A spatial analysis of articulated heavy vehicle crashes occurring in Western Australia: 2001-2013

Geographical information systems (GIS) can be used in order to identify where traffic crashes most frequently occur (termed “hot spots”), which can lead to precautionary measures being taken to prevent crashes in these locations. However, there has been limited use of GIS approaches in the investigation of heavy vehicle crashes across Western Australia (WA). In order to address the lack of current research regarding heavy vehicles and the utilization of spatial analysis, Dr Ori Gudes from the Department of Spatial Sciences at Curtin University and Mr Richard Varhol conducted an investigation using GIS to identify concentrations of fatal heavy vehicle crashes by location that took place between 2001 and 2013 in WA.

Detailed information for 2,828 crashes which occurred on non-state (local) roads and 5,136 which occurred on state roads between 2001 and 2013 and involved an articulated heavy vehicle was collected from the IRIS Crash Database, which is maintained by Main Roads WA. In addition, Main Roads WA supplied a dataset on traffic volume for both WA roads (n=495) and their individual road segments (n=1,601).

According to the spatial-temporal analysis, statistically significant hot spots included the areas of Mandurah, Waroona, Harvey, York and Beverley as well as the near north areas of Wongan Hills and Moora. These areas had consistent numbers of heavy vehicle crashes each year between 2001 and 2013 (these ‘persistent hot spots’ are represented by the red squares in the figure).

In recent years (2012-2013), the areas of Collie, Donnybrook, Narrogin, and Wagin were found to be spatially significant hot spots. In addition, it was also found that certain roads are associated with a significantly increased risk including roads leading to Fremantle Port (e.g. Leach Highway and Stirling Highway), Giford Road that leads to Midland, Brearley Avenue that leads to the domestic airport terminal, Horrie Miller drive that leads into the airport industrial zone, and the entry point from Mill Point Rd to the Kwinana Freeway.

The authors recommended that the roads identified as consistent and emerging hotspots should be given additional attention or monitoring by the appropriate authorities. Further, it was recommended that WA road authorities continue to focus on the improvement of rural and semi-urban roads in order to prevent heavy vehicle crashes from occurring in these areas.

It is expected that the full report will be available for downloading from the c-marc web-page [www.c-marc.curtin.edu.au](http://www.c-marc.curtin.edu.au) during the second quarter of 2015.

From the Director

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

In this issue we tackle the ‘urban myth’ that unlicensed drivers drive more cautiously and take fewer risks so as to avoid detection by police. We outline three current PhD projects being undertaken as part of the ‘Safer Cycling and the Urban Road Environment’ study. You will also find a spatial analysis of heavy vehicle crashes in Western Australia.

I am delighted to announce that C-MARC has been awarded an International PhD Scholarship to be given to a student from Ho Chi Minh City, Vietnam. We hope you enjoy the latest newsletter.

Lynn Meuleners
Unlicensed Western Australian Drivers: Are they really a risk on the road?

The findings of numerous studies of crash involved drivers conducted by the Curtin-Monash Accident Research Centre challenge the ‘urban myth’ that unlicensed drivers drive more cautiously and take fewer risks so as to avoid detection by police. In fact, the results confirm that unlicensed Western Australian drivers involved in crashes are significantly more likely to engage in behaviours that increase the risk of a crash and subsequent injury.

In the first of these studies, a 2013 investigation of killed and serious injury (KSI) crashes occurring across Western Australia 2005-2009 (see Palamara, Kaura & Fraser, 2013) reported that 7.2% of drivers/riders involved in a crash resulting in the death or hospitalisation of an involved road user had no legal authority to drive at the time of the crash because they had never held a licence or their licence had been suspended or cancelled. The study noted that unlicensed drivers were involved in a significantly higher proportion of crashes occurring in the remote area (15.7%) versus the rural (6.9%) and metropolitan area (6.1%). The other noticeable difference across the regions was that proportionately more crashes in the remote area involved unlicensed drivers who had never held a licence (as opposed to one that was suspended or cancelled).

The 2013 investigation also noted that unlicensed KSI crash involved drivers were significantly more likely to test positive for alcohol (i.e., > 0.000gm%) compared with licensed drivers, with the odds of doing so somewhat higher for those crashing in the regional (OR=6.47) and remote (OR=5.35) areas compared with the metropolitan area (OR=3.7).

The findings of a subsequent in-depth analysis of the 2005-2009 data (see Palamara, 2013) that included all crash involved drivers for whom a blood alcohol concentration (BAC) level had been recorded – not just those involved in a KSI crash – found that unlicensed drivers had significantly higher odds than licensed drivers of returning a BAC at various levels, with the odds progressively increasing, ranging from OR=2.72 for a BAC of 0.001-0.049gm% to OR=4.54 for a BAC ≥0.101gm%.

In addition to drink driving, other findings suggest that unlicensed drivers are also more likely than licensed drivers to drug drive. The recently published C-MARC investigation of illicit drug related driver/rider fatalities 2000-2012 (see Palamara, Broughton & Chambers, 2014) found that 46% of fatally injured unlicensed drivers tested positive for one or more illicit drugs (such as cannabis, methyamphetamine, and ecstasy) compared with just 19% of fatally injured licensed drivers. After adjusting for the location of the crash, driver sex and age, and the presence of alcohol and certain legal prescription drugs (i.e., benzodiazepines, opioids), unlicensed fatally injured drivers were nearly three times more likely (OR=2.80) than licensed drivers to test positive for an illicit drug.

Unlicensed driver risk taking appears to extend beyond behaviours that increase their risk of crashing to behaviours that significantly increase their risk of injury in the event of a crash: the non-use of a seat belt or helmet. Analysis of the 2005-2009 KSI crash data (see Palamara, Kaura & Fraser, 2013) found that unlicensed drivers/riders crashing in the metropolitan and remote areas of Western Australia had 2.3 to 3.2 times the odds, respectively, of being unbelted or not using a motorcycle helmet compared with licensed drivers (after adjusting for driver sex and alcohol).

While the prevalence of unlicensed driving in Western Australia is difficult to estimate, the above findings from a number of C-MARC studies highlight the potential crash and injury risks associated with unlicensed driving. The findings also highlight the need and importance of providing opportunities for licensure across geographically isolated areas of Western Australia, not to mention innovative measures to manage drivers who risk licence suspension or cancellation. In recent times Western Australia has introduced a number of new initiatives to counter unlicensed driving, including the immediate impounding for 28 days of vehicles driven by unlicensed drivers, irrespective of the ownership of the vehicle. Information provided on the WA Office of Road Safety website states that this measure has the potential to reduce the number of disqualified driving offences, the number of disqualified drivers involved in crashes, and the number of disqualified driving related injuries. It also has the potential to permanently remove vehicles from the road that would otherwise be judged as un-roadworthy.

The ‘Safer Cycling and the Urban Road Environment’ study is an innovative, multi-centre study being funded by an ARC Linkage Grant and industry partners including Main Roads WA, VicRoads, Amy Gillett Foundation, and Cycling Promotion Fund. The study aims to determine contributing factors to cyclist crashes in urban road environments and develop road infrastructure prototypes that improve cycling safety. The joint collaboration between C-MARC and MUARC (the Monash University Accident Research Centre) features three PhD projects which are being led by Professor Mark Stevenson in Melbourne and Professor Lynn Meuleners in Perth. These are outlined below.

Steven O’Hern, Monash University

Cycling is a sustainable mode of transport that is experiencing a renewed growth in popularity in Australia and throughout much of the western world. However, within the urban road environment, cyclists represent a particularly vulnerable road user group. Therefore, Steve’s study aims to develop and evaluate a range of evidence based road infrastructure solutions that promote safer cycling. Infrastructure designs will be developed applying safe system principles while evaluation will be performed using a bicycle simulator, developed as part of the thesis.

Brendan Lawrence, Monash University

Brendan’s PhD research explores the role the road environment plays in cycling safety. His research will first examine the need to classify the road environment and its constituent features, in accordance with the principles of taxonomy. Such a framework will be used to characterise the on-road cycling environment in Melbourne. It will also be used to characterise the road environment at known cycling-related crash sites, and therefore invite comparison between the two. Detailed naturalistic video and travel data from at least 100 cyclists will be used to characterise the on-road cycling environment. To date, 95 cyclists have been recruited from the road-side around Melbourne for this phase of the study. The on-road locations where a similar number of cyclists crashed and were admitted to hospital will be used to characterise the cycling-related crash environment. It is expected that there will be discernible differences between the two road environments, and understanding these differences will provide much needed insight into the design of safe cycling environments.

Michelle Fraser, Curtin University

Michelle’s PhD aims to gain an understanding of the characteristics, risk factors and outcomes of crashes that occur while riding in a group versus solo, as well as the unsafe events and behaviours that occur while bunch riding specifically. Group and bunch (also known as ‘peloton’) riding are rapidly gaining popularity. Despite this, no specific information exists on group or bunch riding crashes, outcomes or behaviour. This represents a significant gap in the evidence as it is likely that circumstances and risk factors differ considerably for crashes that occur while riding in a group versus solo. Part 1 involves a prospective study of 200 cyclists hospitalised as a result of an on-road crash in Perth, WA. Characteristics, risk factors and outcomes of crashes will be compared for crashes that occur while riding in a group versus solo. Part 2 involves a naturalistic study of bunch/peloton riders in Perth. Forty cyclists will record bunch riding footage using bicycle mounted cameras and undertake a semi-structured interview. Bunch and road environment-related risk factors for unsafe events and behaviours will be identified. To date 50 hospitalised cyclists and 5 bunch riders have been recruited. It is envisaged that the findings of this study will be used to create specific road environment and behavioural recommendations for optimising group and bunch riding safety.

C-MARC Seminar Series 2015

The third seminar for 2015 will be presented by Professor Richard Jones entitled “Microsleeps: Characteristics, dangers, underlying mechanisms, detection and countermeasures” on Thursday the 23rd of July at the Technology Park Bentley—Conference & Business Function Centre.

Lapses of responsiveness (‘lapses’) - microsleeps (0.5-15s), attention lapses, and lapses of task-focused attention—are complete transient disruptions in performance. They can be a surprisingly frequent phenomenon in healthy subjects—even when not sleep-deprived—and particularly so when engaged in extended monotonous tasks. They are of particular importance in the transport, military, and medical sectors in which there is a need to maintain sustained attention for extended periods and in which lapses can lead to multiple-fatality accidents.

Prof Jones will (i) provide an introduction into lapses, (ii) overview their importance in the real world, (iii) overview some of the key findings from his research studies on microsleeps and underlying mechanisms, especially in relation to sleep deprivation, fatigue, and obstructive sleep apnoea, (iv) indicate where we are at in the development of a head-mounted multi-modality lapse detection system, and (v) highlight some remaining challenges in an area which is both fascinating and of such importance to prevention of fatal accidents.

If you are interested in further details, registering for this seminar, or if you would like to be notified via email of future C-MARC seminars please email matthew.goworko@curtin.edu.au
The C-MARC team recently attended the 9th International Conference on Managing Fatigue held over four days at the Esplanade Hotel, Fremantle in March. The conference, organised by C-MARC and the Perth based Australian Road Research Board (ARRB), primarily focused on the effects of fatigue in the transportation sector as well as the aviation, maritime, industrial, resources and health sectors. The event attracted over 120 delegates and was privileged to have keynote speakers who were internationally recognised experts from a range of fields including sleep and fatigue research, sleep medicine, psychology, law, human factors, neural engineering and neuroscience, and transport safety.

During the conference, Professor Lynn Meuleners gave a presentation entitled “Health-Related Factors Associated with Long Distance Heavy Vehicle Crashes in Western Australia”. The C-MARC study, recently published in the Journal of Clinical Sleep Medicine, involved 100 long-haul heavy vehicle drivers who had been involved in a police-reported crash in WA over a three year study period and 100 control drivers recruited from WA truck stops who had not been in a reported crash. Of note, long-haul heavy vehicle drivers diagnosed with obstructive sleep apnea (OSA) were over three times more likely to be involved in a police-reported crash in Western Australia compared to those drivers without OSA. In addition to the importance of OSA, Professor Meuleners addressed the fact that heavy vehicle drivers who reported a diagnosis of depression or had not completed fatigue training had a significantly increased crash risk. As a result, it was suggested that more rigorous screening and subsequent treatment of OSA and depression, in addition to compulsory fatigue management training, are measures that may decrease the number of heavy vehicle crashes in Western Australia.

On behalf of the Organising Committee, Professor Meuleners would like to thank all who attended or presented at the conference, the partners, sponsors, and venue for making the event a great success. To view or download the conference presentation slides, please visit: http://www.fatigueconference2015.com.au/

Upcoming Events

Knowledge Translation and Exchange Short Course
Date: 13—15 July 2015
Location: Perth, Western Australia
Venue: Harry Perkins Institute of Medical Research, Perth
Registration: http://www.sph.uwa.edu.au/courses/winter-spring-summer-school/knowledge-exchange

The Deeble Institute, along with the Australian Healthcare and Hospitals Association, is pleased to announce the 2015 Knowledge Translation and Exchange Short Course which will be held from the 13-15 July 2015 in Perth in partnership with the UWA School of Population Health. The course incorporates theory with a strong practical focus covering topics to assist academic researchers in translating their research findings into policy and practice by making their work more accessible and useful to policymakers and the media. The course also includes presentations and sessions with the senior State and Federal policy makers.

The course is looking to attract researchers and academics as well as public and private sector researchers with an interest in informing policy. A flyer for the course and further information can be found at the link above.

Event: 2015 Australasian Road Safety Conference
Date: 14—16 October 2015
Location: Gold Coast, Queensland
Venue: Gold Coast Convention and Exhibition Centre

ARSC2015 is a direct response to the United Nations call for a Decade of Action on Road Safety. The conference will deliver research results, showcase innovative solutions, and provide educational and networking opportunities across disciplines in all 5 pillars of the United Nations call for a Decade of Action on Road Safety.

For further information please visit: http://australianroadsaftyconference.com.au/