Vol 27 No 4, 2016



# Journal of the Australasian College of Road Safety

Formerly RoadWise – Australia's First Road Safety Journal



# Special Issue: Focus on Young Drivers PLUS papers from Agility, Innovation, IMPACT: ARSC2016 Conference

#### Peer-reviewed papers

- Review of the graduated driver licensing programs in Australasia
- Changing licensing trends and travel mode choices of young adults
- Interim evaluation of the Victorian safer road infrastructure program stage 3 (SRIP3)
- Qualitative consumer input for enhancing child restraint product information to prevent misuse
- An automated process of identifying high-risk roads for speed management intervention

#### Contributed articles

- Resilience and youth road safety
- Blue Datto Keeping Safe Program
- Safe System complementary thinking on the Bruce Highway
- The development of an intelligence-based deployment model to enhance road policing service delivery
- Innovative weather-activated variable speed sign trial
- Validation of a virtual driver assessment tool for older drivers

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If you haven't seen Australia's spectacular West, this is the ARSC conference for you! The Australasian College of Road Safety (ACRS), Austroads, ARRB Group and Curtin Monash Accident Research Centre (C-MARC) invite you to attend the **largest road safety-dedicated conference in the Southern Hemisphere**. The 2017 Australasian Road Safety Conference (ARSC2017) will be held in Perth at the beautiful Crown complex from Tuesday to Thursday 10-12 October 2017.

With a theme of **"Expanding our horizons"**, ARSC2017 will showcase the regions' outstanding researchers, practitioners, policy-makers and industry spanning the plethora of road safety issues identified in the United Nations Decade of Action for Road Safety: Road Safety Management, Infrastructure, Safe Vehicles, User Behaviour, and Post-Crash Care. ARSC2017 will bring with it a special focus on **engaging all levels of government and community, from the city to the bush, to move Towards Zero**. The comprehensive 3-day scientific program will showcase the latest research; education and policing programs; policies and management strategies; and technological developments in the field, together with national and international keynote speakers, oral and poster presentations, workshops and interactive symposia.

#### FOR MORE INFORMATION

For more information on ARSC2017, past conferences, to submit your abstract, or to receive regular conference updates visit **www. australasianroadsafetyconference.com.au** or contact the Conference Secretariat on (08) 9389 1488 or **ARSC2017@eecw.com.au** 

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Online abstract submissions open 14 November 2016

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#### Cover image

This photograph depicts Philip Vassallo with his Blue Datto. Phil passed away in a car crash when he was 17, in which both drivers were red 'P' platers and the charity Blue Datto has been established in his memory. Their vision is that "Each person has the right to enter adulthood carrying positive attitudes and behaviours, supported and encouraged by their families, friends and communities. This vision is fulfilled by facilitating programs which start the conversation and continual awareness, self-belief and pledge to Keeping Safe<sup>™</sup>, for each individual and the communities they belong to.

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# From the President



Dear ACRS members,

This edition presents the Award winning papers from the recent successful Australasian Road Safety Conference held in Canberra. It also has a focus on young drivers, including papers covering travel mode choices for young people and another on graduated licensing.

What is obvious from our

Conference papers and symposia overall: from many Journal papers and articles over the past years, from Chapter symposia, seminars and workshops; as well as submissions, enquiries, research; and also community projects - is that we have many actions which can reduce road trauma.

Unfortunately, over the last two years in Australia at least, trauma from road crashes is increasing, and increasing sharply. Simple, one off solutions are being called for.

However, as the death rates have dropped, so has our appetite to encourage the introduction of the solutions we know; and also our appetite to continue to expand our research to drive us to the "Trauma free" roads we seek. After our Conference last year, I suggested that cooperation and collaboration could bring about the rapid introduction of some new technologies in collision avoidance regrettably our progress with any special encouragement has been slow. While we express surprise and even support for the "disruption" that new organisations, manufacturers and individuals offer in a range of products, there is a reluctance for us to make the same "disruption" in bringing about the changes we need to reduce the increase in trauma.

Exhibitors and presenters at the recent Conference demonstrated equipment available now to measure, and even avoid, the distraction caused by the new technologies - both hard wired and hand held in vehicles. We haven't been able to find a way to encourage the manufacturers of, and service providers for these devices (phones, navigation, traffic, information) to make them available as responsible suppliers so as not to increase the risk to the user and others. In the Safe System approach, we often call for less emphasis on the driver and more on the system such as the infrastructure and the vehicle. It is time to expand or "disrupt" that influence to the technology service providers as well.

Lauchlan McIntosh AM FACRS ACRS President

# Diary 2016

#### November 16-18

27th ARRB Conference Melbourne, Victoria 3206 https://www.ivvy.com/event/ARRB16/

#### November 20

World Day of Remembrance for Road Traffic Victims http://worlddayofremembrance.org/

#### November 22

Driver interactions with mobile phones – driving performance and safety implications Free Webinar https://www.arrb.com.au/webinars/upcoming.aspx

#### November 24-25

International Conference on Traffic and Transport Engineering Belgrade

http://www.ijtte.com/article/102/ICTTE\_Belgrade\_2016.html

#### November 28-30

13th International symposium and accompanying exhibition on sophisticated car safety systems, Mannheim, Germany http://www.ict.fraunhofer.de/content/dam/ict/de/documents/ veranstaltungen/2016/Airbag Call for Papers 2016.pdf

#### November 28 – December 2

Human Factors in Traffic Crashes Melbourne, Victoria http://aspaci.org.au/HumanFactors2016\_Flyer.pdf

#### December 6

Implementing a fleet crash management strategy Free Webinar: ARRB https://www.arrb.com.au/webinars/upcoming.aspx

# 2017

#### January 31 – March 14

Treating Crash Locations: online training series ARRB https://www.arrb.com.au/webinars/upcoming.aspx

#### March 20-23

10th International Conference on Managing Fatigue San Diego http://fatigueconference2017.com/

#### October 10-12

Australasian Road Safety Conference 2017 Crown Perth www.australasianroadsafetyconference.com.au

# Message from the Minister

2016 Australasian Road Safety Conference Dinner and Awards, Great Hall, Parliament House, 7 September 2016

Speech by The Hon Darren Chester MP, Federal Minister for Infrastructure and Transport and Co-Chair of the Parliamentary Friends of Road Safety

Congratulations to the Australasian College of Road Safety, Austroads, and the George Institute on hosting such an important gathering of road safety professionals.

An event like this takes many people to pull together and I would like to acknowledge and thank:

- Claire Howe—the Executive Officer of ACRS;
- Nick Koukoulas—the CEO of Austroads;
- Mike Mrdak—my Departmental Secretary; and
- Marcus James who heads up my Department's Road Safety and Productivity Branch.

Ladies and gentlemen, can I ask you to stand up for a moment.

As a mark of respect for the 1292 people who have died on Australian roads in the past 12 months, please join with me in a moment's silence and reflection. Thank you—and please be seated.

I don't know what you thought about: but I thought about the friends and family I have lost to car crashes. And I thought about what I'm going to do to make a difference; what I've done to make a difference today; what I'm going to do to make a difference tomorrow; and what I can do to make a difference next week, next year and beyond.

I entered politics to 'make a difference' just as many of you chose to work in road safety because you want to 'make a difference'. In this room tonight we have the people with the energy, expertise and opportunity to work together to make that difference.

Ladies and gentlemen, we have a problem. Road trauma is increasing in many parts of Australia and we don't really know why. We've all got some ideas, but if we are honest with each other, we don't really know why it's happening. Our shared challenge is to find out 'why' and decide what we can do about it: in the short term, medium term and longer term.

We have a public health crisis which is claiming more than 1200 lives and seriously injuring tens of thousands of



Australians each year. It's costing the community in the order of \$30 billion and unimaginable personal suffering through grief and a lifetime of regrets. The impact it has on our first responders: the ambulance officers, police, fire brigade, State Emergency Services - is impossible to measure.

There was a 10.3 per cent increase in road deaths over the past 12 months and hardly anyone has noticed in the community or in the mainstream media. Personally, it worries me that we have almost become accepting of deaths and serious injuries as a price we have to pay for a modern transport system. After decades of consistent improvements in road safety and reductions in road trauma, the past two years has presented some alarming figures.

After being among the world leaders, if there was an Olympic Games for road safety in 2016, Australia wouldn't win a medal. The latest BITRE data should serve as a call to action for us all - we are not on target to reach the National Road Safety Strategy targets and we are failing in our efforts to keep Australians safe on our roads.

The day I was appointed Federal Minister for Infrastructure and Transport I pledged to work with state governments, police and local communities to deliver a national focus backed up by practical action to reduce road trauma. I know the states have primary responsibility for road safety but this is not a problem we can handball to other levels of government or police. It's up to each of us to accept responsibility for our own safety along with our passengers and other road users, every time we get behind the wheel, ride a motorcycle or simply cross the road. We have to make this personal and we have to shake off the national complacency and acceptance which I believe is contributing to the growth in road trauma.

Think of it like this: if 120 people died each month in a disease outbreak on Australian soil the community and media would be demanding action. Our governments would respond with legislative changes - some of which would be

unpopular and politically difficult but would be accepted on the basis of 'keeping the community safe'. But we seem resigned to the fact that every day, many people are killed and maimed on our roads and it hardly rates a mention in the media or the national political debate.

I refuse to accept that this is the best we can do.

At the recent Transport Industry Council meeting of state Ministers with a responsibility for road safety, I highlighted my concerns and received support to host a national forum this year to allow for a full exchange of ideas on measures to reduce road trauma. It will be held in Perth in November and will follow an important meeting next month where various departmental heads will meet to bring together actions we can take at all levels of government and community. We need to bring together the best and brightest minds on road trauma and implement their ideas on a national basis.

That's why I invited various industry experts to meet with me in Parliament House on Monday to present their ideas - I asked them to describe their road safety challenges and possible solutions. It may have been the first time, but it won't be the last time. I intend to host regular road safety round tables where experts in particular fields will be asked to gather and put forward practical solutions. I'm not interested in endless talkfests - too many people are dying and being maimed every day - for me to simply talk about road safety.

I want action - I want to make a difference. Ladies and gentlemen: you might have guessed by now that I'm passionate about road safety. A radio reporter once asked me why? When there are so many issues in the infrastructure and transport portfolio - why was I singling our road safety as an area of particular focus. She wanted to know if it was personal. I replied that you don't get to 48 years old in Australia without loving someone who has been killed or injured in a road crash. We've all been touched by road trauma - we've all lost friends or family members in crashes that could have been avoided.

As much as I'm passionate about the issue, I am a realist. I'm not expecting a 'silver bullet' or a single measure that will solve the problem because we all understand there's often a combination of factors which lead to each serious crash. We need to continue our research, share the data widely and take decisions - some of which may be unpopular but will be necessary in the interests of community safety. It's not as if proven safety measures such as compulsory wearing of seat-belts, blood alcohol testing and speed limits were wildly popular when they were introduced. But they were reforms that have saved lives and we should be thankful that our predecessors had the courage of their convictions.

Our research tells us that safer drivers, in safer cars, on safer roads will save lives and reduce serious injuries in the future. We're all familiar with this 'safe system' approach but despite record levels of investment in safer roads by state and federal governments, enforcement blitzes and multi-million dollar road safety advertising campaigns, road trauma has increased.

I'm reluctant to speculate too much and will wait for further advice and the national Ministerial forum but I have my suspicions about some of the causes. Anecdotal reports from police suggest to me that many road users have become immune to the advertising warnings on speed, fatigue and drink and drug driving. They tell me that driver distraction is playing an increased role in crashes.

We've all driven behind a car which is drifting across the freeway only to overtake and observe the driver sending a text message. When we stop at traffic lights: how many times do you see drivers checking their messages? It makes me wonder what is so important in their life that they would risk death or permanent injury to send a message.

'Pick the kids up from soccer', 'Get a loaf of bread', 'See you Saturday night' or 'Thanks for lunch' is a message which is hardly worth dying for. In fact, no message is worth dying for.

The penetration of iphones and other devices into our daily lives is enormous and it is tempting to check that message. I can just about guarantee that my P-plate driving daughters will not 'drink and drive' but I'm not certain they won't check their phones. They've got the message on alcohol, but have they got the message on driver distraction?

We need to keep assessing our research and implement campaigns across state borders that are proven to work. It is a source of great personal and professional frustration that we are often operating in silos across state borders. There can only be one 'best practice' in Australia.

If one state has a better idea, a better set of licensing laws, a better communication campaign - then we should be sharing it. We want the best system in place across Australia, particularly when it comes to public messaging on road user behaviour. But promoting better driver behaviour doesn't touch two of the other key issues in road safety: improving the safety of the road network and getting people into safer cars, trucks and safer motorcycles.

New technology can help the driver to avoid crashes or minimise the severity of injury if an accident occurs. However, the average age of the Australian vehicle fleet of 10 years means it takes several years for the benefits of safety innovations to flow through to the second hand market and some safety features available overseas are slow to arrive in this country.

In any case, if a vehicle is not properly maintained throughout its life, the safety features are worthless. There's not much point in having braking assist technology on bald tyres.

Our challenge is to get Australians into safer vehicles sooner and unfortunately I don't have a simple answer. 'Cash for clunker' schemes haven't worked: but I'm keen to work with industry to develop incentives to get drivers into safer vehicles at a faster rate to allow the benefits to flow. Safe vehicles are proven to reduce the likelihood of a crash occurring and if a crash does occur, the occupants of the vehicle are less likely to be injured. Safer vehicles can also minimise injuries to vulnerable road users like cyclists and pedestrians. A safer vehicle may turn a potentially serious injury into a minor one and save the health budget millions of dollars in follow up treatment. The bitter irony is that young drivers face the highest risk of accident in their early years of driving which usually coincides with them driving the worst car of their lives.

Maybe there's a role here for the private sector to step up and take its share of responsibility to reduce road trauma. The car manufacturers, banking and insurance sectors could be working with governments to develop lower cost loan schemes, insurance incentives or other innovative schemes to help get our young people driving the safest cars possible.

I've also had some discussions - and expect to have more - with the trucking industry to consider measures that will renew the heavy vehicle fleet. There are major environmental benefits to be achieved through newer vehicles and they come with vastly improved safety features. Our heavy vehicle sector plays a crucial role in our national economic life and we want to provide a safe workplace for drivers and other road users.

And that brings me to the road and transport network itself. Ladies and gentlemen: I repeatedly tell anyone who will listen: Good infrastructure can change lives and it can save lives. Our \$50 billion infrastructure investment program is important because it can change lives by reducing congestion, improving productivity, getting people home to their kids sooner - where they want to be. But it can also save lives. Investing in engineering solutions, which are often quite affordable, can actually save lives.

Our investment in major projects like the Pacific Highway duplication, Bruce Highway upgrades and various urban freeways are already paying dividends in reduced crashes and road trauma. We have a \$248 million Heavy Vehicle Safety and Productivity Program and a \$500 million community-led Blackspots program that focuses on reducing deaths and serious injuries. But as passionate advocates for road safety: we need to keep making the case loudly and proudly. In an environment where every budget dollar is hard to secure, we must present the research and evidence to justify the investment by governments, which we all believe is necessary. We know that safer roads, save lives and we need to keep funding this important work in our cities, country roads and regional highways.

Our aim must be to prevent road crashes and if they still occur, to minimise their consequences and extent of injury for all involved. Duplication of major highways, installation of road safety barriers, widening road shoulders, better lighting, tactile line marking, improved signage and increasing the number of rest areas are all strategies currently being rolled out through various local, state and federal initiatives. Supporting rail freight upgrades to take some of the transport task off our roads, improving public transport links and providing dedicated cycling lanes also have a role to play. These measures are all aimed at getting more Australians home safely to their families every night and now is the right time for a national conversation about reducing road trauma. We can't accept the current trend and proceed with business as usual.

Finally, I want to simply thank you all. Thank you for taking the time to be here this week to contribute to this national conversation on road safety. Thank you for your years of hard work - your tireless efforts in the past to reduce the number of road deaths and serious injuries. But most of all, thank you for the work you are going to do in the future.

If we are going to achieve our mutual goals to save lives and reduce serious injuries we are going to have to work together. It is important work, and you will be making a difference.

Thank you.

# College News

# Head Office News

### Membership

Welcome to new corporate members: KidSafe ACT Australian Medical Association (SA) Australian Automobile Association, Canberra National Safety Agency, Tullamarine St Johns Ambulance Australia, Canberra

## ACRS Fellowship

Congratulations to leading road safety advocate, Professor Ann Williamson, Director, Transport and Road Safety (TARS) Research Centre at the University of New South Wales, who was presented with the prestigious 2016 ACRS Fellowship at the glittering ACRS Award Ceremony at Australia's Parliament House. The ceremony took place



From left: Mr Lauchlan McIntosh AM, Professor Ann Williamson FACRS, Hon Darren Chester MP (Federal Minister for Infrastructure and Transport)

in front of 550 of Australasia's foremost road safety professionals and advocates, and is deserved recognition of Professor Williamson's profound commitment to the reduction of road trauma.

The award was presented by Hon Darren Chester, Federal Minister for Infrastructure and Transport, and ACRS President Mr Lauchlan McIntosh AM, during the 2016 Australasian Road Safety Conference (ARSC2016).

In detailing the award, ACRS President Mr Lauchlan McIntosh AM, said "Professor Williamson continues to be an outstanding advocate for road safety both in our region and internationally.

"Professor Williamson has contributed enormously to excellence in road safety research and to providing a strong evidence base for effective road safety interventions. Her dedication to developing and sharing road safety knowledge has been shown through her tireless efforts to work collaboratively in the field with various injury prevention and accident research centres and researchers who work in the field of road safety".

Professor Williamson was the founding Director of the Injury Risk Management Research Centre and the Transport and Road Safety Research Centre and is Australia's leading expert on driver fatigue and heavy vehicle safety. Professor Williamson's personal commitment has seen her contribute her own time to various road safety and injury prevention committees and to State and Federal Parliamentary road safety inquiries. She regularly engages with media on a range of road safety topics as an independent expert voice to help reduce road trauma. Professor Williamson has also contributed greatly to the development of the field through teaching, including PhD supervision.

"It is an honour to be awarded the ACRS Fellowship and I look forward to continuing to support the great work of the College as we aim to halve road deaths and injuries by 2020", Professor Williamson said.

With the 2016 award, Professor Williamson joins an elite group of eminent road safety professionals who have all been bestowed the honour of an ACRS Fellowship. The College first instituted the award of Fellow in 1991 to enable colleagues to nominate a person recognised by their peers as outstanding in terms of their contributions to road safety.

# 2016 3M-ARCS Diamond Safety Award

#### Northern Territory Indigenous Road Safety Program wins Australasian Road Safety Award

A program to enable Aboriginal and Torres Strait Islander people to obtain their drivers' licence has won the 3M-ACRS Diamond Road Safety Award, recognising exemplary innovation and effectiveness to save lives and injuries on roads. The DriveSafe NT Remote project, led by Team Leader Wayne Buckley, is being delivered by the Northern Territory Government to expedite road trauma reductions among indigenous communities.

The award was presented by the Hon Darren Chester MP, Minister for Infrastructure and Transport, Mr Lauchlan McIntosh AM, President of the Australasian College of Road Safety, and Mr Cade Turner representing 3M Australasia. Minister Chester congratulated this year's award winners on their contribution to improving driver safety around the nation. "This year's winners and finalists are doing an incredible job of reducing the national road toll and deserve our sincere congratulations on the valuable work they are doing every day," Mr Chester said.

"There are many elements which must be brought together if we are to achieve a reduction in our national road toll - everything from new vehicle technology and improved driver education and skills, through to better road design and more investment in our infrastructure. "Each of this year's finalists and winners demonstrate the personal commitment we so badly need to help bring down the rate of death and injury happening on our roads every year. Their contribution is valuable - and above all valued."

ACRS President, Mr Lauchlan McIntosh AM, said "Our 2016 winner, represented by Wayne Buckley from the Northern Territory Government, demonstrates an effective and innovative approach to a complex issue - in this specific case road trauma reduction among our indigenous communities.



Lauchlan McIntosh AM (ACRS), Mr Wayne Buckley (Grand Prize Winner), Mr Cade Turner (3M) and the Hon Darren Chester MP.

"The program was set up by the Northern Territory (NT) Government in 2012 across 23 remote communities to address the barriers that prevent Aboriginal people living in remote communities from accessing the licensing system.

"In the NT, Aboriginal and Torres Strait Islander people make up 84 per cent of the prison population. Driving and vehicle regulatory offences account for a quarter of the entire population being in jail.

"DriveSafe NT Remote is a fresh policy perspective on driver education. The program provides an innovative and sustainable solution to the complex, multi-causal and interdependent barriers to getting a driver licence in the bush.

"Since the inception of the program in 2012, the small team of five dedicated officers from the Department of Transport has delivered 3433 learner licences, 1086 provisional licences, 1164 birth certificates and 2103 driving lessons. Over the past year alone the service delivery footprint increased from 42 remote communities to 74 remote and dispersed communities receiving driver education and licensing services.

Judges considered the specific features of the many projects submitted, particularly in terms of innovation in thinking and technology, problem-solving as well as the real benefits in reducing trauma. Cost-effectiveness and transferability to other areas were other key criteria.

Finalists for this hotly-contested award came from many areas. These included new ideas and actions from local and state government groups; collaborative programs led by local and regional police groups; individuals passionately pursuing specific projects to reduce risk; industry associations and transport companies implementing programs with targets to ensure safe operations; news programs; and specific education for specialist

# Chapter reports

## **Queensland Chapter Report**

A number of Chapter members attended the International Conference on Traffic and Transport Psychology, held in Brisbane 5 - 8 August. This was a good opportunity to meet with road safety people from Europe in particular. Joel Tucker attended in lieu of Claire Howe, and prepared a brief report for the ACRS Weekly Alert as well as taking photos.

The Queensland Chapter held a seminar and Chapter meeting on 6 September 2016.

The seminar was presented by Dr Mark King, Senior Research Fellow at CARRS-Q. The presentation was titled "Safety while walking among older people: the intersection of mobility, road safety, physical fragility, gender and fears about personal safety". groups. These are just a few examples of the successful projects awarded as Finalists (26 in total) and Highly Commended (4) winners this year.

Highly Commended winners for 2016 include:

- Mr Alan Hay Boylan Group A compendium of front line road and workzone safety solutions
- **Queensland PCYC -** Queensland Police-Citizens Youth Welfare Association - Braking the Cycle
- Ms Lisa Bagnati Moonee Valley City Council -Better Moves Around Schools
- Mr Andrew Houston Johnson & Johnson SAFE
   Fleet Program Drivers around the world return home
   safely at the end of each day

"In 2010, 3M took the pledge of the Decade of Action for Road Safety, and it was clear that we could do more", said Cade Turner, Sales and Marketing Manager, 3M Australia.

"Our commitment to improving, protecting and saving lives extends far beyond our products and technologies. We are a company driven by the passion to improve every life through our unique approach to innovation.

"This award is modelled on that process - creating an environment where innovative ideas can come together, be shared, collaborated, celebrated, and most importantly, replicated in other regions or capacities to make a much bigger impact on road safety."

As the winning team leader, Wayne Buckley will travel to the USA to attend the 47th ATSSA Annual Convention and Traffic Expo in 2017, and will also visit 3M Global Headquarters in Minnesota.

Across the world the population is ageing, with high income countries showing the greatest changes at present. High income societies are increasingly car-dependent, so giving up driving presents a challenge to mobility that in most cases can only be met by walking, either directly or in conjunction with public transport. Age-related changes affect the safety of road crossing; increasing the risk of being struck by a vehicle. Physical fragility increases the severity of these collision, and also contributes to an increase in falls while walking, a type of injury not included in road injury statistics even though the same transport infrastructure is used. Women form the majority of older people, and in the oldest age groups the numbers of women are growing most rapidly. However, older women are more likely to avoid walking for reasons of personal safety. The implications for mobility and health are discussed, along with possible interventions.

# ACT and Region Chapter

### Road Safety Forum 2016: Drug Driving

The ACT and Region Chapter managed the Road Safety Forum 2016: Drug Driving for the ACT Government on 13 July 2016.

Over 50 people attended, representing a wide range of interested parties to discuss the latest research and developments in drug driving reduction and to examine ways in which this evidence could be used to inform the consideration of interventions which might reduce drug driving in the ACT. The Forum was an important step in the process of monitoring developments in drug driving testing and science as set out in the 2016-2020 ACT Road Safety Action Plan.

ACT Road Safety Minister, Shane Rattenbury, chaired the Forum. A number of speakers generously gave their time to make presentations. These included a video conference link with Dr Kim Woolf who described the findings and policy responses from the UK Expert Panel on Drug Driving which she chaired. She also provided the background to the development of the legislation governing drugs and driving in the United Kingdom.

Copies of the report on the Forum and Dr Woolf's presentation are available on the ACRS website on the ACT Chapter page: http://acrs.org.au/about-us/chapters/act-region-chapter/

#### Findings

The management of drug programs is complex. To date, the response to drug driving has been largely based on the successful implementation of the drink driving programs. Some changes in emphasis may result in significant reductions in drug driving crashes and harm. This can be achieved by improved use of resources and better targeting of programs to achieve a change in the attitude to drug driving in the community as a whole, and amongst all drivers who opt to drive while impaired by drugs.

Alcohol continues to be the predominant drug causing harm in ACT road crashes. Research has found alcohol even in low amounts in combination with other drugs can increase risks between 30 to 100 times. The use of illicit drugs is an important issue. The use of prescribed drugs, particularly when alcohol is taken is a problem with older drivers.

A move to the general deterrent approach of drink driving that includes a greater use of targeted advertising and education campaigns on drug use will achieve behaviour change. Deterrence for drink driving is supported by extensive tests administered; mass media and public education efforts for over 30 years; loss of license, fines and offender programs. The program is underpinned by a mature legislative process and community acceptance. Similar programs for drug driving are more recent. They rely heavily on technology; involve fewer tests and have less mature media and education programs.

The use of different thresholds for alcohol and drugs should be examined. It involves both technical measurement and government policy issues. Central to success is reliance on an improved theoretical knowledge base to support policy objectives: research to guide the best use of testing resources and to identify who should be tested and the best ways of communicating with the various user groups.

#### Findings to take forward

- Messages need to be consistent and from credible sources, with involvement from the community where possible, perhaps setting up an information portal.
- Evidence shows a strong link with alcohol and drug combinations which can be 100 times the risk and this could be used as a targeted ad campaign to draw on the success of alcohol campaigns.
- Thresholds can be detectable amounts with zero tolerance or risk based this is an area which requires further consideration.
- Testing currently is discretionary rather than random across the community should it be broader based (similar to RBT) to provide more deterrence for the general population?
- Are the penalties appropriate and consistent or should alternative programs be available for repeat offenders?
- Prescription medications, particularly with older drivers and in combination with alcohol, needs careful messaging as it is also important for older drivers to be taking their appropriate medication.

#### **Future action**

The first of a number of workshops has been organised by the ACT Justice and Community Safety Directorate for October.

#### **Other activities**

The Chapter has been involved in the preparations for ARCS 2016 held early in September and has had preliminary discussions with ACTION, the ACT Bus provider, to manage a forum early in 2017 on the safe interaction of buses with other road users including pedestrians, cyclists and motorcyclists. Other programs with interested parties are being considered for 2017.

# Other news

# Australasian Road Safety Conference 2016 (ARSC2016)

It was a great honour to be co-chair of the Australasian Road Safety Conference in 2017 and to work closely with the Australasian College of Road Safety and Austroads on the delivery of such a successful meeting. As many will be aware, this was the second national road safety conference delivered by this new partnership, and the positive feedback from delegates was very encouraging. The conference series is certainly shaping up to becoming a major event on the global and national road safety calendar and is certain to attract more and more international delegates in years to come. Australia is a global leader in road safety research, policy and practice and having one major national conference every year to exchange new ideas and network can only enhance our opportunities for collaboration and innovation.

Of the 600 delegates who attended most were from Australia and New Zealand, but there were also 25 international delegates. The conference was also able to offer international scholarships thanks to generous support from the Australian Department of Infrastructure and Regional Development and the Global Road Safety Partnership (GRSP). The formation of these scholarships was in direct response to the United Nations Decade of Action for Road Safety 2011-2020. There were nine scholarships awarded to people from seven countries - Cambodia, Bangladesh, Pakistan, Indonesia, Nepal, Malaysia and Iran. In addition, thanks to further support from the GRSP, the ARSC2016 Organising Committee was very pleased to award two scholarships to Aboriginal community representatives.

The George Institute for Global Health was delighted to co-host the event and provide support for such a successful conference. With myself, Associate Professor Lisa Keay, and Dr Jagnoor contributing to conference organising, scientific and international committees; and many of our staff attending and presenting, we certainly appreciated the opportunity to both contribute and to learn from the event.

Huge thanks are extended of course to the ACRS Secretariat, conference coordinators and the myriad of others who contributed, especially our speakers.

Look forward to seeing you all in Perth in 2017.

Rebecca Ivers, MPH, PhD Co-Chair ARSC2016



# ARSC2016 Awards

The following people were awarded prizes for their high quality contributions to the conference.

### John Kirby Award for Best Paper by a New Researcher

**Winner: Alexandra Hall** Neuroscience Research Australia Qualitative Consumer Input for Enhancing Child Restraint Product Information to Prevent Misuse



# Peter Vulcan Award for Best Research Paper

Winner: Stuart Newstead Monash University Accident Research Centre Interim Evaluation of the Victorian Safer Road Infrastructure Program Stage 3 (SRIP3)



## Best Paper by a New Practitioner Award

### Winner: Haris Zia

Abley Transportation Consultants An Automated Process of Identifying High-Risk Roads for Speed Management Intervention



Best Paper with Implications for Improving Workplace Road Safety Paper to be converted to an NRSPP Thought Leadership Piece & Webinar

### Joint Winner: Sharon Newnam

Monash University Accident Research Centre Identifying the organisational determinants of work related road traffic injury

### Joint Winner: Amanda Warmerdam Monash University Accident Research Centre Best practice versus "in practice": insights into Improving Australian Industry Road Safety management



## Road Safety Practitioner's Award

### Winner: Angela Crean and Adam Francis

New Zealand Transport Agency

Innovative Weather-Activated Variable Speed Sign Trial - a first for road safety in New Zealand

## Road Safety Poster Award

Winner: Ranmalee Eramudugolla

Centre for Research on Ageing, Health, and Wellbeing, Australian National University Validation of a virtual driver assessment tool for older drivers

### Conference Theme Award

**Winner: Julie Hatfield** Transport and Road Safety (TARS) Research Centre, UNSW *The Safest System: Preventing crashes by preventing errors* 

### Policing Practitioner's Paper Award

### Winner: Nils van Lamoen and T Baron

New Zealand Police The development of an intelligence-based deployment model to enhance Road Policing service delivery: a case study

Congratulations to our outstanding authors and presenters at the Australasian Road Safety Conference!

# Search for current and past papers from the *Journal of Australasian College of Road Safety*

The *Journal of Australasian College of Road Safety (ACRS Journal)* has been publishing a diverse range of papers on road safety from researchers, government organisations, and other road safety experts. Did you know you can search for current and past papers from *ACRS Journal* on TRID? TRID is an integrated database that combines the records from Transportation Research Board's Transportation

Research Information Services Database and the OECD's Joint Transport Research Centre's International Transport Research Documentation Database. When you search for papers on TRID, you not only have access to the *ACRS Journal* papers but also to other records of transportation research worldwide. If not already, add TRID as one of your regular online search databases so you have access to a wider range of road safety articles.

# Peer-reviewed Papers

# Review of the graduated driver licensing programs in Australasia

By Bridie Scott-Parker<sup>1, 2, 3</sup> and Karina Rune<sup>1, 2, 3</sup>

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## Abstract

This paper overviews the mandatory conditions and restrictions applied within graduated driver licensing (GDL) programs throughout Australasia, focusing upon changes in Australia since 2009, in addition to the GDL program in New Zealand. Important changes relate to increased restrictions on demerit point thresholds, limits to blood alcohol content for supervisory drivers, a no drug-driving policy, and increased restrictions regarding all mobile phone usage, while increases were introduced to mandated supervised driving hours and holding period. Changes to the GDL programs in the last decade are largely positive and have contributed to significant decreases in road crash injuries and fatalities in young novice drivers. Interestingly, however a number of Australasian jurisdictions do not meet the US Insurance Institute for Highway Safety GDL rating system criteria for a 'good' GDL program. As such, some jurisdictions could benefit from tighter regulations, particularly in regards to night-time and passenger restrictions and increased holding periods.

## Keywords

Graduated driver licensing, GDL, Learner, Pre-Learner, Provisional, Teen driver, Young driver

# Introduction

The pervasive problem of young and novice drivers being disproportionately represented in road crash injuries and fatalities is well-recognised around the world. Graduated driver licensing programs (GDL) were introduced in Australia and New Zealand (referred to as Australasia) as a driving exposure measure, such that more driving experience can be gained over an extended period and in lower risk circumstances. During the learner stage, the young novice driver is introduced to driving while under the direction of a supervisor (including lay instructors such as parents, and qualified driving instructors). In the following provisional (restricted/intermediate) phase, the novice driver can drive unsupervised, but with specific conditions and restrictions which are designed to minimise their exposure to risk from known factors, for example passenger limits emerge from known risk factors such as passenger presence (e.g., see Tefft et al., 2014; Williams et al., 2012). The final phase is an open (unrestricted) licence. Thus, during the learner and provisional phases, young and novice drivers must comply with both GDL and general road rules relevant to their jurisdiction.

There is a growing body of evidence confirming the effectiveness of GDL, with evaluations (Hartling et al., 2009) in New Zealand (e.g., Begg & Stephenson, 2003; Lewis-Evans & Lukkien, 2007), the United States and Canada (Fell et al., 2011; Mayhew, Simpson, Singhal, & Desmond, 2006; Vanlaar et al., 2009) demonstrating reduced risk for teen and novice drivers. Programs with night-driving and passenger restrictions (Masten et al., 2013; Morrisey et al., 2006), and a minimum Learner duration, which therefore increases the age at which independent driving can begin, appear to be the most effective (McCartt et al., 2010; Preusser & Tison, 2007; Williams, 2007). The Insurance Institute for Highway Safety (IIHS) developed a system for rating GDL strength, with points allocated for program elements pertaining to the learner (maximum of 4 points; e.g., minimum holding period < 3 months = 0 points, 6+ months = 2 points) and provisional (maximum of 6 points; e.g., no restriction on night driving = 0 points; 10 pm or earlier restriction = 2points) phases. Programs with a good rating require 6 or more points, whilst programs receiving fewer than 2 points are rated as poor. Programs with good ratings are associated with improved road safety outcomes, such as increased seatbelt use by young drivers and their young passengers, thus improving road safety outcomes for vehicle occupants more generally (Fu et al., 2013).

A review of the GDL systems in operation or about to be introduced in Australia in 2007 summarised key rules and regulations in each Australian state and territory (Senserrick, 2007). As significant changes took place in the following two years in most jurisdictions, a further review was undertaken (Senserrick, 2009). Since this time, several Australian states increased the minimum holding period for a learner licence (from 6 to 12 months) and introduced - or increased - mandatory learner driving hours. Further, mobile phone restrictions were applied to both the learner and provisional stage of the GDL. Reflecting the increased risk of injury or death from a car crash, particularly during the first six months of a provisional licence, restrictions were also placed on high-power vehicles, night-time driving, and the number of passengers that can be carried at high-risk times such as at night. Furthermore, whilst the previous two papers by Senserrick (2007, 2009) provided a summary of the rules and regulations relating to GDL in Australia, they did not include the GDL program in New Zealand (NZ). In addition, unlike the United States (GHSA, 2015), there currently is no readily-accessible resource (online or other) which succinctly summarises the features, conditions, and restrictions of Australasian GDL programs. Thus, the current paper summarises GDL programs in place in Australasia as at August 2014, while highlighting Australian program changes since 2009. In addition, the strength of the Australasian GDL programs will be examined within the context of the IIHS ratings model.

#### GDL models

Currently, several Australian states have moved beyond the traditional three stage GDL program (see Figure 1 for an overview). Further, in Australia, the Australian Capital Territory (ACT), Northern Territory (NT) and South Australia (SA) offer two parallel pathways to progress from a learner licence to a provisional licence. The choice is between showing driving skills and abilities during a driving test by a government assessor, or competency based training and assessment (CBTA) which includes a continued form of assessment including examination and certification of a range of driving skills and related attitudes during the learner period. CBTA can be undertaken with an Accredited Driving Instructor or through a supervisor acquired by the learner driver themselves (e.g., parent, spouse, or friend).

In addition, both the ACT and NZ have an educational alternative to progress through the provisional licence period. In the ACT, a provisional driver who undertakes the *Road Ready Driving Course* can remove their P plates after six months with an increase in the demerit point threshold from four to eight points in three years. In NZ only, undertaking an *Advanced Driving Skill* course effectively reduces the minimum age from 18 years to 17.5 years, and the duration upon a restricted (note the Australian equivalent: provisional) licence by 3 to 6 months, depending on age.



PL = pre learner; L = learner licence; L1 = Learner phase 1; L2 = learner phase 2; P = provisional licence; P1 = provisional phase 1; P2 = provisional phase 2; O = open licence

Figure 1. Summary of Australasian graduated driver licensing programs

# Recent changes to GDL programs in Australasia

Key requirements and restrictions for young novice drivers in Australasia (predominantly referring to drivers less than 25 years of age) are summarised in Tables 1 and 2. For older drivers (generally over 25 years, but in some places referring to drivers between 21 and 23 years of age) there are different requirements mainly relating to a shorter holding period for learner and provisional licence, bypassing the first stage of the provisional licence (P1), and no restrictions on night time driving.

At a broad level, significant changes that have taken place during the learner phase relate to a clearly specified Blood Alcohol Content (BAC) limit for supervisor drivers and the introduction of a 'no drug policy' in many jurisdictions. Practical driving tests were introduced in two Australian states (Tasmania [TAS], Western Australia [WA]) in order to progress from the first to the second phase of a learner licence, while all other areas require an on-road driving test before a provisional licence can be issued. Further increases to supervised driving hours and minimum holding periods were introduced, and demerit point thresholds were applied broadly. Previously, many jurisdictions did not enforce any restrictions on mobile phone use (e.g., could use hands-free, blue tooth or speaker function in both learner and provisional stages); however, most areas now enforce mobile phone restrictions, including all handheld devices, for learner drivers and drivers in the early provisional phase.

Condition and Restrictions	ACT	NSW	NT	Qld	SA	TAS	VIC	WA	NZ
Prior to licensure									
Minimum age (years)	PL 15yrs 9mth	16	16	16	PL <16 ° L 16	PL 15yrs 11mth L1 16 L2 16yrs 3mth	16	16	16
Mandatory education	Yes	No	No	No	No	No	No	No	No
Eyesight test	Yes	Yes	Yes	Yes	No	L1 Yes L2 No	Yes	Yes	Yes
Road law knowledge test	Yes	Yes	Yes	Yes	Yes	L1 Yes (PL) L2 No	Yes	Yes	Yes
During licensure									
Duration licence valid (years)	2	5	2	3	2	L1 3 L2 3	10	3	NA
Minimum holding period (months)	6	< 25yrs 12	6	12	< 25yrs 12 ≥ 25yrs 6	L1 3 L2 9	<21yrs 12 21-25yrs 6 >25yrs 3	12 (6mth pre PDA and 6 mth post PDA)	6
Practical test	No	No	No	No	No	L1 Yes L2 No	No	Yes after 25 hours supervised driving	No
Display L-plates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mandatory education and instruction	No Yes if CBTA	No	No Yes if DS	No	No Yes if CBTA	No	No	No	No
Logbook required	No	<25 yrs	No	< 25 yrs	Yes	L1 No L2 Yes	Yes	Yes	No
Professional instruction 3-for-1 <sup>a</sup>	No	Yes	No	Yes	No	No	No	No	No
Mandatory minimum driving (hours)	No	120 (20 at night)	No	100 (10 at night)	75 hours (15 at night)	L1 No L2 50	< 21 yrs 120 (10 at night)	50	No 120 re- commended
Supervisory driver minimum requirements	Full Licence 4 yrs 0% BAC	Full licence < 0.05% BAC	Full licence < 0.05% BAC	Full Licence 1 yr < 0.05%	Full Licence 2 years violation- free < 0.05% BAC	Full licence 2 yrs violation- free < 0.05% BAC	Full licence < 0.05% BAC	Full Licence 4 yrs < 0.05% BAC	Full Licence 2 yrs NA
BAC limit (mg/100mL)	Zero	Zero	Zero	Zero	Zero	Zero	Zero	Zero	<20yrs Zero >20yrs 400

 Table 1. Learner Licence requirements and restrictions in Australasian graduated driver licensing programs

Condition	ACT	NSW	NT	Qld	SA	TAS	VIC	WA	NZ
and Restrictions									
Illicit drugs	NA	NA	NA	No drugs	No drugs	No drugs	NA	NA	No impairment <sup>b</sup>
Maximum speed restriction (km/h)	No	90	80	No	100	80 (L1) 100 (L2)	No	100	No
Mobile phone restriction (all use)	No	Yes	Yes	Yes	Yes	No	Yes	No	No
Towing restriction GVM	Yes >750kg	Yes	No	No	No	L1 & L2Yes	Yes	No	No
Demerit point threshold (points in months) <sup>c</sup>	No	4 in 12	5 in 12	4 in 12	4 in 12	4 in 12	5 in 12	4 in 12	No
Restrictions on locations <sup>d</sup>	No	Yes <sup>e</sup>	No	No	No	No	No	Yes <sup>e</sup>	No

Note: CBTA = Competency Training and Assessment, DS = DriveSafe driver education and training program, yrs = years, mth = months, PL = pre learner, L1 = learner licence 1, L2 = learner licence 2, PDA = practical driving assessment, NS = not specified, GVM = gross vehicle mass.

<sup>a</sup> Learner drivers who complete a one hour driving lesson with a fully licensed qualified driving instructor can record three driving hours in their logbook, up to a maximum of 10 hours professional instruction (therefore, 30 logbook hours).

<sup>b</sup> It is an offence to drive while impaired and with evidence of a qualifying drug in the bloodstream.

<sup>c</sup> Demerit point threshold refers to maximum number of points a licence holder can accumulate before their driver's licence is, and therefore their driving privileges are, suspended.

<sup>d</sup> In NSW learner drivers must not drive in Parramatta Park or Centennial Park in Sydney; in WA learner drivers are not allowed to drive within the boundaries of Kings Park and wherever signs prohibit learner drivers.

<sup>e</sup> Whilst no conditions are attached to this pre-learner phase, future-drivers are explicitly encouraged to become informed in car and road safety and to learn the road rules.

Conditions	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	NZ
and									
restrictions									
Prior to									
licensure									
Minimum age	17	P1 17	16.5	P1 17	P1 17	P1 17	P1 18	P1 17	16.5
(years)		P2 18		P2 18	P2 18	P2 18	P2 19	P2 17.5	
Practical test	Yes	P1 Yes	Yes	P1 Yes	P1 Yes	P1 Yes	P1 Yes	P1 No	Yes
	No if	P2 No		P2 No	P2 No	P2 No	P2 No	P2 No	
	CBTA								
During									
licensure									
Minimum	36	P1 12	< 25yrs 24	P1 12	P1 12	P1 12	P1 12	< 19yrs	< 25yrs 18
period		P2 24	$\geq$ 25yrs 12	P2 <	P2 24	P2 <	P2 36	P1 6mth	>25yrs 6
(months)				25yrs 24,		23yrs 24;		P2 18mth	ADS <
				$\geq$ 25yrs 12		$\geq$ 23yrs 12			25yrs 12
									$ADS \ge$
									25yrs 3

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Condition and	ACT	NSW	NT	Qld	SA	TAS	VIC	WA	NZ
Restrictions									
Hazard perception test	No	P1 No P2 Yes**	No	P1 No P2 Yes**	P1 Yes* P2 No	P1 No P2 No	P1 Yes* P2 No	P1 Yes* P2 No	No
Display P-plates	Yes RRP at 6mth No	P1 Yes P2 Yes	Yes	P1 Yes P2 Yes	P1 Yes P2 No	P1 Yes P2 No	P1 Yes P2 Yes	P1 Yes P2 Yes	No
BAC limit (mg/100mL)	Zero	P1 Zero P2 Zero	Zero	P1 Zero P2 Zero	P1 Zero P2 Zero	P1 Zero P2 Zero	P1 Zero P2 Zero	P1 Zero P2 Zero	< 20yrs Zero < 20yrs (80/100)
Illicit drugs	Not specified	Not specified	Not specified	No drugs	No drugs	No drugs	Not specified	Not specified	No impairment
Maximum speed restriction (km/h)	No	P1 90 P2 100	100	P1 No P2 No	P1 100 P2 No	P1 80 P2 No	No	No	No
Automatic transmission restriction	Yes	P1 Yes P2 No	Yes	P1 Yes P2 Yes	P1 No P2 No	P1 Yes P2 Yes	P1 Yes P2 Yes	P1 Yes P2 Yes	Yes
Mandatory education and instruction	No Yes if RRP	No	No	P1 No P2 No	P1 No P2 No	No	No	No	No Yes if ADS
Night-time or passenger (yrs) restriction	No	P1 <25yr 1 passenger <21yr btw 11pm- 5am P2 No <sup>b</sup>	No	P1 1 passenger <21 btw 11pm- 5am <sup>b</sup> P2 No	P1 midnight- 5am 1 pass. 16-20 yrs unless supervised P2 No	P1 No P2 No	P1 1 passenger 16-22yrs <sup>b</sup> P2 No	P1 midnight - 5am <sup>a</sup> P2 No	Yes 10pm- 5am 0 passengers unless supervised <sup>b</sup>
Mobile phone restriction (all use)	No	P1 Yes P2 No	Yes	P1 Yes P2 No	P1 Yes P2 No	P1Yes P2 No	P1 Yes P2 Yes	P1 No P2 No	No
High- powered vehicle restriction	No	P1 Yes P2 Yes	No	P1 Yes P2 Yes	P1 Yes <25 yrs P2 Yes <25yrs	P1 No P2 No	P1 Yes P2 Yes	P1 No P2 No	No
Towing restriction	<750GVM first 12mth	P1 <250kg P2 No	No	P1 No P2 No	P1 No P2 No	P1 No P2 No	P1 Yes P2 Yes	P1 No P2 No	No
Demerit point threshold (points in months) <sup>a</sup>	4 in 36 RRP & >26 yrs 7 in 36*	P1 4 in P2 7 in	5 in 12	4 in 12	P1 4 in 36 P2 4 in 36	P1 4 in 12 P2 4 in 12	P1 5 in 12 &/or 12 in 36 P2 5 in 12 &/or 12 in 36	P1 4 in 12 P2 8 in 24	Not specified
Exit test	No	P1 No P2 Yes	No	No	P1 No P2 No	No	No	No	Yes
Minimum age for full licence (years)	20	20	18.5	20	19	20	22	19	18 17.5yrs ADS

Note: CBTA = Competency Training and Assessment, RRP = Road Ready Plus course, ADS = Advanced Driving Skill course, P1 = provisional licence 1; P2 = provisional licence 2, yrs = years, mth = months, btw = between, GVM = gross vehicle mass.

<sup>a</sup> If disqualified from driving while a provisional licence holder will be restricted to carrying one passenger at all times while driving for a period of 12 months.

<sup>b</sup> If not an immediate family member.

<sup>c</sup> Demerit point threshold refers to maximum number of points a licence holder can accumulate before their driver's licence is, and therefore their driving privileges are, suspended.

\* In order to be issued with a probationary driver licence (P1), a hazard perception test must first completed.

\*\* In order to be issued with a probationary driver licence (P2), a hazard perception test must first be completed

In regards to the provisional licence, the structure was revised considerably with the introduction of a second provisional stage (P2) now in place in all jurisdictions except the ACT, NT and NZ, and adjustments to the minimum holding period, and minimum age, for either the first or second phase of the licence in NZ. Restrictions on automatic transmission now applies across the board except in SA, which is the only state that still allows provisional drivers who pass their test in an automatic vehicle to be immediately eligible to drive a manual car. Lastly, as in the learner stages, reduced demerit point thresholds now exist throughout Australia.

# GDL changes according to Australasian jurisdiction

Whilst minor changes were introduced to the GDL programs throughout Australasia since 2009, it is noteworthy that several Australian states underwent major changes to their GDL program in the preceding five years. SA considerably revised its GDL in 2014 by broadly tightening the rules and restrictions in place. Significant changes in the learner phase included an increase in the minimum holding period for a learner licence from 6 to 12 months; an increase in mandatory supervised driving hours from 50 to 75 hours; a no drug policy; a 100km/h speed limit; and mobile phone restrictions. Further, for the first stage of the provisional licence, recent restrictions were applied to night time driving between midnight and 5am, unless for work purposes; no more than one passenger aged 16-20, unless immediate family members, between midnight and 5am; and all mobile (including handheld, loudspeaker, Bluetooth) phone use. Other significant changes include moving the hazard perception test forward by making it a requirement to progress from the learner to first stage of the provisional licence, (previously, the hazard perception test was required to move from the first to the second stage of the provisional licence), and removing regression to a previous licence stage as an additional punishment following a disqualified period. Instead disqualified learner and provisional drivers will return to the driver's licence stage they held at the time the offence was detected.

In Queensland (QLD) the following changes were applied: a BAC limit for supervisory drivers; no drug policy; and a reduced demerit point threshold for learner drivers. In TAS significant changes also took place in 2009 including: a restructuring of the learner stage into a pre-learner, learner 1 and learner 2 phase, a practical driving test during the second learner phase; an increase in the minimum holding period of a learner licence from 6 to 12 months; a no drug policy; and restrictions on mobile phone use. During the provisional licence phase, restrictions now apply to automatic transmission, and all mobile phone use (first stage of provisional licence). The minimum age for the second stage of the provisional licence has been reduced to 18 years, and drivers no longer need to display plates during this phase.

In 2012, WA introduced a practical driving test after 25 hours driving with a learner licence and at a minimum 16.5 years; mandatory supervised driving hours increased from 25 hours to 50 hours; BAC limits were introduced for supervisory drivers; a revised demerit point threshold; an automotive transmission restriction; and the introduction of a second provisional phase. In NZ, changes in 2011 included an increase in the minimum licensing age for a learner licence from 15 to 16 years; restricted (provisional) licence for 15.5 to 16.5 years, and 17 to 18 years for a full licence, or 17.5 if the driver has had a restricted licence for at least 12 months and completed an approved *Advanced Driving Skill* course. In addition, ACT commenced community consultation regarding reviewing the GDL program in April 2014.

# Differences between Australian states and territories, and between Australia and New Zealand

In Australia, the two territories ACT and NT are largely treated like the other states in that they are self-governing entities, with their own parliament and the ability to make their own laws. The similarity between territory and state is reflected in the GDL programs which can be seen as being relatively similar throughout Australia. However, in a few key areas, the GDL programs in the ACT and the NT are more consistent with the GDL program in NZ than the remaining Australian states. Specifically, all three jurisdictions have fewer restrictions and conditions in place overall. Moreover, contrary to all of the Australian states, none of these jurisdictions requires mandatory driving hours or log book entries, with a 6-month only holding period during the learner licence stage. Further, all three jurisdictions have only a single-phase provisional licence.

With regards to NZ specifically where a GDL program was introduced in 1984 (Baughan & Simpson, 2002), few updates appear to have taken place in the past three decades. This is surprising as NZ was a pioneer through being the first jurisdiction in the world to implement a formal GDL program as a way to manage young novice driver risk. Although the minimum age was increased at each stage of the GDL in 2011, NZ overall has less rigorous restrictions in place regarding learner and provisional stages in comparison to Australia. For example, unlike most other areas in Australia, NZ has no mandatory supervised driving hours during the learner stage, requires only a 6-month holding period, and does not specify a maximum BAC limit for supervisory drivers. Despite research indicating the dangers of mobile phone use, especially for young drivers (e.g., Bellinger et al., 2009; Haque & Washington, 2014), NZ has not introduced mobile phone restriction during either the learner or provisional phases. Further, unlike Australia, there is no reduced demerit point threshold in place, when deterrence theory (Homel, 1988; also see the reconceptualisation of deterrence theory by Stafford and Warr, 1993) would suggest that such a condition would act as a deterrent for risky and dangerous driving during the first few years of novice licensure. Finally, NZ holds the youngest minimum age to obtain a full licence with an unrestricted licence possibly gained as young as 17.5 years, an age where most young Australian drivers would be subjected to the increased restrictions in place to guide them through the well-recognised hazardous first stages of independent driving.

#### Australasian GDL program strength ratings

Interestingly, an examination of the learner and provisional conditions as summarised in Tables 1 and 2, and application of the IIHS GDL strength rating system, revealed that only three Australian states (NSW, QLD, VIC) received a good rating (6 points each); three Australian states (SA, TAS, WA) received a fair rating (4-5 points each); and the two Australian territories (NT, ACT) and NZ received a marginal rating (2-3 points). As such, despite the recent improvements apparent in all of the reviewed GDL programs, and despite NZ being the first jurisdiction to introduce a GDL program for young novice drivers, there remains room for improvement.

## Concluding comments

Changes to GDL programs in place throughout Australasia during the last decade offer promising improvements to the training of young novice drivers, and preliminary investigations indicate a reduction in young novice driver crash involvement. In addition to the changes discussed by Senserrick (2007, 2009), some recent enhancements are of particular significance. These include clearly specified BAC limits for supervising drivers and a no drug policy, reduced demerit point threshold, mobile phone restrictions and increases in supervised driving hours and holding periods for young novice drivers. While these changes are likely to have a positive effect on the number of injuries and fatalities seen in young novice drivers, there is still scope for improvement. Further, many jurisdictions still do not have specific rules in place regarding night-time driving and number of (peer) passengers. As this has been found to significantly reduce the risk of fatal road crashes in young drivers and is one of the most successful aspects of the NZ GDL (Begg & Stephenson, 2003), it is imperative that future revisions to GDL programs in Australasia consider implementing tighter restrictions, particular during the early provisional phase.

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# Changing licensing trends and travel mode choices of young adults

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### Abstract

Analysis of driver licensing rates among young adults in Victoria, Australia, found declines in licensing since 2001. In 2014, over one-third of 18-24 year-olds did not hold a licence. Also, a survey of 147 non-driving young Australians found the most frequent main reasons for not holding a licence included the difficulty of the licensing process or its expense, not liking driving or preferring walking. Over a third of those surveyed aged 25-30 said they had never learned to drive, or were still learning. Young Victorian adults are changing their travel modes by driving less, not at all or delaying getting a licence, along with strong preferences for other travel modes, such as public transport and walking. Potential road safety implications include reduced road deaths and injuries, but also an ongoing demand for safer infrastructure for vulnerable road users. Also, all drivers will increasingly experience a road system comprising users aged over fifty along with road safety measures targeting that age group.

### Keywords

Licensing, Travel mode, Young adults, Young drivers

### Introduction

Are young adults' choices of travel mode changing? This is an important question because road user age can influence choice of travel mode, use of or exposure to the road system, and consequently road safety. For example, if fewer young adults choose to take up driving, this could translate into fewer crashes involving that age group as well as travel mode patterns that persist into later adulthood. Declines in licensing rates also have the potential, in broad government and industry policy circles, to affect future transportation needs, driver supply in the transport industries, preferences for non-driving travel modes, vehicle purchases, and environmental consequences.

Changing travel mode choices among young people, particularly declines in the percentages with driver's licences, have been found in several countries. These declines are unique to young adults as they occur alongside increased proportions of licensed drivers of other ages. The countries included the US, Canada, Sweden, Norway, the UK and Germany (van Dender, 2013; Sivak, 2012), but also Australia (Raimond, 2010; Dutzik 2014; Delbosc 2013). Among North American young adults, common reasons given for *not* holding a driver's licence included that they were too busy to get a licence; owning and maintaining a vehicle is too expensive; they are able to get transport from others; and that they prefer walking, cycling or public transport to driving as travel mode choices (Schoettle 2013). Young adults researched elsewhere have given similar reasons (Dutzik 2014; Davis 2012; Foss 2014; Le Vine 2014).

The present study was a preliminary examination of evidence of driver licensing decline among young people in Victoria, Australia, and which surveyed young Australian adults' reasons for not wanting to drive or obtain a licence, for comparison with North American findings (Schoettle 2013). The study focussed on the potential road safety implications of changing travel mode choices because much of the research hitherto has been conducted from sociological and public transport planning perspectives, with very little attention paid to potential road safety implications.

# Why are young adults' travel mode choices changing?

Past research into young adults' changing travel mode choices generally reports declines in driver licensing (van Dender 2013; Sivak 2012; Raimond 2010; Dutzik 2014) coupled with their increased use of alternative transport modes (Dutzik 2014; Kuhnimhof 2013; TransitCenter 2014; Asad FHA 2013). Other young adults, for various reasons, are delaying obtaining licences until their mid-20's or older (Raimond 2010). As well, even among *licensed* young adults, many are complementing their driving with increased use of alternative transport options (van Dender 2013; Kuhnimhof 2013). There are likely to be many inter-linked, societal-level factors influencing whether or not and, if so, when to obtain a licence, as well as choice of alternative travel modes (Aretun 2014). These factors include:

- transport planning policies, economic circumstances and market forces restricting access to and usage of cars (van Dender 2013; Metz 2013; Sivak 2014);
- a delayed transition from teenage to adult lifestyles (Aretun 2014; van der Waard 2012);
- increased use of bicycles and car-sharing schemes (van der Waard 2012; Strang 2013);
- a devaluing of car ownership and car use as a lifestyle characteristic (Kronenberg 2014; Delbosc 2013).

Also, public transport is becoming an increasingly more attractive choice among the young (at least for those who have good access to it) due to convenience, shorter travel times and that it facilitates sustained use of technological equipment such as smartphones and laptops (Davis 2012; TransitCenter 2014). Many jurisdictions explicitly ban young drivers from using hand held mobile phone technologies, thus providing a further incentive to travel as a passenger. In addition, evidence from Belgium suggests that many young people prefer to work from home or other convenient location (teleworking), rather than physically travel to business premises (Pirdavani 2014).

# Declines in licensing among young Victorians

CASR obtained the total number of licensed drivers (Probationary and Full licences together) at each age from

18 to 90 on 30 June for the years 2001 to 2014 from the VicRoads Registration and Licensing Department. These ages were grouped as in Sivak and Schoettle's study (Sivak 2012) to permit comparison with the 15 countries they studied. The 30 June date is used by the Australian Bureau of Statistics (ABS) in its annual estimates of the population by age and sex. As the study sought to quantify the extent of gaining a licence in Victoria, the licence numbers included suspended and disqualified licences. It was not possible under the terms for this project to definitively identify numbers of licences first issued out of all issued licences in a particular year.

The driver licence numbers by age were tabulated alongside respective ABS population data for Victoria, and the percentage of licensed drivers then calculated for each age category across 2001-2014. These percentages were then examined for initial indications of any trends over time (see Figure 1), in anticipation of conducting a detailed statistical analysis as a separate future exercise.



Figure 1. Licensing rates as percentages of Victorian population, by age group, 2001-2014

Between 2001 and 2014, there was an overall decline in the proportion of Victorians aged 18-24 who were licensed, culminating in over one-third of 18-24 year olds *not* holding a driver licence in 2014. The most marked decline was seen for 18 year olds specifically (not shown on Figure 1), with 52.5% per population holding a driver licence in 2001 (34,112 drivers), dropping to 39.9% per population by 2014 (29,274 drivers). There was also a decline in licensing among 25-29 year olds, going from 94.4% of the population in 2001 to 83.4% of the population in 2014.

By contrast, the rates for ages 30-49, while fluctuating a little, nevertheless indicated an overall pattern of little change. However, the age group 50-90 experienced a steady increase in licensing rates per population across 2001-2014, with the steepest rates found among those aged over 60. Importantly, these trends for drivers aged 30 to 90 are inconsistent with the declining patterns found for drivers under 29, demonstrating that the declining licensing rates of young drivers constitute a unique phenomenon not part of a broader licensing pattern.

For the years 2002 and 2014, the numbers of licence holders for each of the ages 18-24 were further analysed by subtracting each number of licence holders a year

Age	Licence rate as % of Vic population in 2002	Licence rate as % of Vic population in 2014	Difference between 2002 and 2014
19	18.5	18.5	0
20	7.2	8.5	+1.3
21	2.8	6.8	+4.0
22	3.0	5.0	+2.0
23	2.8	5.1	+2.3
24	1.4	1.7	+0.3
Average	5.9	7.6	1.7

Table 1. Estimated first time licensing rates aspercentages of Victorian population, ages 19-24, at 30June 2002 and 30 June 2014

younger in the previous year (as at 30 June). This provided an *indirect* estimate of the numbers of *new* (i.e. first time) licence holders aged 19-24 in 2002 and 2014. These numbers were then expressed as percentages of the Victorian population for those ages in 2002 and 2014, as can be seen in Table 1.

This indirect approach estimated that, in 2002, 18.5% of the population of 19 year olds in Victoria were first time licence holders (12,272 drivers), and this proportion was the same in 2014. By contrast, a greater proportion of 20 to 23 year olds were licensed in 2014 compared to 2002, which suggests there had been slight increases in first time licence holders for these ages, despite the overall decline in licensing for young drivers across that period.

#### Survey of young adults not licensed to drive

An online survey was conducted during February-March 2015 with Australians aged 18-30 who self-identified that they do not currently have a driver's licence or drive, and primarily seeking their reasons for their choices. It was anticipated that Victorian response patterns in the survey could assist in explaining any trends found when analysing the VicRoads licensing data, as well as gauging consistency with the survey responses nationally.

For purposes of results comparison, the survey was modelled on the questionnaire used by Schoettle and Sivak (Schoettle 2013), who provided permission to use a slightly modified format. Approval was also given by the University of Adelaide's Human Research Ethics Committee. The survey was short, containing eight questions, beginning with a confirmation of the participant's licence status. The remaining questions asked about age, gender and postcode, main and secondary reasons for not having a licence (if this was the case), any plans to become licensed and current main mode of travel. The two questions about main and secondary reasons for non-licensure provided several answer options that were randomised between the two questions and for each new participant to limit potential for any priming effects on respondents.

It was anticipated that young adults who do not drive constitutes a minority population who would be difficult to identify for purposes of conducting a survey. Consequently, SurveyMonkey, an on-line business providing guidance in designing and implementing on-line surveys, and which was used by Schoettle and Sivak (Schoettle 2013) in their survey, was employed in the present study. Most of the respondents were recruited by SurveyMonkey from their current Australian audience pool. A separate SurveyMonkey weblink to the survey was promoted by the RACV among its young adult members via electronic newsletter and social media. Due to cost and timeline limitations, additional means of attracting potential participants were not pursued. In their survey, Schoettle and Sivak (Schoettle 2013) obtained a sufficiently large respondent pool to set age-based quotas to control for representativeness of the North American population. The respondent pool in the present study was not large enough to permit setting such quotas.

Nonetheless, responses were received from 270 individuals nationally (with 50 coming from the RACV weblink). Of the 270, 121 had indicated at the first question that they currently have a licence. These respondents were thanked but disqualified from completing further questions, as was the case in Schoettle and Sivak's (Schoettle 2013) original survey. It was important to have this initial filtering question as it constitutes an extra check to ensure that the survey sample comprised only individuals who did not hold a current licence. Two other respondents were excluded from further analysis as they had indicated their age was 31 or over. This left 147 adults aged 18 to 30 who did not currently hold a licence, although some of these had a learner's permit or an expired licence.

The overall gender breakdown of the 147 was 19.7% male (n = 30), 76.2% female (n = 112) and 4% 'other' or no response (n = 5). The 60 Victorian respondents contained 46 females (76.7%). The preponderance of females over males was likely due to SurveyMonkey's audience pools containing many more females than males, as well as females generally being more predisposed towards survey participation. In the present study, gender balance was not a prime issue of concern as it was deemed more important to maximise eligible respondent numbers, given the difficulty of locating 18-30 year olds who do not drive. Given this and the substantial female skewing among respondents, breakdowns of the survey data by gender are not reported here. Respondents' residences were: Melbourne metropolitan area 47 (32.0%), rest of Victoria 13 (8.8%), Western Australia 13 (8.8%), Tasmania 4 (2.7%), South Australia 14 (9.5%), Queensland 11 (7.5%), New South Wales 40 (27.2%), the Australian Capital Territory 4 (2.7%) and the Northern Territory 1 (0.7%), with 2 nil responses (1.4%).

Respondents were asked to give their one main reason for not having a licence and these, in descending order of frequency, are displayed in Table 2. As a majority of the respondents came from Victoria, those response proportions are presented alongside the national response proportions.

It can be seen in Table 2 that the three most frequent main reasons were that the respondent had *never learned or* 

Reason	%	n	Vic % (n)
Never learned or are still learning to drive	26.2	38	33.3 (20)
Do not like to drive or are afraid of driving	18.6	27	8.3 (5)
Too busy, too difficult, or not enough time to get a driver's licence	15.2	22	11.7 (7)
Owning and maintaining a vehicle is too expensive	6.9	10	8.3 (5)
Prefer to walk	6.2	9	6.7 (4)
Disability, medical problems or vision problem	6.2	9	8.3 (5)
Able to get transport from others such as friends or family	5.5	8	8.3 (5)
Other reason	4.1	6	6.7 (4)
Concerned about how driving can affect the environment	3.4	5	3.3 (2)
Prefer to use public transport	3.4	5	0
Planning to get a licence when older as licensing rules will be different	2.1	3	1.6 (1)
Prefer to cycle	1.4	2	3.3 (2)
Legal issue (e.g. a Court ban on obtaining a licence)	0.7	1	0
Can communicate / conduct work online instead	0	0	0
TOTAL	100*	145	100* (60)

Table 2. Main reason for not having a driver's licence, % of respondents

\*totals not exactly 100% due to rounding off; there were also 2 blank responses

was still learning to drive (26.2%), followed by not liking driving or being afraid of driving (18.6%), and too busy, too difficult or not enough time to get a licence (15.2%). These three reasons also constituted the three top reasons among the Victorian respondents, though not in that exact order. The free text "other" reasons generally related to lack of opportunity to get a licence, such as the costs or that no supervising driver was available.

When analysing the responses by age, the range of individual ages meant that most cells would contain numbers that would have been too low for meaningful analysis by single age, hence the following age groups were employed: 18-21, 22-24 and 25-30. Table 3 displays the three top main reasons for not being licensed from Table 2, but broken down by these age groups.

It can be seen in Table 3 that *never learned or still learning to drive* was the most frequent reason for not being licensed among the 18-21 year olds and 25-30 year olds. It is also interesting that *not liking driving* was a solid reason for not being licensed among respondents aged 22-24 and 25-30, and may be associated with *never learning or still learning to drive* responses of the age 25-30 group. The third most frequent main reason overall was being *too busy or that it is too difficult to get a licence*, and this predominated among the 18-21 age group. It should be noted that there are differences in minimum licensing ages across Australian jurisdictions and this may have influenced the response patterns by age.

Breaking down the 60 Victorian responses by both age group and reason for no licence yielded cell sizes that were too small for meaningful comparison. Nonetheless, as with the national data, majorities of Victorian 18-21 and 25-30 year olds also gave *never or still learning* as their top main reason (n = 9 and n = 9 respectively).

As only 13 of the 60 Victorian respondents resided in rural areas, it was not possible to meaningfully analyse the main or additional reasons for not being licensed by an urban versus rural divide due to the resultant small cell numbers. Consideration was given to adding the four rural NSW respondents to the 13 rural Victorian ones, but this would not have overcome the cell size problem.

Respondents' additional reasons for not being licensed are displayed in Table 4, where it can be seen that 53.8% or 78 of the respondents chose *never learned or still learning* as an additional reason. In fact, the frequency order for additional reasons is similar to that for the main reason, except that *owning and maintaining a vehicle is too expensive, able to get transport from others,* and prefer *public transport* were higher in the frequency ordering. The proportions for Victoria were in most cases similar to those for the participating jurisdictions collectively; certainly the frequency order was identical for the top five additional reasons and among the remaining additional reasons except in two instances.

Table 5 displays the six top additional reasons by age group, where it can be seen that 43.6% of those who chose *never learned or still learning* as an additional reason were from the 18-21 age group. It can be expected that the majority of these would have been still acquiring a licence. By contrast, 38.5% who chose this additional reason were from the 25-30 age group and it seems plausible that the majority of these were those who simply had never learned, although some may have decided to delay obtaining a licence. The 25-30 age group were also most likely to have stated that *owning or maintaining a car is too expensive*, that they do *not like driving* and that they prefer using *public transport*. Of all those respondents (national and Victoria) who gave *never learned or still learning* as their main reason for not

Reason (descending overall frequency)	18-21 (n=61)	22-24 (n=34)	25-30 (n=52)	Total*
Never learned or are still learning to drive	<b>39.7</b> (31)	21.8 (17)	<b>38.5</b> (30)	100 (78)
Do not like to drive or are afraid of driving	25.4 (13)	<b>37.3</b> (19)	<b>37.3</b> (19)	100 (51)
Too busy, too difficult, or not enough time to get a driver's licence	<b>54.1</b> (20)	18.9 (7)	27.0 (10)	100 (37)

Table 3. Top main reasons for not having a dri	ver's
licence, % of respondents by age	

\*rounded to 100%

being licensed (Table 2), a quarter commonly indicated *not liking driving* among their additional reasons.

As with the national data, majorities of Victorian 18-21 and 25-30 year olds also gave *never or still learning* (n = 9 and n = 9 respectively) as their top additional reason, followed by *expense* (n = 6 and n = 7) and *not liking driving* (n = 5 and n = 6).

In the next survey question, respondents were asked when they plan to get a driver's licence, if at all. The majority (46.5%) said they planned to get one within 1 to 5 years, with 39.6% planning to get one within the next year, and 2.1% in 6 or more years. However, 11.8% said they had no plans to obtain a licence. This pattern order was similar among the Victorian respondents, where 48.3% planned to get a licence between 1 and 5 years, 37.9% within 1 year, and 12.1% having no plans to get a licence.

The younger driver age group (18-21) and the older group (25-30) predominated among those intending to obtain a licence within one year and in 1 to 5 years. In addition, 25-30 year olds were the age group most likely to indicate intentions to never obtain a licence.

As might be expected, those who indicated intentions to defer obtaining a licence for up to five years gave reasons for not being licensed that were consistent with their goals. Among this group, the most common main reason was that they had *never learned to drive or were still learning*, while common additional reasons were: *able to get transport from others, not liking driving* and *too busy*.

The final survey question asked respondents how they usually travel. The most common mode choice was public transport, followed by passenger travel. By age, 18-21 year olds (45.7%) appeared to be more likely than the other age groups to use public transport (compared with 21.0% for age 22-24 and 33.3% for 25-30). For those who travel as passengers, age 25-30 predominated (41.5%) (compared with age 18-21 — 36.6%, and for age 22-24 — 22.0%). As might be expected, respondents residing within a

Melbourne postcode area (n = 23) were more likely to cite public transport than did those residing in rural areas of Victoria (n = 7).

### Discussion

Consistent with overseas and other Australian work, this study found an increasing likelihood of 18-29 year olds in Victoria *not* holding a driver licence compared to drivers in older age groups. By 2013-2014, just over one-third of 18-24 year-old Victorians chose not to be licensed. The trend is likely to be an underestimate due to the unquantified proportions who hold a valid driver's licence but choose not to drive. Not only is the trend consistent with other studies that use licence data, but the trend is similar to the findings of studies based on other types of data. Declining licensing among the young has also been demonstrated in major Australian statewide surveys of travel mode (Raimond 2010; Delbosc 2014).

Moreover, despite the overall decline in licensed young drivers, although based on indirect estimations, 2014 appeared to be slightly more likely to see *new* licence holders aged 20-23 compared to 2002. This could suggest that some young adults in Victoria, for whatever reason or reasons, have been delaying obtaining driver licences for a few years.

The study revealed increasing licensing rates among drivers aged over 50, which can largely be explained by demographic factors such as a larger cohort of older adults; increasing longevity; fitter and healthier cohorts of older people into the future and associated strong interests in maintaining personal motorised mobility; plus increasing proportions of older women with licences (Staplin 2013). If licensing rates among young drivers continue their characteristic pattern of decline found so far, it will mean that the age mix of drivers overall will increasingly comprise middle-age and older drivers, although this is already happening in part due to an ageing population.

Over a third of the national and Victorian survey respondents aged 25-30 said, as main and additional reasons, that they had never learned to drive or were still learning. This, together with the finding that not liking driving was a common main reason among 22-24 and 25-30 year olds from the Victorian and national respondents, as well as a similar finding in Sydney-based research (Raimond 2010), suggests the emergence of a strong pattern of not driving at all, particularly among some 25-30 year olds. Further support comes from the majorities of 25-30 year olds, nationally and in Victoria, who cited vehicle expenses and a preference for public transport as reasons for not having a licence (similar to overseas research findings (Dutzik 2014; Davis 2012; Foss 2014; le Vine 2014). As well, possible increases in the numbers of Victorian 20-23 year olds obtaining licences for the first time, rather than commonly doing so at the minimum licensing age of 18, suggest an emergent tendency among some young Victorian adults to delay obtaining licences, and this is consistent with the research from Sydney (Raimond 2010). For as long as young adults do not yet

Reason	*% of	n	Vic % (n)
	respondents		
Never learned or are still learning to drive	53.8	78	56.7 (34)
Owning and maintaining a vehicle is too expensive	36.6	53	38.3 (23)
Do not like to drive or are afraid of driving	35.2	51	33.3 (20)
Able to get transport from others such as friends or family	30.3	44	30.0 (18)
Too busy, too difficult, or not enough time to get a driver's licence	25.5	37	25.0 (15)
Prefer to use public transport	24.1	35	26.7 (16)
Prefer to walk	20.0	29	15.0 (9)
Disability, medical problems or vision problem	10.3	15	13.3 (8)
Concerned about how driving can affect the environment	6.9	10	6.7 (4)
Planning to get a licence when older as licensing rules will be different	6.9	10	10.0 (6)
Other reason	4.1	8	5.0 (3)
Prefer to cycle	4.1	6	3.3 (2)
Can communicate / conduct work online instead	3.4	5	1.6 (1)
Legal issue (e.g. a Court ban on obtaining a licence)	0.7	1	0
TOTAL		382	(159)

\*Respondents could choose as many additional reasons as they preferred; there were 2 blank responses.

have a licence, they, too, will be choosing other modes of travel.

# Implications for road safety of young adults' changing travel mode choices

Although this study, in common with other research, points to a continuing pattern of licensing decline among young adults in Victoria, it is not certain to what extent this might be indicative of trends over the coming decades. In particular, it is not yet known if the present generation of young adults who do not drive will tend to maintain this choice as they get older, or if they will adopt transport mode choices more traditionally associated with middle adulthood and raising a family (Dutzik 2014; Sigurðardóttir2014), which are often more car-reliant. Added to this is evidence of a declining need to travel from the rising popularity of teleworking among the young, at least in Belgium if not elsewhere (Pirdavani 2014).

Assuming that such licensing and population trends persist into the future, several implications for road safety can be suggested; fortunately, potentially positive ones. Any trend for fewer young Australian adults being licensed, along with preferences for other travel modes such as increased use of public transport (Richardson 2013), and preferences to walk and/or live closer to work, will mean reduced overall young driver exposure to the road, which potentially could result in fewer crashes involving young drivers and their passengers (Dutzik 2014). However, these benefits may be limited by the extent to which these young people become vulnerable road users in other transport modes. Hence, there will be an ongoing need for infrastructure measures that support safe cycling, walking and motorcycling (Moeinaddini 2015). The survey findings also suggest there is a particular need for improving public transport to cater for young people who are not driving.

Amid a trend for fewer young drivers on the road, young drivers by virtue of their inexperience are likely to continue to be disproportionally represented in road tolls. While the survey shows some young adults say they do not intend to take up driving, others intend to obtain licences but are deferring that action for a few years. When they do obtain their licences, they will be older and likely more mature in their driving outlook (Williams 2011; Langley 2012), which, in theory at least, has potential to contribute to lowering young driver crash involvement. Nonetheless, Graduated Licensing Systems (GLS) that support young drivers while they gain experience will continue to be paramount. This includes those who obtain their first licences at older ages than the traditional minimum licensing ages. There may be a case for re-examining the appropriateness of GLS provisions for older first time drivers.

Over the next 50 years, the proportion of 15-29 year olds in Australia is projected to decline while the proportion aged 65 and over will rise substantially (ABS 2012). Consequently, within the coming decades it is conceivable that at least a half, if not more, of the country's drivers will be aged over 50, with a great many aged 65 plus. Many of the measures designed to improve the safety of older drivers will ultimately improve the safety of all drivers, including young drivers. All drivers, especially the declining proportion of young drivers, will come to find the road system increasingly occupied by older road users as well as the infrastructure improvements designed to better accommodate them. Moreover, not only are improvements needed in our public transport system to cater for increasing

Reason (descending overall frequency)	18-21 ( <i>n</i> =61)	22-24 ( <i>n</i> =34)	25-30 ( <i>n</i> =52)	Total
Never learned or are still learning to drive	<b>43.6</b> (34)	17.9 (14)	<b>38.5</b> (30)	100 (78)
Owning and maintaining a vehicle is too expensive	<b>37.7</b> (20)	20.8 (11)	<b>41.5</b> (22)	100 (53)
Do not like to drive or are afraid of driving	33.3 (17)	29.4 (15)	<b>37.3</b> (19)	100 (51)
Able to get transport from others such as friends or family	<b>56.8</b> (25)	22.7 (10)	20.5 (9)	100 (44)
Too busy, too difficult, or not enough time to get a driver's licence	<b>56.8</b> (21)	16.2 (6)	27.0 (10)	100 (37)
Prefer to use public transport	<b>34.3</b> (12)	28.6 (10)	<b>37.1</b> (13)	100 (35)

Table 5. Top additional reasons for	not having a
driver's licence, % of responses by	age

proportions of older adults, but improvements are also needed because of strong preferences for public transport as a changing travel mode choice among young people.

#### Study limitations

While this study's chief finding of licensing decline among young adults in Victoria supports previous Australian studies and overseas work, and the surveyed reasons for non-licensure bear similarity with those of Schoettle and Sivak (Schoettle 2013) in the US, there are several limitations that should be borne in mind.

The trends found for licensing decline should be considered as indicative rather than definitive. This is because licence numbers obtained for a single day (30 June) do not reflect changes in those numbers over the previous 12 months due to, for example, newly licensed drivers, and drivers who die or who transfer from interstate. As noted earlier, the study sought to quantify the extent of gaining a licence in Victoria, so the licence numbers included drivers whose licences were suspended or disqualified. Moreover, it was not possible under the terms for this project to identify numbers of licences first issued out of all issued licences in a particular year (or account for those who were first licensed elsewhere, or who first obtained a motorcycle licence), so in this respect the dataset includes licence holders outside the target field. Obtaining numbers of licence holders in relation to population numbers is similarly an indirect means of estimating numbers of non-licence holders, the focus of the study. However, given the difficulty of quantifying non-licence holders the method used was an appropriate approach. It should also be appreciated that the licence data analysis is likely to give underestimates of non-drivers as it is feasible for many

adults to not drive despite holding licences. Lastly, despite finding licensing trends similar to those in other studies, care should still be exercised in extrapolating the Victorian licensing trends to other Australian jurisdictions.

The difficulty of identifying adults who do not drive also affected the response rate for the survey. Even though most jurisdictions were represented, as well as urban and rural areas, having just 147 eligible respondents (including the 60 from Victoria) restricted the extent to which reasons for not being licensed could be explored in relation to other variables such as age. Also, as many times more females than males responded, there was potential for the findings to be more characteristic of females than males. In addition, there are differences in minimum licensing ages across Australian jurisdictions, and this may have influenced the response patterns by age. It was unfortunate that 121 potential respondents had to be excluded on the basis that they currently had a licence, even though they may not have been active drivers. Current licensed drivers were excluded from the survey to allow reliable comparison of the findings with the original US survey (Schoettle 2013). Due to the nature of the SurveyMonkey respondent pool, the limited sample size and its restricted representativeness of the population, care should be exercised in extrapolating the survey findings to the broader populations of young Victorian and Australian adults.

### Recommendations for further research

While this study, among others, identifies changing travel mode choices among young adults, further consideration of the road safety implications of these changes is needed. Recommended areas for further research include:

- the extent to which licensing decline among young adults exists in Australian jurisdictions besides Victoria, and especially in relation to urban versus rural localities;
- the prevalence of young adults who choose to not drive despite holding a valid driver's licence;
- the non-car driving travel modes chosen by young adults (namely public transport, cycling, motorcycling and walking) and their reasons for doing so; and
- the road safety implications of the findings from such research directions.

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# Interim Evaluation of the Victorian Safer Road Infrastructure Program Stage 3 (SRIP3)

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# Abstract

The Safer Road Infrastructure Program Stage 3 (SRIP3) is a \$1b road infrastructure improvement program delivered over 10 years from 2007 aimed at reducing the incidence and severity of crashes at high risk locations across Victoria. This paper presents the results of an interim evaluation of 553 projects completed under SRIP3 up to 2014 at a cost of \$481M. Evaluation has been conducted in terms of the impact of the program on reducing the frequency and severity of crashes both for the program as a whole as well as for both broad and specific treatment types implemented under the program.

# Background

Following on from the successful implementation of the Safer Road Infrastructure Program Stages 1 and 2, in May 2006 the Victorian Government announced the allocation of Transport Accident Commission funds to implement the third stage of the Safer Road Infrastructure Program. SRIP3 is a ten-year program (2007-2017) with an indexed funding of \$722 million. Unlike stages 1 and 2, the third stage, SRIP3, not only addresses sites identified by high crash frequencies, but also includes safety upgrades at locations that do not necessarily have a current identified crash problem but are considered to have potential for high crash rates in the future (known as 'Greyspots') and 40 km/hr speed limit treatments along arterial shopping centre roads. SRIP3 also includes additional road segment treatment types not included in stages 1 and 2, such as mass action edge line installation on class C roads and tactile centrelines for class A roads. At the end of 2014, SRIP3 comprised 721 projects: 543 projects were at sites identified by high crash frequency with 375 of these at intersections and 168 along lengths of road; six were projects completed under a

special Princess Highway East program; 148 were Greyspot projects located at intersections; and the remaining 24 projects were 40km/h speed limit reductions at strip shopping centre sites.

## Aims and Scope

The overall aim of this study was to undertake an evaluation of projects delivered under the SRIP3 program over the period January 2007 to December 2014. The evaluation aimed to measure the extent to which treatments were associated with reduced number of casualty crashes, serious casualty crashes, casualties, and serious casualties at treated sites which had sufficient after treatment history to be included in the analysis. A single generic null hypothesis was tested: that implementation of SRIP3 was not associated with a change in casualty crash frequency at project sites. This was assessed against a 2-sided alternative hypothesis allowing for the analysis to detect either increases or decreases in road trauma associated with the program. As well as providing program level estimates of effectiveness, where possible the study also estimated reductions in crash frequency for different broad and narrow types of treatments and for specific crash types, as well as reductions in injuries for specific road users. Estimates of the economic worth of the program were also derived.

Of the 721 projects approved under SRIP3 funding, crash data from 553 projects with sufficient after treatment history were used to determine the interim benefits of the program. Six projects were excluded because the treatment had not been completed prior to 30/12/2014. A further 64 Greyspot projects and 16 other projects were excluded because no crash data, either before or after treatment were available, or because of problems identifying required information on the treatments. In addition to the 553 high crash frequency site treatments, 82 Greyspot projects were analysed separately. The six projects identified by VicRoads on the Princess Highway East were not able to be analysed due to three being incomplete and because one of the incomplete projects completely confounded the after treatment period of the completed projects. The capital costs of implementing the 553 projects was \$481M (\$AUS 2015). The capital costs of the 82 Greyspot projects was \$23M.

### Methods

The evaluation used a quasi-experimental study design where treated sites were matched with comparison sites in order to adjust estimates of SRIP program effectiveness for the effects of other influences on crash risk and injury outcome (Hauer, 1997). These factors include other road safety programs, changes in exposure and socio-economic measures. Sites where treatments were completed as part of Stages 1 and 2 of the SRIP program were excluded as potential comparison sites.

Once the location of each project had been identified, rather than choosing a single untreated site to contribute

comparison data for each project, all non-treated sites with the same local government authority (LGA) served as potential comparison sites. Not all untreated sites in an LGA containing a SRIP3 site were selected to contribute comparison data. For intersection sites (including Greyspot sites), comparison sites were restricted to untreated sites that were intersections. If the treated intersection was signalised prior to treatment, comparison sites were further restricted to signalised intersections. Intersection sites that were not signalised prior to treatment were matched to non-signalised intersections within the group of potential comparison sites. For road segment and 40 km/h SSC treatments, comparison sites were not restricted to sites defined as road length: they could either be intersections of untreated roads, or untreated lengths of road. Generally, only classified roads were eligible to be comparisons for road segment project sites. Furthermore, road segment project sites that were divided roads prior to treatment were only matched to comparison roads that were also divided. Similarly, road segment project sites that were undivided sections of road prior to treatment were only matched with undivided comparison sites. For road segment project sites that contained both divided and undivided sections of road, the dominating feature in terms of number of crashes in the before period was used to determine whether comparison sites should be divided sections of road. Comparison sites were further limited to classified roads (i.e. a highway, freeway, main road, forest road or tourist road). In addition to the matching by LGA, dividedness and signalisation, comparisons for 40 km/h SSC projects were also matched to the project before treatment speed zone. This was because this treatment was specifically testing reduced speed limits.

Where there were multiple project sites of similar type within the one LGA, these sites were matched to the same group of comparison sites (providing the treated sites were similar in terms of whether they were intersections, or occurred on divided roads, etc.). Generally, where a road segment project site passed through multiple LGAs, the pre- and post-treatment data at this site were matched to comparison sites in each LGA. Exceptions were made for some sites that passed through several LGAs, but for which relatively few crashes at the SRIP3 site occurred in one LGA compared to the others. Using these strategies for matching treated and comparison sites, the 553 projects included in the evaluation of SRIP3 and the 82 Greyspot projects, were matched to 224 distinct sets of comparison sites.

For each group of treated sites matched to the same group of comparison sites, the pre-treatment period was defined as the period beginning on 1 January 2000 to the day before the first commencement of works at any of the treated sites. The post-treatment period was defined, for each group of treated sites matched to the same group of comparison sites, as the period from a day after the last treatment works had been completed at any of the treated sites to 7 February 2015. For the 553 high crash risk projects and for the 82 Greyspot projects, the earliest date on which treatment works commenced was 11 March 2007. The earliest date for a comparison group pre-treatment period to end was 10/03/07. Not all comparison group pre-treatment periods began on 1 January, 2000; the latest date for the pre-treatment period to start was 1 December 2012. Truncation was to avoid conflicts with SRIP1 and SRIP2 projects. Using this approach, 86% of project pre-treatment periods were 8 years or more; 4% had a period of 4.5 to 7.5 years and 7.6% had a period of 1.5 up to 4.5 years. A total of 39% of the project post-treatment periods were 1.5 up to 2.5 years and 19% were 0.5 up to 1.5 years long.

As noted, it is acceptable to have pre-treatment and posttreatment periods of differing durations as long as for each treatment-comparison pair, the pre-treatment period for the treated sites covers the same time-span as the pre-treatment period at the comparison sites and that the same applies for the post-treatment periods.

Poisson regression was used to estimate the percentage change in casualty crash frequency from before-treatment to after-treatment at the treated sites relative to that at the comparison sites. This methodology is well established in the literature for analysing quasi-experimental designs (Breslow & Day, 1987; Hosmer & Lemeshow, 1989).

Two important issues to be considered when using a quasiexperimental study design to evaluate road safety programs are *accident migration* and *regression-to-the-mean*.

#### Accident migration

One possible outcome of treating sites on the road network is accident migration, which involves the casualty crash risk being moved, either entirely or partly, from the treated site to another site nearby by such mechanisms as changing exposure patterns or risk compensation behaviour by drivers after they have passed through a treated site (McGuigan, 1985). The most likely cause of an accident migration effect in this study would be through a treatment altering traffic volume at the treated site. However, accident migration effects are unlikely to be large provided that treatments do not lead to substantial shifts in traffic volumes. Traffic volume data required to measure changes in traffic volume at treated sites and neighbouring sites were not available for the study since such data are not routinely collected for all treatment sites analysed and neighbouring sites to which traffic may have migrated. Furthermore, the types of treatments completed under SRIP3 were not those likely to significantly limit mobility at treated sites hence it is considered unlikely that traffic migration was a likely outcome from the program.

#### Regression-to-the-mean

Regression-to-the-mean is caused by selecting sites for treatment from a set with the same underlying crash rate that have a high casualty crash frequency measured over a narrow window in time, due to the expression of an extreme in random variation. Selecting sites for treatment on such a basis means that the likelihood of the casualty crash frequency at the selected site reducing in the immediate next period, merely due to chance, is high. If the treatment effect at the site is evaluated using the same inadequate casualty crash data from which the site was selected for treatment, the results of the evaluation will be spurious.

One way of minimising the effect of regression-to-the-mean is the use of adequate pre-treatment casualty crash histories to give an accurate estimate of the true pre-treatment casualty crash frequency at the chosen site. Simulation of crash count data (Nicholson, 1986) suggested that the effects associated with regression-to-the-mean are only very small when five years of pre-treatment data are available. For this study, most treated sites that were evaluated had more than five years of pre-treatment casualty crash data. Furthermore, an analysis technique was used that properly recognised the level and distribution of random variation in the data and that computed confidence limits and significance probability levels that properly reflected this variation. Furthermore, the distribution of crashes per site in the before treatment period for comparison sites were compared to treatment sites. The distributions for the treatment and comparison sites were found to be similar. In addition, analysis of pre-treatment differences in crash histories were carried out using propensity scores (Sasidharan & Donnell, 2013), which were, for each comparison group, the odds of a higher crash frequency per intersection in treatment sites obtained through logistic regression. The propensity scores showed that for 81% of comparison groups, there was no evidence of a significant difference in pre-treatment crash histories between treatment and comparison sites.

#### Evaluation output measures

In order to test the primary null hypotheses of the evaluation, the percent reduction in crash or injury frequencies at treated sites in the post-treatment period compared with the pre-treatment period adjusted for parallel changes at the comparison sites were estimated. Net percent changes in crash or injury frequencies were measured for casualty crashes, serious casualty crashes, specific crash types, casualty injuries, serious casualty injuries and specific injury types for the whole program, and by region, program type, by region and program type, by two levels of aggregated treatment types and by project. Measures of economic worth considered were: benefit-cost ratio (BCR) and cost-effectiveness of preventing a casualty or serious casualty crash over the treatment life. All measures of cost and savings were based on year 2015 Australian dollar values and BCR was estimated using a discount rate of 5%.

#### Data

VicRoads provided data on all SRIP 3 projects completed to mid-2015 including description of treatment type, location of treatment, installation start and completion dates, capital cost of works and treatment life. Using the description of treatment types, treatments were classified into groupings for analysis at various levels including intersection versus midblock treatments, metropolitan Melbourne versus regional treatments as well as specific treatment type categories (e.g. signal installation, guard rail, shoulder sealing etc.). Each treatment location was mapped using
a GIS system in order to match police reported crashes occurring at each treatment site. Data on the 226,132 police-reported casualty crashes that occurred during the period 1 January 2000 to 31 December 2014 were provided for the evaluation. This data was linked to TAC claims data to verify hospital admission status for the purposes of defining serious injury. Of the 226,132 crashes, 70,321 were used in the analysis due to occurring in either a treatment or control area in the defined before or after study periods. Crash cost data for the economic analysis was taken from the Bureau of Infrastructure, Transport and Regional Economics estimates based on the human capital valuation approach (BITRE, 2010).

#### Results

#### **Overall Results**

Implementation of the SRIP3 program was estimated to be associated with a 21% reduction in the number of casualty crashes and a 26% reduction in the number of serious casualty crashes relative to crash frequency changes at matched comparison sites (p<0.0001). Corresponding reductions in casualties and serious casualties were estimated at 25% and 29%. All of these results were highly statistically significant. The overall casualty crash reduction estimated is slightly smaller than that previously estimated for the SRIP1 (24%, p<0.0001,(L. Budd, Scully, J., Newstead, S., 2011)) and the SRIP2 evaluation (33%, p<0.0001,(L. Budd, Newstead, S. , Scully, J., 2011)).

Across the 553 projects evaluated in the Phase 2 evaluation, a 21% reduction in casualty and a 26% in serious casualty crashes translates to an estimated saving of 377 casualty crashes (resulting in 630 injuries) and 169 serious casualty crashes (resulting in 238 serious injuries) per annum and a saving of 6,440 casualty crashes (resulting in 10,819 injuries) and 2,927 serious casualty crashes (resulting in 4,133 serious injuries) over the life of the program. The average life of the 553 SRIP3 treatments was 17 years. This translates to an estimated present value of savings in community costs from reduced road trauma estimated over the life of the program of \$1,815M (using a discount rate of 6.5%), with a 95% confidence interval of \$1,362M to \$2,239M. When compared to the cost of completing and maintaining the 553 projects (\$507M), the program is estimated to deliver a benefit-cost ratio of 3.6 (95% confidence interval of 2.7 to 4.4). The estimated BCR shows that the total benefits that the program provides by reducing injury and death statistically significantly exceed costs of completing and maintaining the treatments.

### Results by location, treatment and crash type

The evaluation also provided separate estimates of crash savings associated with the program for sites located in metropolitan Melbourne and sites located in rural areas. It was estimated that the treatment of sites located in Melbourne were associated with an 18% reduction in casualty crashes and a 24% reduction in serious casualty crashes (p<0.0001). The treatment of rural sites was associated with a 31% reduction in casualty and in serious casualty crashes (p<0.0001).

The evaluation also considered the associated effectiveness of different broad types of treatments. There was strong evidence that implementation of both road segment and intersection treatments were associated with reduced casualty and serious casualty crashes, and that intersection treatments had statistically larger casualty crash reductions. Serious casualty crash reductions for intersections were greater than 40%. Road segment serious casualty crash reductions were less than half that for intersection treatment types (21%). It was estimated that casualty crashes were reduced by 37% (95% C.L. 32% to 42%) for intersection treatments compared with 13% (95% C.L. 6% to 20%) for road segment treatments. Due to limited data at Greyspots and 40 km/h strip shopping centre treatments and difficulties with the evaluation design for these projects, the evaluation was generally unable to draw conclusions about the effectiveness of these treatments.

Road segment treatments were found to be more effective at reducing casualty and serious casualty run-off crashes than at reducing casualty and serious casualty on-path/ overtaking/head-on crashes. The most effective road segment treatments for casualty crashes were shoulder sealing with safety barriers and tactile edge or centre lines without shoulder sealing or safety barriers, with significant casualty crash reductions greater than 50%. Run-off road casualty and serious casualty crashes were best reduced by shoulder sealing with safety barriers without delineation and non-tactile line marking without safety barriers or shoulder sealing. On-path/head-on/overtaking casualty and serious casualty crashes were most improved by safety barrier treatments without shoulder sealing or tactile lines but with culvert extensions/end walls. Furthermore, there was some evidence that road segment treatments of this evaluation were associated with a greater (16 percentage unit) reduction in serious casualty crashes than those of SRIP1.

Intersection treatments were more effective at reducing opposite and adjacent style (47%) crashes than same direction (16%). The most effective treatments for preventing casualty crashes were hazard removal, installation or modification of splitter islands, control of left turn with signals, installing or extending right turn lanes with or without fully controlled right turn, new traffic signals and new roundabout installations, all with significant casualty crash reductions greater than 50%. The most effective treatment at improving opposite and adjacent intersection casualty and serious casualty crash outcomes were roundabout installations and installation of both fully controlled right turn and installing/extending the right turn lane. The most effective for same direction serious casualty crash reduction was skid resistance surfaces with or without other treatments and traffic signal treatments. Table 1 summarises the key overall estimates of effectiveness of the program and their 95% confidence limits:

Program Level Casualty Crash Reduction		Serious Casualty Crash Reduction Reduction		Serious Casualty Reduction	BCR	
Whole Program	21%	26%	25%	29%	3.6	
	(16%, 26%)	(18%, 32%)	(19%, 30%)	(21%, 36%)	(2.7, 4.4)	
Intersection         37%         41%           Treatments         (32%, 42%)         (32%, 42%)		41% (32%, 50%)	42% (35%, 49%) 46% (35%, 55%)		6.1 (5.2, 7.0)	
Road Segment	13%	21%	14%	23%	2.0	
Treatments	(6%, 20%)	(10%, 30%)	(4%, 24%)	(11%, 34%)	(0.9, 3.0)	
Metropolitan	18%	24%	23%	28%	4.1	
	(14%, 23%)	(15%, 31%)	(19%, 27%)	(21%, 35%)	(3.0, 5.1)	
Rural 31%		31%	30%	31%	3.2	
(22%, 29%)		(19%, 41%)	(23%, 36%)	(19%, 41%)	(2.3, 3.9)	

Table 1. Estimated crash and injury reduction effects of SRIP3 overall and by major treatment groupings

#### Results by road user

The program and region level analyses showed no significant associations of casualty or serious casualty reductions of injured pedestrians. However, the treatments involving installation of both fully controlled right turns and installing or extending the right turn lane were found to be associated with a 90.3% reduction in casualty pedestrian injuries (p=0.017).

For bicyclists a strongly significant 46% (95% C.I. 28%, 59%) casualty reduction was associated with intersection treatments. A significant reduction of 44% was associated with metropolitan intersection treatments; no significant reductions in bicyclist injuries were observed for rural intersections. However, significant reductions for the program as a whole and on road segment treatments were observed for cyclists in rural areas: 66% (95% C.I. 12%, 87%) and 89% (95% C.I. -3%, 99%) respectively. No significant reductions in bicyclist serious casualty injuries were found due to limited data on bicyclist serious casualties. The specific intersection treatments that were associated with measurable reductions in casualty bicyclist injuries were of the traffic signal type and right turn modification type, particularly those involving new installations, modifications such as LED upgrades, right turn bans and fully controlled right turns. Lane modifications which included bus and bicycle lane installations at intersections also proved effective at reducing bicyclist injuries (78%, p=0.006).

The program and region level analyses showed no significant associations with casualty reductions of injured motorcyclists. A reduction in serious motorcyclist casualties was associated with the whole program (37%, p=0.0002) and with intersection treatments (63%, p=0.0003). Intersections treatments associated with large significant reductions in serious casualty motorcycle injuries were new traffic signals and right turn modifications, particularly those involving fully controlled right turns with extended right turn lanes.

#### Crash savings and economic benefits

Economic analysis showed that SRIP3 is expected to return favourable economic benefits over the life of the treatments implemented. Specifically, it was estimated that the reduction in casualty crashes associated with the 553 SRIP3 projects considered in this evaluation would result in an annual saving of \$118M. The present value of future savings expected based on treatment lifetime and the estimated annual crash cost savings at treated sites was estimated to be \$1,815M. The capital expenditure required to complete the 553 treatments was \$434M, and when future maintenance costs are added to this value, the present value of completing and maintaining treatments using a discount rate of 6.5% was estimated to be \$507M. This equates to an estimated net present worth of the program which is significantly greater than zero dollars (\$1,308M, varying from \$856M to \$1,732M with 95% certainty) and a benefit-cost ratio significantly greater than one (3.6, varying from 2.7 to 4.4 with 95% certainty). Furthermore, the internal rate of return of SRIP3 was estimated to be 23%, varying from 17% to 29% with 95% certainty.

It was estimated that the 21% (16%, 26%) estimated casualty crash reduction associated with the 553 SRIP3 projects evaluated will prevent 6,440 casualty crashes and 10,819 casualties over the life of treatments, with this estimate ranging from 4,835 to 7,944 casualty crashes with 95% certainty. This translated to a cost effectiveness of \$78,660 spent per casualty crash saved, ranging from \$63,767 to \$104,771 with 95% certainty.

Statistically significant economic worth as a result of associated casualty crash reduction was observed for regional and program level aggregations including intersection and road segment treatments. Intersection treatments exhibited a greater economic worth than road segment treatments with three times the BCR of road segment treatments (6.1 c.f. 2.0) and slightly higher %IRR (22 c.f. 20) and a four times better cost effectiveness (\$40,320 c.f. \$164,844). Although exhibiting only a slightly higher BCR (4.1 c.f. 3.1), metropolitan treatments proved their economic worth over rural treatments with more than double the %IRR (31.1 c.f. 12.7) and almost double the cost effectiveness (\$64,686 c.f. \$109,833). The trend to greater economic worth in metropolitan treatments was observed through both intersection and road segment treatments reflecting the higher crash numbers at metropolitan treatments.

#### Discussion

There was strong evidence that the overall effect of SRIP3 was an associated reduction in the number of casualty and serious casualty crashes at treated sites. There was strong evidence (p<0.001) that both road segment and intersection projects were associated with reductions in casualty crashes. Statistical evidence for the effectiveness of 40km/h SSC projects and Greyspot treatment was less certain. This largely shows a need to further evaluate these treatment types after full implementation of the SRIP3 program and when more post-implementation crash data are available. Methodology for evaluation of Greyspot type treatments might also need to be reconsidered considering the primary purpose of such treatments is to prevent the development of future crash problems at sites where traffic volume and subsequent crashes are expected to increase dramatically. A methodology for accurately estimating the likely future crash problem based on this growth is necessary to properly evaluate the effectiveness of these treatments. The question the SRIP3 program poses in this area is how to effectively balance the treatment of anticipated problem areas through a Greyspot program against the treatment of the many sites with current crash problems identified and treated under SRIP3.

It was estimated that road segment treatments were associated with a 13% (95% CI: 6%, 20%) reduction in casualty crashes at the 164 project sites where they were employed. The estimated effectiveness for the 365 intersection projects was significantly more with a reduction in casualty crashes by 37% (95% CI: 32%, 42%). The difference was found to stem from differences in metropolitan regions, where small insignificant crash reductions were associated with road segment treatments and intersection treatments were associated with a crash reduction of 38% (32%, 43%). The difference between intersection and road segment associated casualty crash reductions was not evident in rural regions.

Both the 311 SRIP3 treatments completed in metropolitan Melbourne and the 242 treatments located in rural areas were associated with reduced casualty and serious casualty crashes (p<0.0001). Based on the degree of overlap that the 95% confidence intervals have for the metropolitan and rural serious casualty crash reduction rate estimates, it was found that there was no statistical evidence for a difference between them. For casualty crashes, the overlap was small providing some weak evidence of a true difference. This difference is evidenced in the road segment program which is significantly lower (by 30% units) in metropolitan regions. A statistically significant difference of 30% units

was also observed for road segment treatments between metropolitan and rural regions for serious casualty crashes.

Metropolitan projects were associated with an estimated reduced casualty crash rate of 18% (varying from 14% to 23% with 95% certainty) and rural projects by an estimated 31% (95% CI: 22% to 39%). Metropolitan projects were associated with an estimated reduced serious casualty crash rate of 24% (varying from 15% to 31% with 95% certainty) and rural projects by an estimated 31% (95% CI: 19% to 41%).

Road segment treatments were more effective at reducing run-off road casualty and serious casualty crashes than on-path/overtaking/head-on casualty crashes. Intersection treatments were more effective at reducing opposite and adjacent style (47%) casualty crashes than same direction (16%). Their associated effects were similar for serious casualty crashes. Intersection treatments were associated with greater serious crash reductions in the key crash types in metropolitan compared to rural regions. Road segment treatments showed similar crash type reductions in metropolitan and rural regions.

### Implications of results on project selection for future infrastructure improvement programs

Where there are finite funds available to make improvements to road infrastructure with the aim of reducing casualty crashes, treatments that are known to be highly effective should be applied at sites where the annual number of crashes is high or where the crashes are most frequently of high severity. Furthermore, treatments involving the lowest possible implementation costs applied to these sites will ensure maximisation of the economic benefits of the program. If future road infrastructure programs are to be evaluated with respect to their contribution to achieving targets defined in terms of reductions in casualty crashes, prioritising sites to be treated in terms of predicted cost effectiveness is an important indicator of which mix of projects will deliver the greatest savings. In order to predict the cost-effectiveness of different projects, it is necessary to: (1) accurately estimate the cost of a potential project; (2) accurately measure the casualty crash problem at potential sites to be treated, and (3) as accurately as possible estimate how the project is likely to reduce serious casualty crashes at the site as a result of the treatment.

This study supports the finding from the previous SRIP evaluations that intersection projects have been more costeffective than road segment treatments. This evaluation of SRIP 3 has estimated that the average expenditure of \$95,973 was required to prevent one serious casualty crash at an intersection site compared with \$120,619 at road segment treatments. Intersection projects were estimated to be more cost-effective than road segment projects because of the higher crash densities at intersections compared to road lengths and because the average cost of intersection treatments was less than that of road segment treatments (\$448,546 per project compared to \$1,899,825). However, this should not be interpreted as meaning that intersection treatments should be applied in preference to road segment treatments. Instead it supports the principles of treatment site selection outlined above where the lowest cost treatments should be implemented at sites with the largest crash problem, whether that problem is one of high frequency or one of high fatalities or serious injuries. In the case of the SRIP treatments, it is intersection treatments that meet this criterion better than road segment treatments. This may not always be the case depending on whether new, lower cost road segment treatments can be developed and whether in the future intersection crash densities continue to be higher than those on the highest risk rural road segments.

#### Conclusions

Evaluation of the implementation of SRIP3 clearly demonstrated an association between program implementation and reduced casualty and serious casualty crashes and the resulting casualties and serious casualties at treated sites. It also suggests the program has been cost effective, producing benefits to the community in terms of reduced road trauma costs that outweigh the costs of implementing and maintaining treatments implemented under the program.

Final evaluation of SRIP 3 is planned once all treatments have been completed. Further evaluation will allow all sites that will ultimately be treated under the SRIP 3 program to be evaluated in terms of crash effects and economic worth rather than just the sites treated under the program that were evaluated in this study.

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# Qualitative consumer input for enhancing child restraint product information to prevent misuse: preliminary results

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#### Abstract

Child restraint system misuse is a global public health issue leading to increased risk of injury and death in motor vehicle crashes. Although some interventions are effective at reducing misuse, they are prohibitively costly to adopt at a population-level. We aim to develop a novel, consumerdriven intervention to counter misuse embedded in product information supplied with child restraints. If effective, this cost efficient measure can be broadly implemented via product standards. The first stage of this project involved using a semi-structured discussion guide to conduct six indepth focus groups (N = 44; 95% female) to elicit problems and preferences with current product information. There are some distinctions between the different populations of child restraint users sampled here (i.e., reliance on graphics versus text instruction), but preliminary results suggest that at a minimum, restructuring information, improving graphics, removing text, and providing links to other sources of information will increase the attractiveness and ease of understanding instructions and labels supplied with child restraint systems.

#### Background

### Child restraint systems (CRS): non-use, misuse, and age-inappropriate use

The use of child restraint systems (CRS) for children travelling in motor vehicles is common in most developed countries and it is becoming the norm for legislation to cover the protection of children in cars worldwide (WHO, 2013). In Australia, the law requires that children under seven years of age be restrained in an approved booster seat or child restraint system that is appropriate for the child's height and weight. Recent estimates of use have predicted that more than 99% of children 0-7 years are restrained (Brown et al., 2010).

The same estimates predict that about half of all children are incorrectly restrained (Brown et al., 2010). While mandating the use of a child restraint might promote use, it does not ensure the seat is being used correctly; that is, installed and used as intended by the manufacturer. Correct use is predominantly measured by the presence or not of errors in installation (CRS in vehicle) or securing (child in CRS) (e.g., Rudin-Brown et al., 2004). Very loose or twisted harnesses, seatbelts routed incorrectly, and non-use of a top tether are examples of serious errors that would reduce the restraints' crash protection potential (Brown et al., 2011). As more countries mandate restraint use and population estimates of use increase, the focus of child passenger safety is now shifting to preventing misuse from promoting appropriate use. A number of studies have identified demographic factors associated with an increased likelihood of errors in use. Brown et al. (2013) found that children from a family who speak a language other than English at home are more than twice as likely to be incorrectly restrained. Children from low-income families have also been found to be substantially more likely to have errors in child restraint or booster seat use (Bilston, Du, & Brown, 2011). While Bilston et al. (2011) did not find a significant relationship between education level and restraint use, other research indicates that lower health literacy (ability to understand and use health information) is associated with low injury prevention behaviours (Heerman et al., 2014). Lack of information and experience with restraints are also predictors of misuse (Arbogast, 2014; Bilston et al., 2011; Rudin-Brown et al., 2004).

Some predictors of incorrect use (i.e., lack of information and experience, low health literacy, etc.) suggest that the misuse of restraints is due to a user's skill deficit. Information on how to use a restraint is communicated on the labels and instruction manuals accompanying the restraint. It is inevitably the first point of communication for new restraint users. In Australia, all child restraints must be approved under the Australian Standard AS/ NZS 1754. It is this product standard that stipulates the content and layout of information given to consumers about installation and use of child restraint devices. And while product information provides instructions on correct use and warnings against misuse, continuing high rates of errors in use suggest there is a gap between the correct use messages being sent and how users are responding (using) the restraint.

Basic communication principles suggest that there are characteristics of the message (i.e., correct use), channel (i.e., instruction manuals/labels), recipients (i.e., child restraint users), and environment (i.e., first time) that will affect how information is processed. Although most research on communication for health is focused on patient decision-making in clinical care situations, there are some public health and literacy principles concerning risk communication and medical product information (Fischhoff, Brewer, & Downs, 2011). The gold standard in health communication also involves taking a consumer centric approach to the development of information materials. While child restraint users have typically been seen as passive recipients of safety information, there is a move in health research toward designing consumer-centred information.

Researchers in Australia, Canada, and North America have recently developed some educational interventions targeting restraint misuse that involve consumer-centred design processes. In Australia, the product standard for child restraints (AS/NZS 1754; 2010) was amended to include shoulder-height marker labels affixed to restraints that visualised for parents when a child had outgrown their restraint (child's shoulders are above dotted line). Although the law still makes recommendations of appropriate restraint use based on age, the shoulder height markers being used were designed using size of child (height) as a proxy for appropriate use – an indication leading to more appropriate use (Brown, Fell, & Bilston, 2010). In 2002, Rudin-Brown et al. (2004) designed new 'optimal' labels for child restraint systems that were aligned with human factors principles that performed better than the traditional label for rearward-facing mode installation and use. More recently, Klinich et al. (2010) and Kramer et al. (2015) found similar results with instruction manuals and labels they designed. However, despite the fact these studies used best practice in designing the information, and the participants in these studies were highly motivated to perform correctly, and had access to correct information in an appropriate format, the absolute improvement in errors was relatively small. This indicates that a communication gap between the information being conveyed in the instructions and labels and the information received and enacted continues to exist.

We believe that the critical step to ensuring users can understand and act on instructions and labels is by involving them in the process of design, and continuing re-design until the behaviour is being performed correctly. A modified consumer-testing and consensus design method is being used to design new instructions, labels, and videos that aim to increase the correct use of restraints. The consumer-centred design *process* is the critical step to success, not the re-designing of materials themselves. With the final prototypes of enhanced instructions and labels, we will then be able to look retrospectively into the critical elements of design and feedback that made the most significant changes and translate these processes into recommendations for manufacturers.

The first stage of this consumer-centred design process is qualitative focus groups to identify barriers to using and understanding current child restraint product information in a diverse population of users.

We aim to elicit specific feedback on how to improve current child restraint informative materials. The preliminary results presented below are being used to design the first prototype of new child restraint product information to be tested in a consumer-testing cycle and later laboratory trial.

#### Method

Six focus groups were conducted to explore consumer preferences on content, format, and appearance of current child restraint system product information. To capture the diversity of child restraint users and their needs, we conducted two groups of participants who are from high income and high education brackets (high SES), two groups of participants from culturally and linguistically diverse (CALD) communities, and two groups of participants who are classified as living in an area of socioeconomic disadvantage (low socioeconomic status; low SES) according to the Australian Government Socioeconomic Index For Area (SEIFA; Australian Bureau of Statistics, 2013).

#### Sample

High socio-economic status participants were recruited using a study brochure and email distribution through university and research channels, and asked to register their interest to participate in an online screening survey. CALD community participants were recruited using study brochures given out by moderators in community playgroups in southeastern Sydney. Local community organisations for CALD parents assisted with the recruitment of these participants. We recruited potential low SES participants through community playgroups in low SEIFA areas in the greater Western Sydney area. Participants were eligible to participate if they: a) were aged over 18 years of age, b) have used a child restraint system to transport children, and c) were conversant in English.

#### Procedure

Focus groups were held at Neuroscience Research Australia (NeuRA - two focus groups) and in the community (four focus groups). Each group was moderated by a member of the research team using a semi-structured discussion guide, and one other researcher attended the group to take notes. Participants provided written consent and completed a screening questionnaire either online or in person which included demographic information and past experience with child restraint use.

The focus groups were structured such that participants were first asked to reflect on their experiences using child restraint systems. Next, participants were presented with five convertible child restraint systems currently on the market in Australia. Restraints were selected that fulfilled the following criteria: a) with and without self-adjusted headrest and harness combinations; b) convertible design (high propensity for misuse); c) currently on the market in Australia and expected to stay on the market for the next five years; and d) conforms to the Australian Standard for Child Restraints (AS/NZS 1754:2013).

The restraints included three rearward facing/forward facing convertible restraints, and two convertible forward facing/booster restraints.

The discussion guide was developed using review of the literature on consumer preferences related to health communication, principles in communicating with people with lower health literacy, and previous research on problems using child restraint systems. The guide was formulated to encourage reflection of potential modification of content and format of product information typically supplied with child restraint systems. Some specific prompts included: finding specific pieces of information related to areas of high misuse propensity, general impressions of instruction manuals or labels, ordering of information, previous experience and feedback on text size, drawings, and manufacturer videos.

The focus group discussions were audiotaped and then transcribed and de-identified. Audio-recordings were deleted following transcription. The University of New South Wales Human Research Ethics Committee (HC15547) approved the study.

#### Data Analysis

Six focus groups were conducted, with four audiorecordings transcribed in full. Two focus groups (one CALD group and one low SES group) were held during playgroup hours and extensive background noise prevented transcription. For the purposes of thematic analysis, the combined discussion notes taken by the group moderator and observer are used in place of transcripts.

Two researchers read each transcript and discussion note document independently and identified key content areas. These key content areas were used to code the transcripts and discussion notes into relevant themes. Overlapping themes were merged. The use of flexible content analysis allowed us to capture all instances of a theme being present in conversation, explore the context in which these issues were raised, and general agreement or disagreement within and between groups. The results presented below are the preliminary higher-level findings.

#### Results

A total of 44 participants (95% female) attended the six focus groups. Two groups were classified as having high income and education (high SES; n = 8), two groups of participants from CALD communities (CALD; n = 12), and two groups were held with participants from low socioeconomic areas in Sydney (low SES; n = 24). Key themes emerged across the following content and format areas: appearance, format, readability, information needs, and videos.

Within and between groups, there was consensus on installation being an important but difficult task, and consensus that instruction manuals and labels do not provide sufficient information to ensure correct use.

#### Appearance of instructions and labels

**Colour.** The instruction manuals and labels were viewed by all groups as having sufficient colour coding to determine differences between modes of configurations. Important information presented in yellow and warnings presented in red were congruent with the participant's pre-conceived knowledge and preferences for use of colour.

**Pictures/diagrams.** The high SES group found that instruction manuals had sufficient diagrams and pictures to aid installation; the low SES reported the need for more diagrams and pictures; and the CALD groups rated the current pictures as unrealistic and uninformative. It was noted that CALD participants are more likely to use pictures as the sole source of instruction, whilst other groups use pictures to help understanding of text. The same was true for CALD participants concerning the pictures and diagrams on labels affixed to the restraint:

"Yeah maybe more pictures. More pictures, more than letters, but pictures that we can understand better" (CALD)

And both the CALD and low SES groups called for more realistic diagrams and graphics to be used for pictures on the restraint.

"...more real life, that would be easier ... " (Low SES)

**Location of labels.** When examining labels affixed to the restraint, the high SES group pointed out that text heavy information was typically toward the bottom of the restraint; manufacturers should consider placing labels in the line of sight of the user when the seat is in the car.

#### Readability

For CALD groups, instruction manuals not being available in their primary languages was the main concern expressed. Labels can be improved by simplifying text, removing unnecessary words, providing other language options, and increasing font size. All groups reported that instructions and labels are text heavy and would benefit from less text and more diagrams or pictures. While most high SES participants found the instructions easy to read, all groups reported that text should be simplified. "I look at that and – I'm the person that reads every word and instruction – but honestly I look at that and I just shut down 'cause it's too much information. There's too many words" (Low SES)

#### Format

**Order of information.** There was a consensus across both the high and low SES groups that the instruction booklet should be ordered to reflect the order of tasks: pre-installation adjustments, installation, and then securing information. The high SES group recommended that each instruction manual have a quick set up guide and triage system at the beginning of the manual to guide the user through subsequent tasks. It was also recommended that the booklet should be separated based on mode of installation; different sections of the manual should focus on only one mode of configuration or separate manuals completely for different modes. For the labels, the CALD group asked specifically for simple, ordered, and numbered steps to perform the installation.

**Warnings.** Although group members in the high education group noticed and valued the warnings on the restraint, one participant pointed out that they would become redundant over time with exposure. While all focus group members seemed generally concerned with the safety of their children in cars and ensuring that they were correctly using seats, one group called for better labelling and warnings on the restraint to prompt other people securing their children in the car to do so correctly:

"Definitely for your partner ... have a big thing saying: fasten me tight!"

And also to remind users to untwist straps on the harness by placing labels on the straps themselves prompting removal of twists:

"... So I think if there was a big warning that your child is going to have a punctured spleen or something if this [strap] is twisted... the more information there is on the seat - I think - the better"

#### Information needs

**Mode of configuration**. The CALD groups expressed confusion about installing the seat in the mode that is appropriate for their child. The instructions and labels report on age, size, and weight requirements indicators for choosing the mode to install the restraint. The CRS has shoulder height markers as well. One CALD participant gave an example of conflicting information regarding which configuration to use for their child:

"That's why it's a little bit confusing, because it says from two to three [...] but then they said forward facing from twelve months to four years so they have two information?"

**How to correct misuses.** More specific information is needed on how to act on warning information when warnings are made about incorrect use. For example, providing information about how to make adjustments to tether straps: "... No, I'm not even sure it clearly tells you how to remove the slack, it just tells you to make sure the slack is removed."

**Need for feedback on performance**. The high SES and CALD groups consistently expressed the need for reassurance that they were performing installations successfully. One participant noted that the use of checkpoints for critical behaviours would increase confidence of installation success.

"It's all very well having a statement saying, 'Make sure strap is finely secured', but what about a test or demonstration to yourself that you've achieved that part of the task?"

Links to more information. All groups provided information about consulting other sources of information regarding restraint installation and use (i.e., YouTube videos, websites, manufacturer hotline). It was recommended by the high SES and CALD groups that links to other reliable sources of information be provided in the instruction manuals. It was suggested that a link to online video tutorials for installation demonstration should be permanently affixed to the restraint.

#### Videos

Across all groups, participants are receptive of video demonstrations as sources of instruction. Users are actively looking for videos on the web to clarify issues with installation (e.g., needing to adjust seat before threading belt through belt paths). However, the CALD group found manufacturer videos to be too general and not focused on problem solving:

"I did [see manufacturer's videos]. I tried to find manufacturers video but it didn't show me what I found in the YouTube video".

This group also spoke about the importance of using instructors/models on demonstration videos that are relatable and 'real'. The high SES group valued information coming from a trusted source. They noted that videos should be recorded and distributed through the manufacturer's official media channels, with direct links to these on the products and in instructions.

#### Discussion

The findings from this work have been used to develop a set of preliminary recommendations pertaining to re-design of instruction manuals, labels, and videos. These include:

- 1. Re-ordering information in manuals and on labels to reflect the order of performing installation
- 2. Provide a triage or checklist system at the beginning of the manual and in labels to guide use
- 3. Simplify text, and remove unnecessary text and repetitive warnings on labels

- 4. Provide specific warnings for tether and harness twisting on the labels
- 5. Provide instructions in languages other than English, and if not possible then:
- 6. Make diagrams and pictures more realistic to aid understanding (both manuals and labels)
- 7. Provide feedback on performance for key tasks, for example installation checks and information for the user to self-check their performance
- 8. Provide links to other reliable sources of information or videos in manuals and on labels
- 9. Simplify by separating manuals by mode of installation and removing ambiguous information
- 10. Place labels in line of sight of user, and increase font size
- 11. Manufacturer video should be short, problem-focused, and feature relatable role-models

Even though the recommendations above were not brought up in all focus groups, there were no disagreements between groups on the majority of suggestions made. For example, even though two high SES groups were the only to suggest change in placement of labels on the restraint, no information from other groups contradicted this recommendation. It is important to note that different themes emerged from different groups, and this highlights the need to ensure work with child restraint users samples a diverse range of users to address universal needs.

The only disagreement between demographic groups in this study was on preference for diagrams and pictures over text in instruction manuals. The high SES group found that the number and type of diagrams were sufficient in addressing their needs, while the CALD groups identified a need for more and better pictures. As mentioned by one CALD group, pictures and diagrams are used in the place of text as the main source of instructional information when instructions were hard to read and understand. This could explain the reliance on pictures.

### Participant recommendations versus previous CRS research

In their report for the U.S. Department of Health and Human Services, Fischoff et al. (2011) provided a guide to best practices in labelling medicine products to promote correct use. As both labels on medicines and on child restraints aim to authoritatively persuade users to perform a specific sequence of behaviours, it is not surprising that recommendations in this report overlapped with the themes that emerged from this study: a) organise label components to reflect how the instructions will be processed, b) emphasise critical information, c) simplify language, d) limit auxiliary information, e) address English proficiency by providing multiple language translations, and f) font – high-contrast, simple, large.

Although information needs tend to be similar across health disciplines, direct comparison with the findings of previous studies using child restraint information is pertinent. Similar to findings relating to labels and/or instructions designed by Rudin-Brown et al. (2004) and Klinich et al. (2010), participants in this study asked for information to be ordered in the sequence it needs to be performed and for text to be simplified to increase readability. In the current study, participants requested that the pictures and diagrams resembled the actual seat and tasks more realistically (e.g., using a photo of the restraint instead of a black and white 2D drawing). The only condition to decrease errors in use significantly after controlling for other conditions was improved graphics (Klinich et al., 2010). A high preference for video instructions in the current sample is in support of Klinich et al. (2010).

A key finding here is that the warnings for misuse in instructions and on labels are not engaging. A participant noted that they wouldn't pay attention to the risk statement due to familiarity. Reducing large text warnings was a recommendation made by Kramer et al. (2015) in their report to Transport Canada.

Kramer et al. (2015) reported that instructions should be explained using a combination of pictures and text, with *text being used for more abstract tasks*. With inclusion criteria requiring participants to have no difficulty reading or writing English, expectedly, this is in direct disagreement with the needs of the CALD participants sampled in this study who rely on pictures and diagrams in place of text due to English literacy problems. Further, at least 80% of Kramer et al.'s (2015) population had at least a tertiary level education.

The results of these focus groups support the suggestions made by Klinich et al. (2010), Kramer et al. (2015) and Rudin-Brown et al. (2004) that instructions and labels can and need to be improved to address consumer needs. This is interesting because the different populations of users across the Canada, North America, and Australian studies are converging on best-practice recommendations for instructions and labels. Across all three studies, there has been sampling of high and low education, literacy, income, and experience. The focus groups conducted here now provide consumer-centred recommendations from culturally and linguistically diverse child restraint users.

While understanding that focus groups are snapshots of user behaviour and not a complete picture of consumer needs, we are now well placed to use the results here and in past literature to draft a prototype of new instructions, labels, and videos to increase the correct use of restraints.

Both Rudin-Brown et al. (2004) and Klinich et al. (2010) found significant increases in user satisfaction and preference for re-designed materials, but only limited success at increasing actual correct restraint use compared to current products. And while Kramer et al. (2010) was able to significantly increase the percentage of correct installations, more than 60% of all installations were still incorrect. To ensure that errors in use are reduced in new prototype information, the next stage of the project will focus on iterative prototype design involving consumertesting until at least 90% of all participants in a testing cycle are able to install and use the prototype without significant error (guidelines developed by Sless and Wiseman, 1997).

#### Limitations

The results outlined in this paper are preliminary. Saturation of themes related to how information is currently communicated was not reached in this small number of diverse focus groups. However, the data generated will be extremely useful input into the first stage of the prototype material design. The next step is to consult the focus group data to explore motivational and emotional factors relating to correct child restraint use.

Socio-economic Index for Areas was used as a proxy for education and income for sampling purposes. While it is not as important to look at the distribution of recommendations from participants based on their demographics in this first round of user-input, the next stage of this project requires more and complete demographic data and assurance that all key child restraint users are being captured by sampling strategies. Homogenous groups were chosen to increase participant's comfort with expressing opinions. However, this meant that groups were selected by researchers based on demographic information. The next stage of this project will use randomisation to allocate participants to usertesting cycles so that diversity of needs is addressed.

#### Conclusion

The qualitative results in this study have extended previous research efforts to improve instruction manuals and labels for child restraint products. Guidance from child restraint users from diverse backgrounds is necessary to ensure that consumers' needs are driving the direction of design, and focusing attention on the key factors for change at the outset of re-design. We have elicited 11 key recommendations from users that will be applied to re-design new prototype instruction manuals, labels, and videos. Through iterative design and user-testing, this project as a whole will result in new product information that is designed according to user needs, and effective at reducing errors in child restraint use. Eventually, the products will be tested in a laboratory trial against current materials in Australia.

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## An automated process of identifying high-risk roads for speed management intervention

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(This paper was the winner of the award for Best Paper by a New Practitioner at the Australasian Road Safety Conference held in Canberra in September 2016).

#### Abstract

Infrastructure Risk Rating (IRR) is a significant input to the speed management framework, set to be introduced as part of NZ Transport Agency's Speed Management Guide. It is a road assessment methodology designed to assess risk based on infrastructure elements and interactions with surrounding land use, independent of crash history. The road safety risk is assessed by coding each road and roadside feature; such as land use, road stereotype and alignment; that feeds into the IRR model so that a risk rating can be determined. The methodology was originally developed as a manual coding exercise using street view imagery. However, this approach is neither economic nor time efficient when applied across a large network as is the requirement of the speed management framework.

This paper presents a geospatial process to automate the calculation of IRR. The process utilises various national and regional geospatial datasets to extract road features needed to calculate IRR. A comparison of the automated process outputs with manually coded IRR data of the same network resulted in a matching rate of almost 90 percent, hereby confirming the validity of the automated process. Aside from demonstrating the true potential of transport related data, this innovative approach will enable road controlling authorities to efficiently identify parts of their network where speed management intervention is most likely to reduce road trauma.

#### Introduction

Safer Journeys, New Zealand's Road Safety Strategy 2010-20 has a vision to provide a safe road system increasingly free of death and serious injury (Ministry of Transport, 2010). This Strategy adopts a safe system approach to road safety focused on creating safe roads, safe speeds, safe vehicles and safe road use. These four safe system pillars need to come together if the New Zealand Government's vision for road safety is to be achieved.

The second action plan of the Strategy, Safer Journeys 2013-15 Action Plan, aims to address speed as a cause of road death and serious injury (New Zealand Transport Agency, 2013). Therefore, NZ Transport Agency (NZTA) is tasked with delivering a Speed Management Guide that provides a framework to better align travelling speeds with road function, design, safety and use.

This speed management framework provides a single assessment method for determining safe and appropriate speeds on New Zealand's entire road network. The aim is to identify parts of the network where there is misalignment between the posted speed limit and the safe and appropriate speed and then prioritise investment to those parts where speed management intervention is most likely to reduce death and serious injuries.

In order to progress the Speed Management Guide to final status, NZTA initiated a speed demonstration project in the Waikato region of New Zealand to test and inform the speed management framework. The Waikato Speed Demonstration Project is an essential element in proving the robustness of the assessment methodology and building confidence in the process.

Infrastructure Risk Rating (IRR) is one of the three metrics, along with road classification and historic safety performance, required to classify a safe and appropriate speed to a road corridor. The IRR assessment methodology was originally developed as a manual exercise of coding



Figure 1. Waikato region locality map

#### Table 1. IRR Attributes and their categories

Road Attribute	Categories
Road stereotype	<ul> <li>Divided – non-traversable or one-way</li> <li>Divided – traversable</li> <li>Multi-lane undivided</li> <li>Two lane undivided</li> <li>Unsealed</li> </ul>
Horizontal alignment	• Straight or gentle, Curved, Winding, Tortuous
Lane width	<ul> <li>&lt;3m - narrow</li> <li>3m to 3.5m - medium</li> <li>&gt;3.5m - wide</li> </ul>
Shoulder width	<ul> <li>0m to &lt;0.5m - very narrow</li> <li>0.5m to 1m - narrow</li> <li>&gt;1m to 2m - wide</li> <li>&gt;2m- very wide</li> </ul>
Surrounding land use	<ul> <li>No access (Freeway)</li> <li>Remote rural</li> <li>Rural residential</li> <li>Rural town</li> <li>Controlled access (Urban arterials)</li> <li>Commercial big box/ Industrial</li> <li>Commercial strip shopping</li> <li>Urban residential</li> </ul>
Traffic volume	<ul> <li>&lt;1000 veh/day</li> <li>1,000 to &lt;6000 veh/day</li> <li>6,000 to &lt;12,000 veh/day</li> <li>&gt;12,000 veh/day</li> </ul>
Intersection density	<ul> <li>&lt;1 intersection/km</li> <li>1 to &lt;2 intersections/km</li> <li>2 to &lt;3 intersections/km</li> <li>3 to &lt;5 intersections/km</li> <li>5 to &lt;10 intersections/km</li> <li>10+ intersections/km</li> </ul>
Access density	<ul> <li>&lt;1 access/km</li> <li>1 to &lt;2 accesses/km</li> <li>2 to &lt;5 accesses/km</li> <li>5 to &lt;10 accesses/km</li> <li>10 to &lt;20 accesses/km</li> <li>20+ accesses/km</li> </ul>
Roauside nazards	• Low, minor, moderate, righ, Severe



Figure 2. Corridor aggregation process and segmentation thresholds

road attributes using street view imagery or high speed video. However, manually coding the whole of Waikato region in order to demonstrate the framework is neither economic nor time-efficient.

Therefore, as part of the Waikato Speed Demonstration Project, NZTA commissioned Abley Transportation Consultants to develop an automated process of calculating IRR across a large network. The Top of the South region of New Zealand was chosen to develop and refine the automated process before being applied in the Waikato region.

#### Infrastructure risk rating

IRR is a predictive road assessment methodology that has been developed by NZTA (Waibl et al., 2016). It is based on the Star Ratings process and involves coding a number of road and roadside attributes. These attributes then feed into the IRR model, resulting in a five-band risk rating, ranging from 'low' to 'high'. The overall IRR score for a road corridor is calculated by assigning a category-based risk score to the attributes given in Table 1.

The IRR assessment is designed to predict road safety risk on long sections of road. These long sections are referred to as 'homogenous sections' and are identified based on little variation in IRR features along the length of the section. In a rural environment, homogenous sections are around 5km in length, whereas urban sections are generally shorter due to frequent changes in road attributes such as surrounding land use and road stereotype.

As with other risk rating methodologies, divided carriageways are separated from undivided carriageways and coded in both directions. Short changes in IRR features such as a dividing median on the approach to an intersection or a turn along a straight corridor are ignored when identifying homogenous sections. In broad terms, homogenous sections are those where the speed limit would be the same.

#### Methodology

A majority of the road attributes that feed into the IRR model are stored in national or regional geospatial road datasets. Therefore, to deliver the Waikato Speed Demonstration Project in a cost-efficient manner, the process of calculating IRR was automated using geographic information systems (GIS). This included the development of GIS models that accurately extract road attributes from various geospatial datasets and applying assumptions based on engineering analysis and professional judgement. This methodology is discussed, in brief, below.

#### Corridor aggregation

The first step in automating the IRR methodology is to develop a method of aggregating road corridors that is comparable to manually identifying homogenous sections. Figure 2 summarises the geospatial process developed to automate this process. A road centreline dataset was initially dissolved into long corridors defined only by the posted speed limit and the road name. These corridors were then progressively segmented based on the IRR attributes that have the most significant influence on the overall score.

According to the speed management framework, the primary factor in distinguishing different road environments in terms of setting speed limits is the surrounding land use. As IRR is used to determine safe and appropriate speeds, land use has been used as the first order of segmentation.

Corridors with a uniform land use are then segmented further based on changes in road stereotype, alignment and traffic volume. These attributes were analysed to have



Figure 3. An example of corridor segmentation

a significant weighting to the overall score. For example, access density score has a difference of only 0.3 between the highest and the lowest risk category compared to road stereotype and alignment which have the same difference of 10 and 6 respectively (Waibl et al., 2016).

The segmentation thresholds (minimum lengths) where chosen to avoid segmenting corridors due to short changes in road attributes such as overtaking lanes or short divided medians. These thresholds have been adjusted as the methodology has been refined in order to align the automated process of corridor aggregation with manually identifying homogenous sections.

Figure 3 shows an example of a rural corridor initially dissolved into a long section based on road name and posted speed limit. The corridor remains aggregated at the first and second order of segmentation as the land use is 'remote rural' and road stereotype is 'two lane undivided' along the entire length. There is a distinct change in alignment category that is longer than the segmentation threshold of 1km and therefore, the corridor is segmented at this stage of the process. There is no further segmentation, as the traffic volume category remains consistent along the segmented sections.

#### Geospatial datasets

The GIS models have been developed to extract IRR attributes from various geospatial datasets. These include a national road centreline dataset with speed limit, road name and alignment data, and Road Assessment and Maintenance Management datasets maintained by local territorial authorities. Land use was modelled using urban and rural boundaries and the density of residential and commercial developments sourced from planning zones, Open Street Map (OSM) and Land Information New Zealand (LINZ) datasets.

Figure 4 shows how the automated process calculated each IRR attribute along with the datasets used to extract the attributes.

#### Assumptions

While most IRR attributes can be extracted from spatial transport datasets, the automated process incorporates assumptions regarding access density and roadside hazards.

Regression analysis of almost 600km of manually coded IRR data identified that the combination of land use and posted speed limit is a robust predictor of access density. This data was collected for urban and rural parts of New Zealand's road network and represented a good sample upon which to base the access density model.

A comparison of actual and predicted access density categories, as shown in Figure 5, shows that the derived equation incorporating land use and posted speed limit



Figure 4. IRR Automation overview and datasets used



Figure 5. Comparison of actual and predicted access density

variables predicted the right access density category for almost 70 percent of the sample network. This result is considered adequate considering that access density has the least influence on the overall IRR score.

The roadside hazard attribute was determined using a combination of manual identification and applying assumptions based on sample IRR data. In addition to trees and poles, roadside hazards also include aggressive rock face, deep drainage ditches and cliffs with steep drop offs. These hazards were identified manually where possible using high quality spatial imagery and topographic maps.

Further analysis of the sample IRR data showed that the roadside hazard attribute correlates most with the combination of land use and road alignment. Generally, sample corridors with a rural land use were coded as 'moderate' to 'moderate-high' in terms of roadside hazards and urban corridors were coded as 'high'. One exception to this is corridors with the combination of 'tortuous' alignment and 'remote rural' land use which were generally coded as 'high' in terms of roadside hazards due to mountainous terrain in most cases.

In terms of speed management, assuming a consistent roadside hazard category along a particular land use ensures that the presence or absence of hazards intermittently does not have an impact on the resulting safe and appropriate speed.

#### Results

As part of testing and refining the methodology, 50 homogenous sections in the Top of the South region, equalling a network length of approximately 134km, were manually coded and also run through the automated process. These roads were selected to have a mixture of surrounding land use with varied IRR attributes and included some of the highest risk corridors in the region in terms of historic safety performance.

As shown in Figure 6, the automated process successfully predicted the IRR of almost 90 percent of the sample network length while the remaining parts of the network were predicted to within one band of the manually coded rating.



Figure 6. Comparison of automated and manual IRR bands

Furthermore, the automated process successfully predicted the IRR of almost 97 percent of rural corridors in terms of network length. Whereas, only 78 percent of the urban network was successfully predicted, which suggests that some refinements may be required to this part of the methodology.

IRR scores calculated from manual coding and applying the automated process were also compared in order to gain further insight into the validity of the model. These scores have been plotted in Figure 7 for the 50 homogenous sections.

The high correlation between the manual and automated scores confirms that the GIS-based process is robust in automating the IRR methodology. This result gives confidence to road controlling authorities that the automated process is an efficient tool to proactively assess road safety risk in terms of speed management.

The outputs of this methodology were delivered through the integration of IRR with risk maps based on historic crash performance through a single mapping website. IRR attributes assigned to each corridor were displayed along with Google Street View integration to allow users to view actual road conditions. An example screenshot demonstrating the IRR outputs displayed on the website is shown in Figure 8.

#### Discussion

The automated process developed to efficiently calculate IRR across a large network is considered a significant step in demonstrating the proposed speed management framework. The model has been developed in a manner that allows it to be applied to any transport network and therefore has the potential to provide an enduring benefit throughout New Zealand and overseas.

#### Effectiveness

The IRR methodology, while still being refined as part of proving the speed management framework, can be used to proactively assess road safety risk across a large network, especially on lower volume roads where crash history can be an unreliable indicator of risk. The automated process



Figure 7. Plot of automated and manual IRR scores

enables the methodology to be applied in a cost effective manner and the convenience of GIS allows the process to be easily adjusted.

This project required the innovative use of GIS technology to improve the affordability and scale of applying the IRR methodology. While it is technically feasible to manually code road attributes and calculate IRR, the process is hugely time-consuming and cost prohibitive when applied at network level as is the requirement of the speed management framework. Furthermore, the analysis underpinning the automated process involves using existing geospatial datasets and therefore, no new or expensive data collection is required in applying the process.

Feedback from various stakeholders regarding the IRR and resulting safe and appropriate speed outputs indicates that the automated process produces sensible results when applied as a screening tool to identify parts of the network requiring speed management intervention. As an input to the speed management framework, the GIS-based methodology is intended to be rolled-out across New Zealand in an effort to assist all road controlling authorities in identifying corridors where speed management intervention is most likely to reduce death and serious injuries.

#### Limitations

The automated process of calculating IRR is of greatest value to road safety practitioners when it is used as a network screening tool for speed management intervention. The methodology should be applied with care when considering individual corridors. The process incorporates assumptions regarding roadside hazards and access density due to the lack of such data. Therefore, these site specific attributes should be taken into account when identifying or prioritising speed management interventions at a corridor level. Aerial imagery, Google Street View and other contextual data can be used while undertaking desktop reviews. The simplicity of the IRR model allows users to easily modify the roadside hazard and access density categories as part of sense testing the modelled outputs.

#### Conclusion

The automated IRR methodology demonstrates that innovative assessment methods and tools are required in order to efficiently deliver the action plans of the Safer Journeys strategy. Current application of this methodology in New Zealand relating to the demonstration and refinement of the proposed Speed Management Guide demonstrate the potential of this methodology in supporting the safe system philosophy. The automation of corridor risk rating methodology presented in this paper will be of particular interest to any road controlling authority wanting to efficiently identify parts of their network where speed management intervention may be an appropriate response to improving road safety performance.

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Figure 8. IRR Outputs displayed on the website

## Contributed articles

### Resilience and youth road safety: some thoughts

#### By Teresa Senserrick PhD

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A presentation was given at the recent Australasian Road Safety Conference 2016, introducing young driver road safety issues and the potential role of resilience education as a countermeasure. The session was the Road Safety Educators Workshop, not only held on the first morning of the conference, but with an hour earlier start time than the rest of the program. The workshop was full, with standing room only for most of the morning, reflecting the breadth of interest from a wide range of educators and wider stakeholders.

Introducing youth road safety statistics, one focus was on road crashes as a persistent leading cause of death and acquired disability for youth, as well as the persistent overrepresentation of youth, and young drivers in particular, in fatal crashes (BITRE, 2016; AIHW, 2016). This is not only true in Australasia, but echoed globally (WHO, 2015). Moreover increased attention to non-fatal injury outcomes suggests we have achieved little change in youth crash-related serious injuries in recent years (AIHW, 2015p Centre for Road Safety, 2016). The 388 deaths in Australia and New Zealand involving young drivers and motorcyclists in 2014 (latest data available BITRE, 2016; Ministry of Transport, 2015), are coupled with thousands of serious injuries (AIHW, 2015; Ministry of Transport, 2015); beyond what should be considered an acceptable trade-off for mobility, for any road user group.

The contributing factors are many (reviewed in Johnson, 2011; Senserrick, 2013; Senserrick, 2015; Twisk, 2007). This includes risks for drivers of any age, including inexperience and more driving at night, on weekends, recreationally and in less crashworthy vehicles. But some factors increase crash risk to a much greater extent for youth than older, experienced drivers, including (even low levels of) alcohol and carrying multiple peer passengers. The stage of brain development during this period of mid-adolescence also contributes to young drivers having greater propensity to take risks, important for developing independence, but including potentially harmful risks such as speeding and text messaging. It also contributes to fatigue, anxiety, depression and strong waves of emotions; all with potential to increase crash risk.

What then could be the role of resilience and the potential role of resilience education as a crash countermeasure? Deb Zines, Road Safety Coordinator at School Drug Education and Road Aware (SDERA) and chair of the Road Safety Education Reference Group Australasia (RSERGA), kicked off the workshop challenging participants to think about their perspectives and definitions of resilience. There were many, but being able to maintain an enduring sense of wellness, with the ability to "rise above" or "bounce back" after adversity, were viewed as particularly important aspects. Dr Michael Ungar, Co-Director of the Resilience Research Centre, puts it this way: "In the context of exposure to significant adversity, resilience is both the capacity of individuals to navigate their way to the psychological, social, cultural, and physical resources that sustain their well-being, and their capacity individually and collectively to negotiate for these resources to be provided in culturally meaningful ways" (Resilience Research Centre, 2016). Further investigation of model pathways to resilience were then reported, with research findings linking low levels of resilience to an array of negative outcomes, including higher risk of leaving school at a young age, unemployment, poverty, mental health problems and harmful risk-taking taking behaviour (e.g. Hattie, 2009; Criminology Research Council, 2003; Kraft, 2003).

How then can we teach young people to be resilient and what role might this have in improving youth road safety? Resilience education focuses on empowering youth, enhancing or building strengths and competencies in relation to risk-taking generally. That is, the focus is on the individual rather than on the specific risky behaviour per se. There are many angles this can take, which draw back to classic psychological theories such as "causal attribution" and "perceived control" (Heider, 1958; Fiske, 1991): simply, whether we attribute behaviours to internal factors within our control (personality, motives, beliefs), or to external factors outside of our control (situational or environmental factors). This presentation identified many aspects of resilience that we could address with young people, which was conceptualised as their "resilience backpack" or "resilience toolkit":

- Decision making (safe choices).
- Assertive communication (straight talking).
- Help seeking (being brave, ask for help).
- Knowing your strengths.
- Optimistic thinking and persistence.
- Humour (smiley thoughts).
- Conflict resolution and negotiation (win-win or I hear you).
- Goal setting (Goldilocks goals).
- Emotional awareness and regulation (see it, feel it).
- Social awareness (develop friends).
- Empathy (kind and in your shoes).

These are all good, accessible examples for parents and anyone with a role in supporting young people. From a resilience education approach, the aim then is not just to draw young people's attention to aspects such as these, but to include a focus on the strategies they can employ to enhance and rehearse these to reduce risks. That is, it is not just the "what" and "why", but also the "how" to prevent or avoid making poor decisions to engage in risks. Traditional driver education focusing on the "what" and "why" only, such as drink driving or speeding and why they increase crash risk, for example, is not unimportant but is largely ineffective in influencing behaviour and therefore crash risk (Senserrick, 2015; Beanland, 2013). The underlying assumption is that ensuring awareness and knowledge of the risks and fostering positive attitudes alone should result in safe behaviour. The complementary assumption, therefore, is that young people have the skills and the "know how" to effect such change. Resilience education addresses this last assumption and seeks to provide youth with the "tools" they need to make safer choices in keeping with their beliefs and intentions.

The impacts of a resilience-focused education program on youth road safety were explored in 2009 as part of the DRIVE study - a cohort study with over 20,000 young drivers in New South Wales (Senserrick, 2009). Newlylicensed drivers completed a detailed survey, including questions regarding their involvement in driver education programs as a learner, and their answers were linked to police-recorded crash and offences records about two years later. Large enough numbers had participated in two particular school-based programs in order to compare the results: one a more traditional driver education program and the other a broader resilience-focused program. Comparing the outcomes of those who took part in the programs to those who did not, neither program was associated with fewer offences. However, the resilience-focused program (and not the traditional program) was associated with much lower crash involvement.

The size of the crash reduction in the study was striking. This does not mean the program reduced crashes by this large effect. DRIVE was an "observational" study over time and not designed for program evaluation – we cannot know if there was any systematic bias among those who completed the program in choosing to be in the study or not. But that a large effect was found, and not for the traditional program (with the same potential for bias), points to the potential of the resilience program to have reduced crash risk for those young drivers.

Further, around the same time as the DRIVE study, stronger evidence of the potential of resilience education to improve road safety emerged from the United States (Griffin, 2004). A "gold star" evaluation study, a randomised control trial, was conducted of a school-based program for 7<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> grade students. The program did not include specific focus on driver education or road safety per se, but in fact focused on alcohol and other drug misuse generally. However, by the end of high school, students who had participated in the program had fewer demerit points on their driver licence than those who did not.

Comparing the two studies, the U.S. study did not include crash records, but showed reductions in traffic offences, whereas DRIVE did not find any differences in offences, but did find crash reductions. Writing up the DRIVE study with colleagues back in 2009 for an international journal, the appeal was made for more research on this promising approach to account for these inconsistencies and draw out the true potential of resilience education (Senserrick, 2009). With the importance of resilience for youth spanning a range of health and safety risks, the implications seemed compelling. Yet several years on, a rudimentary search of peer-reviewed literature fails to find any such further evaluations.

There is a collective disappointment in the recent rising road toll in our region. For me, that this particularly includes an increase among young people, including novice drivers, is particularly tough. Reflecting on why this might be and where to focus our efforts next does not bring any ready or easy answers. There is no one answer and no one solution. Applying wider "systems thinking" to recognise there are many avenues to influencing young driver road safety, not just via traditional transport and road safety "actors" (Scott-Parker, 2016), there are multiple opportunities to increase youth resilience and we might all have opportunity to play a role. Both formal and informal resilience education, addressing the "how" and inspiring young people to build and draw on their "resilience backpack", offers a promising building block in our collective efforts to improve youth road safety.

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### Blue Datto: Keeping Safe Program

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#### Vision

The Blue Datto Foundation has a vision that: each person has the right to enter adulthood carrying positive attitudes and behaviours, supported and encouraged by their families, friends and communities. In order to achieve this vision, Blue Datto provides attitude and behaviour courses to year 10 age students in schools, community groups, and to young people in need. Participants attend a half-full day workshop that provides tools to empower them to speak up as passengers, to behave responsibly when they become drivers, and pledge to do so. The program encourages conversations between young Australians and their families at home, at school and in their communities.

The Foundation was established in memory of Philip Vassallo who passed away in a car crash when he was 17, in which both drivers were red 'P' platers.

Changing the culture of young drivers in NSW through educational workshops

#### Keeping Safe Program

Blue Datto<sup>™</sup> Keeping Safe workshops encourage young people to make good decisions when faced with risky driving situations, both as passengers and drivers. Keeping Safe is about changing attitudes and behaviours – not driving skills. Students participate in workshops, presentations and talks on young driver facts and a real life case study. They also create their own personal safety plan so they'll be prepared when dealing with difficult and unsafe driving situations.



### Educating youth in Keeping Safe<sup>™</sup> before they start driving

The peer-based driver education is aimed at year 10 students based on a whole car approach, highlighting that every person in the car has a role to play: the driver, their driving teacher, and the passengers. The optimum time for students to undertake this program is before they begin driving or when they are applying for their learner driver permit.

The Keeping Safe program is provided to the whole year or community group, and includes a range of whole group and small group workshops of up to 20 students. The Peer Mentors run the small workshops. They are university students (near-peers) who have been specifically trained by Blue Datto to facilitate the workshops. As they are close in age to the school students, they open up a different level of conversation than others might, and can become role models. In undertaking the training and running of the courses they become road safety ambassadors and are a wonderful resource for the community and Blue Datto.

To begin the day as a whole group they are presented with an introduction to the day and to Blue Datto. Workshop 1 addresses the values of the students and their rating of risks. Through the interactive activities in this workshop students become aware of the complications and distractions which can arise when in a car. The whole group then combines, where the police provide a Young Driver Facts presentation, and the students are then presented with the interactive Rescue Services Case Study. Workshop 2 concentrates on skills to assist the students in speaking their mind when in tough situations, and they are assisted to create their Keeping Safe Personal Safety Plan. The whole group then gathers, where the students present to school and community leaders their ideas for keeping themselves and their communities safe. Here the students, school and community leaders make a commitment to Keeping Safe plans, and students write a personal pledge. The Pledge is then emailed to them around their birthday and at other significant milestones until they are 21, to remind them of their pledge to Keeping Safe<sup>™</sup>.

Officially starting in term three 2016, close to 1000 students have undertaken the Keeping Safe program from five schools and community groups. Term four should see a further 10 schools complete the program and bookings are still being taken. The Blue Datto Keeping Safe program is delivered free of charge to schools in New South Wales. This is made possible through sponsorship and community support. roung people are told lots of different things about road safety and managing risk though parents are their biggest role models on the road

Here's some ways you can support and educate your children while they're learning to drive

"l ám a good drivar"	"Driving is about experience, it's about anticipating hazards, and driving in all types of conditions. You might be a very good driver but you also have to contend with all of the other drivers on the road."
"It will be all right and you worry too much."	"Driving is about judgment and minimising risk, it's not OK to have a policeman knock on the door and tell us you are dead or in nospital,"
"Speeding is ok."	"Speed hurts. You don't want to end up in a wheelchair or worse."
"You speed and you run red lights."	"I now know that is dengerous and i wan't be doing it anymore. I know i need to be there for you and i shouldn't take stupid risks oither"

Figure 1. Information to guide parents in their support of learner drivers

#### Parent Keeping Safe Program

Parents and driver trainers play a crucial role in the safety of young adults on the road. Recent research shows that more experienced drivers and new drivers see a very different road.

Unfortunately, many parents aren't up-to-date with teen behaviours, attitudes and experiences let alone current road rules. There are few resources available to this group.

The parent program is under design and aims to provide guidance for parents to assist in supporting and educating their learner drivers. (See Figure 1). Further information about parent information evenings and support forums are available by signing up to the newsletter at bluedatto.org.au or on Facebook at Blue Datto Foundation.

#### Evaluation

Through the Blue Datto Keeping Safe program young people are being empowered to develop strategies to keep themselves and their community safe on the roads. The workshop is led by university students who themselves become safety ambassadors. The program is currently being evaluated by a research team at Western Sydney University, and the accompanying Parent Program is under design.



Peer mentors at a school

### Safe System complementary thinking on the Bruce Highway: a step change safety improvement

#### By David Bobbermen

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(The Bruce Highway project was awarded a 3M Diamond Safety Award at the Australasian Road Safety Conference in 2015. This report provides details of this award winning project and the impact it has had in improving road safety and saving lives).

#### Introduction

One of the traps often confronting road safety engineers is a project level solution with an improvement focus directed solely on the '*here and now*' and without considering the contextual longer term asset management implications. Naively hoping that funding will match the requirement to complete all projects to the same standard of treatment will lead to increases in crash rates at other locations with marginal, at best, improvements in safety to the network overall.

Furthermore, when designers or consulting engineers are charged with designing a project without the correct direction or network-wide context, the result will be an inconsistent network comprising project driven standards or a network vision which will never be met. A project manager or project designer is not in the right position nor has the information at their disposal to fully understand the context to make the right decision for driver consistency and for an achievable total network solution. How can the right direction be provided?

This paper provides a comprehensive approach to address this question. The approach has been implemented on the Bruce Highway in Queensland from the planning undertaken in 2012 with the early signs showing a significant step change improvement in performance. The photograph shows the completion of the first project on the highway.

#### General

The Australian National Road Safety Strategy 2011-2020 (NRSS) has set targets for a 30% reduction in the number of fatalities and serious injuries over the 10-year timeframe. It also indicates that the rate of achievement made up until 2010 has slowed in recent times:

"... the overall performance [of Australia] in recent times has not kept pace with the achievements of other developed countries, and there is a need for a major shift in thinking by governments and the community." [Refer NRSS 2010-2020 page 11]

In more recent times, it is getting increasingly more difficult to achieve safety improvements via the traditional safety treatment processes. For example, the "Black Spot" approach through the bottom up identification of



problem locations is not seen to deliver the step change in performance that is required. Also, as each site is treated, this generates two more higher risk interfaces with untreated sections and therefore promoting an elevated crash risk at each inconsistent interface. Analysis of crash performance suggests that crashes move to the next worst location due to the level of *inconsistency* of the road.



As most of the "low hanging fruit" have been addressed at crash locations through these programs, new approaches are needed. The NRSS explains:

"Although black spot programs do a good job of fixing problems in specific locations with poor crash records, the majority of crash sites are widely dispersed across the network."

The NRSS goes on to say that a new approach of treating high risk sections is proposed. However, both of these treatments (black spot and high risk sections) can be considered reactive (bottom-up) problem driven approaches. These solutions are implemented with the knowledge that it is only time before crashes will occur at other locations/sections.

Experience suggests that by reactively treating historic crash locations, only a limited benefit will be realised. A model treating location by location may help to contribute to the 30% reduction target set under the National Road Safety Strategy 2011 – 2020 but will not achieve the step change required to meet the anticipated 50% reduction target set by the United Nations or the *Vision Zero* target.

A truly proactive means to address the problem is to consider a total network implementation through vision standards for road stereotypes. This relies upon the design practices moving upstream to the network planning phase so that network level design analysis is undertaken (rather than being solely applied to project design) to ensure the best decision is made for that specific network stereotype.

Also, with the removal of the non-feasance rule, road agencies no longer have immunity from legal claims arising from not knowing of road deficiencies. Therefore, a comprehensive assessment approach would be expected to mitigate legal risk on a consistent basis and not just treating past crash locations. Such an approach has been applied on the Bruce Highway. This work has led to many outstanding results and is described in the sections which follow that detail the findings.

#### Australian and New Zealand Context

The NRSS [page 53] emphasises the "need...to find and apply cost effective and innovative solutions". With Australia and New Zealand having some of the most challenging demographics (see Figure 1) with long lengths of road outside urban areas, corridors supported by low population density, and roads in areas with limited local construction industry support, smarter approaches to better mitigate the challenges of distance and delivery efficiency are required. The learning from the Bruce Highway implementation across six key principles will be outlined to complement existing safe system practices to address this challenge.



Fatality Rate versus Area/network km

(Figure 1. Source OECD 2013 traffic data and WHO 2013 road safety data)

#### **Recent Experiences**

Some specific and fundamental changes in practice on the Bruce Highway over the last three years has led the way to rapid implementation of treatments to bring about this change in performance. These benefits come through a change in organisational thinking and a shift in decision making from the context of project management to network planning and programming with road design decisions being critical in these earlier phase of road system management.

The initiating concept and prime objective of this strategy was to develop consistent network-wide standards by balancing crash risk for significant components and which are also matched to the likely investment profile. This approach, shown by Figure 2, was developed to guide the strategy and planning completed in 2012.

The application of this objective relied upon the integration of disciplines or specialist practices as a necessary and mandatory prerequisite to truly maximise the benefits through a safe system. More detail on these disciplines is provided in the following Network-wide Strategy section.

This led to a significant change in thinking when compared to traditional approaches. As a means to simply communicate this concept, provocative statements have been developed to emphasise the necessary change in thinking and are included in Attachment A.

Through the Bruce Highway implementation, significant benefits have been realised by motorists (see Figure 3) showing the reduction in fatalities as the new type cross section has been rapidly implemented over long lengths of highway and with relatively little initial investment.

This was only possible through a concerted effort to integrate design, safety, asset management, network analysis and delivery thinking from the earliest phase of network-wide planning. Also for noting is that this task of planning to set practical and affordable network-wide standards is not undertaken by many road management jurisdictions.

While implementation has now slowed with higher investment costs per km to be incurred for the balance



Figure 2. Balanced risk strategy

#### Safety step change



Figure 3. Step change Bruce Highway implementation

of the highway and for the remainder of the ten-year investment timeframe, only a limited safety-focused investment of less than \$15 million has been needed to implement the majority of the safety focused treatments to date. This is primarily due to the balanced approach to crash risk together with a tempered but engineered intervention standard.

A number of basic principles have been derived from this work which are complementary to the current safe system direction and which provides further refinement and constraint to ensure the best outcome is achieved for the (whole) road system. These principles and the associated necessary change in thinking is emphasised in Attachment A through the use of some proactive and challenging statements. The change in thinking is summarised below under six basic principles which will be outlined in the following sections:

- 1. Use a Network-wide Strategy
- 2. Set Realistic Network-wide Intervention and Construction Standards
- 3. Balance Crash Risk
- 4. Prioritise for Delivery Efficiency
- 5. Consider Risk Compensatory Influences
- 6. Focused Management of the Road System

### Finding 1 – use a network-wide strategy

#### Network-wide focus

The findings suggest greater strategic control is exercised through a total road network strategy to maximise the beneficial outcome and to not leave the safety solution to chance through many decisions on many projects.

#### Strategy driven focus

The network-wide focus is a top down network strategydriven process to set a realistic network vision and not the aggregation of bottom-up driven solutions for problem sites. The specific vision standards are covered in the following section. Problem sites would automatically be included in the strategy.

#### Incremental improvement in stages

This top down strategy proactively sets standards to improve the total network in increments thereby consciously making deliberate decisions on the consistent standard for the infrastructure that will be met over the desired time frame. This is outlined further in the next section - Finding 2.

#### Integration of disciplines

Design, safe system, delivery and asset management disciplines were integrated as part of the network analysis. These related disciplines were integrated and applied in the following way:

- Network-wide planning to develop a strategy which brings together the various disciplines when trying to match the vision standards with a realistic funding profile.
- Application of a new concept of network-wide design where the key technical aspects of design are decided at a network level rather than at each project.
- Asset management to set the evaluation lifecycle for the strategy development and to accommodate the impacts of changes in standards for key components such as pavements.
- Program Delivery management practices to prioritise projects and achieve cost savings due to the realisation of free projects through the application of 'economy of scale' and 'economy of location' principles.
- Integration of road design and road safety practice to balance crash risk for key components which have a significant influence and sometimes a competing interest on the outcome.
- Network-wide economic analysis to demonstrate the benefits for the best total network option.

#### Road stereotype

One of the first steps is to identify the road stereotype which comprises more than just the traditional functional hierarchy classification. It comprises the function (such as arterial), characteristic (such as multi-lane) and traffic volume. These are important characteristics which influence the setting of standards for a "self-explaining road". The Bruce Highway is a high speed, highly trafficked, two lane/single carriageway national highway. It is important to recognise the stereotype of the specific network as the significant components (used in the analysis) will differ between stereotypes. While this approach has been applied to this major national highway stereotype, the same principles can be applied to other stereotypical environments such as low speed urban streets, multi-lane urban arterial roads, rural regional connector roads, highspeed highly-trafficked motorways, and hilly/mountainous rural secondary roads. Each of these components will require the setting of vision standards so as to balance crash risk. This is outlined in the following sections.

### The Risk of applying a Black Spot approach to a network

If a blackspot solution is applied to networks with many deficient sections, every project will potentially create two new crash risk locations at adjoining higher risk sections. Also the blackspot treatments have traditionally applied a high level solution treatment at the location rather than a tempered network-wide solution.

Treating a whole network/link relatively quickly to a consistent standard creates a much lower overall crash risk. This means that the safest project driven solution which is not aligned to the network assigned standards will have implications on either network affordability or driver consistency.

#### Finding 2 - set realistic networkwide intervention and construction standards

Set both network-wide intervention and construction standards

Traditionally, a vision standard has been set for a network to describe the ultimate vision for the operation of that road. However, does this mean the total length of the road will be upgraded instantaneously?

To ensure a practical and realistic approach was applied to the Bruce Highway, the treatment process was clarified through the setting of both:

- A network-wide intervention standard (which is the trigger for enhancement work) and
- A network-wide construction standard (the completed construction standard for new work).

It is critical to the process that both these standards are identified to bring the road up to a consistent standard within a desired timeframe and to ensure the intervention and construction standards are relatively consistent. The ultimate vision is still relevant and can be explained as the standard which current and subsequent increments will meet. However, each increment is both realistic and practical and will be completed in a timeframe which links with the asset lifecycle and will avoid asset wastage or rework.

#### Road consistency

Setting such standards on a network-wide basis will reduce the variability in standards for a link/network, facilitate quicker implementation, mitigate the non-feasance legal risk, and provide greater consistency for the driver. This will also implement treatments in a way where the resulting road will be "self-explaining".

Also, for a rapid change to occur, an approach which brings the network up in completed whole-of-network incremental stages will result in a consistent driver experience over a shorter period and achieve total network benefits earlier.

#### Iterative approach

This strategy process is iterative and requires various checks on affordability, design limits, developing safety treatment options, balancing crash risk, maximising benefits, minimising risk, and considering complimentary flooding and efficiency enhancement projects to arrive at the best result for the network-wide stereotype (see the figure below). More on this will be outlined in the following sections.

#### Design competency in setting network-wide standards

The intervention and construction standard for each component is considered through a calculated and informed process relying upon a network-wide design exception or extended design domain to justify the decisions for the stereotype. It is not about naively accepting a traditional standard as a project treatment. This analysis process relies on a proficient design engineer, who also considers network and asset performance, to be involved in and approve the standard. The resulting network-wide analysis will thereby limit any decision for a standard within a contained project. This concept has historically been referenced as the project needing to "*strategically fit*" or align with the network strategy.

As an example, the considerations to support the Bruce Highway decision and gain approval of a "tempered" but engineered standard are shown in Figure 5.



Figure 5. Considerations to support the Bruce Highway decision



Figure 4. The iterative approach to the strategy process

As an example, significant savings from the application of the critically reviewed network-wide standards were achieved (estimated at more than \$5 billion) to complete the Bruce Highway with consistent standards through:

- reduced lengths of higher cost treatments resulting from the network-wide intervention standard and
- reduced cost for new enhancement works through a realistic network-wide construction standard.

#### Identify the significant components

For a specific road stereotype, there is a need to focus on only the significant components which are those that will influence the balanced crash risk, the benefit and the cost so that insignificant components do not adversely or inadvertently alter decisions and compromise the achievement of maximum network benefit. For the Bruce Highway stereotype, the following significant components have been evaluated with clear vision and intervention standards:

- lane width, shoulder width WCLT
- intersection type
- seal width and pavement width
- formation width, average height and culvert widening
- batter height and slope
- obstructions and clearing
- overtaking lanes
- specific exceptions (such as substandard horizontal geometry)

In contrast, the significant components for an urban street stereotype would be different and involve a focus on components like speed environment, pedestrians, cyclists, traffic light phasing, skid resistance, traffic management devices, crossings etc. Of course, any treatment which has an insignificant cost can be applied to compliment the main objectives.

#### Evaluate the existing asset condition

The network strategy will comprehensively evaluate the gap from the intervention standard and the existing asset condition to determine the extent of work to be completed. The new work will be built at the construction standard. Of course the remaining asset life will also be considered as part of the treatment so as to avoid wasting remaining infrastructure life.

#### Funding driven reality

Traditionally, while one project may be solved with a fantastic solution, it is troubling that this nearly always means there are numerous other unidentified sites left untreated and with delivery presumed to be unachievable or not even known. The funding profile is to be considered for the typical asset life for any treatment when setting the vision standards (intervention and construction). This ensures that a realistic program can be implemented for a total network solution in a practical timeframe.

A further upgrading of the standard can be adopted in the next asset renewal cycle thereby enhancing the network in stages and aligned to asset lifecycle and realistic funding profiles. The strategy will also help to justify and support the call for funding. Also, the likely funding profile can be set at a slightly optimistic level so that the strategy may help in gaining commitments to an ongoing elevated funding profile, particularly when network-wide benefits can be quantified, defined and used to garner support.

#### Setting standards equated to star rating

There is also an opportunity for the standards used for various road infrastructure components to be equated to star ratings. In this way, decision makers during the planning phase can advise stakeholders of the star rated standard for the network. There will be significant effectiveness and efficiency benefits that can come from this initiative.

#### Finding 3 - balance crash risk

#### Treatments for all crash types

The history of crashes on the Bruce Highway indicated that 40% of crashes were head-on. However, designs traditionally focused on upgrading shoulder treatments and maintaining lane widths making the addition of crosscentreline mitigation treatments almost impossible due to the high costs involved with widening narrower seals and formations to meet the requirements of traditional standards.

#### Balancing crash risk

The solution to this was through balancing the crash risk of significant components. This meant that a calculated and risk assessed reduction in shoulder width and lane width made space available for a wide centreline to facilitate quick retrofitting to existing narrow asset formations.

As a result of this approach to balance crash risk for significant (influential) components, more than 500km of the Bruce Highway was able to be retrofitted with WCLT in two years, making it by far the longest length anywhere in the world. (Since 2012, more than 700km has now been completed as at January 2016.)

Traditionally, design practice had a keen focus on lane widths and shoulder widths with empirical crash modification factors (CMFs), however, there was no CMF for the most significant crash type of cross-centreline crashes. As part of this Bruce Highway strategy work in 2012, a cross-centreline CMF was deduced from available performance information. Table 1 summarises how the relationship between CMFs was balanced (at approximately 1.1) to achieve the optimum result.

Table 1. Balancing crash risk to achieve optimum results



#### Balance crash risk

#### Consistency for road components

Also design guidelines have espoused the principle of *"road consistency"* which has traditionally been considered to mean a consistent user experience while driving along the road. This new term of "balancing crash risk" overtly creates a new concept of achieving consistency across a road and considers the crash risk of all components in a type cross section in order to maximise benefits. This can be extended to intersections, barriers, batters, and clearing standards also.

### Finding 4 - prioritise for delivery efficiency

#### Economy of location and economy of scale

Delivery efficiency can be gained through both "economy of location" by bundling projects in the same vicinity or "economy of scale" by bundling work of similar type over a larger area. The benefits are realised through contractor practices including production efficiencies, camp establishment, stockpiling, materials supply and workforce travel. There are also benefits to the client and tenderers through reduced effort in contract management and tendering.

#### Prioritise for delivery efficiency

These delivery benefits consequently meant that the program realised free projects by bundling widening projects which were in close proximity to provide these opportunities for contractor efficiency. While this meant that projects with slightly lower BCRs were elevated in delivery priority, the net result was longer lengths of the highway were treated quicker. The benefits realised from free projects far outweigh the slight deferment of a notionally higher BCR project, given that the degree of accuracy in the economic analysis is limited anyway. It is not worth chasing the marginally higher BCR project at isolated locations and forego a free project through delivery efficiency gains.

This broader discipline of delivery is now mandatory for design engineers and road safety practitioners to integrate as part of the program and project management processes for safety program implementation.

#### Challenge scope creep

Project scope was challenged to ensure that objectives, treatment, standards and costs were maintained and that well intentioned project managers did not fall victim to the bias of scope creep. Program managers must ensure that properly set standards for the network which are defined in early planning processes align to those developed as part of the project management processes. Any deviation from this will result in an inconsistent network with a consequence of higher crash rates and lost opportunities from potential network-wide influences on driver behaviour.

A strategy used to remove the temptation for project managers to spend project funds (particularly contingency or risk allocation) on improved scope items is to remove budget allocation from projects. A component of the allocation is removed at project milestones during the project lifecycle such as business case, design or contract award when risks have been avoided, managed or mitigated.

### Finding 5 - consider risk compensatory influences

Risk compensatory decisions

The reduction in fatalities on the Bruce Highway has been much greater than that expected as the proportion of the highway treated to date:

- is approaching 50% actual reduction over the full length (treated and untreated sections compared against
- a forecast reduction of 16% (for say a 30% reduction of the 50% length treated in two years).

There are three (driver risk compensatory) areas which probably have contributed to this:

- compensatory decisions by providing regular overtaking opportunities (Applied in Strategy)
- compensatory decisions due to reduced freedom from narrower lanes (Applied in Strategy)
- compensation decisions on untreated 150mm centreline sections (Not considered in Strategy Development)

It will be difficult to determine the relative contribution from each of these initiatives in reducing fatalities. Further work could be considered to determine the relative merits of these so that this can be considered for other stereotypes (plus serious injury statistics when data is available).

#### Overtaking risk compensatory decisions

While there is limited, if any evidence, to support overtaking lanes as a treatment to improve safety, overtaking lanes were a key feature of the Bruce Highway strategy for both travel time and safety benefits. The significant number of cross centreline crashes required treatment which mitigated the potential for head on crashes. This was considered as a possible treatment to reduce the anxiety of drivers who have not been able to find a safe overtaking opportunity when behind a slower driver.

The overtaking frequency (intervention standard) has been applied on the basis of three stereotypes for covering various traffic volume ranges (>4000vpd, >6000vpd, >8000vpd).

#### Lane width influence on drivers

Another aspect of the approved type cross-section is the reduced lane width. This reduction is thought to have a risk compensatory effect of drivers by providing 250mm less width for vehicle tracking within the lane and thereby requiring greater attention. ATLMs will be rolled out along all treated sections in 2016 which will also provide feedback to drivers who either inadvertently traverse the lane lines or fall asleep.

#### WCLT risk compensatory decision by drivers

One of the not readily understood aspects of driving on a high speed, highly trafficked, two-lane single carriageway highway is the actual risk of oncoming traffic. The crash risk of having a head-on crash at 100km/h is the same as driving off the top of a 12 storey building. Drivers are complacent to this risk as no one would consider driving one metre away from the top edge of a 12 storey building at 100km/h.

The one and seemingly only proposition to answer this significant network-wide improvement in safety is that drivers are now perceiving the risk when driving on the untreated sections. This is believed to be due to improved perception of safety on the treated WCLT sections particularly when passing heavy vehicles. Anecdotally, after the first treatments were implemented, drivers could be seen to reduce speed ('*taking foot off accelerator*') at the interface between treated and untreated sections. Also, there have been many occasions where drivers have reported on how "great" the treated sections are and that they "feel much safer now". The underlying assumption here is that the inverse applies and drivers are now being extra cautious on the untreated (existing) sections because they feel relatively unsafe.

#### Next steps

Some combination of these three propositions described as risk compensatory behaviour influences are the best explanation for the dramatic reduction in fatalities which is far-greater than the proportional length that has been treated. Crash reductions have occurred on the untreated sections as well as the treated sections.

Also, the Bruce Highway results have been compared with a baseline for comparison. The baseline was established using the performance information on the balance of the network to eliminate any suggestions that other broader Queensland initiatives (for example education or enforcement) were influencing the results across all networks. There has been no discernible change in performance contributed by other factors across the broader network with the only significant step change in performance realised on the Bruce Highway.

#### ACTION: 1. Assess benefits on untreated sections

Evaluate the network-wide performance of these three factors to understand the relative contributions, if at all, to the risk compensatory influence of drivers and the step change improvement in performance on untreated sections.

If total network risk compensatory behaviour benefits can be realised when significant lengths of a network have been treated (compared with site by site treatments), consideration is being given to retrofitting a 0.5m WCLT by reducing lanes from 3.5m to 3.25m (and leaving edge lines untouched) as the next step change initiative across all applicable rural roads. While narrower (than 1 metre) widecentreline '*project-initiated*' solutions have not directly been seen to offer significant benefits to drivers, a networkwide application may have risk compensatory influences on driving behaviour. The ease of implementing a narrower 0.5m WCLT by simply reline-marking the centre-line is an opportunity for significant benefit.

#### ACTION: 2. Implement narrower (0.5m) WCLT

The introduction of a 0.5m WCLT should be further evaluated and comprehensively applied over a short timeframe to a specific road and compared to other roads in that stereotype group as a baseline.

There is also an interdependence between crash risk of components in that the crash risk profiles will change as a result of changes to adjacent components. Future research and evaluation is necessary to consolidate emerging thinking in this area and specifically the step change in performance from network-wide implementation for road stereotypes.

### ACTION: 3. Establish network-wide planning practices

Develop network-wide practices to support road system planning for road stereotypes. This will include the collation of historic crash reduction forecasts and aligning these to road design practices to balance component risk.

The significant reduction in fatality rates found on the Bruce Highway has been considered as step-change compared with current theory. This relates to both the treated and untreated sections. Metrics for crash modification factors or crash risk deserve a review given these benefits achieved from WCLT.

### ACTION: 4. Review WCLT safety risk improvement metrics

The results from the most significant WCLT implementation in the world should be evaluated to confirm historic crash reduction metrics for use by road jurisdictions. An additional output should include advice on risk compensatory influences on drivers when significant lengths are completed.

### Finding 6 – focused management of the road system

#### Integration

One of the most challenging aspect of the earlier planning work was the integration of various disciplines as part of a sequence of planning steps. The integration of asset management, planning management, design management, delivery management and safety management was necessary to achieve a successful engineering plan. The results would not have been achieved if these elements were not fully considered from the earliest planning phase.

#### Comprehensive

Analysis of all crash types, previous experience in achieving improved safety and having a focus of "leaving no stone unturned" were critical to getting the most out of every investment and achieving the best total network result.

#### Understand the complexity

The technology and engineering in road management in the 21<sup>st</sup> century is complex. It is important that decision makers do not succumb to naïve decision-making because it is seemingly just too difficult. The level of effort in getting the decision right in network-wide planning should not be underestimated. This is a critical ingredient to getting the best outcome.

#### Alignment over time

The concept of "strategic alignment" between the standards applied in projects to those designed as part of networkwide planning must be maintained. Again, jurisdictions which have complex organisational structures make this difficult and therefore rely on the influence of leaders in the organisation to maintain this alignment over time throughout the road system lifecycle from planning to program to project.

#### Safety outcome ownership

When the outcome of safety is clearly delegated to a specific team or unit, there is a high level of ownership generated. It is important that a single line of accountability is established so that team members own the result but are also empowered and supported to make the necessary decisions to improve safety. Organisations with complex structures where safety ownership is eroded due to dispersed line reporting arrangements does little to facilitate the meeting of objectives. In the case of the Bruce Highway, consistency of team members was maintained from planning through program management to program delivery for the total network which crossed many Regional and District boundaries.

#### Recommendations

Given the constraints of potential funding profiles and the variable pre-existing asset condition, the following six key principles have been followed on the Bruce Highway and shown to produce an outstanding step change in reducing fatal crashes: use a network-wide strategy; set realistic network-wide intervention and construction standards; balance crash risk; prioritise for delivery efficiency; consider risk compensatory influences; and focused management of the road system.

The combination of these objectives have facilitated accelerated retrofitting of the network with an unexpected and significant step change in benefits. This has been due to the likely generation of network-wide strategy approach, risk compensatory behavioural influence of drivers and the refinement of safe system complimentary thinking. The presentation of these findings through seminars and other forums is recommended (see Attachment B).

Attachment C summarises the actions requiring evaluation of the Bruce Highway to better inform the benefits of the practice if it is rolled out across Australia or the rest of the world.

In summary, road and transport agencies have a long term asset management accountability which obligates their decisions to be the best for the long term of the asset and the highest benefit to stakeholders. The Bruce Highway approach has delivered on this accountability with the following outstanding results:

- rapidly completing 500km of safety treatment in about two years
- saving approximately 50 lives in the short period from 2013 2015
- has delivered a step change in reducing the number of fatalities by 50%
- saving significantly more than \$5b in total program costs when compared to traditional standard treatments

This Bruce Highway approach is best described as using an incremental approach to improve the total network, profiling likely future investment to set realistic visions, setting standards through an iterative process, balancing crash risk across significant components and prioritising projects for delivery efficiency. It has generated a step change in safety performance and demonstrated how a change in thinking to a network-wide focus can aid road authorities to move quickly towards *Vision Zero*.



#### Attachment A - Recent experiences - principles and findings

On face value, the learning from the Bruce Highway could be described as "provocative", however once explained, the reasons supporting this perspective are logical with the opportunity to realise significant benefits. If design engineers and safety practitioners want to save more lives quicker, the following provocative statements and reasons have been designed to change the thinking behind how safe system treatments are designed and developed.

Provocative Statement	Why	Recommendation		
Develop a Network-wide Strategy to Balance Crash Risk				
1. Don't focus on providing the safest solution now for a project (similar to Blackspot programs)	<ul> <li>Untreated sections in the network will remain</li> <li>Non-feasance immunity rule no longer applies</li> <li>Creates two network inconsistent interfaces</li> <li>Crashes move to adjacent locations</li> </ul>	Apply the network-wide approach to optimise the total outcome and solve all the gaps for a timeframe matched to the asset lifecycle and the likely funding profile		
2. Don't think that traditional safety treatment approaches will make a step change in safety performance	<ul><li>Crash risk will not be balanced</li><li>Maximum benefits not realised</li></ul>	The integration of planning, design, safety, asset management and delivery disciplines are needed to maximise benefits (as road system manager)		
3. Don't consider solutions through an independent project by project approach	<ul> <li>This misses the opportunity for benefits much larger</li> <li>Inconsistency</li> <li>Piecemeal</li> <li>Reactive rather than Proactive</li> <li>Inefficient</li> <li>Not comprehensive</li> </ul>	Develop a strategy to provide an aspirational network-wide incremental vision which can also support higher funding profile to complete a total network. The benefit from the whole network outweighs the aggregate benefit of isolated projects • Consistent driver experience • Self-explaining road • Driver risk compensatory benefit		
4. Don't automatically attempt to provide the complete solution now	<ul> <li>For every project completed there will be many locations that remain untreated</li> <li>Chasing the additional treatment (with a lower BCR) is costlier</li> </ul>	Improve the total network in stages to match realistic funding profiles and aligned to asset lifecycles so infrastructure is not wasted		
5. Don't focus on past crash locations	• Crashes will emerge on the next worst section or latent crash locations	Use network-wide crash risk evaluation to set consistent standards for only the significant and influential components		
Set Realistic Intervention and Construction Standards for Road Stereotypes				
6. Don't adopt standards on a project-by-project basis	<ul> <li>Funding will limit what can be achieved</li> <li>Untreated sections will remain</li> <li>Inconsistent road will result</li> </ul>	Adopt both an intervention standard and a construction standard for the network stereo type. Standards set on a network-wide basis to maximise benefits.		

Provocative Statement	Why	Recommendation		
7. Don't automatically use the best project standard	<ul> <li>Benefits not maximised across the total network</li> <li>Higher cost with many untreated sections remaining</li> </ul>	Network-wide standards which balance all significant road component crash risks and match the network funding profile through an incremental approach.		
8. Don't adopt the same standard for all roads	• Gold plated standards for lower order roads or lower trafficked roads where benefits are difficult to realise	Establish Road Stereotypes (function, characteristic and traffic) where consistent standards are relative to the crash risk and road importance		
9. Don't take a short or long term perspective	<ul> <li>Short term approach will not maximise benefits</li> <li>Long term approach will never realise total network benefits</li> </ul>	Develop standards to align treatments with the typical life of the asset components and the likely funding profile		
<b>Prioritise Programs for Efficient</b>	Delivery			
10. Don't automatically do the highest BCR project first	• Forego opportunity for free projects	Prioritise for improved delivery efficiency via 'economy of location'		
11. Don't automatically schedule all work types at a location	• This will be at the expense of more beneficial components on other parts of the network	Consider Delivery Efficiency Delay component treatments with a small incremental BCR until complimentary work types make it cheaper		
12. Don't allow scope creep of project standards because it is safer	• This will incur extra cost for the project, reduce opportunities to complete the full network earlier and minimise network benefits.	Maintain strategic fit of project standards during the delivery phases to that defined in the network-wide strategy.		

### Attachment B – Guideline development activities

Potential project activities for consideration:

- 1. Check Complimentary Safe System Thinking:
  - a. Challenge the concepts contained here from various discipline and jurisdictional perspectives
  - b. Reflect on the learning from other jurisdictions since this development in 2012
  - c. Harmonise terminologies and approaches for relevance across all jurisdictions for safety and traffic engineers, asset managers, program managers, project managers, and design engineers
  - d. Capitalise on any feedback from the safe system workshops being held in 2016/17
  - e. Communicate this learning to the ANRAM project team for consideration as part of ANRAM support for network-wide analysis.
- 2. Develop a Business Case including a plan to develop or update relevant guidance materials in areas such as:
  - a. The concept of road stereotypes (function, characteristics and traffic) and associated intervention and vision standards for links and networks

- b. Consider how a consolidated view can be presented for use by practitioners with information held in many different guidelines (such as RP&DM & Road Geometry Study for Improved Rural Safety, Safe System in the Planning Framework, and Safe System Assessment Framework)
- c. Specific learning relating to the wide centreline treatment, the practice of balancing crash risk and consequential risk compensatory behaviour developed through network-wide implementation (reference to Road Geometry Study for improved Road Safety)
- d. Consider the possibility of a consistent set of risk factors and benefit calculation for road designer guidelines and well as that for safety practitioners (ANRAM) and to establish a common, single language to relate design standards and safe system treatments with a risk factor with the level of intelligence supported in road design manuals
- e. Connecting safe system thinking with the practicalities of delivery in terms of the asset life cycle
- f. Engineering designer approval (CPEng, RPEQ) of intervention and construction standards in network planning project design will need to strategically fit with this.

- g. Recognition of the need to target the significant components in providing benefits for a particular stereotype and reflection of this in approaches outlined in guidelines.
- h. Methods of presuming a likely funding profile for the practical setting of standards to achieve a vision over a life cycle matched to likely funding profile.
- i. Realise free projects through program development supported by prioritisation for delivery efficiency and not solely BCRs.
- j. Reflect the inconsistencies generated through black spot projects at adjoining sections in various guidelines and that crashes move to next locations.

### Attachment C – Bruce Highway learning activities

Bruce Highway analysis should be directed with action in the following areas:

1. ACTION: Evaluate the network-wide performance of the following three factors to understand the relative contributions, if at all, to the risk compensatory influence of drivers and the step change in performance on untreated sections:

- compensatory decisions by providing regular overtaking opportunities (Considered in Strategy)
- compensatory decisions due to reduced freedom from narrower lanes (Considered in Strategy)
- compensation decisions on untreated sections 150mm centreline sections (Not considered in Strategy Development)
- 2. ACTION: The introduction of a 0.5m WCLT should be evaluated and comprehensively applied over a short timeframe to a specific road and compared to other roads in that stereotype group as a baseline.
- 3. ACTION: Develop network-wide practices to support road system planning for road stereotypes. This will include the collation of historic crash reduction forecasts and aligning these to road design practices to balance component risk.
- 4. ACTION: The results from the most significant WCLT implementation in the world should be evaluated to confirm historic crash reduction metrics for use by road jurisdictions. An additional output should include advice on risk compensatory influences on drivers when significant lengths are completed.



# The development of an intelligence-based deployment model to enhance Road Policing service delivery: A case study

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<sup>1</sup>New Zealand Police, Police National Headquarters, 180 Molesworth Street, Wellington 6140, New Zealand (This article was the winner of the Police Practitioner's Award at the Australasian Road Safety Conference held in Canberra in September 2016).

#### Abstract

New Zealand Police's Southern District (SD) has been facing increasing and competing demands for Road Policing service delivery. Road Policing (RP) was conducted in silos and it was unclear if activities and deployments reflected risk. An intelligence risk assessment was developed that identified the safety risks and priorities across the district, which was compared with current practice. A deployment model was developed to align with risks, allocate staff and resources based on demand and the integration of RP with other workgroups. This model is put forward as an evidence-based means to aligning deployment and resources to risk and shifting demands.

#### Background

Geographically, SD is New Zealand's largest district and has a widely dispersed rural population. This being a popular region for tourism means visiting drivers also create substantial seasonal increases in traffic volume. RP staff were split between multiple teams and had four separate reporting lines. RP teams decided where to deploy (often based on 'gut feel' and experience) and did so independently of other groups, which led to parts of the network being saturated and others under-patrolled. This also created shortfalls in equipment and vehicles. Lack of a coordinated approach to deployment meant it was unclear if temporal and spatial risks were being appropriately prioritised, and RP was not aligned well with other work groups.

#### Intervention

1. Intelligence district road risk profile (DRRP) created to identify risks and priorities.

An intelligence product was developed to identify priorities and top risks in SD, including: long and short term trends, hotspots, top risk factors and key journey routes (Figure 1). This product presented a complete picture by combining data from a wide array of sources, including: traffic crash reports, motor vehicle injury claims data, offence data, behavioural and attitudinal data, GIS crash maps, police reported traffic incidents and vehicle stops, community complaints, hospitalisation data, and the community risk register. 2. Compare and contrast with current practice to seek opportunities to address the risks.

The findings of DRRP were compared against: current practice and activities undertaken, staff allocated to role types, rosters, deployments and taskings across the district, and equipment resourcing.

3. Realignment of staff and resources to address the demand/risk and integrate this with other parts of the business as part of the wider deployment plan.

Mismatch was revealed between what the DRRP identified as risks, and where, how and when staff were being deployed. Non-RP groups were introduced to the findings and included in the development of a deployment model.

4. Equipment access and type assessed and reallocated

Vehicles and tactical equipment was no longer assigned to areas, workgroups and individuals, but assigned based on shift tasking requirements. This provided staff with access to equipment when and where it was needed to carry out duties and also freed up seven patrol vehicles.

5. Create a deployment model to align with risk and demand

SD RP was restructured so that staff from the all areas reported to the district Road Policing Manager. This allowed for staff to be rostered on for shifts that matched local risk profiles, which varied by type (urban/rural/ highway), day of week and time of day. Specific changes made include:

- Shift rosters altered and staff relocated to provide optimum coverage.
- Staff rotated through areas to compensate for moving risk patterns.
- Activities undertaken and role types aligned to local risk profiles.
- RP deployment integrated into other workgroups' deployment.

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Figure 1. Sample summary page of DRRP intelligence report

- Enhanced performance monitoring and reporting across RP and non-RP workgroups.
- 6. Monitoring, evaluation and adjustment

The structure changes and deployment model were successfully implemented in January 2016. An adjustment period of four months was allowed for where issues and risks are identified and corrected and changes are progressively implemented. The outcomes of the deployment model will be evaluated in 2017 once the final structure has been operating for 12 months. The evaluation will make comparisons against control periods to assess: alignment of officer deployment and activity with the top risks; output levels; traffic offending; crashes and hospitalisations.

#### Conclusion

This case study provides a practical model of how intelligence and demand data can be used to perform a robust assessment of the current state of practice and deployment against evidence-based priorities and risks. The SD RP deployment model provides a platform for staff and resources to be allocated to best address risk and shifting demands, producing efficiencies and more effective service delivery. The evaluation of the intervention will assess the key outcomes and identify opportunities for improvement, providing a platform for other Police districts to optimise their Road Policing

## Innovative weather-activated variable speed sign trial – a first for road safety in New Zealand

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(This article was the winner of the Road Safety Practitioner's Award at the Australasian Road Safety Conference held in Canberra in September 2016).

#### Abstract

Linking the Waikato and Bay of Plenty is the nationally strategic State Highway 29 (SH29) over the Kaimai Range. Between 2007 and 2015 there were 267 crashes and data identified 70% were in wet weather with 40% driving too fast for the conditions. This prompted development of a system which encourages people to drive at speeds appropriate to the road and conditions. The system is New Zealand's first to use weather-activated road signs with adjustable speed limits - commissioned in November 2015. The objective of the innovative two year trial is to educate drivers to better understand speed limits in adverse weather.

#### Background

The development and implementation of the Weather Activated Variable Speed Limit signs (WAVSL) trial is part of the Government's *Safer Journeys* road safety strategy, to reduce the number and severity of crashes. Managing speeds is crucial as the outcome of all crashes is strongly influenced by the impact speed. The *Safer Speeds Programme* promotes helping people increasingly understand what travelling at safe speeds means.

The SH29 Kaimai Range has a poor crash history, with unpredictable, and at times dangerous, weather at the summit. The 100km/h speed limit did not take into

consideration adverse weather and studies show that drivers did not adjust their speeds, attempting to travel 100km/h in poor conditions; compromising theirs and others' safety.

As the existing static reflective signs were not able to show temporarily reduced speed limits another solution was sought.

#### Innovative thinking

The WAVSL system aims to encourage drivers to drive at safe and appropriate speeds during adverse weather conditions.

It does this through an operational system for varying the speed limits on a road where significant changeable conditions result in increased risk, initiating the variable speed limits only during the time of the adverse conditions. Once activated, the speeds are enforceable by Police.

The 12km trial site has two zones; the eastern flank is 8km and the western flank is 4km. Following comprehensive consultation with the community, Transport Agency safety advisors and NZ Police it was agreed that the speed reductions for adverse weather would be set for 80km/h for the eastern flank and 60km/h on the western flank.
	Eastern flank downhill Baseline Sign off	Eastern flank downhill Baseline Sign would be on	Eastern Flank Downhill System Off speeds	Eastern Flank Downhill Slippery Road speeds	Eastern Flank downhill Limited visibility speeds
Mean	88	89	87	80	80
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Effect size				0.54	0.54
Count	68,343	5,852	235,506	30,483	10,414
% of Vehicles	92%	8%	85%	11%	4%



Figure 1. WAVSL Trial in operation on SH29 Kaimai Range

A MetService weather station located near the summit captures most of the weather data relevant for WAVSL. Existing sensors in the station measure rain, wind, ice and surface water on the road. A visibility sensor was installed to capture fog and visibility information.

The weather station collects data which is transmitted to the team at the Auckland Transport Operations Centre (ATOC) at one-minute intervals. When predetermined weather thresholds are reached an alarm is triggered whereby an ATOC controller can monitor web cameras to ensure the alert is correct and if so, which zones are affected. The WAVSL response is triggered by rain, ice, wind and fog.

### Effectiveness and results

From activation in November 2015 to end of January 2016 (12 weeks) the WAVSL signs had been activated 97 times.

Results showed when the signs were activated (due to rain or poor visibility) traffic speeds have reduced significantly. A strong link between reduced travel speed and improved road safety is commonly accepted in road safety literature and so it is expected that WAVSL will lead to reduced crashes and fatalities.

While there was a moderate increase in travel time when the signs were activated, the overall travel time impacts were negligible as 86% of the traffic flow was not impacted by the activated signs.

Ongoing monitoring and further tweaking of the innovative WAVSL system will optimise the trial and ensure the system has a positive impact on drivers' speed and safety.

Results for both uphill and downhill on the Kaimai eastern flank show that WAVSL has been very effective at reducing speeds to an operating speed of approximately 80km/h during adverse weather events. The baseline speeds in wet weather show the inadequate driver response to wet weather conditions, which may help to explain the high crash rate in wet weather, and reinforces the justification for WAVSL.

# Validation of a virtual driver assessment tool for older drivers

By Ranmalee Eramudugolla, Sidhant Chopra, Xiaolan Li, Kaarin J. Anstey Centre for Research on Ageing, Health and Wellbeing Australian National University, Canberra

(This extended abstract submitted to the Australasian Road Safety Conference was the basis for the winning Road Safety Poster Award presented at the conference in Canberra in September 2016. A copy of the completed poster is provided in the inside back cover colour pages of this edition of the ACRS Journal).

### Abstract

Few studies have developed and validated a driving simulator for use with older drivers. As the population ages and demand for maintaining mobility in late-life increases, so will demand for efficient, safe and cost-effective methods of assessment and training that is suitable for older drivers. We compared simulator-based driving in older drivers against on-road driving with matching route and scoring procedure. We found that errors on the simulator predicted general driving safety. This has implications for the use of simulator technology for identifying at-risk older drivers.

### Background

Road safety is an ongoing public concern and recent data indicate a need for further research into injury prevention focusing on the growing population of older drivers (e.g., Betz et al, 2014). Driving simulators provide a safe, economic and repeatable measure for determining safety in at-risk drivers. However, few studies have examined the acceptability and validity of simulator-based assessment in older drivers (e.g., Lee et al, 2003). Most validation studies also tend not to match their simulator measure with their on-road criterion in terms of driving environment and scoring method (Mullen et al., 2011). Furthermore, existing virtual set-ups are costly and require technical expertise reducing their potential for translation and clinical utility.

### Aim

Here, we develop a cost-effective, desktop virtual driving assessment for older adults, and validate it against an onroad assessment using matching environment, route and scoring methodology.

### Method

Sixty-three drivers (mean age=75.6 (5.87) years) recruited from the community, were screened for motion sickness susceptibility before completing a simulated driving session. The simulator test comprised four instructorguided and one self-navigation scenario. Standard scoring criteria were used by the experimenter to identify errors in observation, indication, brake/acceleration, lane position, gap selection and approach. Participants also underwent an on-road assessment with a driver-trained Occupational Therapist (OT) using the same standard criteria for scoring errors as used in the simulator test. The OT rated errors for each section of the on-road route that matched the simulated scenarios, as well as general safety (1 (unsafe) to 10 (safe)) based on the participants' driving performance over the whole 45-minute route.

### Results

Fifty-four of 63 volunteers were screened eligible (85% of volunteers), and seven (13%) withdrew due to simulator sickness. Data from the remaining 47 were analysed. Bivariate correlation indicated that the simulator errors were moderately correlated with OT rated on-road safety: r = -0.398 (95%CI:-0.212 to -0.592), p<0.01. Regression analysis indicated that the relationship remained after adjustment for simulator sickness and age (*B*= -0.063 (SE=0.02), p<0.01). Simulator errors also predicted pass/fail on the on-road test - classifying on-road fails with a sensitivity of 69.2% and specificity of 100%.

### Discussion and conclusion

The findings show that around 74% of older adults can tolerate a short simulator-based driving assessment. The simulator set-up is low cost and easy to score, and is a valid predictor of overall driving safety. Further analysis will determine whether the error rate and type of errors made on-road corresponds to those on the simulator. The findings suggest that, for those able to tolerate the simulator, this type of set-up may be useful as an older driver screening tool.

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• Attending events

A myriad of events are linked in the weekly e-newsletter - take your pick!

#### Registering as a Road Safety Professional

By drawing on the Register of Road Safety Professionals, the College assists members with access to expertise such as expert witnesses for court proceedings and to field media enquiries.

### To become a member, contact the College:

Australasian College of Road Safety Ph: (02) 6290 2509

Email – Finance and Administration: faa@acrs.org.au



### Calls for submission of papers to the ACRS Journal

### Call for Papers: February 2017 Issue

The Journal of Australasian College of Road Safety is soliciting contributions for the February 2017 issue on all topics of road safety. Sample topics may include, but are not limited to: in-depth analyses of the rising road deaths in Australia with practical implications on actions to address them; drug-driving related research, technology, and countermeasures; research related to autonomous vehicles; research/evaluation of road safety activities in low and middle income countries; research suggesting likely areas of road safety action. To assist authors in considering papers, we now have specified article types - Original Road Safety Research; Road Safety Data & Research Methods; Road Safety Policy & Practice; Road Safety Case Studies; Road Safety Evidence Review; Road Safety Media Review; Perspective/Commentary on Road Safety; Correspondence. More details on the scope and requirements of each of these article types can be found in the updated Instructions to Authors available from the ACRS website at www.acrs.org.au. Please submit your manuscript online.

### SUBMISSION DEADLINE:

Wednesday, 16<sup>th</sup> November 2016

Authors wishing to contribute papers and discuss their ideas with the Editor in advance of submission or to ask any questions, please contact Dr Chika Sakashita.

Journal of

journaleditor@acrs.org.au

Journal of

### Call for Papers: Special Issue on Speed, May 2017

The Journal of Australasian College of Road Safety is soliciting contributions for a special issue on speed. This Special Issue is scheduled for publication in May 2017, to coincide with the Fourth UN Global Road Safety Week 8-14 May 2017 which is on the theme of Speed. May 2017 also marks the sixth anniversary of the launch of the Decade of Action for Road Safety 2011-2020. In support of the UN Global Road Safety Week on Speed and the Decade of Action for Road Safety 2011-2020, the purpose of this Special Issue is to increase understanding of the important role of speed management in reducing deaths and injuries on our roads worldwide and to further generate globally committed focus on speed management. The Special Issue on Speed considers all aspects associated with speed. Sample topics may include, but are not limited to: research on setting speed limits or related policy; research/evaluation of speed reduction measures (e.g. road design, enforcement, etc) or speed increases; research/evaluation of measures that facilitate compliance with the speed limit; research/evaluation of measures that address driving above the legal speed limit and/or inappropriate speed for prevailing conditions; critical review and analyses of ill-informed arguments related to speed and measures to address them; analyses of media coverage on speed; the contribution of speed in the recent increases in deaths in Australia.

To assist authors in considering papers, we now have specified article types - Original Road Safety Research; Road Safety Data & Research Methods; Road Safety Policy & Practice; Road Safety Case Studies; Road Safety Evidence Review; Road Safety Media

Review; Perspective/Commentary on Road Safety; Correspondence. More details on the scope and requirements of each of these article types can be found in the updated **Instructions to Authors** available from the ACRS website at www.acrs.org.au.Please submit your manuscript online.

### SUBMISSION DEADLINE: Wednesday, 1<sup>st</sup> February 2017

Authors wishing to contribute papers and discuss their ideas with the Editor in advance of submission or to ask any questions, please contact Dr Chika Sakashita journaleditor@acrs.org.au





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## CHANGES ARE COMING TO HELP MAKE P P P DRIVERS SAFE

From 1 December 2016, P2 licence holders **will no longer be permitted to use a mobile phone at all while driving or riding**. P2 licence holders will have the same restrictions as learner and P1 licence holders.

For more information about the current NSW mobile phone laws when driving or riding, go to **mobilephoneroadrules.com.au** 







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Visit the College website at www.acrs.org.au

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