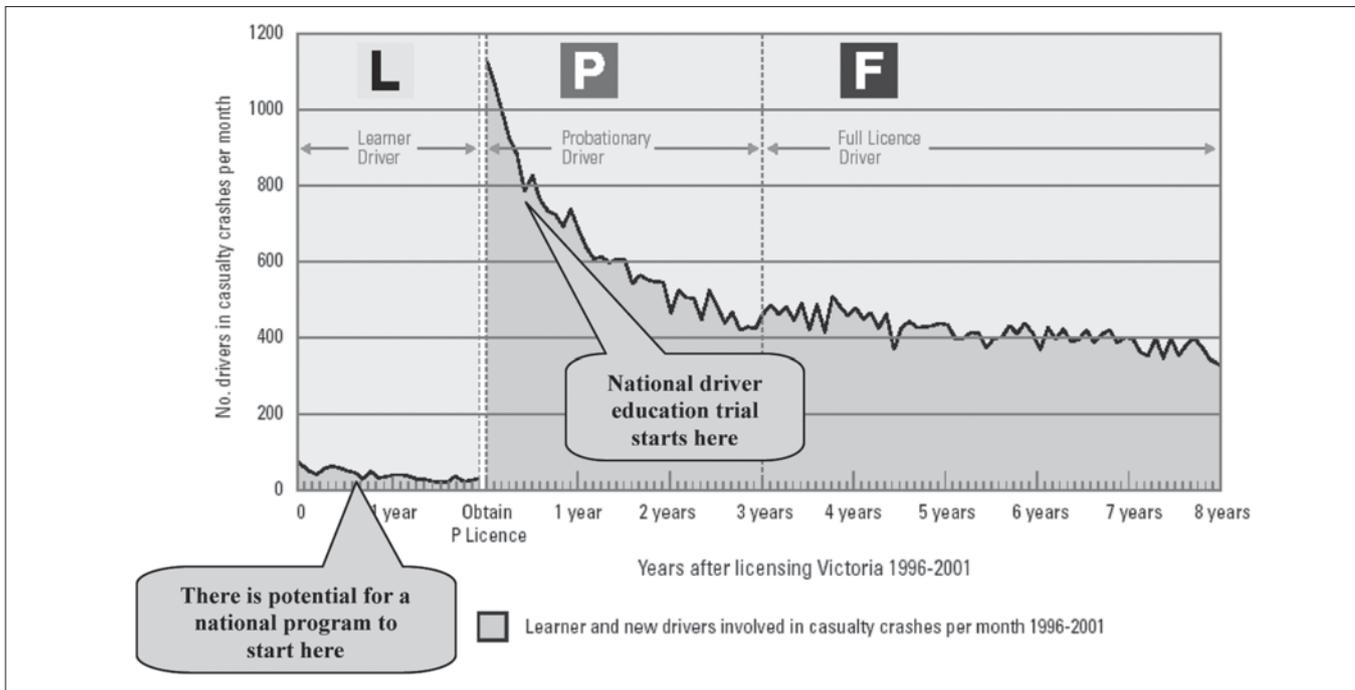
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Figure 1 Novice driver risk (VicRoads, 2005)



### Getting better on-road experience

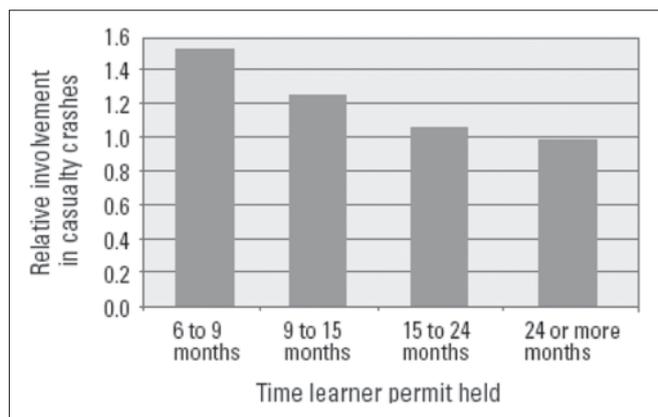
Learning to drive is a highly complex and challenging task, so practice is important. In fact, if there is one sure thing in driver training and education, it's that high levels of supervised practice, involving a variety of driving circumstances before making the transition to driving solo, result in fewer deaths.

Experience in Sweden, which has one of the best road safety records in the world, showed that increasing supervised, on-road experience to about 120 hours reduced crashes in the two years following licensing by about 40%, compared to those drivers who only got 45 hours experience.<sup>4</sup>

<sup>4</sup> OECD, 2006. "Young Drivers: The Road to Safety."

VicRoads research supports this case. It showed that Learner drivers who complete a longer Learner period, and therefore get more on-road experience, were less likely to be involved in a crash in the first year of their provisional licence period (see Figure 2 below).<sup>5</sup>

**Figure 2** More experience as a Learner improves safety (VicRoads, 2005)



Most States and Territories have now introduced a requirement that Learners obtain a minimum number of hours of on-road driving experience.<sup>6</sup>

However, many supervisors – who are often parents, brothers, sisters or friends – find teaching their Learner a daunting and stressful task. Many supervisors also underestimate the risk that young drivers face. As a result, research shows that Learner drivers are not getting an optimal number of hours on the road and are not being exposed to sufficient variety of road types and conditions.<sup>7</sup>

### keys2drive: AAA’s plan to help Learner drivers become safer drivers

AAA is developing a national model that could help Learner drivers become safer drivers. It would require a collaborative effort by the Australian motoring clubs and driver training industry and the Commonwealth Government.

<sup>5</sup> VicRoads, 2005. “Young Driver Safety and Graduated Licensing: Discussion Paper.”

<sup>6</sup> NSW and Victoria have introduced a minimum of 120 hours, Queensland has introduced a minimum of 100 hours, South Australia and Tasmania have a minimum of 50 hours, Western Australia has a minimum of 25 hours, and the Northern Territory and ACT currently have no minimum. In NSW, Victoria, Queensland, and the Northern Territory Learner permits have a minimum tenure of 12 months. South Australia, Tasmania and the ACT have a minimum tenure of 6 months, and Western Australia has no minimum tenure. Test procedures and also vary from state to state.

<sup>7</sup> Monash University Accident Research Centre (MUARC), 2005. “Development of a Model Resource for Parents as Supervisory Drivers.”

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*Most States and Territories have now introduced a requirement that Learners obtain a minimum number of hours of on-road driving experience.*

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The model, named *keys2drive*, is based on the principle that learning to drive should be a three-way partnership between the Learner, their supervising driver and a qualified driving instructor. *keys2drive*, would aim to foster that partnership, and provide the opportunity for every Learner driver and their supervisor to increase the quality of their on-road experience. There would be three key components of *keys2drive*.

1. The first component would be one Commonwealth funded professional driving lesson by a qualified driving instructor for Learner drivers when they bring their supervisor. The lesson would be based on RACV’s existing *Parent Plus* program (see box below).

The *keys2drive* lesson would involve a specially tailored driving lesson for both Learner and supervisor. The aim is to help build the supervising driver’s skills and confidence, so that they are more likely to spend time in the car with their Learner. Supervising drivers would receive comprehensive advice on how to assess whether their Learner has developed sufficient skills in lower risk level driving environments before progressing to higher risk environments — like driving on busier roads, at night and in the rain.

After the first year of the program, RACV surveyed 130 parents who had participated in *Parent Plus*. 93% of respondents felt that their *Parent Plus* lesson was useful assisting them to supervise their Learner driver. In particular, as a result of the *Parent Plus* lesson:

- 66% of respondents thought that they would be more likely to provide more on-road supervised driving experience to their Learner;
- 73% of respondents felt more confident to give their Learner driver experience in various on-road conditions; and
- 84% of respondents had a better understanding of how to help their Learner driver develop their driving skills.

2. The second component of *keys2drive* would be a voluntary accreditation scheme for professional driving instructors. This component would be based on RACWA’s pilot scheme (from which the name *keys2drive* is taken). It would go beyond that required by the normal statutory licensing process, to encourage best practice within the industry, and would seek to actively promote those driver instructors who are accredited.

Accreditation would include committing to a Code of Conduct and successfully completing an annual two-stage review — a desk-top review and a practical review. These reviews could include checks of statutory licensing details, a ‘working with children’ check, examination of the instructor’s knowledge of current road rules, their ability to instruct others, and their ability to deliver *keys2drive* lessons. And consistent with the motoring clubs’ promotion of safe vehicles, accreditation may also require that by year 3 of the program, all tuition be undertaken in a car with a 4-star ANCAP safety rating.

3. The final component would be a *keys2drive* website, which would promote accredited driving instructors, and act as a central, national portal to jurisdiction-specific advice on every step involved in obtaining a licence, reducing crash risk, choosing a driving instructor, lesson plans, quick-reference checklists, interactive tests and competitions. The site would reference existing particularly good sites, such as VicRoads’ *L-Site*.

Depending on the level of uptake of the free lessons, we estimate the cost of *keys2drive* over five years to be between \$21,995,000 and \$37,995,000.<sup>8</sup>

## Summary

*keys2drive* could be the most extensive and far-reaching novice driver training and education initiative seen in Australia, delivering a tangible benefit into the hands of the some 320,000 drivers who obtain a Learner permit every year. The program would not only help Learners, but also give supervisors the opportunity to brush up on their own skills and knowledge.

<sup>8</sup> The majority of this cost would be a result of the free lessons, which we have assumed would be \$50 each.

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# Road Safety on the Asian Highway

By Lori Mooren, ARRB Group



Rapid economic development is a welcomed relief from the devastating poverty affecting families living in some Asian countries. However, this development also brings other problems. As economies grow, so must the road and transport infrastructure.

And with this growth in infrastructure the exposure to road traffic injury risk also grows – all too often resulting in dramatic rises in road deaths and serious injury crashes. This is an important dilemma for the Governments of these countries.

The Executive Director of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) advises that, last year an estimated \$170 billion was spent on Asian roads and more than \$20 billion are currently being spent or committed for the Asian Highway. But unfortunately, this impressive economic success of Asia has been at the expense of the continent having the worst road safety record in the world. Last year more than half a million people were killed and 20-30 million injured in road crashes, at an economic cost of some \$100 billion.

UNESCAP covers the largest UN Region spanning from Australia and the Pacific nations to Turkey and the Russian Federation. A major project coordinated by UNESCAP is the *Asia Highway Project*. This project is securing intergovernmental agreements by member nations to bring conformity to classification and design standards for all routes of this highway network that spans across the Region. The idea is that putting good standards and practices in place – including safety standards – on a network that touches most of its member nations will assist to provide a tangible model of good practice to be applied on other roads as well.

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*UNESCAP covers the largest UN Region spanning from Australia and the Pacific nations to Turkey and the Russian Federation. A major project coordinated by UNESCAP is the Asia Highway Project.*

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In the ESCAP meeting of member nations in Busan, Korea in November, 2006, a historic *Ministerial Declaration on Improving Road Safety in Asia and the Pacific* to “develop the Asian Highway as a model of road safety”<sup>1</sup> was adopted. Following a further resolution in May, 2007 which “encouraged members to continue to act upon the recommendations contained in the Ministerial Declaration”<sup>2</sup>, UNESCAP convened an Expert Group Meeting on Improving Road Safety on the Asian Highway. This was organised with the objectives to: (a) share experiences on how to improve road safety on the Asian Highway Network; (b) discuss resource requirements, priorities, possible partnerships and funding sources and financing; and to (c) discuss (road-related) follow-up actions to the Ministerial Declaration on Improving Road Safety in Asia and the Pacific.

The Expert Group Meeting was held in Bangkok on 21-22 June 2007, chaired by the Secretariat of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). The Meeting was attended by (mostly road authority) participants from the following member countries: Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Democratic Republic of Korea, France, Georgia, India, Indonesia, Islamic Republic of Iran, Japan, Kyrgyzstan, Lao People’s Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Russian Federation, Singapore, Sri Lanka, Tajikistan, Thailand, Turkey, Uzbekistan.

In addition representatives of the Road Administration of Sweden, the Asian Development Bank, ARRB Group, Automobile Association of Malaysia, Asia Injury Prevention Foundation, Automobile Association of the Philippines, Global Road Safety Partnership, Handicap International Belgium, International Federation of Pedestrians, International Road Assessment Programme, IRU, Korea Transport Institute, Korea International Cooperation Agency (KOICA), National Road Safety Council of Armenia, Volkmann & Rossbach GmbH & Co. attended the Meeting.

Beyond the Asia Highway project, the ESCAP members have adopted a set of goals and targets for road safety, as well as specific indicators for monitoring achievements.

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1 Report of the Ministerial Conference on Transport, ESCAP document E/ESCAP/63/13, [http://www.unescap.org/EDC/English/Commissions/E63/E63\\_13E.pdf](http://www.unescap.org/EDC/English/Commissions/E63/E63_13E.pdf)

2 ESCAP resolution 63/9 (“Implementation of the Busan Declaration on Transport Development in Asia and the Pacific and the Regional Action Programme for Transport Development in Asia and the Pacific, phase I (2007-2011)”), [http://www.unescap.org/EDC/English/Resolutions/2007\(63\)Resolutions.pdf](http://www.unescap.org/EDC/English/Resolutions/2007(63)Resolutions.pdf)

## UNESCAP Road Safety Goals of Asia and the Pacific, 2007-2015

Goals and Targets	Indicators for monitoring achievements
<b>Overall Objective:</b> Saving 600,000 lives and preventing a commensurate number of serious injuries on the roads of Asia and the Pacific over the period 2007 to 2015	
a) Reduce the fatality rates by twenty percent from 2007 to 2015 (or reduce it to less than 10 per 10,000 motor vehicles by 2015).	1) Number of road fatalities (and fatality rates per 10,000 motor vehicles, per motor vehicle-km and per passenger-km). 2) Number of anticipated road fatalities (baseline). 3) Number of road crashes. 4) "Fleet safety records" of public or private organisations (e.g. deaths per 100,000 km).
b) Reduce the rates of serious road injuries by twenty percent from 2007 to 2015.	5) Number of anticipated serious injuries on roads (baseline). 6) Number of serious road injuries (and injury rate per 10,000 motor vehicles and per motor vehicle-km).
<b>Goal 1: Making road safety a policy priority</b>	
a) Create a road safety policy/strategy, designate a lead agency and implement a plan of action, by 2010.	7) Documents of road safety policy, strategy, and plan of action etc. Information on their actual implementation. 8) Name of designated lead agency. Description of responsibilities of local, regional and national government organizations. 9) National road safety reports or impact evaluation reports of government programmes.
b) Allocate sufficient financial and human resources to improving road safety.	10) Amount of public financial and human resources allocated to road safety. 11) Amount of private sector contributions, as well as special funds, from donors, or relevant financial institutions. 12) Road safety programmes and activities conducted. At least one major national road safety campaign.
<b>Goal 2: Making roads safer for vulnerable road users, including children, senior citizens, pedestrians, non-motorized vehicle users, motorcyclists, and persons with disabilities</b>	
a) Reduce by one third the pedestrian death rate in road crashes (or reduce it to less than 1 per 10,000 motor vehicles).	13) Pedestrian deaths per head of population and per 10,000 motor vehicles.
b) Increase the number of safe crossings for pedestrians (e.g. with subway, overhead crossings or traffic signals).	14) Number of safe crossings, or information on programmes for constructing or improving crossings.
c) Make the wearing of helmets the norm and ensure minimum helmet quality, in order to reduce the motorcyclist death rate by one third (or reduce it to below the average motorcyclist death rate of the ESCAP).	15) Motorcyclist deaths and motorcyclist death rate. 16) Law or administrative rule (Yes/No). (Survey) information on helmet use (percentage) and minimum helmet quality standards.
d) Ensure minimum child safety measures, in order to reduce the child death rate by one third (or reduce it to less than 0.01 per 10,000 motor vehicles).	17) Death rate of children less than 5 years in road crashes. 18) (Survey) information on the following of child safety norms (e.g. child restraints) (percentage). 19) Existing measures for child safety in cars and on motorcycles (qualitative indicator).
e) Equip all school children with basic road safety knowledge.	20) Road safety education part of the school curriculum (Yes/No). 21) Existing education programs on road safety (qualitative indicator).
<b>Goal 3: Making roads safer and reducing the severity of road crashes (building "forgiving roads")</b>	
a) Integrate road safety audit in all stages of road development starting at the design stage, carry out necessary improvement works, and improve hazardous locations.	22) Road safety audit programme (Yes/No); Blackspot programme (Yes/No). 23) Extent to which road safety audits are carried out for new road constructions and major improvements (estimated share of all cases). 24) Programmes to make roads "forgiving" by removing or cushioning roadside obstacles.
b) Increase separate/secure road space for pedestrians and cyclists in urban and peri-urban areas (where space permits).	25) National or local programmes. Existing length of pedestrian and bicycle tracks in kilometres per 100,000 people (along highways and city roads).
<b>Goal 4: Making vehicles safer and encourage responsible vehicle advertising</b>	
a) Make regular inspection of road vehicles mandatory and ensure enforcement of inspection (starting in urban areas).	26) Law or administrative rule (document). Information on vehicle inspection facilities and organizations (qualitative).
b) Ensure safety requirements for new vehicles to be in line with international standards.	27) Documents specifying laws and regulations and implementation.

continued next page

## UNESCAP Road Safety Goals of Asia and the Pacific, 2007-2015 (continued)

Goals and Targets	Indicators for monitoring achievements
<b>Goal 5: Improving national and regional safety systems, management and enforcement</b>	
a) Implement a national (computerized) database that provides information on the location of road crashes.	28) Yes/No indicator. If yes, which database system and responsible organizations (qualitative indicator). 29) Country coverage of the regional APRAD database.
b) Significantly increase "compliance", e.g. with mandatory helmet, seat-belt wearing and speed limits.	30) Information on rules and "compliance" on helmet wearing levels (percentage from surveys). 31) Information on rules and "compliance" on seat-belt wearing levels (percentage from surveys). 32) Information on rules and "compliance" related to "drinking and driving" (information from surveys not prosecutions).
c) Allow alcohol tests for prosecution (either breathalyzer) and/or behavioural tests).	33) Yes/No. If yes, description of existing rules, types of tests and alcohol limits used and allowed for prosecution.
d) Make it the norm to keep motorbike front-lights on at all times.	34) Law or administrative rule (document). Description of existing practices (from survey), or technical measures.
e) Increase coverage of emergency assistance systems for road victims, to cover at least all urban areas and trunk roads.	35) Kilometres of road (by type) on which emergency services are provided. 36) Average response time. 37) Number of emergency service centres per length of highways (except city roads).
<b>Goal 6: Improving cooperation and fostering partnerships</b>	
a) Encourage and recognize private-sector sponsored initiatives.	38) Number of major private sector initiatives. (Financial) volume of commitments. 39) Number of major public-private partnerships in the area of road safety (Financial) volume.
b) Create new and deepen existing partnerships with NGOs.	40) Number of major private sector initiatives. (Financial) volume of commitments.
<b>Goal 7: Developing an Asian Highway as a model of road safety</b>	
a) Reduce the total number of fatalities and road crashes on the Asian Highway.	41) Total number road fatalities and road crashes on the Asian Highway in each country per year.
b) Reduce the number of fatalities on <i>all</i> Asian Highway segments to below 1,000 per 100 million vehicle-kilometres.	42) Number of fatalities per 100 million vehicle-kilometres for each Asian Highway segment per year.
c) Increase resource allocation for road safety-related measures along the Asian Highway.	43) (Financial and human) resources allocated for safety-related works for Asian Highway segments. 44) Amount of safety-related grants and loans for Asian Highway segments from international sources.
d) Improve Asian Highway road segments to be forgiving to road users if a crash occurs. Demonstrate best practise.	45) Develop a road safety rating program.
<b>Goal 8: Providing effective education on road safety awareness to the public, young people and drivers</b>	
a) Carry out targeted awareness campaigns and training programs.	46) Information on awareness campaigns and training programs carried out.

The ESCAP meeting delegates from member nations spoke candidly about their achievements and challenges to achieve road safety, sharing specific experiences as well as positive outcomes being achieved – or not.

Presentations delivered by international delegates, such as the ARRB Group, International Road Assessment Program and the Swedish Road Administration, offered ideas that could be considered for the enhancement of road safety in Asia. The ARRB representative spoke of the Australia experience and lessons in interagency collaboration, institutional strengthening and financing options. The Swedish

representative spoke of Sweden's Vision Zero policy framework and specific ways the Vision is being pursued with low cost road engineering practices. The iRAP representative showed how a network risk assessment could assist the Asia Highway Project to establish and measure safety ratings of Highway routes and sections.

The Meeting made recommendations about how best to pursue the general road safety goals as well as actions to improve the road safety effort on the Asian Highway project.<sup>3</sup>

<sup>3</sup> A full report on the Meeting can be obtained at

These include:

- ESCAP members to consider improving their data collection and reporting systems, in particular to annually provide the basic safety data contained in the Asian Highway database;
- ESCAP members to consider the carrying out network risk assessments in the region. In particular, to explore iRAP assessments of the Asian Highway Network;
- ESCAP members to explore the possibility of adopting a systems approach similar to the Vision Zero approach
- ESCAP members to seriously consider and explore all options for domestic financing of road safety, for example, through road funds, various user charges, insurance premium, etc., in line with good practices around the world;
- ESCAP to track the potential good experience in the ESCAP region with setting up road safety research institutes, and noted the catalytic role that these institutes have played in improving road safety.

The leadership approach and support being offered by the UNESCAP Secretariat is to be congratulated. The Meeting acknowledged this key role of ESCAP by requesting the Secretariat to: (a) to step up its support to national road safety programmes of ESCAP members, (b) to promote regional collaboration for improving the safety of the Asian Highway (towards a vision of zero accidents), (c) to promote time-tested safety devices such as seat-belts and helmets, (d) to support campaigns against drunken driving and for promotion of safe driving practices, (e) to provide training and capacity building, (f) promote sharing of best-practices in road safety in the region, (g) support networking of academic and research bodies, (h) promote the creation of simple and effective technical aids to make driver licensing procedure safe and foolproof, and (i) to facilitate safety-related research and development.

This is a good example of how the United Nations is putting into practice a proactive leadership approach to advancing road safety consistent with the goals of the World Report on Road Traffic Injuries.

# Peer Reviewed Papers

## Teaching Old Dogs New Tricks?: Training and Older Motorcyclists

By Narelle Haworth<sup>1</sup>, Christine Mulvihill<sup>2</sup>, Peter Rowden<sup>1</sup>  
Queensland University of Technology<sup>1</sup> and Monash University<sup>2</sup>

*This paper was originally presented at the Australasian Road Safety Research, Policing and Education Conference held at Surfers Paradise, Queensland, 25-27 October 2006.*

### Abstract

Past studies of the effects of motorcycle training on crash involvement have shown mixed results. However, many of the studies were conducted when most trainee riders were aged under 20. Now, many trainees are older and have considerable car driving experience. Training programs have also changed. For these reasons, this paper examines the training history of a sample of older riders and the links to their crash involvement.

### Introduction

The number of older motorcyclists killed or injured in crashes has increased in the last decade in many developed countries including the United States (1, 2), Great Britain (3) and Australia (4). In some countries, this increase has been the main contributor to an overall rise in rider fatalities.

In Australia, the number of motorcyclist (rider and pillion) fatalities fell from a high of 299 in 1989 to 175 in 1997 and has since increased to 233 in 2005. There has been a decrease in the number of motorcyclists aged under 25 killed and an increase in the number of riders aged over 25 killed since 1991. The percentage of riders killed who were aged over 25 increased from 49% in 1991 to 70% in 2005 (4).

This pattern is not confined to fatalities. In the State of Victoria, as in other jurisdictions, the involvement of “older” motorcyclists in crashes has increased since 1990. The number of riders in crashes aged 30 and over more than doubled from 501 in 1991 to 1,120 in 2003. In contrast, the number of riders in crashes aged under 30 more than halved from 1,353 in 1991 to 663 in 2003. Riders aged 30 and over comprised 26.8% of riders in crashes in 1991 and this increased to 63.2% in 2003.

While the numbers of older riders in crashes have increased, older riders have lower crash rates per licence held (5) and

per distance travelled (6). Thus, there appear to be two main rider groups of concern; riders aged under 25 who continue to be over-represented in casualty crash rates, and older riders aged 30-54 who are the fastest growing group among serious crashes.

The trends in motorcycle involvement in crashes have mirrored changes in motorcycle registration and rider licensing data. In Australia, the number of motorcycles registered increased by 18.7% from 1999 to 2004 (7), showing the strongest growth of any vehicle type in Australia. There is relatively less information available regarding the age profile of riders. In New South Wales, the number of motorcycles registered to people aged 40 and over increased by 57% between 1995 and 2000, while the number of motorcycles registered to people aged under 25 years decreased by 33% (8). At the same time, the number of licences held by older riders also increased.

### Motorcycle Rider Training

Rider training is one of the most popular measures aiming to reduce motorcycle crashes. While there is little empirical evidence to demonstrate improvements in motorcycle safety as a result of training, training is encouraged and is compulsory in some jurisdictions. An international review concluded that voluntary motorcycle training programs do not reduce crash risk (9). On the contrary, these programs seem to increase crash risk. This may be due, in part, to the increased confidence felt by many riders who have completed training, despite minimal improvements in rider skill. These riders may ride more often or take more risks in situations where they lack the skills to safely avoid a crash.

The same review concluded that compulsory training through licensing programs produces a weak but consistent reduction in crashes (9). This may result from reductions in the amount of riding (exposure reduction) or by riding more safely (risk reduction). It is not always possible to neatly separate these effects. For example, one of the underlying principles of graduated licensing is to reduce exposure in high-risk situations.

In a recent review of motorcycle licensing and training (10), it was asserted that there are some key deficiencies in most current training programs that may account for the apparent lack of overall effectiveness. These include a lack of attention to higher order cognitive factors such as hazard perception, attitudes and motivation as well as insufficient duration of training (see 10 for a full review).

Recent changes in the demographics of riders lead us to question whether the results of earlier evaluations of rider training remain valid. Traditionally, most riders undertaking training were young, with little car driving experience. Thus, the published evaluations relate to a different age profile of trainees to that now presenting to training. The effectiveness of training has not been studied as a function of rider age. There are a number of issues that cause us to wonder if the effects of training are different for older riders, compared with younger riders.

Firstly, older riders bring more car driving experience (and possibly more riding experience) to the training situation and arguably a lower propensity to take risks (11). Alternatively, they may bring a range of bad habits and preconceived ideas to the training situation which may inhibit their learning.

Secondly, many States (such as Queensland) provide exemptions from the graduated licensing requirements for older novice riders who hold full car licences. Thus, older novice riders are moving from training straight into riding without restrictions on engine size (or power to weight ratio) or lower travel speeds or lower BAC limits or restrictions on carriage of pillion. This could potentially increase the crash risk or crash severity for newly trained and licensed older riders (compared to younger riders) and at least appear to reduce the benefits of training for the older riders.

Thirdly, most of the published evaluations of training were based on large numbers of riders taking learner or licence courses. Many older riders are returning riders, who already have motorcycle licences and therefore, if they take training courses, are taking refresher or advanced courses. Some of these riders may have not undertaken training for many years and some may never have received formal training at all.

Fourthly, many older riders may not ride often enough to practice and improve the skills taught in training. Earlier analyses of the survey data showed that half of the older riders rode less than 100kms per week (12). Previous studies suggest that riders who ride infrequently are at greater risk of crashing (13). Paradoxically, whilst new riders who have just completed licensing training and need to gather experience, increased on-road exposure particularly places them at high risk as well (12).

Keeping these issues in mind, training is only one measure that may affect motorcycle crash occurrence or crash severity. A range of further measures aimed at riders, other road users, vehicle design, the road environment, and injury response/treatment can all have influence on overall rider safety. Therefore, it is difficult to isolate at any given time the pure effects of training.

Requirements for motorcycle training (and licensing systems) differ across Australia (10). This paper will focus on riders from Victoria, New South Wales and Queensland, because they comprised the largest numbers of respondents in the survey. Training has been compulsory to gain a motorcycle learner permit or a licence in NSW (except for some riders in rural or remote areas) since 1989 and has been effectively compulsory in Victoria since at least 1993. In Queensland there is no requirement for training to obtain a motorcycle learner permit and competency-based training and assessment (the Q-RIDE system) has been optional to gain a motorcycle licence since August 2001. In each State, many older riders gained their licence before the current requirements were put in place and so were not required to complete a training course.

Clearly the issues associated with measuring the effectiveness of rider training for older riders are complex. This paper seeks to contribute to answering this question by presenting new analyses of data related to training history and crash outcome that were collected as part of a survey of older rider crash characteristics and countermeasures conducted in 2005. Preliminary analyses of a wide range of variables collected in this survey were presented in an earlier paper (12). The present study aims to investigate the influence of training on crash involvement for older riders with particular reference to when training was last undertaken (if at all). Where training occurred many years ago, it is less likely to have had an effect on crash involvement than when it occurred closer in time to the period when crash involvement was measured (2001-2005 in this study).

## Method

An on-line survey of Australian motorcycle riders aged 25 and over was undertaken to explore potential contributors to crash risk such as attitudes, personal characteristics, self-reported riding behaviours and level of experience and training. The rationale for choosing this method and its advantages and disadvantages are discussed elsewhere (14). A detailed description of the methodology is provided in the earlier paper (12).

## Results

### Characteristics of respondents

Of the 1,500 valid questionnaires received, 86.7% were from male riders. The largest age group was 45-54 years old (32.9%), with 25.6% of respondents aged 35 to 44, 22.9% aged 25 to 34 and 16.4% aged 55 and over. Most of the respondents were residents of Victoria (45%), with 28% from New South Wales and 13% from Queensland.

Overall, 92.7% of respondents held a full motorcycle licence, with 2.4% holding a learner permit and 3.7% holding a provisional or restricted licence. Of the riders who held a full licence, 12.2% had obtained their licence before 1970, 25.3% in 1970-79, 17.9% in 1980-89, 21.9% in 1990-99 and 22.7% in 2000 to 2005.

### Training history

Riders were asked whether they had ever undertaken a motorcycle rider training course, and if so, the type of course they had most recently completed and the year in which that occurred. Overall, 68.5% of fully-licensed riders had undertaken a motorcycle rider training course at some time (see Table 1). The percentage of riders who had completed a training course was lower for riders licensed before 1990 (51.8% to 57.1%) than after 1990 (84.7% to 90.1%).

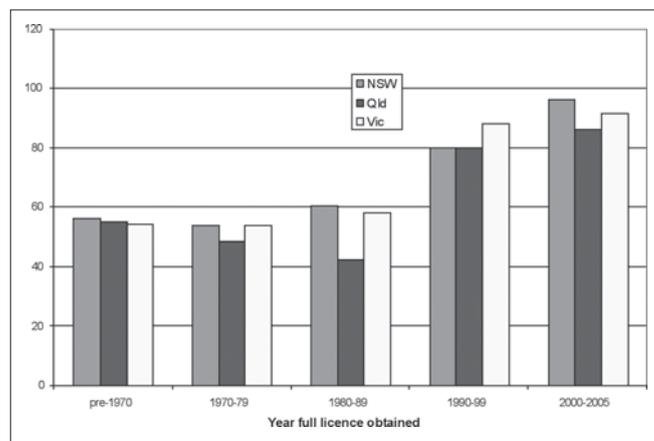
Table 1 shows that more than half of the most recent training courses were completed in 2001-05 (51.8%). While this was most evident for riders who obtained their full licence in 2000-2005 (82.8%), between a third and a half of riders licensed before 2000 also completed their most recent training course in 2001-2005 (31.5% to 47.4%).

Given the current and past differences in requirements for training in NSW, Queensland and Victoria, an attempt was made to compare the training histories of riders from these three States. The analyses were conducted based on reported current State of residence because the questionnaire did not ask about State of initial licensing.

There was little difference among the States in the percentage of fully-licensed riders who had completed a training course at some time: 69.7% for NSW, 65.5% for Queensland and 71.6% for Victoria. In each State, the percentage who had undertaken training was highest for riders who obtained their full licence after 1990 (see Figure 1).

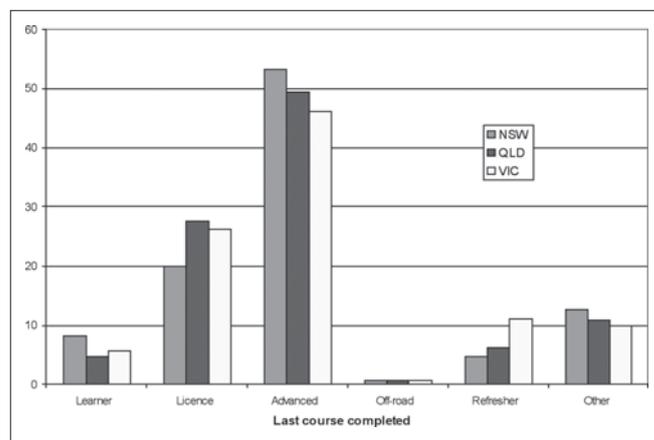
Riders were asked to describe the most recent rider training course they had completed. The options provided were “learner”, “licence”, “advanced”, “off-road”, “refresher”, and “other”. The last course that had most commonly been undertaken by fully-licensed riders was an advanced course (33.3% of riders). A licence course was the last course for 16.2% of riders, with a refresher course taken most recently by 6.3% of riders and learner course by 4.5% of riders. Among riders who had completed training, the

**Figure 1.** Percent of riders in the survey from each state who had completed training according to the year they obtained their full motorcycle licence.



mix of types of training did not differ significantly for riders from New South Wales, Queensland and Victoria ( $\chi^2(10)=16.7, p>.05$ , see Figure 2).

**Figure 2.** Percent of trained riders from NSW, Queensland and Victoria who had completed each type of training course.



**Table 1.** Summary of numbers and percentages of riders who had completed training as a function of year of their most recent training course and year their full motorcycle licence was obtained.

	Year obtained full licence					Total
	pre 1970	1970-1979	1980-1989	1990-1999	2000-2005	
Year of most recent training course						
pre-2001	48	88	75	160	28	399
2001-2005	46	82	57	82	226	493
% trained in 2001-05	47.4	44.6	41.3	31.5	82.8	51.8
Year unknown	3	14	6	18	19	60
Total trained	97	184	138	260	273	952
Total not trained	73	171	114	47	30	435
% trained	57.1	51.8	54.8	84.7	90.1	68.5
Total number of riders	170	355	252	307	303	1391*

\* includes 4 unknown

## Crash involvement

Riders were asked how many crashes they had been involved in while riding their motorcycles on Australian roads in the last five years. They were asked to include only those crashes in which someone was hurt, the Police were called, or a vehicle was damaged to the extent that it had to be taken away. Overall, 445 riders (about 30%) reported that they had been involved in at least one crash. About 75% of these riders had been involved in one crash, 20% in two crashes, 4% in three crashes and 2% in four crashes.

For those riders who had been involved in a crash, the severity of the most recent crash was measured in terms of injuries sustained to the rider and the damage to the rider's motorcycle. Riders most commonly suffered slight injuries (cuts and bruises) (46% of crashes). About 19% of riders suffered no injuries at all. About 20% of riders suffered serious injuries that required hospital emergency treatment and 16% suffered serious injuries that required admission to hospital.

Over half of the crashes were single vehicle (54%) (involving the motorcycle only). New riders appeared to be over-represented in single vehicle crashes (61%) compared to returned riders (55%) and continuing riders (51%), although these differences were not significant ( $\chi^2(2) = 2.6, p > .05$ ).

## Relationship between crash involvement and training history

In order to assess whether training reduced crash risk or severity, data were first excluded where the most recent training course occurred after the most recent crash (55 riders) or in the same year (49 riders). This procedure was conservative and may have incorrectly removed some eligible riders.

It may be that only recent training courses are likely to have a measurable effect on crash involvement. For this reason, the analyses compare the crash involvement of riders who have never undertaken training, those who have undertaken training since 1996 and those whose most recent training course was before then.

The analysis involved a multivariate logistic regression approach to control for the importance of other potential confounding influences on crash risk. Earlier studies have shown that crash risk increases with amount of riding and decreases with age of the rider (12). While crash risk is often found to decrease with experience (as measured by years since licensing), this variable is so closely linked with age that it was not possible to include both in the analysis.

The comparisons of crash and non-crash involved riders and the results of the multivariate logistic regression are summarised in Table 2. Given that training may potentially have a larger effect on single vehicle crashes since their occurrence is relatively less affected by the actions of other road users, the analyses were repeated separately for single and multi-vehicle crashes.

**Table 2.** Comparisons of characteristics of crash and non-crash involved riders. Odds ratios and confidence intervals from multivariate logistic regression analysis.

Characteristic	Crash-involved	Non-crash involved	OR	95% CI	p value
<b>ALL CRASHES</b>					
<b>Training course</b>					
None	34.0%	34.9%			
Before 1996	16.5%	15.3%	1.194	0.877-1.624	.260
1996 or later	49.5%	49.8%	1.323	0.892-1.962	.163
<b>Distance ridden per week (km)</b>					
Less than 300	77.5%	85.0%			
300 km or more	22.5%	15.0%	1.660	1.192-2.312	.003
<b>Mean age (years)</b>	41.6	45.5	0.985	0.971-0.974	.001
<b>SINGLE VEHICLE CRASHES</b>					
<b>Training course</b>					
None	37.2%	35.0%			
Before 1996	12.4%	16.2%	1.049	0.713-1.544	.809
1996 or later	50.3%	48.8%	0.753	0.430-1.319	.320
<b>Distance ridden per week (km)</b>					
Less than 300	80.4%	83.0%			
300 km or more	19.6%	17.0%	1.249	0.808-1.929	.315
<b>Mean age (years)</b>	43.0	44.7	0.991	0.976-1.007	.259
<b>MULTI-VEHICLE CRASHES</b>					
<b>Training course</b>					
None	30.8%	35.9%			
Before 1996	20.3%	15.1%	1.043	0.683-1.593	.845
1996 or later	49.0%	49.0%	1.693	1.039-2.757	.035
<b>Distance ridden per week (km)</b>					
Less than 300	75.3%	83.7%			
300 km or more	24.7%	16.3%	1.583	1.032-2.426	.035
<b>Mean age (years)</b>	40.2	45.0	0.962	0.945-0.979	.001

There was no clear relationship between undertaking a training course since 1996, before 1996 and not at all and involvement in crashes overall or in single vehicle crashes. The only significant finding (at the 5% level) was an increase in the risk of involvement in a multi-vehicle crash for riders trained since 1996 compared to untrained riders.

Crash risk was strongly related to distance ridden per week, with riders who rode 300 kms per week or more being at a 66% greater risk of crashes overall and a 58% greater risk of multi-vehicle crashes than riders who rode less than 300 kms per week. Crash risk decreased with increasing age, with a reduction of about 1.5% for overall crashes and 3.8% for multi-vehicle crashes for each year of age.

## Discussion

The survey data showed that almost 70% of fully-licensed riders aged over 25 had undertaken some form of training. More than half of the riders licensed before 1990 (when training was unlikely to be compulsory) had completed a training course and about half of these had completed a training course in 2001-05. Thus, for many older riders their most recent experience of training was a post-licence course, rather than a learner or licence course. This supports the concern raised earlier in this paper regarding the likely applicability of the results of studies of learner and licence training to older riders.

It is useful to consider whether the high prevalence of training among the older riders who responded to this survey is representative of older riders as a whole. Certainly we know that many older motorcycle licence holders are not active riders (5) and thus it is likely that the prevalence of training in our sample of active older riders would be higher than among all licensed older riders. An examination of the characteristics of respondents shows that there is an over-representation of riders from Victoria in the sample, reflecting the degree of local interest in the project and the recruitment of riders by means of an article in the Victorian motoring club magazine. Given that learner and licence training has been effectively compulsory in Victoria since at least 1993, this might boost the prevalence of training among the sample. However, the data showed that the prevalence of training was very similar for riders (currently resident) in NSW, Queensland and Victoria, so the over-sampling of Victorian riders is unlikely to account for the high prevalence of training (and particularly since advanced training, not learner licence training was the most frequent form of most recent training course).

Of greater concern for the representativeness of the data collected is the extent to which the survey attracted motorcycling enthusiasts. The larger proportion of continuing riders, many of whom are enthusiasts, in the current survey compared with an earlier survey (5) may also reflect the effect of advertising the survey in motorcycle magazines. Enthusiasts are probably more likely to undertake training, particularly post-licence training. Nevertheless, comparisons of

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the demographic characteristics of respondents in this study and those of the earlier survey (5) which had a response rate of 49% to a mail-out to motorcycle licence holders, suggest that the sample in the current study was of a similar level of representativeness to that of earlier studies.

The percentages of riders who had completed training courses and the types of courses completed were similar for riders resident in Victoria, New South Wales and Queensland, despite the current differences in the requirements for training to obtain a motorcycle licence in these three jurisdictions. The lack of difference can be largely ascribed to advanced training (which is voluntary) being the most common form of training course most recently completed by respondents from each jurisdiction. Secondly, many of the respondents obtained their motorcycle licence before training became compulsory in New South Wales or more widespread in Victoria and Queensland.

An attempt was made to assess the relationship between crash involvement in the past five years and training history. While earlier preliminary analyses (12) had shown that crash involved riders were more likely to have undertaken training than non-crash involved riders, this effect disappeared when riders whose most recent crash had occurred in the same year or prior to the year of their most recent training course were removed from the sample. Although the relationship between training and crash involvement should conceptually be stronger for single vehicle crashes (because there is no contribution from another road user), there was no significant relationship between training and the most recent crash in the last five years being a single vehicle crash. Conversely, the only evidence was for an increase in the risk of multi-vehicle crash involvement for riders trained since 1996.

Given that the effects of training may not be permanent, the effect of recency of training on crash involvement was investigated. Again, there was no significant relationship between crash involvement (all crashes, single vehicle or multi-vehicle crashes) in the past five years and whether training occurred since 1996, before 1996 or not at all. While it is tempting to conclude that this result is evidence of no effect of training on crash risk, there are a number of constraints to the analysis that should be considered. In terms of the analyses of the recency of training, the time periods used may not have been appropriate. It may be that training does reduce crash involvement but only for 6-12 months, rather than the period of up to 10 years as used in the analysis.

In addition to the issues related to the analysis of the effect of recency of training on crash involvement, there are wider issues that relate to the general analysis of the relationship between training and crash involvement. Firstly, the analysis is constrained by not knowing the content of the training that riders have undertaken and the wide variety of courses that have been completed. Some courses may have positive effects on crash involvement, others may have no effect or even a negative effect.

This analysis examined the crash involvement of current riders. Therefore it was unable to measure some potential benefits of compulsory training in terms of exposure reduction – making learning to ride less attractive by increasing the expense associated with obtaining a licence, riders being discouraged from further riding by their experiences of rider training (finding out that riding is “not for them”).

## Conclusions

Many of the published evaluations of rider training as a method for reducing crash occurrence and severity were undertaken when most trainees were young novice riders undertaking learner or licence courses. The results of this survey show that many recent trainees are older riders completing advanced courses and so the results of earlier evaluations may no longer be relevant. Difficulties in measuring the effects of training remain. The results of the current study are similar to those of the earlier ones in that they suggest that training is not the strongest predictor of crash involvement and that other factors such as distance ridden and age (or perhaps years of licensing) are more important.

## Acknowledgements

The survey was undertaken by the Monash University Accident Research Centre under a grant from the Motor Accidents Authority of New South Wales. Our special thanks to all the motorcyclists who provided comments on the draft questionnaire, publicised the survey or completed the survey. Ashley Verdoorn and Glenda Cairns made the Internet survey work and Ian Morrison entered the data from paper questionnaires.

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# Characteristics of Rollover Crashes

By Jack McLean, Craig Kloeden, Giulio Ponte  
Centre for Automotive Safety Research, The University of Adelaide  
jack@casr.adelaide.edu.au

*This paper was originally presented at the Australasian Road Safety Research, Policing and Education Conference held at Surfers Paradise, Queensland, 25-27 October 2006.*

## Abstract

This paper analyses data from an in-depth study of rural crashes, supplemented by some data from police reports on crashes, to examine the characteristics of rollover crashes in South Australia. The risk of a crash being a single vehicle rollover increases markedly at higher travelling speeds and eighty per cent of them were initiated by the vehicle running at least partially onto the left unsealed shoulder. Road and traffic related countermeasures such as audio-tactile edge lining and sealed shoulders are noted, as is the potential to reduce the risk of a crash being a single vehicle rollover by reducing rural speed limits. The paper concludes with a brief discussion of the design of vehicles in relation to rollover crashes, including the benefits of electronic stability control.

## Method

A series of 236 rural road crashes to which an ambulance was called within 100 km of Adelaide was investigated by the Road Accident Research Unit (now the Centre for Automotive Safety Research, CASR) between March 1998 and February 2000. Unit personnel attempted, usually successfully, to reach the scene of the crash before the vehicles were moved. Vehicle positions and damage were recorded and the site was mapped and photographed. Participants and witnesses were interviewed in most cases, initially at the scene in some cases and later in follow up interviews. In some fatal cases, where the vehicle positions had been marked by the Police Major Crash Investigation Unit, the CASR investigating team examined the crash scene within 24 hours. This had the effect of increasing the proportion of fatal crashes in the sample.

The sample of crashes investigated is not fully representative of all crashes occurring in the study area because the investigating teams were on call more frequently during daylight hours from Monday to Friday than on weekends. Similarly, night time crashes were under represented, apart from Thursday and Friday nights. However, characteristics associated with single vehicle rollover crashes can reasonably be compared with corresponding characteristics associated with other types of crash in this sample.

Some comparisons are made with data on all reported crashes in South Australia from the Traffic Accident Reporting System

(TARS). These comparisons are influenced by the inclusion of crashes in the metropolitan area of Adelaide in the State-wide TARS data and by differences due to the study area including most of the hill country in the State.

## Rollovers alone and after a collision

Sixty four of the 236 crashes resulted in a vehicle rolling over. There were 19 cases in which a vehicle rolled without any prior collision. Another 21 of these rollovers occurred following a collision with another vehicle and in the remaining 24 single vehicle rollover crashes the vehicle rolled after a collision with a tree or an embankment (Table 1). However, it should be noted that in many of these single vehicle rollovers after a collision with a fixed object it is probable that the vehicle would have rolled over in any event had the collision not occurred.

**Table 1** Rollover crashes and prior collisions

Prior collisions	Number of crashes
No prior collision	19
Collision with fixed object	24
Collision with other vehicle	21
Total	64

## Road alignment and speed limit

Almost half (49%) of the single vehicle rollover crashes occurred on straight sections of road, with about two thirds of the remainder on right hand curves (Table 2). The percentage on straight roads was slightly higher in the TARS cases (57%) which may be due to chance variation but also to the topography of the in-depth study area which, as noted above, covered a much higher proportion of hill terrain than the whole State, which is mainly flat and hence with mostly straight roads. The vehicle movements on straight roads that typically result in rollover are described later in this paper.

**Table 2** Road alignment in single vehicle rollover crashes compared to all other crash types

Road alignment	Rollover	Other	Column % Rollover	Column % Other
Straight	21	117	48.8	60.6
Right curve	13	45	30.2	23.3
Left curve	9	31	20.9	16.1
Total	43	193	100.0	100.0

The default open road speed limit in South Australia is 100 km/h, with most major highways zoned at 110 km/h. Consequently, it is not surprising that over 80 per cent of these single vehicle rollover crashes occurred on roads having a speed limit of at least 100 km/h (Table 3). However, eight of the single vehicle rollover crashes on 100 km/h roads occurred on bends having a posted advisory speed ranging from 25 to 80 km/h. Two of the 16 crashes on 110 km/h roads occurred on bends where an advisory speed was posted (65 and 75 km/h).

Eighty one per cent of these single vehicle rollover crashes occurred on 100 or 110 km/h roads. This is very close to the State-wide figure of 84 per cent for single vehicle rollover crashes. Single vehicle rollover crashes increase as a percentage of all crashes at the higher speed limits, both in the in-depth study data and the State-wide TARS data, to the extent that 30 per cent of all crashes on 110 km/h speed limit roads are single vehicle rollovers, compared with less than 20 per cent on 100 km/h roads (Table 3).

The two crashes which occurred on 60 km/h roads were unusual in that one involved a rigid truck on which the load shifted when cornering and the other an elderly driver whose car ran up onto an embankment for no apparent reason and rolled over.

Some of these crashes were included in a case control study of travelling speed and the risk of crash involvement and so the travelling speed of the vehicle which rolled over was estimated. There were two crashes on 100 km/h speed limit roads where the cars were estimated to have been exceeding the limit by a wide margin (travelling speeds of 150 and 170 km/h).

**Table 3** Speed limit by percentage of single vehicle rollover crashes: In-depth study and State wide

Speed limit	Rollover crashes	Other crashes	% Rollover	% Rollover TARS*
60 km/h	2	32	5.9	0.7
70 km/h	2	4	33.3	1.7
80 km/h	2	32	5.9	4.9
90 km/h	2	7	2.2	7.7
100 km/h	19	81	19.0	18.9
110 km/h	16	37	30.2	30.6
Total	43	193	18.2	6.1

\* Note: Crashes resulting in a fatality or injury requiring at least treatment at hospital in South Australia 1999-2003

### Type of vehicle

A car or car derivative (station wagons and some utilities) accounted for almost three fifths of the vehicles which rolled over in the 64 crashes (Table 4, note that two vehicles rolled over in one crash). What is more interesting, given the relative numbers of vehicles on the roads, is the high percentage (24.6%) of 4WD vehicles, and the fact that three of these 4WD vehicles

were towing trailers. The percentage of semi-trailers in Table 4 (10.8%) may be accounted for in part by the comparatively high exposure of these vehicles in terms of distance travelled but their crash circumstances demonstrated a marked deficit in lateral stability compared to other types of vehicle.

**Table 4** Type of vehicle in all crashes resulting in a rollover

Type of vehicle	Number of vehicles	% of vehicles
Car or car derivative	38	58.5
Semi trailer	7	10.8
Light van	1	1.5
Rigid truck	3	4.6
4WD (three towing a trailer)	16	24.6
Total	65	100.0

Note: Two vehicles rolled in one crash (semitrailer & 4WD)

The percentage of 4WDs among those vehicles which rolled following a collision with another vehicle (31.8%) was higher than it was for single vehicle rollovers (20.9%) (Tables 5 and 6). Conversely, cars were much less likely to be the vehicle which rolled following a collision (45.5%).

**Table 5** Type of vehicle rolling over after colliding with another vehicle

Type of vehicle	Number of vehicles	% of vehicles
Car or car derivative	10	45.5
Semi trailer	3	13.6
Rigid truck	2	9.1
4WD (one towing a trailer)	7	31.8
Total	22	100.0

Note: Two vehicles rolled in one crash (semi trailer & 4WD)

Two thirds of the crashes in which a vehicle rolled over involved only that vehicle and almost two thirds (65.1%) of the vehicles in these single vehicle rollovers were cars or car derivatives (Table 6). The relative involvement of cars compared to other vehicles (mostly 4WDs) differed markedly however depending on whether or not the vehicle struck a fixed object, usually a tree, before rolling over. In the cases involving no prior impact, 42.1 per cent of the vehicles were cars whereas the corresponding percentage for cars in rollover crashes with a prior impact was 83.3 per cent (Tables 7 and 8, respectively). This does not mean that none of the cars which rolled following a collision with a fixed object would not have rolled had that collision not have occurred. As mentioned above, it is likely that a rollover would still have occurred in many of these cases. The evidence for this is presented later in this paper.

The numbers of cases involving 4WD vehicles in Tables 7 and 8 are too small to provide a reliable comparison with the corresponding data for cars presented in the previous paragraph but the percentages are consistent with 4WD vehicles rolling over before they have travelled out of control far enough to collide with a fixed object.

**Table 6** Type of vehicle in single vehicle rollover crashes

Type of vehicle	Number of vehicles	% of vehicles
Car or car derivative	28	65.1
Semi trailer	4	9.3
Light van	1	2.3
Rigid truck	1	2.3
4WD (two towing a trailer)	9	20.9
Total	43	100.0

**Table 7** Type of vehicle in single vehicle rollover crashes without prior collision with a fixed object

Type of vehicle	Number of vehicles	% of vehicles
Car or car derivative	8	42.1
Semi trailer	3	15.8
Rigid truck	1	5.3
4WD (two towing a trailer)	7	36.8
Total	19	100.0

**Table 8** Type of vehicle in single vehicle rollover crashes with a prior collision with a fixed object

Type of vehicle	Number of vehicles	% of vehicles
Car or car derivative	20	83.3
Semi trailer	1	4.2
Light van	1	4.2
4WD	2	10.5
Total	24	100.0

The percentage of each of the above types of vehicle involved in a single vehicle rollover is compared with all vehicles of that type involved in the crashes investigated in the in-depth study in Table 9. The two types of vehicle that have by far the highest rate of single vehicle rollover, given involvement in a crash, are 4WDs and semi-trailers. This is consistent with the corresponding State-wide TARS data, as far as the types of vehicle can be compared. Once again, the higher percentage of all types of vehicle involved in single vehicle rollovers in the in-depth study is probably mainly a reflection of differences in topography.

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*The two types of vehicle that have by far the highest rate of single vehicle rollover, given involvement in a crash, are 4WDs and semi-trailers. This is consistent with the corresponding State-wide TARS data, as far as the types of vehicle can be compared.*

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**Table 9** Type of vehicle in single vehicle rollover crashes compared to vehicles involved in all other crash types and TARS data

Type of vehicle	Rollover	Other	% Rollover	% Rollover TARS <sup>1</sup>
Car	28	247	10.2	3.6
4WD	9 <sup>2</sup>	25 <sup>3</sup>	26.5	10.7
Semi trailer	4	13	23.5	–
Rigid truck	1	14	6.7	–
Van	1	15	6.3	4.5
Total	43	314	12.0	4.15
All trucks	5 <sup>4</sup>	27 <sup>4</sup>	15.6 <sup>4</sup>	9.5

Notes: 1 See note to Table 3; 2 Two towing a trailer; 3 One towing a trailer; 4 Included above

### Driver characteristics

The age distribution of the drivers involved in single vehicle rollover crashes was very similar to that for all other drivers in this sample of crashes. There were eight drivers under 20 years of age and they were all on Provisional licences. They represented 18.6 per cent of all of these 43 drivers, slightly more than the 14.4 per cent of those drivers in this age group involved in the other types of crash in this study sample. Overall, however the percentage of drivers under 30 years of age was almost exactly the same in both groups of drivers (37.2% for those in single vehicle rollovers and 37.7% for the remainder). This is consistent with the results from the TARS data, which showed little difference in the age distribution of these two groups of drivers apart from an apparent over representation of drivers in the 16 to 18 year age range.

There were more male than female drivers involved in single vehicle rollover crashes but the difference was small (55.8% were male) and less than for the other types of crash in the in-depth study sample (62.6%). There was some difference in the percentage of all male drivers in this sample who were involved in single vehicle rollover crashes compared with other types of crash (10.9%) and the corresponding percentage for female drivers (14.0%) but it was not statistically significant ( $p=0.389$ , Chi square=0.74). The corresponding percentages for the State-wide single vehicle crash data were 4.2 and 4.1 per cent respectively (Table 10).

**Table 10** Sex of drivers involved in single vehicle rollover crashes compared to drivers involved in all other crash types

Sex of driver	Rollover	Other	% Rollover
Male	24	196	10.9
Female	19	117	14.0
Total	43	313	12.1

**Table 11** Licence status of drivers involved in single vehicle rollover crashes compared to drivers involved in all other crash types and TARS data

Licence status	Rollover	Other	% Rollover	%TARS
Learner	–	–	–	8.2
Provisional	8	45	15.1	5.0
Full	35	275	11.3	3.1
Unlicensed	–	–	–	8.6
Total	43	313	12.1	4.1

Drivers operating on a Provisional licence had a higher rate of involvement in single vehicle crashes than in other types of crash but not to a statistically significant degree (Table 11). However, a slightly larger difference was observed in the TARS data and it was statistically significant, as would be expected with the much larger number of cases.

### Injury severity

Injury severity is expressed here in terms of the level of treatment required or, for fatal cases, the outcome. The distribution of the maximum injury severity in each of these single vehicle rollover crashes is shown in Table 12.

**Table 12** Maximum injury severity in single vehicle rollover crashes

Maximum injury severity	Number of crashes	% of crashes
Property damage only*	9	20.9
Treatment at hospital	18	27.9
Admission to hospital	14	32.6
Fatal	8	18.6
Total	43	100.0

\* Note: Includes some cases involving injuries treated by private doctor

The percentage of fatal crashes is larger than would be expected in a representative sample of crashes for the reason noted earlier in this paper.

The comparison of the distribution of injury severities between single vehicle rollover crashes and other crashes shown in Table 13 provides a more meaningful assessment of the importance of single vehicle rollover crashes. Bearing in mind that the criterion for entry into this sample of crashes was that an ambulance be called, it is notable that over one third of all of the occupants involved did not require ambulance transport (36.3% of the 571 occupants). However less than 20 per cent of the occupants in single vehicle rollover crashes were in that category compared with 38 per cent of vehicle occupants in other types of crash ( $p=0.004$ , Chi square=8.12). This difference was accounted for mainly by a higher percentage of the rollover cases requiring treatment at hospital, but not admission, and a higher percentage who were fatally injured. In other words, occupants in a single vehicle rollover were more likely to be injured to a degree requiring transport to hospital by ambulance but no more likely to be admitted to

**Table 13** Injury severity of occupants in single vehicle rollover crashes compared to occupants involved in all other crash types

Injury severity	Rollover	Other	Column % Rollover	Column % Other
Property damage only*	12	195	19.7	38.2
Treatment at hospital	22	127	36.1	24.9
Admission to hospital	18	138	29.5	27.1
Fatal	9*	50	14.8	9.8
Total	61	510	100.0	100.0

\* Note: Includes some cases involving injuries treated by private doctor and two occupants of one car were fatally injured

hospital. The higher percentage of rollover cases resulting in a fatal injury was within the bounds of chance variation, and partially due to the method of inclusion of such cases.

There was no meaningful difference in the maximum injury severity distributions between single vehicle rollover crashes with and without a collision with a fixed object but the number of cases was small in each group.

### Seat belt use, injury severity and ejection

Eighty per cent of the most severely injured occupants (the most severely injured in each of the single vehicle rollover crashes) were wearing a seat belt in the crash, based on the 40 out of 43 crashes for which this information was available. There was a clear negative association between belt use and injury severity, as can be seen in Table 14. Comparing admission to hospital and fatal with less severe and no injury with respect to belt use yielded a statistically different difference ( $p=0.033$ , Chi square (corrected)=4.57).

**Table 14** Maximum injury severity of occupants in single vehicle rollover crashes by seat belt use

Maximum injury severity	Belt worn	Belt not worn	Belt use unknown	% Worn (known)
Property damage only*	9	–	–	100.0
Treatment at hospital	11	1	–	91.7
Admission to hospital	19	4	1	69.2
Fatal	3	3	2	50.0
Total	32	8	3	80.0

\* Note: Includes some cases involving injuries treated by private doctor

Similarly, four of the eight most severely injured occupants per vehicle who were not wearing a seat belt were ejected in the crash, compared with none of the 31 who were wearing a seat belt (Table 15).

**Table 15** Occupant ejection from the vehicle in single vehicle rollover crashes by seat belt use

Ejection	Belt worn	Belt not worn	Belt use unknown	% Worn (known)
Yes	–	4	1	0.0
No	31	4	–	88.6
Unknown	1	–	2	–
Total	32	8	3	80.0

Finally, the five ejected occupants included three of the seven fatalities for whom ejection status could be determined (Table 16).

**Table 16** Maximum injury severity of occupants in single vehicle rollover crashes by ejection from the vehicle

Maximum injury severity	Ejected	Not ejected	Ejection unknown	% Ejected (known)
Property damage only*	–	9	–	0.0
Treatment at hospital	1	10	1	9.1
Admission to hospital	1	12	1	7.7
Fatal	3	4	1	42.9
Total	5	35	3	12.5

\* Note: Includes some cases involving injuries treated by private doctor

**Vehicle movements preceding rollover**

Most of the cars involved in single vehicle rollovers in this sample of crashes were travelling on a straight road (Table 17). Two of these crashes were not relevant to this consideration of

**Table 17** Cars in single vehicle rollover casualty crashes by road alignment and initial and final off road excursion

Road alignment	Initial off road excursion on:		Final off road excursion on:	
	Left	Right	Left	Right
Straight	12 (4) <sup>1</sup>	2 (1)	5	4
Right curve	6 (2)	2 (2)	3	1
Left curve	3 (2)	1	1	1
Total <sup>2</sup>	21 (8)	5 (3)	9	6

Notes:

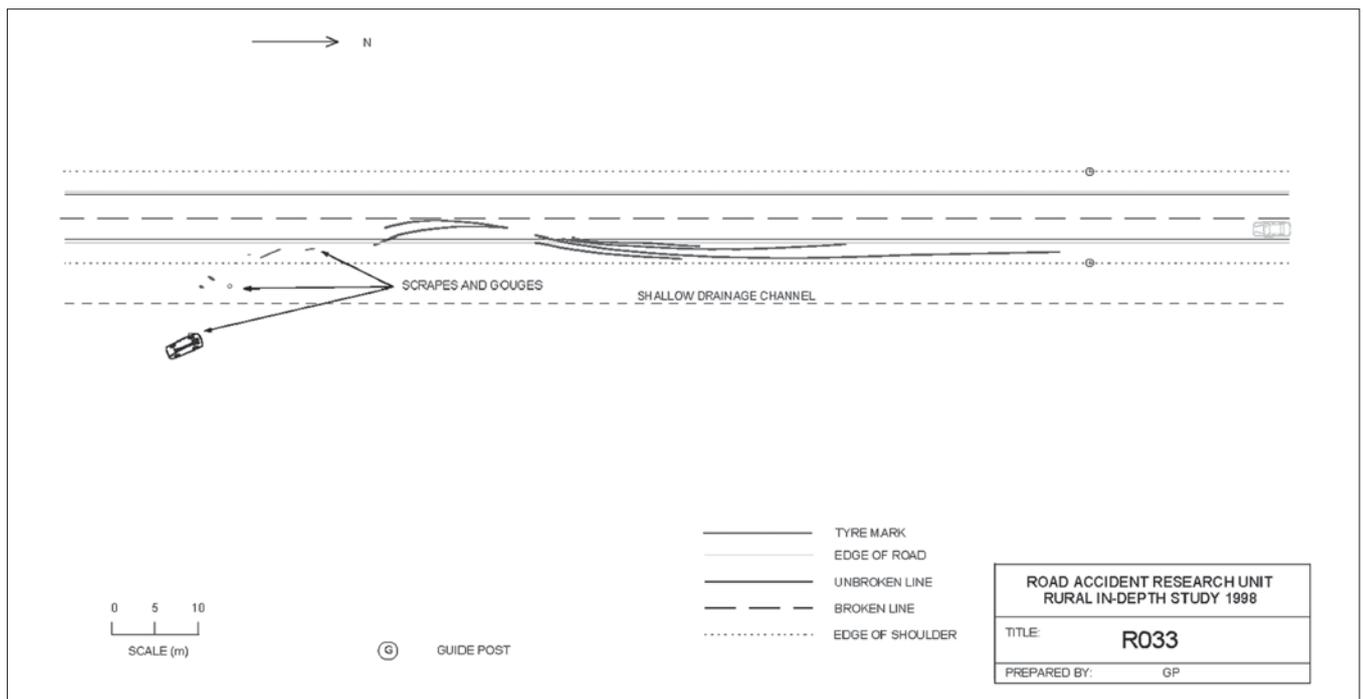
- 1 Number in parentheses indicates that the initial off road excursion was also the final one
- 2 Two cases have been omitted (see text)

vehicle movements preceding rollover. One simply involved a car running off the road and along an embankment for no apparent reason. The elderly driver ceased driving following that accident. Another crash was thought probably to have been intentional.

In every case the car that rolled over yawed out of control before rolling. The typical vehicle movement that precipitated the loss of control was running gradually across to the left until the left hand wheels ran onto the unsealed gravel shoulder when the driver swerved back to the right and then overcorrected to the left, as shown in the site diagram of one such crash. (Figure 1)

There were more single car rollovers on right hand rather than left hand curves, but together they still accounted for fewer crashes than the single car rollovers on straight sections of road (Table 17).

**Figure 1** Site diagram showing tyre marks from initial off road excursion and overcorrection back to the left. Case R033



## 4WDs in single vehicle rollovers

There were nine single vehicle rollovers involving a 4WD vehicle. In one of these the vehicle rolled on a winding downhill section of a divided highway but, despite rolling several times, remained on the two lanes for traffic in its direction of travel. There were also two cases in which the initial loss of control was either precipitated by, or strongly influenced by, a trailer which was being towed by the 4WD vehicle. One of these two crashes occurred on a straight road when the trailer began to oscillate behind the short wheelbase 4WD and the other on a gradual left hand curve during an overtaking manoeuvre.

The number of cases involving 4WDs is too small to provide a reliable basis for comparison with single vehicle rollovers involving cars but two thirds of the nine cases occurred on curves whereas less than half of the car crashes were initiated on curves (Table 18).

**Table 18** 4WDs in single vehicle rollover casualty crashes by road alignment and initial and final off road excursion

Road alignment	Initial off road excursion on:		Final off road excursion on:	
	Left	Right	Left	Right
Straight	2 (1) <sup>1</sup>	1 (1)	1	–
Right curve	1 (1)	–	–	–
Left curve <sup>2</sup>	3 (2)	1	1	1
Total	6 (4)	2 (1)	2	1

### Notes:

- 1 Number in parentheses indicates that the initial was also the final off road excursion  
 2 There was one case, not listed here, in which the vehicle rolled on a winding road without leaving the paved roadway

## Vehicle Characteristics and Rollover Prevention

### Rollover resistance ratings

Until the early 1990s attention was focussed primarily on the static lateral stability of a vehicle as a measure of the risk of that vehicle rolling over in a turn or emergency evasive manoeuvre. Lateral stability, commonly referred to as the Static Stability Factor (SSF), is measured as a function of the track of the vehicle in relation to the height of its centre of gravity.

The United States New Car Assessment Program (NCAP) rollover resistance rating is primarily based on the Static Stability Factor for the following reason:

“About 95% of rollovers are tripped – meaning the vehicle struck something low, such as a curb or shallow ditch, causing it to tip over. The Static Stability Factor (SSF) is specifically designed to measure this more common type of rollover and thus plays a significantly larger role in a vehicle’s star rating” .... “than the results of the dynamic maneuvering test.”

The “dynamic maneuvering test” (see: [www.safercar.gov](http://www.safercar.gov)) measures whether a vehicle tips up in a “fishhook” or Road Edge Recovery manoeuvre which, as its name indicates, is very similar to the motion which results from a driver allowing a vehicle to run off onto the unsealed shoulder and swerve abruptly back onto the road, often then overcorrecting back to the left, as was commonly the case in the rollover crashes reviewed here.

### Electronic stability control

Electronic stability control (ESC) uses technology which is an extension of the antilock braking system (ABS) which is fitted to most new cars. (The terminology for ESC varies from one manufacturer to another but the technology is similar.) Additional sensors monitor the steering angle and rotation around the vertical axis of the vehicle. When they detect that the vehicle is not travelling in the direction indicated by the position of the steering wheel the ESC system automatically applies the brake on one or more wheels to help the driver to maintain control over the vehicle.

The Insurance Institute for Highway Safety has reported that cars and SUVs equipped with ESC had 77 per cent and 80 per cent respectively fewer fatal single vehicle rollover crashes than the same make and model without ESC. (IIHS, 2006)

## Discussion

The risk of a casualty crash being a single vehicle rollover increases markedly at higher travelling speeds, as indicated by the speed limit of the road on which the crash occurs. This adds strong support to the case for reductions in the higher speed limits in rural areas.

Eighty per cent of the single car rollover crashes in the in-depth study sample were initiated by the car running at least partially onto the left unsealed shoulder. Countermeasures such as audio-tactile edge lining and sealing the shoulder could be expected to reduce the frequency of out of lane excursions and the loss of control in those excursions that do occur.

As already noted, in every case in this in-depth study in which a car rolled in a single vehicle crash it yawed out of control before rolling over. It is clear that the introduction of electronic stability control has great potential to achieve similar savings from crash reduction in Australia as has been the case in the United States.

It is recommended that consideration be given to allocating a substantial proportion of road safety publicity budgets to publicising the safety benefits of electronic stability control, as has been done by the Swedish Road Administration (Tingvall, 2005) to encourage both the provision of ESC on new vehicles and the purchase of vehicles so equipped.

## **Acknowledgements**

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

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# Why Do Older Drivers Have a High Rate of Involvement in Casualty Accidents Per Distance Driven?<sup>1,2</sup>

By John Catchpole, Senior Research Scientist, ARRB Group Ltd  
john.catchpole@arrb.com.au

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## Abstract

This study investigated the rate of involvement in casualty accidents per distance driven for Victorian drivers of various ages and the factors that contribute to the over-representation of older drivers in casualty accidents. The study drew on records of all drivers involved in casualty accidents in Victoria from 1998 to 2004, inclusive; and on the Melbourne On-Road Exposure Survey of 2001, which generated estimates of the distance driven on arterial roads in Melbourne by various demographic groups during a typical non-holiday week. The rate of involvement in casualty accidents per distance driven followed a U-shaped curve, being lowest for drivers aged 40-49 years and higher for both younger and older drivers, especially those aged less than 26 and those aged more than 70 years. The study identified a range of environments and manoeuvres associated with over-representation of older drivers in accidents. There is evidence that changing exposure patterns, increasing physical frailty and declining driving competence all contribute to the elevated rate of casualty accident involvement per distance driven for older drivers.

## Melbourne On-Road Exposure Survey

*Exposure* is the opportunity for a road user to be involved in a traffic accident, usually measured by the amount of travel by the road user on the road network. Information about the exposure of various road user groups can be used to calculate accident rates per unit exposure, so that the risk associated with road travel can be compared between road user groups. Since 1984, VicRoads has conducted an irregular series of surveys, known as the Melbourne On-Road Exposure Surveys, to collect information about the exposure of drivers of light passenger vehicles on arterial roads in Melbourne.

The most recent Melbourne On-Road Exposure Survey was conducted in autumn 2001. The survey was conducted on weekdays and weekends, but excluded school holidays and public holidays. Information about drivers and vehicles was collected by teams of two (an observer and an interviewer) at 64 signalised intersections in the Melbourne Statistical Division. The 64 sites comprised two sites in each of Melbourne's 31 Local Government Areas (LGAs) plus two in Docklands. Sites with extremely high or extremely low traffic flows were avoided.

To allow drivers to be interviewed and observations of vehicles and occupants to be made, interviewers pressed the pedestrian call button to stop vehicles at a red signal. For safety reasons, interviewers and observers operated exclusively from the central median and did not step onto the roadway. This meant that sampling was restricted to vehicles in the lane nearest the median, which was often a right turn lane. Most sites were located on primary arterials, since secondary arterials were less likely to have a central median with a pedestrian call button. Among other questions, the interviewer asked the age of the driver. For drivers who refused to be interviewed or did not give their age, the interviewer's estimate of the driver's age was used instead. Apart from assisting the interviewer to collect information about sampled vehicles in the lane nearest the median, the observer also counted all vehicles passing the survey site in all lanes.

Drivers of cars, station wagons, utilities, small 4-wheel drives, multi-passenger vehicles (up to 12 seats) and small 4-wheeled vans were included in the survey. No information was collected about travel by bicycle, motorcycle, bus or truck.

Expansion weights were applied to the counts of sampled vehicles at each site in each LGA to yield estimates of the total distance travelled in the LGA during one week by vehicles and drivers of various types. In the first step, counts of vehicles sampled and drivers interviewed were weighted up to be representative of all vehicles passing the survey site in all lanes during the survey session (using the count of all passing vehicles kept by the observer). Second, data for vehicles passing during the survey sessions conducted at the site at various times were weighted up to be representative of all vehicles passing the site during a full week. In the third step, the number of vehicles passing the survey site during the week was multiplied by the total length of arterial road in the LGA to yield an estimate of the total distance travelled on arterial roads in the LGA during the week<sup>3</sup>.

1 The author gratefully acknowledges the valuable contributions to the research made by Victoria Pyta, Dr Tanya Styles, Kelly Imberger and Dr Peter Cairney of ARRB and by Pat Rogerson and Tricia Williams of VicRoads.

2 This paper provides a summary of selected findings from a project carried out by ARRB Group for VicRoads. For a full report of the research, see Catchpole, Styles, Pyta and Imberger (2005).

3 It can be shown that this method yields a valid estimate of total travel in the LGA that is not dependent on assumptions about the distance travelled by each vehicle sampled.

Finally, a correction factor was applied to take account of above average or below average traffic flow at the survey site as compared with the entire arterial network in the LGA (making use of vehicle counts collected by traffic signal controllers at signalised intersections throughout the LGA).

### Driving exposure by age group

The survey yielded estimates of the total distance driven on arterial roads in Melbourne in one week by drivers in each of 15 age groups. The estimated weekly distance driven on Melbourne arterials by drivers in each age group was reported by Steer Davies Gleave (2002). These estimates are shown graphically in Figure 1.

The chart shows that drivers aged 35-39 and 40-44 years account for more driving exposure in Melbourne than any other age group. The total distance driven each week by drivers aged 60-64 years is just less than a quarter of the total distance driven by drivers aged 40-44 years. Out of an estimated total of 327.0 million km driven on arterial roads in Melbourne each week, drivers aged 65 years or more account for just 14.1 million km or 4.3%. The distance driven by males is substantially greater than the distance driven by females in every age group except drivers aged 16-17 years. The relative

difference between males and females is especially large for drivers aged 60 years or more.

### Generalising the exposure findings

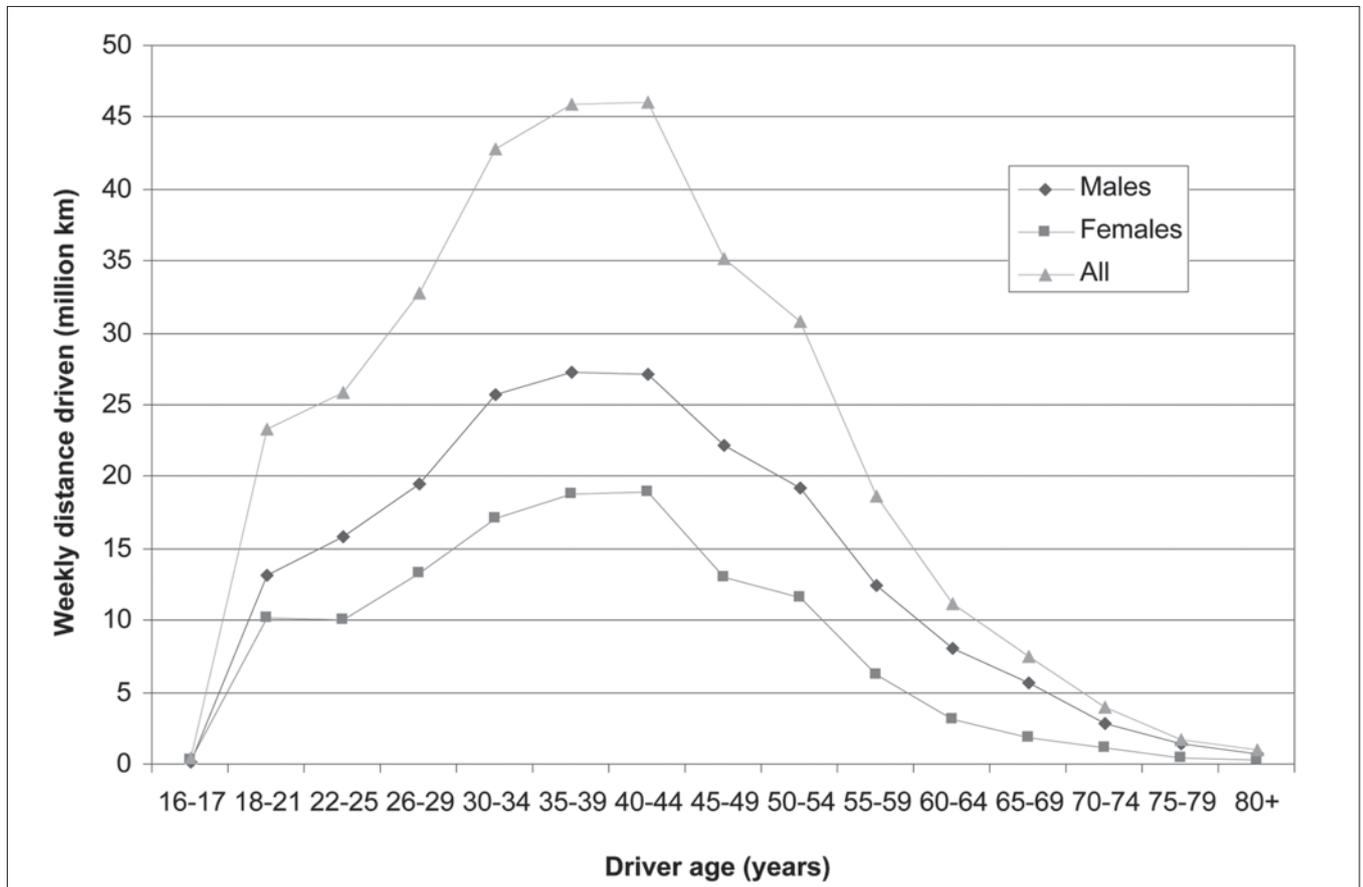
The exposure information reported by Steer Davies Gleave (2002) has previously been used by Drummond (2003) to calculate the rate of accident involvement per distance driven for various age groups. However, the rates calculated by Drummond applied only to accidents and exposure on arterial roads in the Melbourne Statistical Division during non-holiday weeks.

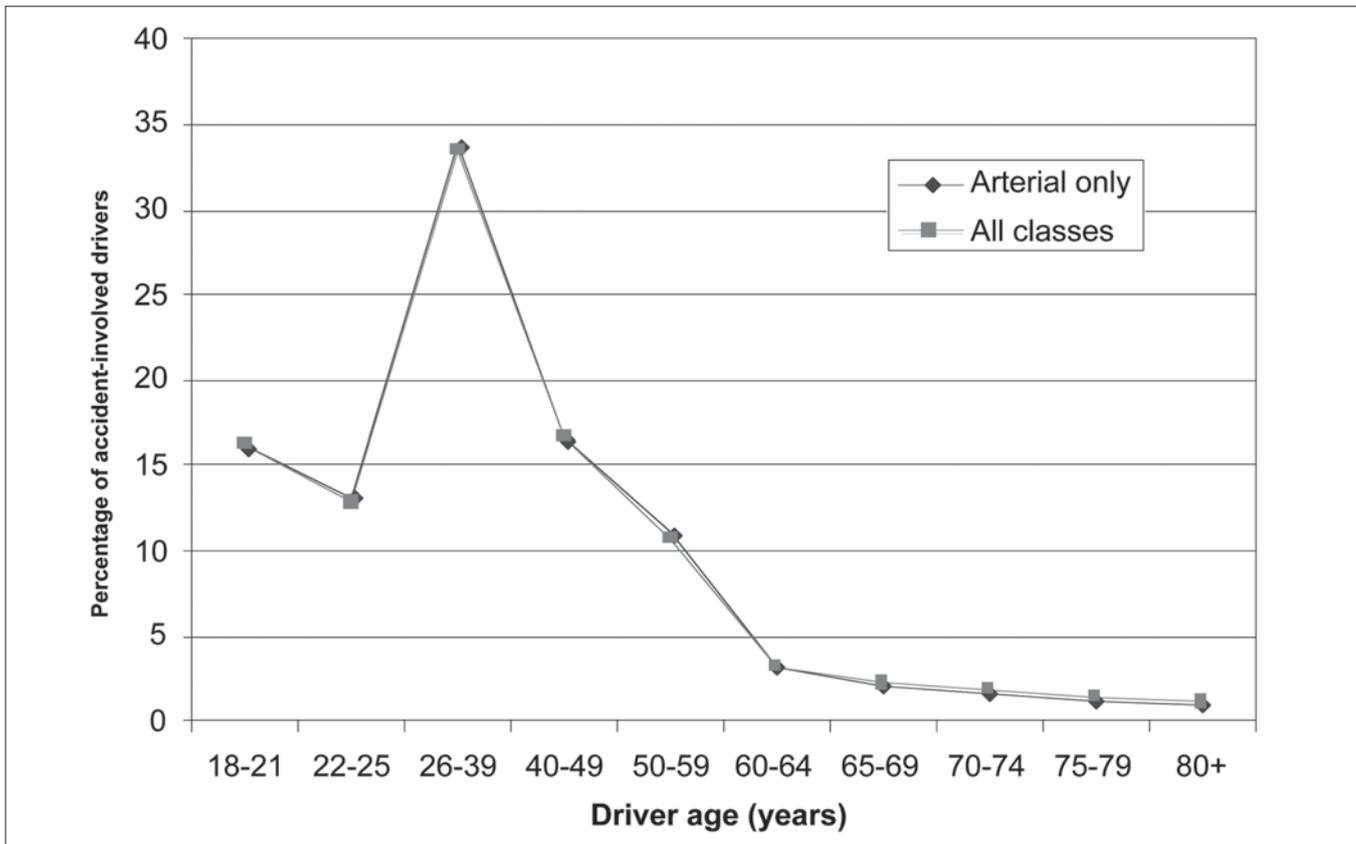
Using information about drivers of light passenger vehicles involved in casualty accidents in Victoria from 1998 to 2004, the project team investigated whether the exposure data from the 2001 Melbourne On-Road Exposure Survey could be used to calculate accident involvement rates for the whole of the Victorian road network and for all times of year.

### Region of Victoria

Analysis of data on drivers involved in casualty accidents revealed noticeable differences between the driver age profiles for the Melbourne Statistical Division and the rest of Victoria. In particular, drivers aged 65 years or more comprised only

Figure 1. Total distance driven on arterial roads in Melbourne each week during non-holiday periods by driver age and sex.



**Figure 2.** Percentage of accident-involved drivers by age group for accidents on arterial roads and accidents on all Melbourne roads.

6.7% of drivers in casualty accidents in the Melbourne Statistical Division but 11.0% in the rest of Victoria. This suggests EITHER that drivers aged 65 years or more account for a lower proportion of all driving exposure in Melbourne than in the rest of Victoria OR that the relative accident rate per distance driven of drivers aged 65 or more (relative to younger age groups) is lower in Melbourne than in the rest of Victoria. No matter which of these explanations is true, it is clear that exposure data collected only in Melbourne cannot be used to calculate accident rates that apply to the whole of Victoria.

### Road class

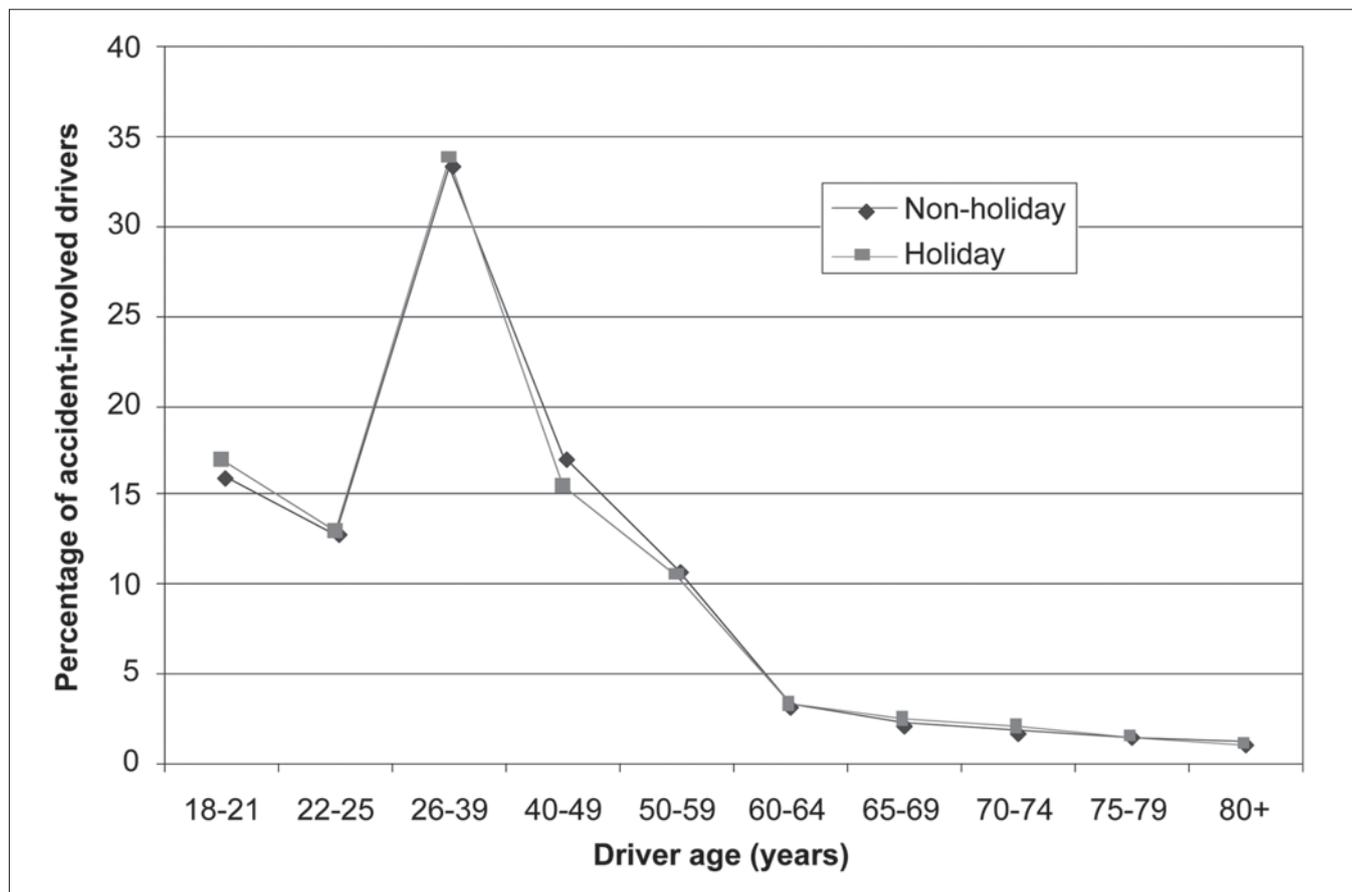
Some differences were found between the age profiles of drivers involved in accidents on different road classes in Melbourne. Drivers aged 65 or more comprised a relatively small proportion of drivers involved in accidents on freeways (3.8%), a higher proportion of drivers involved in accidents on arterial roads (6.1%) and a higher proportion again on local roads (7.7%). However, the under-representation of older drivers in freeway accidents (relative to arterial road accidents) partly compensates for their over-representation in local road accidents, so that the overall representation of drivers aged 65 or more in accidents across all road classes (6.7%) does not differ greatly from their representation on arterial roads (6.1%). The similarity of the age profiles of accident-involved

drivers on arterial roads and all road classes is illustrated in Figure 2. While it seems likely that the relative exposure of various age groups does vary between road functional classes, it appears probable that exposure patterns on arterial roads are reasonably representative of total exposure across all road classes. Consequently, the results of the on-road exposure survey can be used to estimate relative rates of accident involvement for each age group on all Melbourne roads.

### Time of year

As shown in Figure 3 (on the next page), the age profile of drivers involved in accidents in Melbourne is very similar for holiday and non-holiday periods. Drivers aged 65 years or more comprise 7.0% of drivers involved in accidents in Melbourne on school and public holidays and 6.6% at other times. Whilst there are, no doubt, differences in exposure patterns between holiday and non-holiday periods, there is nothing in this chart to indicate that the proportion of overall exposure accounted for by drivers in each age group differs greatly between holiday and non-holiday periods. Thus it seems reasonable to assume that the relative exposure of various age groups during non-holiday periods is fairly representative of relative exposure across the whole year. The results of the on-road exposure survey can therefore be used to estimate relative rates of accident involvement for each age group for the whole year.

Figure 3. Percentage of accident-involved drivers by age group for accidents in Melbourne during holiday and non-holiday periods.



### Relative rate of casualty accident involvement per distance driven

The calculation of relative rates of accident involvement was based on counts of drivers aged 18 years or more driving light passenger vehicles<sup>4</sup> involved in casualty accidents on all roads in the Melbourne Statistical Division from 1998 to 2004 (inclusive). Steer Davies Gleave (2002) provided estimates of exposure only for a single, non-holiday week and only for arterial roads. Thus it was not possible to calculate absolute rates of accident involvement per distance driven. Instead, relative rates were calculated, with the rates for each age group being expressed relative to the rate for drivers aged 40-49 years, the group with the lowest rate of accident involvement.

Using counts of drivers involved in casualty accidents on all roads in the Melbourne Statistical Division from 1998 to 2004 and estimates of exposure on arterial roads in the Melbourne Statistical Division from the Melbourne On-Road Exposure Survey of 2001, four relative rates were calculated:

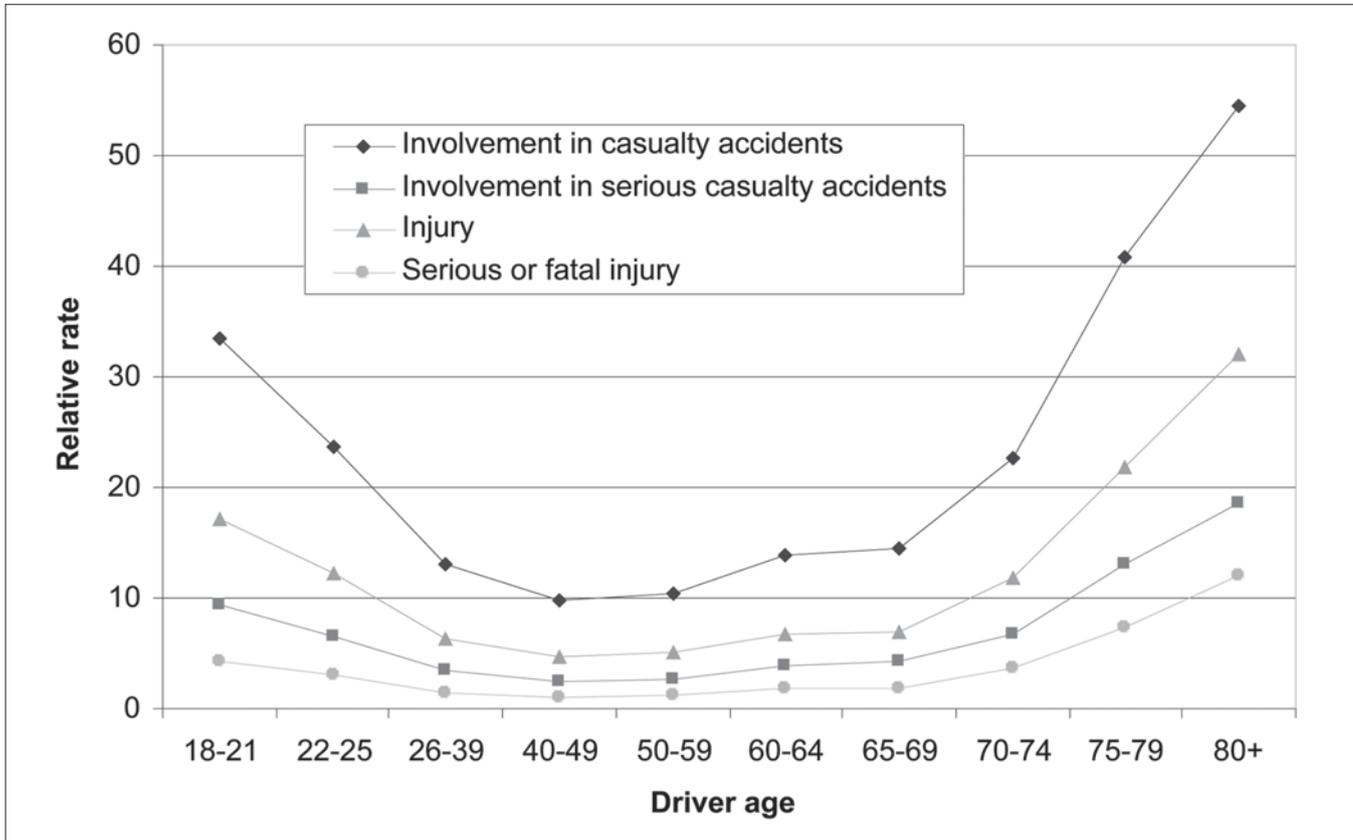
- the rate of involvement in casualty accidents per distance driven

- the rate of involvement in serious casualty (serious injury or fatal) accidents per distance driven
- the rate of injury per distance driven
- the rate of serious or fatal injury per distance driven.

The four relative rates are shown for all age groups in Figure 4. All rates are relative to a rate of 1.0 for serious or fatal injury among 40-49 year old drivers. For all age groups, the rate of driver injury is lower than the rate of driver involvement in casualty accidents because not all casualty accidents result in an injury to the driver (it may be a pedestrian or a passenger or an occupant of the other vehicle who is injured). The rate of involvement in serious casualty accidents is lower than the rate of involvement in casualty accidents and the rate of serious or fatal injury is lower than the rate of injury because serious and fatal injuries comprise a subset of all injuries. All four rates rise steeply for drivers aged 70 years or more (and for drivers aged 25 or less).

Relative standard errors and 99% confidence intervals were calculated for the relative rates of involvement in casualty accidents. Tests based on relative standard errors revealed that all age groups other than 50-59 year olds have a rate of involvement in casualty accidents per distance driven that is significantly higher than the rate for 40-49 year olds.

<sup>4</sup> Light passenger vehicles comprise cars, station wagons, utilities, panel vans and 9-13 seat mini-buses.

**Figure 4.** Relative rate of accident involvement and injury per distance driven by driver age group for accidents in the Melbourne Statistical Division.

The relative rate of involvement in casualty accidents per distance driven is shown for males and females in Figure 5 (on the next page). All rates are relative to 40-49 year old males. For 18-21 year old drivers, the rate for males is higher than the rate for females, but the reverse is true for all remaining age groups. All groups except males aged 50-59 years and females aged 75 years or more have a significantly higher rate of involvement in casualty accidents per distance driven than males aged 40-49 years. For males aged 50-59, the rate is only 8% higher than for males aged 40-49 and the difference is not significant. The elevated rate for females aged 75 years or more is not significant because of the very small sample size for this group in the exposure survey.

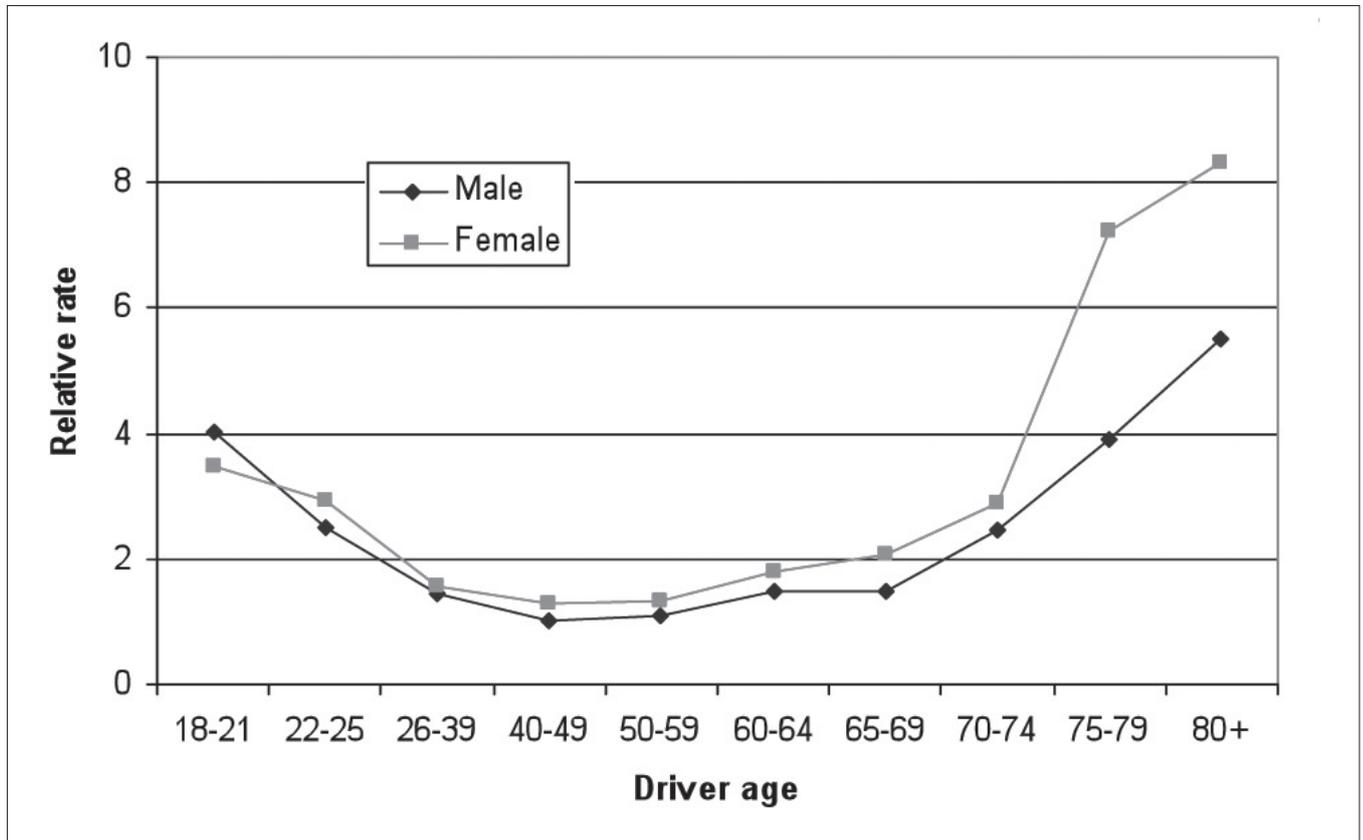
### Characteristics of older driver casualty accidents

In order to get an indication of the factors that contribute to the elevated casualty accident rates of older drivers, data on drivers of light passenger vehicles involved in casualty accidents on all Victorian roads from 1998 to 2004 (inclusive) were examined in greater depth to identify differences between the accidents in which older drivers are involved and those involving young and middle-aged drivers. In view of the very large sample size for this analysis (169,745 drivers of all ages involved in casualty accidents), tests of statistical significance

were not required and the differences identified by the analysis can be assumed to be statistically reliable. The differences identified include the following:

- (1) By comparison with young and middle-aged drivers, older drivers are over-represented in accidents at intersections. The proportion of accidents at intersections is 64.3% for drivers aged 65 or more, compared with 58.6% for drivers aged 40-49 and 57.4% for all drivers aged 18-64 years.
- (2) Older drivers are over-represented in accidents at Stop and Give Way signs. The proportion of accidents at Stop and Give Way signs is 18.4% for drivers aged 65 or more, compared with 8.3% for drivers aged 40-49 and 7.8% for all drivers aged 18-64 years. Older drivers are also slightly over-represented in accidents at pedestrian signals.
- (3) Older drivers are over-represented in accidents in 50 km/h and 60 km/h zones. The proportion of accidents in 50 km/h zones is 9.3% for drivers aged 70 or more, compared with 6.7% for drivers aged 40-49 years. The proportion of accidents in 60 km/h zones is 56.1% for drivers aged 75 or more compared with 52.9% for drivers aged 40-49.
- (4) Examination of the vehicle movements being performed at the time of the accident revealed that older drivers are over-represented performing a variety of low-speed manoeuvres. Drivers aged 60 or more are over-represented in accidents that occur while performing U-turns and

Figure 5. Relative rate of involvement in casualty accidents per distance driven by driver gender and age group for accidents in the Melbourne Statistical Division



entering or leaving parking spaces. Drivers aged 65 or more are over-represented making right turns. Drivers aged 70 or more are over-represented in accidents that occur while reversing or leaving a driveway.

- (5) Older drivers are over-represented in a variety of accident types that are suggestive of the driver having insufficient control of the vehicle, including collisions with fixed objects, temporary road works, stationary vehicles and parked vehicles. However, failure to detect the object struck cannot be ruled out as an alternative explanation for some of these collisions, especially those that involve reversing into a parked vehicle or fixed object.
- (6) Older drivers are over-represented in a variety of roles that apparently involve failing to give way (including, among others, driving a right-turning vehicle that is struck by an oncoming vehicle or a vehicle approaching from the right) or encroaching on another vehicle’s space (including unsafe lane changes and side swipes).
- (7) For all multi-vehicle accidents<sup>5</sup>, VicRoads assigns the labels ‘Vehicle 1’ and ‘Vehicle 2’ to the two vehicles involved in the initial collision on the basis of the movement being undertaken by each vehicle at the time of the collision. Examining the movements being performed by Vehicles 1 and 2 in the various multi-vehicle accident types shows that the driver of Vehicle 1 is more likely to

be at fault than the driver of Vehicle 2 in most multi-vehicle accidents (other than cross-traffic accidents). In multi-vehicle accidents, older drivers are over-represented as the driver of Vehicle 1. The proportion of drivers in multi-vehicle accidents recorded as driving Vehicle 1 is 53.5% for drivers aged 60 or more, compared with 39.9% for drivers aged 40-49 and 41.5% for drivers aged 26-59.

- (8) Older drivers are under-represented as the driver of the front vehicle in a rear-end accident and as the driver of a vehicle not involved in the initial collision. Drivers in these roles are typically the innocent parties in accidents caused by errors of other drivers.
- (9) Despite their apparent difficulties with vehicle control and encroaching on the space of other vehicles, older drivers were found NOT to be over-represented in run-off-road accidents, loss of control while overtaking or head on collisions while overtaking. All of these accident types, typically involving high speeds, were found to be much more characteristic of young drivers.

<sup>5</sup> For the purposes of this analysis, a multi-vehicle accident is one in which the first harmful event is a collision between two vehicles, neither of which is parked.

### Factors contributing to high accident rates

A recent New Zealand study (Keall and Frith, 2004) found that older drivers undertake shorter trips, on average, than young and middle-aged drivers. It is reasonable to suppose that a similar pattern would apply in Victoria. This implies that the low speed manoeuvres associated with the start or finish of almost every trip, such as parking or leaving parking, entering or leaving a driveway, driving on local streets and entering the arterial road network, would comprise a greater proportion of the total risk associated with each trip for older drivers than for young and middle-aged drivers. Consistent with this hypothesis, older drivers were found to be over-represented in most of the manoeuvres mentioned and also in accidents in 50 km/h and 60 km/h zones. Thus it appears that many of the characteristics typically associated with older driver accidents may be partly or even largely the result of older drivers typically making shorter trips than young and middle-aged drivers.

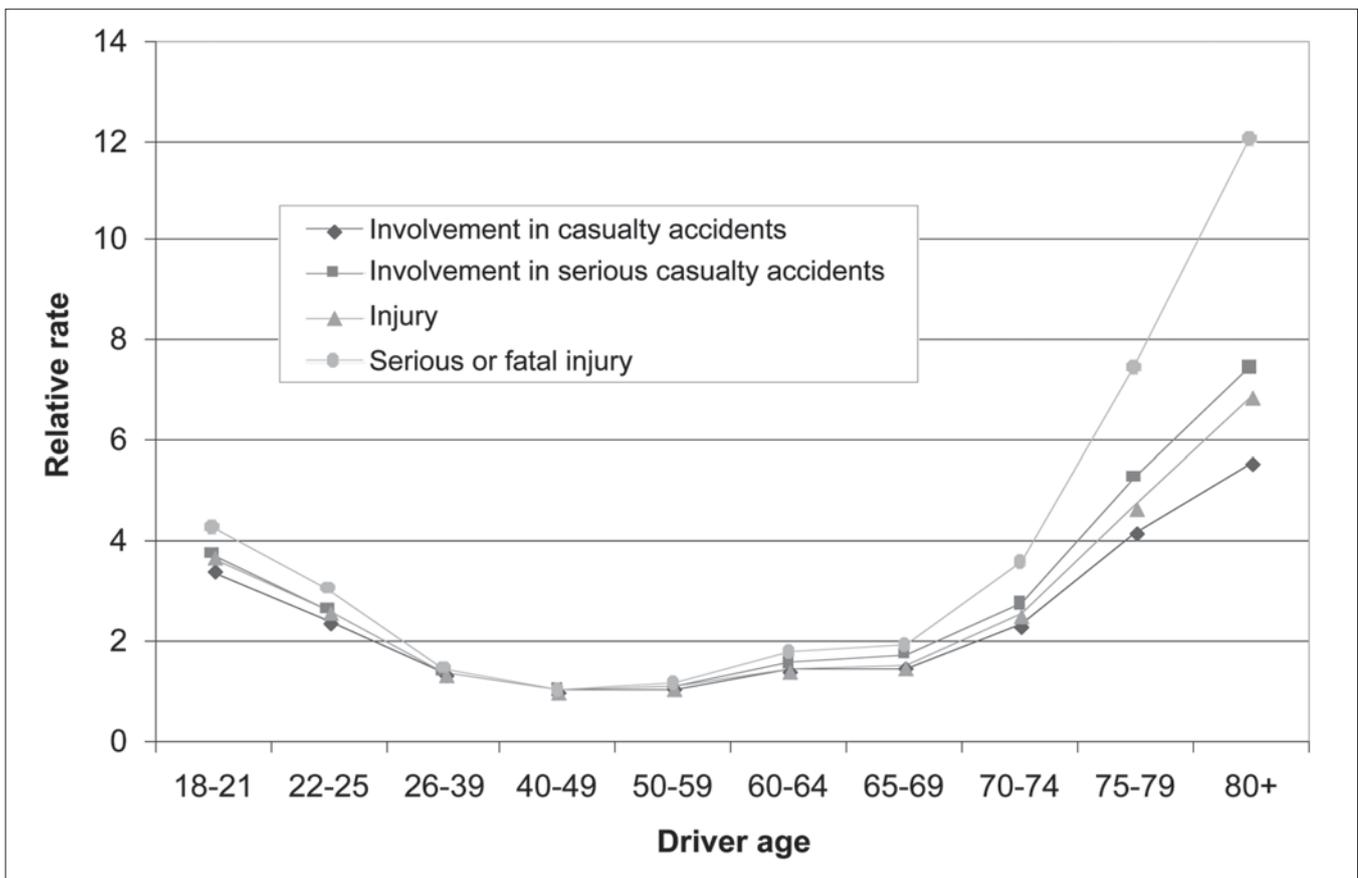
The risk of being involved in an accident varies greatly between different road environments and road types. For example, accident rates per distance travelled are typically far lower on freeways than on arterial roads and local streets. The over-representation of older drivers in accidents on local roads and their under-representation on freeways suggests that

older drivers do a high proportion of their driving (relative to young and middle-aged drivers) on local streets, where accident rates are highest, and a low proportion on freeways, which are comparatively safe. Differences in risk associated with different road types and road environments are likely to contribute substantially to the elevated accidents rates of older drivers.

All four of the accident involvement rates plotted in Figure 4 rise steeply with increasing age. However, the rate of involvement in serious casualty accidents rises more steeply than the rate of involvement in casualty accidents and the rate of serious or fatal injury rises more steeply than the rate of injury. This is seen more clearly in Figure 6, where the rates have been recalculated so that each rate separately is relative to the rate for the 40-49 age group, meaning that the four curves meet at 1.0 for the reference age group.

The steeper increases for the more severe accidents and injuries largely reflect the lesser physical robustness of older drivers when compared with young and middle-aged drivers (although other factors such as older, less protective vehicles may also contribute). Of two drivers involved in similar crashes, the older driver is the more likely to be injured; of two drivers injured in similar crashes, the older driver is the more likely to be seriously or fatally injured. Thus an accident

Figure 6. Relative rate of accident involvement and injury per distance driven by driver age group for accidents in the Melbourne Statistical Division



involving an older driver is more likely to be counted in official records of casualty accidents than is a similar accident involving a young or middle-aged driver. In other words, the physical frailty of older drivers directly contributes to their elevated rate of involvement and injury in casualty accidents. What is more, the passengers of older drivers are likely to be of comparable age to the driver, so the frailty of their passengers also contributes to their high rate of involvement in casualty accidents.

It has been seen that the elevated casualty accident rates of older drivers are partly due to the types of situation in which their driving typically occurs (exposure) and partly due to their greater likelihood of being injured in the event that an accident occurs (frailty). Other factors such as vehicle crashworthiness may also make a contribution. However, some characteristics of the accidents in which older drivers are involved strongly suggest that a gradual deterioration in driving competence also contributes to their high accident rates. Relevant findings from the analysis of involvement in Victorian casualty accidents in the present study include the following:

- Older drivers are under-represented in the roles where they are most likely to be the innocent parties in accidents caused by errors of other drivers.
- In multi-vehicle accidents, older drivers are over-represented as the driver of Vehicle 1, the driver more likely to be at fault.
- Older drivers are over-represented in roles that involve failing to give way to another vehicle or encroaching on another vehicle's space.
- Older drivers are over-represented in roles that are likely to involve having insufficient control of the vehicle.
- Older drivers are over-represented in collisions with parked vehicles.

These patterns of accident involvement lead to some speculations about the nature of the functional impairments that may become more common with increasing age. The over-involvement of older drivers in accidents involving low speed manoeuvres such as U-turns and entering or leaving a parking space, if it is not entirely attributable to a higher proportion of exposure in these situations, suggests that some older drivers may find it difficult to perform large steering movements at low speed. On the other hand, these same accident characteristics, plus the over-representation of older drivers in accidents while reversing, might indicate that some older drivers have difficulty turning their heads far enough to monitor stationary objects and approaching vehicles in all directions. Consistent with this speculation, U-turners of all ages were much more likely to be hit by a vehicle approaching from behind (i.e. from the same direction as the U-turner's initial direction of travel) than by a vehicle approaching from the opposite direction, suggesting that the difficulty of monitoring for traffic approaching from behind may contribute to U-turn accidents (in which older drivers are

over-represented). In extreme cases, difficulty in turning one's head might even make it difficult to monitor traffic approaching from the right or left when facing a Stop or Give Way sign, another accident scenario in which older drivers are over-represented.

Older drivers were found to be over-represented in collisions with parked vehicles, buildings and fences. In view of the size and conspicuity of such objects, this is unlikely to indicate difficulties with detection and seems much more likely to indicate difficulties either with judgement of distance or with vehicle control. In some circumstances, failure to realise that the vehicle is parked rather than in motion might also contribute to collisions with parked vehicles.

Other aspects of ageing that might contribute to high accident rates for older drivers include gradually deteriorating vision and slower processing of incoming information in high demand situations such as when negotiating busy intersections. It is also possible that the much lower distance driven each week by many older drivers, especially females, means that some skills are not practised often enough to be performed optimally. However, the present study was not able to investigate these factors.

## Conclusions

The Melbourne On-Road Exposure Survey of 2001 collected information about the distance driven by light passenger vehicle drivers of all ages in a typical non-holiday week on arterial roads in the Melbourne Statistical Division. Investigation of variations in accident involvement with age suggested it would be reasonable to use the exposure data to calculate relative rates of accident involvement for drivers of all ages on all classes of road at all times of year. However, the results cannot be generalised from Melbourne to the whole of Victoria because exposure patterns and/or relative accident rates differ between Melbourne and the rest of the state.

For both males and females, accident rates follow a U-shaped curve, being lowest for drivers aged 40-49 years and rising steeply with increasing age, especially beyond age 70. Factors contributing to the elevated accident rates of older drivers include:

- changing exposure patterns, with older drivers typically undertaking shorter trips and doing more of their driving in relatively high risk road environments
- increasing frailty, which increases the likelihood that any accident that does occur will result in an injury and will therefore be counted in official statistics
- a gradual deterioration in driving competence, which may involve difficulty in performing large steering movements at low speed, difficulty in turning the head far enough to monitor stationary objects and approaching vehicles in all directions, difficulty in judging distance and/or difficulty with vehicle control.

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## New to the College Library

**‘Criminal liability of drivers who fall asleep causing motor vehicle crashes resulting in death or other serious injury’** – issue paper No. 12, August 2007, published by the Tasmania Law Reform Institute.

## Recent Publications

### ATSB Reports

**ATSB Supplementary Transport Safety Investigation Report 2006/015.** Results of Trials for Heavy Vehicle Clearance Times at Level Crossings, Fountain Head Road Level Crossing, Ban Ban Springs, Northern Territory. The full report is available at: [http://www.atsb.gov.au/publications/investigation\\_reports/2006/RAIR/rair20060015.aspx](http://www.atsb.gov.au/publications/investigation_reports/2006/RAIR/rair20060015.aspx)

#### **Road Deaths Australia, Monthly Bulletin.**

<http://www.atsb.gov.au/publications/2007/mrf082007.aspx>  
(This is the last issue at time of preparation for this publication)

#### **Psychological and social factors influencing motorcycle rider intentions and behaviour**

The complete document may be downloaded on: [http://www.atsb.gov.au/publications/2007/road\\_rgr\\_200704.aspx](http://www.atsb.gov.au/publications/2007/road_rgr_200704.aspx)

#### **International Road Safety Comparisons: The 2005 Report (Released 17/05/07)**

This publication provides tables of data on road deaths in Organisation for Economic Co-operation and Development (OECD) nations as well as Australian states/territories. The statistics allow for comparison of road safety performance, with allowance for different levels of population, extent of motorisation and distances travelled.  
[http://www.atsb.gov.au/publications/2007Int\\_comp\\_05](http://www.atsb.gov.au/publications/2007Int_comp_05)

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## The Centre for Automotive Safety Research, University of Adelaide

The Centre for Automotive Safety Research has released the following reports which are available in full text online:

CASR028 Patterns of bicycle crashes in South Australia  
<http://casr.adelaide.edu.au/reports/CASR028.pdf>

CASR037 – Vehicle design for pedestrian protection  
<http://casr.adelaide.edu.au/publications/researchreports/CASR037.pdf>

You can access the entire report series and subscribe to our RSS feed from the CASR website  
 (<http://casr.adelaide.edu.au/reports>).

## Research Report Summaries

Beran RG, Ainley LA, Beran ME, 2007, “Opinions, attitudes and practices of Australian neurologists with regard to epilepsy and driving”, pp. 251-257, *Internal Medicine Journal*, Vol. 34, No. 4, Blackwell Publishing.  
 (Strategic Health Evaluators and Liverpool Hospital, Sydney)

Austrroads Guidelines for fitness to drive were promulgated in 2003. Epilepsy was one of the conditions included. This publication discusses the results obtained in a survey of Australian Neurologists to obtain opinions and details of practices relevant to the guidelines.

The survey was developed, pilot tested and approved by the Human Research Ethics Committee. Members of the Australian Association of Neurologists received three mailings and responses were analysed. Almost 90% respondents assessed epilepsy and 70% found the guidelines helpful. The answers of respondents, regarding ideal circumstances, were predictable; the surprise was the large undecided numbers.

Other findings:

- most (70%) did not report recalcitrant patients;
- most claimed to adhere to the guidelines and yet advocated more lenient driving restrictions that may allow preventable accidents;
- there was agreement between neurologists on guidelines for more rigorous restrictions for commercial drivers, although again neurologists were more lenient.

- three-quarters favoured licences carrying a warning to self-report and two-thirds felt that product information should identify driving implications.
- seventy-seven per cent endorsed Doctor assessors although half discounted General Practitioners as insufficiently knowledgeable and half advocated that only Neurologists evaluate potential drivers with epilepsy.

There is need for prospective research on epilepsy and driving.

**Bobevski I, Hosking S, Oxley P, Cameron M, 2007, “Generalised linear modelling of crashes and injury severity in the context of the speed-related initiatives in Victoria during 2000-2002”**, Monash University Accident Research Centre. The full document is available online:

<http://www.monash.edu.au/muarc/reports/muarc268.pdf>

Generalised linear models of road trauma outcomes have been found to be a powerful way of representing the trends and variations over time and to explain the effects of influential factors such as countermeasure initiatives. This report discusses their application to monthly casualty crash frequencies and injury severity outcomes in Victoria during 1998 to 2003.

During 2000 to 2002, the mobile speed camera program in Victoria was changed by introducing “flashless” camera operations during daytime and other modifications to make the enforcement more covert and unpredictable, increasing the targeted camera operating hours from 4200 to 6000 hours per month, and reducing the speeding offence detection threshold in three stages.

There is doubt that the flashless speed camera initiative and the enforcement threshold reductions have been adequately represented in the monthly crash outcome models. It was concluded that the effect of these initiatives on crash outcomes is unknown at this stage.

The assumed functional form of the relationship between monthly speed-related advertising levels and road trauma appears to represent this relationship well. The speed-related television advertising had a statistically significant association with a decrease in monthly casualty crash frequencies during times of increased advertising levels. In general the relationships connecting speed camera hours and levels of speed-related advertising, on the one hand, with road trauma reductions in Victoria, on the other hand, confirmed previous research on the effectiveness of these road safety programs as operated in the State.

**Boseto F, Jacob J, Jacob A, 2007, “Single vehicle roll over accidents: an unique pattern of motor vehicle accidents in Central Australia”, ANZ Journal of Surgery, 77(Suppl 1): A93, Blackwell Publishing.**

This report, conducted from the Alice Springs Hospital, concerns:

1. The incidence and injury patterns of rollover accidents
2. Pre rollover characteristics on rollover propensity
3. The injury severity and outcome of rollover accidents.

**Brovold S, Ward N, Donath M, Simon S, Shankwitz C, Creaser J, 2007, “The use of technology to address patterns of risk among teenage drivers”, pp. 413-422, *Journal of Safety Research*, Vol.38, No. 4, Elsevier.**

(Authors at Department of Mechanical Engineering, ITS Institute, University of Minnesota).

Teenage drivers have a high crash risk. The rate of fatal crashes involving teenage drivers is higher than in any other age group. There is need for specific approaches to reduce these traffic fatalities. One possible approach is through the use of vehicle-based intelligent driver support systems. For effectiveness, emphasis should be placed on the driving behaviour linked with an overwhelming number of fatal crashes involving teenagers, viz., speed, low seatbelt use, and influence of alcohol.

In-vehicle technology also offers an opportunity to address the issue of inexperience through enforcement of certain Graduated Driver’s Licensing provisions. There should be an intensified effort to further the development of in-vehicle technology and to fully understand its capabilities. Human factors testing should take place to understand the effects on the driver.

The projected outcome of the successful implementation of a “Teen Driver Support System” (TDSS), such as the one described in the article, is a significant decrease in the number of teenagers killed in traffic crashes.

**Ch’ng CW, Fitzgerald M, Gerostamoulos J, Cameron P, Bui D, Drummer OH, Potter J, Odell M, 2007, “Drug use in motor vehicle drivers presenting to an Australian, adult major trauma centre”, *Emergency Med Australas* 19(4): 359-65. Blackwell Publishing.**  
(Alfred Hospital, Melbourne)

The objective was to determine the drug use in injured Victorian drivers involved in motor vehicle collisions and subsequently transported to a major adult trauma centre in Victoria. A blood sample was obtained from 436 patients who had been taken to The Alfred Emergency & Trauma Centre in Prahran, following a motor vehicle collision. This was performed at the same time and under the same law as compulsory blood screening in Victoria (Section 56 of the Road Safety Act).

- Metabolites of cannabis were the most commonly found drug (46.7%),
- the active form of cannabis (Delta9-tetrahydrocannabinol) was found in 7.6% specimens.
- the next most prevalent drugs were benzodiazepines (15.6%), opiates (11%), amphetamines (4.1%) and methadone (3%).
- Cocaine was detected in 1.4% of cases.

Drug usage found in this group of injured drivers was disturbingly high. The introduction of further initiatives to decrease the prevalence of drug use in motor vehicle drivers is required.

**Davey J, Wishart D, Freeman J, Watson B, 2007, “An application of the driver behaviour questionnaire in an Australian organisational fleet setting”, pp. 11-21, *Transp Res F Traffic Psychol Behav*, Vol. 10 No.1, Elsevier Publishing.**  
Centre for Accident Research and Road Safety – Queensland (CARRS-Q), School of Psychology and Counselling, Faculty of Health, Queensland University of Technology, Carseldine, QLD 4503, Australia

This study reports on the utilisation of the “Manchester Driver Behaviour Questionnaire” (DBQ) to examine the self-reported behaviour of a sample of Australian fleet drivers. It highlights implications regarding the utilisation of the DBQ within fleet settings to examine on-road behaviour among professional drivers, specifically (e.g., errors, highway code violations and aggressive driving violations). A large number of items traditionally related with violations of road rules were found to be associated with aggressive driving acts among the current sample. Additional analysis revealed that the DBQ factors were negatively related with self-reported traffic offences, although at a multivariate level only the number of kilometres driven each year (i.e., exposure) proved to be predictive of incurring fines/demerit points.

**George S, Clark M, Crotty M, 2007, “Development of the Adelaide driving self-efficacy scale”, *Clin Rehabil* 2007; 21(1): 56-61. Sage Publications.**  
(Flinders University Department of Rehabilitation and Aged Care, Repatriation General Hospital)

In order to describe the development of the “Adelaide Driving Self-Efficacy Scale” (ADSES) and to report on its reliability and validity, a set of 12 aspects of driving behaviour (developed through literature review, clinical experience and expert review) were:

1. rated for self-efficacy using a Likert scale.
2. investigated for internal consistency using Cronbach’s alpha coefficient. This was 0.98, indicating high internal consistency.
3. examined for construct validity by comparing ADSES scores of drivers who had and had not suffered stroke. The two groups showed statistically significant differences, demonstrating construct validity.

- examined for criterion-related validity by comparing ADSES scores with the result on a standardized on-road assessment. Differences in ADSES scores for those who passed or failed were statistically significant.

The ADSES has demonstrated internal consistency and construct validity with subjects who have and have not suffered stroke. The scale demonstrated criterion validity in its relationship with outcome of an on-road driving assessment. It appears to be a reliable and valid measure of driving self-efficacy.

**Glendon AI, 2007, “Driving violations observed: an Australian study”,** pp. 1159-1182, *Ergonomics*, Vol. 50 No.8, Taylor and Francis Group (School of Psychology, Griffith University)

This study analysed the driving behaviour of 2,765 persons in three Australian states – New South Wales, Queensland and Victoria. (Age group and gender, passenger characteristics and vehicle age and type were noted).

In-car coordinated video and audio recording sequences were used to gather data. (driving violations and other driving behaviours, including lane use, speeding, close following (tailgating), driver’s hands position and mobile phone use). Test were made in free-flowing traffic along two-, three- and four-lane highways with varying speed limits on all days of the week in daylight and fine weather conditions.

By focusing upon vehicle and driver characteristics, and their impact on driving behaviour, including identified violations, this study explores some implications both for future research and for traffic policy makers.

**González-Wilhelm L, 2007, “Prevalence of alcohol and illicit drugs in blood specimens from drivers involved in traffic law offenses: systematic review of cross-sectional studies”,** pp.189-198, *Traffic Injury Prevention*, Vol. 8 No. 2, Taylor and Francis Group. (J.W. Goethe University. Frankfurt/Main. Germany).

The objective was an attempt to obtain more reliable data concerning the prevalence of alcohol and illicit drugs among drivers involved in traffic law offences worldwide. The search was performed by using several international biomedical databases and additional publications, in order to reduce publication bias. The review included cross-sectional studies published between 1990 and 2005 in English, Spanish, German, Portuguese, and Italian. Only studies based on the analysis of blood specimens and chromatographic quantification of drugs were included.

Alcohol appears to be still the predominant substance, with the consideration that among drivers primarily suspected of driving under the influence of drugs, cannabinoids are more prevalent. Certain trends could be identified, e.g., very low prevalence of cocaine in reports from Nordic countries, a high prevalence of amphetamines between Norwegian and Swedish studies, and low rates of THC among Australian studies.

It was concluded that, to obtain a better assessment of the real current role of alcohol and drugs (illicit and medications), it seems strongly necessary to update the case-control study conducted by Borkenstein et al. in 1964, including now blood analyses of the whole spectrum of substances that can impair drivers.

**Harms L, Talbot M, 2007, “The aftermath of road trauma: survivors’ perceptions of trauma and growth”,** pp. 129-137 *Health Soc Work*, Vol. 32 No. 2, NASW Press. (School of Social Work, University of Melbourne).

For many survivors of serious road trauma, the physical and psychological consequences are complex and lifelong and their psychosocial recovery experience is rarely documented in the social work literature.

This article reports on findings from a study of post-traumatic growth and post-traumatic stress experiences, as measured by the Post-traumatic Growth Inventory and the Impact of Event Scale. Data were collected from 79 anonymous, self-administered postal surveys of participants who had received treatment in an Australian rehabilitation centre following serious orthopedic injury. One-third of these survivors continued to experience serious psychological distress in the aftermath of road trauma and a range of other psychosocial consequences four years after their accident. Although 87 percent of the sample continued to experience post-traumatic stress difficulties, 99 percent reported experiences of post-traumatic growth.

**Hayen AD, Boufous S, Harrison JE, 2007, “A discussion of the potential benefits to injury surveillance through inclusion of date of injury in hospitalisation data in New South Wales and Australia”,** pp. 130-132, *New South Wales Public Health*, Vol. 18, No. 7-8, New South Wales Health Department.

Most patients with injuries are brought to a Hospital suddenly, at a specific time and date, as determined by an external cause (eg., a road crash). It is not the current practice to record the date of injury in routine hospital separations data in New South Wales or Australia (This does occur in New Zealand).

There are benefits from adding the date of injury to the Inpatient Statistics Collection. These include:

- a more accurate estimation of the level of serious injury in the community
- a better assessment of the utilisation of the health system and costs attributable to injurious events; and
- better linkage of hospital data with other data relevant to injury measurement and control (eg., road crash data).

Ivers RQ, Blows SJ, Stevenson MR, Norton RN, Williamson A, Eisenbruch M, Woodward M, Lam L, Palamara P, Wang J, 2006, “A cohort study of 20 822 young drivers: the DRIVE study methods and population”, pp. 385-389, *Inj Prev* 2006; Vol. 12 No. 6, BMJ Publishing Group.  
(The George Institute for International Health, The University of Sydney)

The DRIVE Study was established to facilitate research, involving New South Wales drivers, aged 17-24, holding their first Provisional Driver’s Licence, on direct links of risk factors to serious injury and death.

Baseline data collection involved a questionnaire to drivers about their training, risk perception, driver behaviour, sensation-seeking behaviour and mental health. Participants gave consent for prospective data linkage to their data on licensing, crashes and injuries, held in routinely collected databases.

The questionnaire was completed by 20 822 drivers, including men and women, from capital cities and regional or remote areas. The recruited study population showed a wide variation in the risk factors under examination. For example, almost 40% of drivers reported drinking alcohol at hazardous levels and about 32% of participants seemed to be at a high or very high risk of psychological distress. Participants reported a mean of 67.3 hrs of supervised driver training while holding their learner’s permit.

Karam E, Kypri K, Salamoun M, 2007, “Alcohol use among college students: an international perspective”, pp. 213-221, *Curr Opin Psychiatry* Vol. 20, No. 3, Lippincott Williams and Wilkins.  
(Departments of Psychiatry and Clinical Psychology, at St George Hospital University Medical Centre, and Balamand University, Beirut, Lebanon).

During 2005-2006, the authors reviewed the literature on alcohol use among college students worldwide to assess the prevalence of alcohol use, hazardous drinking and related problems, and review the effectiveness of intervention methods and implications for future research. They identified 26 journal articles from **Australia**, Brazil, Ecuador, Egypt, Germany, Hong Kong, Ireland, Lebanon, **New Zealand**, Nigeria, Sweden, The Netherlands and Turkey.

They found a prevalence of hazardous drinking in **Australasia**, Europe, North and South America, but lower in Africa and Asia. Alcohol policies should be reviewed and prevention programmes initiated in light of research evidence, for this high-risk population. College students in many countries are at elevated risk for heavy drinking, with serious immediate health risks, such as **drink-driving** and other substance use; and longer term risks, such as alcohol dependence

Moxey E, Johnson N, McCarthy MG, Galloway L, Parker GA, McLundie WM, 2006, “Advanced Protection for Vulnerable Road Users: A Case Study”, pp. 723-734, *Proceedings of the Institute of Mechanical Engineers, Part D: Journal of Automotive Engineering*, Vol.220, No.6, PEP Journals.  
(School of Engineering, University of Surrey, UK)

Interest in collision avoidance and more recently, in safety systems for vulnerable road users is increasing internationally. Included in vulnerable road users are pedestrians and cyclists who account for approximately one in four of all road deaths in the European Union.

The aim of the “advanced protection for vulnerable road users” project was to develop a sensor system capable of detecting vulnerable road users, distinguishing them from the road environment, tracking their position, and predicting potential impacts with the vehicle. The proposed fusion of sensor data from multiple, short-range, high-accuracy, pulse radar units and a low-resolution passive infrared sensor array served to eliminate the majority of clutter by negating false triangulation combinations, while ensuring that only thermally distinct, moving targets are considered. The intention is that a derivative of the sensor system may eventually provide the technological link between vulnerable road user detection and a driver warning, collision avoidance, and/or the activation of a safety system on the vehicle (external airbags). The performance of this preliminary, ‘proof-of-concept’ advanced protection for vulnerable road users (APVRU) system was demonstrated during real-world accident scenarios, impacting with an anthropometric dummy, at speeds, limited by current hardware, up to 25 km/hr (15.5 mile/hr).

Senserrick TM, 2007, “Recent developments in young driver education, training and licensing in Australia”, pp. 237-244, *Journal of Safety Research*, Vol. 38 No. 2, Elsevier.

Senserrick is based at the Centre for Injury Research and Prevention, Philadelphia, USA. He has reported on young driver education and training in an international context.

He has observed the predominance of voluntary programs conducted outside the licensing procedure as compared with mandatory school-based programs used internationally.

Matters of discussion are as follows:

- pre-learner, learner & provisional licensing stages
- state-based graduated licensing
- increased supervised practice and delayed licensure
- passenger and night-time restrictions

Vassallo S, Smart D, Sanson A, Harrison W, Harris A, Cockfield S, McIntyre A, 2007, “Risky driving among young Australian drivers: Trends, precursors and correlates”, pp. 444-458, *Accident Analysis and Prevention*, Vol. 39 No. 3, Elsevier Publishing.

The characteristics or circumstances in young drivers’ earlier lives may have contributed to their current driving behaviour.

This possibility was explored using data from the Australian Temperament Project (ATP), a large longitudinal community-based study, which commenced in 1983 with 2443 families and has followed children's psychosocial development from infancy to early adulthood.

A series of analyses indicated that it was possible to distinguish a group of young adults who engaged in high risky driving behaviour (high group) from a group who engaged in low levels of risky driving behaviour (low group) from mid childhood. Young drivers with a tendency towards risky driving differed from others on aspects of temperament style, behaviour problems, social competence, school adjustment and interpersonal relationships.

**Watson B, Freeman J, 2007, "Perceptions and experiences of random breath testing in Queensland and the self-reported deterrent impact on drunk driving", *Traffic Injury Prevention*, Vol. 8, No. 1, Taylor and Francis Group.** (Centre for Accident Research and Road Safety Queensland, Queensland University of Technology).

This study explored the impact of random breath testing (RBT) on the attitudes, perceptions, and self-reported behaviour of motorists in Queensland. Particular attention was given to how exposure to RBT affected motorists' perceived risk of apprehension and self-reported behaviour, relative to other variables of interest such as alcohol consumption.

The data for the study was collected in a telephone survey of 780 motorists drawn from throughout Queensland. Volunteers were recruited from a random sample of all listed telephone numbers in the state, adjusted according to district population figures. A survey questionnaire was used to collect information relating to the participants' socio-demographic characteristics, drinking and drunk driving behaviour, attitudes toward drunk driving and Random Breath Testing, and experiences and perceptions of Random Breath Testing.

Data analysis showed that a large proportion of the respondents had both observed Random Breath Testing and been breath tested within the last six months. These people believed the Random Breath Testing practice served an important role in the improvement of road safety. However, a considerable percentage also reported driving under the influence of drink at least once in the last six months without being detected, with further analysis indicating that the threat of apprehension associated with Random Breath Testing did not appear to greatly influence their offending behaviour. Rather, a higher frequency of alcohol consumption, combined with more favourable attitudes to drunk driving and lower levels of support for Random Breath Testing, appeared to be associated with offending behaviour.

It was concluded that, while the results confirmed the high levels of exposure to Random Breath Testing achieved in Queensland, the direct impact of recent exposure on drunk driving behaviour appeared less important than other factors

such as alcohol consumption and attitudes to drunk driving and Random Breath Testing. Further research is required to better understand how recent and lifetime exposure to Random Breath Testing impacts on motorists' perceived risk of apprehension and subsequent drunk driving behaviour.

**Young KL, Regan MA, Triggs TJ, Tomasevic N, Stephan K, Mitsopoulos E., 2007, "Impact on Car Driving Performance of a Following Distance Warning System: Findings From the Australian Transport Accident Commission SafeCar Project", pp. 11-131, *Journal Intelligent Transport Systems: Technology, Planning and Operations*, Vol.11 No. 3, Taylor and Francis Group.**

The *SafeCar study*, to evaluate the impact on driver performance of three Intelligent Transport System technologies, alone and in combination, was carried out by the Transport Accident Commission (TAC). The technologies were: (a) Following Distance Warning; (b) Intelligent Speed Adaptation; and (c) a Seatbelt Reminder. Each test vehicle or "SafeCar" was also equipped with Daytime Running Lights and a Reverse Collision Warning system. Twenty-three fleet car drivers each drove a SafeCar for 16,500 kilometers.

Investigation in the article focuses on the impact on (a) driving performance, (b) mental workload and (c) driver acceptability of the *Following Distance Warning* system. The results indicated that the Following Distance Warning system had a positive effect on drivers' following behaviour. It was demonstrated that use of the system significantly increased mean time gap between the SafeCars and lead vehicles in several speed zones and reduced time gap variability in one speed zone.

The drivers rated the system as acceptable and indicated that it did not increase subjective mental workload. However, most drivers indicated that use of the system caused an increase in frustration because of the occasional issuing of nuisance warnings.

**Young KL, Regan MA, 2007, "Use of manual speed alerting and cruise control devices by car drivers", pp. 473-485, *Safety Science*, Vol. 45 No. 4, Elsevier Publishing.** (Accident Research Centre, Monash University)

Almost nothing is known about the extent to which drivers use in-vehicle technologies such as cruise control and manual speed alerting devices, designed to reduce the incidence and severity of speed-related crashes. This study assessed the use, acceptability and effectiveness in reducing speeding of these devices.

Four groups in Sydney (metropolitan) and in Wagga Wagga (rural), involving 31 drivers aged 25-49 years, including users or non-users of the devices participated

Preliminary recommendations, based on the research, are made.

# ACRS Campaign Priorities

The Australasian College of Road Safety currently has two Road Safety Campaign Priorities, **Fatigue and Lights On During Daylight.**

## Fatigue – A Priority Road Safety Issue

Fatigue is a major road safety problem. It probably represents as big a killer as alcohol, which accounts for about 27-28% of driver and rider deaths. Sleep deprivation is a major fatigue issue. Driving performance after 17-19 hours awake – equal to, say, being awake from 7am to beyond midnight – has the same effect on driving performance as being at the legal blood alcohol limit of 0.05. At 0.05 one is twice as likely to be involved in a crash as with no alcohol in the blood.

When seriously sleep deprived, and especially in the hours after midnight and to a lesser extent in the afternoon, when the drive for sleep is strongest, the desire to sleep can be overwhelming and sleep can come almost instantaneously.

Even if we are not in danger of falling asleep, drowsiness, lack of alertness and inattention can all be dangerous, leading to failure to see traffic hazards or be able to avoid them, and contribute to crashes.

So as far as possible, avoid driving when very tired and especially late at night. Most importantly, do not start long trips at the end of a day's work. On a trip take regular breaks, and at the first sign of drowsiness or erratic driving, pull over and have a break – stretch your legs and have a (non-alcoholic) drink and a light snack. A power nap of 15-20 minutes may have more benefit than a short break.

Simple measures are available to avoid the dangers of fatigue. The most important are:

- Get a good night's sleep before travelling: repay any sleep debt
- Avoid leaving for holidays after work on Friday. The effect of a full day's work and wakefulness will affect alertness, judgement and anticipation
- Plan the trip to allow for rest breaks
- Take frequent breaks – a break every 2 hours is good practice.
- Know what signs to look for. Passengers can look for some of these too and alert the driver.
  - wandering in the lane or over lanes
  - changes in speed, especially slowing down without reason
  - yawning
  - nodding
  - lapses in concentration

Finally and very importantly, remember that alcohol is a central nervous system depressant, and that even small amounts of alcohol when you are also fatigued can have an effect on driving performance. Play it safe.

For more information visit [www.acrs.org.au](http://www.acrs.org.au) to see the full ACRS paper on Fatigue and our Policy on Fatigue. There is also a College Policy on Heavy Vehicle Fatigue.

## Lights On: A Key Safety Aid

ACRS in one of its policy statements supports daytime running lights, and suggests that until they become standard on vehicles, drivers use their low beam during daylight.

To reiterate the reasons for doing so, by making the vehicle more visible, lights on can avoid many of the more serious kinds of crashes: head on overtaking crashes, right turn across path crashes, and pedestrian crashes. Although having daytime running lights is thought to be less effective in lower-latitude Australia and New Zealand than in, say Scandinavia, northern Europe and North America, it has been estimated that in Australia they could prevent:

- between 3% and 11% of non-pedestrian fatal crashes
- between 4% and 11% of non-pedestrian non-fatal crashes
- between 4% and 12% of all pedestrian fatalities (Paine 2003).

Low beam headlights, although not as effective as dedicated daytime running lights, will still provide many of these benefits (see the ACRS policy statement for a fuller discussion).

ACRS has resolved to lobby state and territory authorities to encourage campaigns advocating lights on during the day as a priority safety issue. We regard this as an interim measure: the ideal is to have daytime running lights available on motor vehicles as standard, as they are already on many cars in Europe. In not having daytime running lights standard on Australian cars we are in fact accepting inferior safety standards.

Some other issues surrounding the problem:

People may be concerned that having lights on flattens batteries. They don't, since while the engine is running the alternator is charging and replenishing the battery. However, be careful not to leave your lights on when you leave the car. Many vehicles turn the lights off automatically or have a warning tone

Do not use fog lights as daytime running lights; in fact do not use fog lights at all except in foggy conditions. Their intensity and beam pattern create glare under normal daylight and night ambient light conditions, and result in discomfort and distraction to other road users. Under the Australian Road Rules it is an offence to use rear fog lights except in foggy or reduced visibility conditions. It is also an offence to dazzle other road users with any light in or on the car, and this definitely applies to fog lights.

So don't use your fog lights except when they are needed for their intended purpose, but for a positive safety benefit, drive with your headlight low beam on during the day.

### **Business Correspondence**

Business correspondence regarding advertising rates, subscriptions, changes of address, back issues and guidelines for authors should be sent to the Managing Editor, PO Box 198, Mawson, ACT 2607, Australia or email: [journaleditor@acrs.org.au](mailto:journaleditor@acrs.org.au).

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The ACRS Journal publishes articles in all facets of the study of traffic safety. Articles are accepted from a variety of disciplines, such as medicine, health studies, road and automotive engineering, education, law, behavioural sciences, history, urban and traffic planning, management, etc. Interdisciplinary approaches are particularly welcome.

Authors' guidelines may be downloaded from the College website at [www.acrs.org.au/publications/journal](http://www.acrs.org.au/publications/journal).

Articles may be up to 5,000 words in length and should be submitted to the Managing Editor in Microsoft Word format as email attachments: email address: [journaleditor@acrs.org.au](mailto:journaleditor@acrs.org.au) The email message should state whether or not peer review is requested. It is assumed that articles submitted have not previously been published and are not under consideration by other publishers.

### **Office Contact Details**

Staff: **Mr Kevin McLoughlin**  
*Executive Officer*  
**Mr Geoff Horne**  
*Manager, ACRS Journal and Professional Register*  
**Mrs Jacki Percival**  
*Executive Assistant*

Office hours: Monday 9.30-2.30  
Tuesday 9.30-2.30  
Wednesday 9.30-5.30  
Thursday 9.30-5.30  
Friday Closed

*Messages can be left on Voice Mail when the office is unattended.*



**Australasian College of Road Safety Inc.**

Visit the College website at [www.acrs.org.au](http://www.acrs.org.au)  
ACRS, PO Box 198, Mawson ACT 2607 Australia  
Tel 02 6290 2509  
Fax 02 6290 0914  
Email [eo@acrs.org.au](mailto:eo@acrs.org.au)

Head Office  
Pearce Centre, Collett Place, Pearce ACT Australia

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