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# Curtin-Monash Accident Research Centre

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## Non-Illicit Substances in Fatally Injured Drivers

A recent C-MARC investigation of fatally injured drivers and illicit drugs provided the opportunity to investigate the incidence and types of non-illicit substances present in all drivers fatally injured in Western Australia (WA) during the period 2000-2012. For the investigation, the crash and associated ChemCentre toxicology records of 1,375 fatally injured drivers were retrieved from WA police. All substances detected by the ChemCentre were classified into one of three groups – alcohol, illicit substances, non-illicit substances – with a further classification of substances within the illicit and non-illicit substance groups. Despite the decline since 2007, alcohol (excess 0.05gm%) remained the most frequently detected substance among fatally injured drivers for most of the period, followed by non-illicit drugs - which rose sharply from 2000 - and then illicit drugs (e.g., cannabis, methamphetamine, MDMA).

The proportion of fatally injured drivers testing positive for non-illicit substances has slowly increased over time. Overall, approximately 24% (n=327) of fatally injured drivers tested positive for one or more non-illicit substances (up to a maximum of six substances) for a total of 510 positive test results. Seventy-two percent of drivers who tested positive were male, with a median age of 40 years. Nearly eight in 10 positive tests were accounted for by four groups of substances: Opioid Analgesics\* (36%); Anti-Depressants (21%); Benzodiazepines (Hypnotics and Anxiolytics) (18%) and Stimulants (3.5%). The most frequently detected

Opioids were morphine (44%) and codeine (30%), while the most frequently detected Benzodiazepines and Stimulants were Diazepam (57.6%) and Amphetamines (74%) respectively.

Around a third of drivers who tested positive did so for two or more substances. In some cases drivers tested positive for multiple Benzodiazepines (e.g., Diazepam with Temazepam or Alprazolam) or multiple Opioids (e.g., Codeine with Morphine) or multiple central nervous system depressants such as Benzodiazepines with Opioids.

Certain non-illicit substances like Benzodiazepines are known to increase the risk of crashing for drivers and when used in combination with other substances like alcohol and illicit drugs the risk is likely to be even greater. As the recent analysis of illicit drugs in fatally injured WA drivers showed, excess alcohol and the presence of a combination of non-illicit substances such as Benzodiazepines and Opioids was associated with a significantly increased likelihood of the co-use of an illicit substance. These findings suggest there is a need to develop new and expanded measures to counter the increased impairment associated with the co-use of legal *and* illegal substances.

The full report *“Illicit Drugs in Driving: An Investigation of Fatalities and Traffic Offences in Western Australia”* can be downloaded from the C-MARC webpage [www.c-marc.curtin.edu.au](http://www.c-marc.curtin.edu.au)

*\*Positive tests for these substances may in some cases be the result of treatment administered prior to death.*

- Proportions of fatally injured drivers testing positive for non-illicit substances has slowly increased over time
- Approximately 24% of fatally injured drivers tested positive to one or more non-illicit substance
- Opioid Analgesics, Anti-depressants, Benzodiazepines and Stimulants accounted for the majority of positive tests

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## From the Director

Welcome to the third issue of the Curtin-Monash Accident Research Centre newsletter for 2015.

In this issue we are pleased to introduce three new members to our team here at the Centre. I would also like to take this opportunity to thank the Acting Road Safety Commissioner Kim Papalia who visited C-MARC staff in mid-August and presented the new structure and vision for road safety in Western Australia.

We hope you enjoy the latest newsletter.



Lynn Meuleners

## Road Safety Performance of Seagull Intersections

A T-junction or T-intersection that utilises a seagull island, defined by Austroads (2005) as “a triangular island used to separate right turning traffic from through traffic in the same carriageway” (Austroads 2005), is known as a seagull intersection (see figure 1 below). This intersection layout is commonly implemented on high traffic volume roads and dual carriageways as a form of traffic control that has the ability to channelize traffic into appropriate paths through the intersection and separate potentially conflicting vehicle movement. A seagull intersection can also be implemented in order to reduce a certain type of crash, particularly right angle crashes. However, there are multiple variations of seagull intersections that can differ with respect to design layout, road geometry and site conditions.



**Figure 1** An Example of a Seagull Intersection in Western Australia (Radalj et al. 2006)

In order to evaluate the benefits of seagull intersections with respect to road safety, Dr Kyle Chow and Professor Lynn Meuleners conducted a review of the national and international literature. They identified the strengths of each article and areas for further consideration.

Previous evaluations suggested that well-designed seagull intersection configurations have the potential to reduce the frequency of motor vehicle crash-

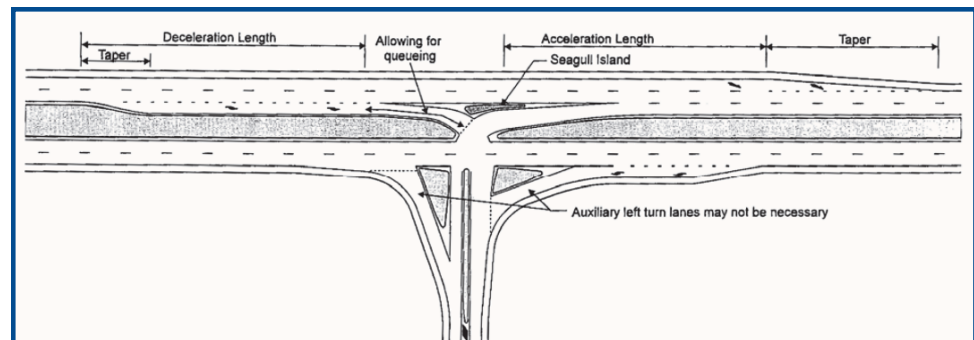
es requiring medical treatment (Radalj et al., 2006). Multiple Australian studies supported the fact that later implementations of seagull intersections did indeed reduce the frequency of crashes compared to earlier implementations (Meuleners & Hendrie 2008a; 2008b; Radalj et al., 2006; Zhang et al., 2014a; 2014b). A case study from the United States demonstrated the effectiveness of seagull intersections in substantially reducing angle, injury and total crashes at their study locations (Rice & Znamenacek 2010).

The literature review also found evidence that seagull intersections can improve traffic flow (Litsas & Rakha 2002; Radalj et al., 2006). Studies by Harper et al., 2011; Meuleners & Hendrie 2008a; 2008b; Radalj et al., 2006; Zhang et al., 2014a; 2014b found that a poorly designed seagull intersection was likely to result in an increase in the number and severity of crashes.

The authors recommend that future analyses of the safety performance of seagull intersections should follow a “before and after” study design where possible, incorporating details of traffic volume.

The literature review forms part of a broader study in which further statistical analysis will be undertaken to assess the effectiveness of seagull intersections in reducing crashes in WA. The results will provide Main Roads WA with comprehensive information which is essential to assist future decision making regarding the implementation of seagull intersections in the Western Australian road network.

The final report *A literature Review of the Road Safety Performance of Seagull Intersections in Australian and International Evaluations* can be downloaded from [www.c-marc.curtin.edu.au/completed/index.cfm](http://www.c-marc.curtin.edu.au/completed/index.cfm).



**Figure 2** A Typical Seagull Intersection Layout (Tang & Levett 2009)

- Seagull intersections are commonly implemented on high traffic volume roads and dual carriageways
- Can be a form of traffic control that has the potential to reduce the severity and frequency of crashes
- Correct design and implementation is critical in order to reduce the number and severity of crashes

## Motor Vehicle Crashes and Dementia: A Population-Based Study

Dementia is associated with permanent changes in the normal brain activity that affects memory, speech and the ability to undertake daily tasks. Essential cognitive abilities that are required to undertake the complex task of driving, including memory, visual perception, attention and judgement, can be affected by dementia.

Using data from the Western Australia Data Linkage System, Professor Lynn Meuleners, Dr Kyle Chow and Ms Michelle Fraser from C-MARC and Professor Mark Stevenson from The University of Melbourne examined the crash risk among older drivers aged 50 years or older in the three years prior to an index hospital admission with a diagnosis of dementia, compared to a group of older drivers without dementia.

Data was extracted for the years 2001 through to 2013 from the Hospital Morbidity Data System, the Integrated Road Information System to identify those who had a crash and the Western Australian Death Registrations. International Classification for Diseases (ICD-10-AM) codes were used to identify cases who were residents of Western Australia (WA) and had "dementia" listed as a principal diagnosis or co-morbid condition in any hospital record in the HMDS and was their first or 'index' record for dementia. The external comparison group consisted of a random sample of Western Australians aged 50+ years obtained from the State Electoral roll. It is mandatory for all citizens in WA over 18 years to be enrolled to vote. Persons with dementia are required to have their names removed from the electoral roll by a relative provided there is written evidence from a medical practitioner.

There were 1,666 (34%) individuals with an index hospital admission for dementia and 3,636 (66%) individuals without dementia who had been involved in at least one motor vehicle crash. In the three years before the index hospital admission, 43.22% (n=720) of the 1,666 participants with dementia were involved in at least one crash as the driver. There were a total of 801 crashes among participants with dementia in the three years before index hospital admission with 56.78% (n=946) having no crashes, 38.84% (n=647) having one crash, 3.90% (n=65) having two crashes and 0.48% (n=8) having three crashes. Among the group without dementia, 30.11% (n=1095) of 3636 participants were involved in at least one crash as the driver in the three years before the index hospital admission. There were a total of 1166 crashes among the comparison group in the three years before index hospital admission with 2,541 (69.88%) having no crashes, 28.33% (n=1,030) having one crash, 1.62% (n=59) having two crashes and 0.16% (n=6) having three crashes. In the three years before the index hospital admission, the adjusted crash risk for the dementia group was almost double (OR= 1.77, 95% CI =1.57 – 1.99) that of the group without dementia after adjusting for relevant confounders.

These findings indicate that older drivers with dementia are at increased risk of a crash before they may be formally diagnosed or in the early stages of dementia. Better methods are needed to identify 'at risk' drivers with early dementia and prevent crashes. This is significant given the fact that in the absence of effective prevention, the number of Australians with dementia is predicted to triple by 2050, and hence, the likelihood of older Australians driving with dementia, both diagnosed and undiagnosed, will also increase.

## C-MARC Team News

C-MARC has recently welcomed three new members to the team.



### John Hess—CITS Senior Technologist

John has a long association with Curtin University. He has 16 years of experience as a Curtin Information Communication Technology Specialist including seven years within CITS (Curtin Information Technology Services). He has worked within several areas of the University and the Technology Park Research precinct and contributed to several major projects, including the Office 365 email migration. He is familiar with many diverse and complex analytical systems within the research realm. John will be responsible for managing, maintaining and developing the specialised systems and applications used for the new driving simulator. He will also design driving scenarios to be used within the Centre and by PhD students and external research groups. John is very excited to be a part of C-MARC and looks forward to applying his technical and analytical skills to road safety research.

### Dr Michelle Hobday—Research Fellow

Michelle is an epidemiologist with an interest in injury prevention. As a physiotherapist in her native South Africa, she worked with many people injured in road crashes and was an expert witness in cases involving road crashes. In 2009, she completed a Master in Public Health in Durban, South Africa. Her master's research examined collisions involving child and adult pedestrians who were seriously and fatally injured in Durban. After relocating to Perth in 2010, she began a PhD in alcohol and injury epidemiology at C-MARC and the National Drug Research Institute at Curtin University. She completed her PhD in March 2014, and worked at the National Drug Research Institute before moving to C-MARC in August 2015.



### Doan Thi Ngoc Han — PhD Student

Han completed a Bachelor of Public Health at Ho Chi Minh City University of Medicine and Pharmacy and a Master of Public Health at Queensland University of Technology. Since 2004, Han has been a lecturer at the Department of Biostatistics and Informatics, Faculty of Public Health, Ho Chi Minh City University of Medicine and Pharmacy where she teaches biostatistics and scientific research methods. Han has also conducted and participated in over 30 research projects in the field of public health. Han will be researching risk factors for motorcycle crashes in Vietnam.

## Publications

Hobday M, Chikritz T, Liang W, Meuleners L. **The Effect of Alcohol Outlets, Sales, and Trading Hours on Alcohol-Related Injuries Presenting at Emergency Departments in Perth, Australia, from 2002 to 2010.** *Addiction* 2015. (Epub ahead of print).

Hobday M, Meuleners L, Liang W, Gilmore W, Chikritz T. **Associations Between Alcohol Outlets and Emergency Department Injury Presentations in Perth, Australia: Effects of Distance from Central Business District.** *ANZ Journal of Public Health* 2015. (Article accepted for publication).

Meuleners L, Fraser M, Govorko M, Stevenson M. **Obstructive Sleep Apnea, Health-Related Factors and Long Distance Heavy Vehicle Crashes in Western Australia: A Case Control Study.** *Journal of Clinical Sleep Medicine* 2015, 11(4): 413-418.

Stevenson M, Johnson M, Oxley J, Meuleners L, Gabbe B, Rose G. **Safer Cycling and the Urban Road Environment: Study Approach and Protocols Guiding an Australian Study.** *Injury Prevention* 2015. 21 (1): e3.

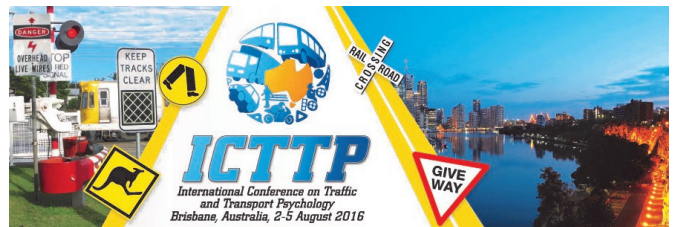
## Upcoming Events

**Event:** 6th International Conference on Traffic & Transport Psychology

**Date:** 2—5 August 2016

**Location:** Brisbane, Queensland

**Venue:** Brisbane Convention and Exhibition Centre



The quadrennially held international ICTTP conferences have achieved a long-standing and highly-regarded reputation as the leading international meeting in the field of traffic and transport psychology. The Sixth International Conference on Traffic & Transport Psychology (ICTTP2016) will be a global forum at which all those involved in traffic and transport psychology, human factors, cognition and behaviours, road safety research, policy, education, enforcement and injury prevention, can meet with researchers, academics, and professionals to discuss and present on the latest work being undertaken in these areas. The conference is expected to attract 300-350 delegates from around Australia and overseas, including academics, researchers and practitioners in the areas of public health, law, medicine, economics, law enforcement, public policy, education, human factors and psychology. With a theme of "Taking Traffic and Transport Psychology to the World", the conference themes will provide an invaluable opportunity for a broad range of presentations, workshops, symposia and discussion, with a particular focus on geographic regions where road safety action is needed most.

For further information please visit: <http://icttp2016.com/>

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C-MARC is a West Australian based independent multi-disciplinary road safety research centre established by the West Australian State Government's Office of Road Safety in 2009.

The Centre represents a significant partnership between the Office of Road Safety (now the Road Safety Commission), Curtin University and Monash University's Accident Research Centre (MUARC).

C-MARC's mission is "to be a Centre of excellence in road and other injury research and the translation of that research into policy and practice that will inform government, industry and the wider community."

