The MUARC-TAC Enhanced Crash Investigation Study: Study Update, analysis of crash types and contributing factors

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Abstract

This paper presents an update of the Monash University Accident Research Centre (MUARC) – Transport Accident Commission (TAC) *Enhanced Crash Investigation Study (ECIS)* as well as an exploration of the characteristics of injured drivers, crash types and factors implicated in crash occurrence. Three configurations are of particularly high frequency and severity, whilst crashes involving young and older drivers are different in nature and have different contributing factors. Fatigue, driver error, and pre-crash driver blackouts due to medical conditions were prominent contributing factors. Injury severity would be significantly lower in 32% of cases if either front or side airbags were fitted. The findings point to key risk factors that can be addressed in road safety strategies.

Background

Crashes resulting in serious injuries are approximately 25 times more common than fatality crashes and are associated with significant impairment in quality of life (Fitzharris et al., 2007, 2010, 2015). While the personal and social impact of these crashes is significant, so too is the economic cost to the broader community (Collins, Lenné & Fitzharris, 2015).

It is thus important to understand the factors associated with the occurrence of serious injury crashes as this understanding can be used to guide road safety policy. Equally important is understanding the nature of injuries sustained, how they occurred, and how they can be mitigated in the event of a crash. The MUARC-TAC ECIS was purposefully designed to identify key road safety issues in Victoria and to create a robust evidence-base upon which road safety strategies can be based. The aim of this paper is to document common crash types that result in serious injury, and to document contributing factors for both crash occurrence and high injury severity.

Methods

The ECIS is a multidisciplinary case-control study that aims to examine the causes and consequences of 400 serious road crashes in Victoria across a three-year period. A complete description of the ECIS study is provided elsewhere (Fitzharris et al., 2015).

Relevant to this paper is the process of case completion and identification of contributing factors for drivers involved in the 'case arm' of ECIS. In short, injured drivers 18 years and older consent to participation in the study and are interviewed whilst in hospital. For those seriously injured, a next-of-kin may provide consent and details of the crash. Following this, each ECIS case is subjected to a comprehensive investigation with information collected from the injured driver supplemented with ambulance, police and medical history information, as well as a physical inspection of the vehicle and the crash location. This information is used to assess the factors that contributed to the crash, which is done first by each member of the 'case team', and following this, the case is

subjected to a review by the entire ECIS team. Multiple information sources are used for this determination with each *Case* subject to a series of comprehensive reviews and panel discussions. Contributing factors are those where documented evidence exists that the particular 'factor' was not only present, but that it played a role in the occurrence of the crash or influenced the injury severity; for each factor deemed to have contributed in these ways, a 'confidence measure' of high, medium and low is awarded. More than one factor can be present at the time, although in the analysis presented here, the proportion of crashes where each was present and deemed a factor is reported.

Results

As at February 2016, 237 drivers aged 18 years and older admitted at least overnight agreed to participate in the study. Two-thirds of eligible drivers approached by the ECIS Research Nurses consented to the study. The sample consists of 135 males (57%) and 102 (43%) females, and 20% are aged 18-25 years, 19% were 26-39 years, 27% were 50-59 years, 20% were 60-75 years and 14% are 76 + years. One-third of crashes occurred in regional Victoria. The sample had a similar age and sex profile to all injured drivers admitted to The Alfred as well as those declining consent.

Crash types - Based on the information collected thus far, there appear to be five characteristic types defined by vehicle movement and location, and driver age, these being:

1. Crashes at un-signalised intersections in regional Victoria
2. Lane-departure crashes (run-off-road, head-on) in regional Victoria
3. Crashes at busy metropolitan intersections
4. Young driver crashes
5. Older driver crashes

These five characteristic crash types, noting overlap with the age-based categories, form the basis of identifying vehicle, infrastructure, technological and behavioural measures with the goal of reducing the likelihood of crash occurrence as well as mitigating the severity of injuries should these crashes occur.

As ECIS is an on-going program, to date 107 cases had been submitted to full internal MUARC panel review. Table 1 presents the most common factors directly associated with the crash occurring, and includes drivers involved in all five crash types noted above. Fatigue, driver error (e.g., failed to see other road user, misjudged road layout), medical condition-related 'blackouts' and driver emotional state were key contributing factors. Whilst not in the 'top-10' factors, current drug use (e.g., ice, THC, GHB) was a known factor in 7.6% of crashes which was only marginally lower than alcohol affected drivers (9.5%). Based on impact configuration, the absence of either a frontal or side airbag system adversely affected injury outcomes for 32% of drivers, as did excessive vehicle intrusion which was largely observed in vehicles that performed poorly in NCAP tests (13%) and lack of seat belt use (8.6%). Error on the part of another driver was the core contributing factor in 10% of crashes. In producing this table, no distinction was made between contributing factors of single vehicle and multi-vehicle crashes, which comprised 28% and 72% respectively of the sample.

Table 1. Contributing factor for serious injury crashes

Contributing factor category / factor description	Percent	Rank
Factors affecting driver ability: driver fatigue (stated fell asleep at wheel, so tired, crash evidence)	27.1%	1
Driver error: failed to see other road user (stated by driver)	24.8%	2
Factors affecting driver ability: blackout pre-crash due to medical conditions (seizure, diabetes, cardiac conditions)	17.8%	3

Factors affecting driver ability: emotional state (high levels stress, mental health)	13.1%	4
Driver error: misjudged road layout	12.4%	5
Factors affecting driver ability: inexperience	11.2%	6
Other driver factor: driver error	10.9%	7
Driver behaviour: inappropriate speed for conditions	9.5%	8
Factors affecting driver ability: alcohol / BAC (case driver)	9.5%	9
Driver error: counteractive avoidance action	7.6%	10

Conclusions

This early look at the data highlights the immense value of in-depth data in understanding serious injury crashes. This level of detail and its holistic nature about crash causation has not been seen before in the analysis of road crashes in Victoria. Of particular concern is the scale of medical conditions and other driver impairments as contributing factors for crash occurrence. The data also demonstrates that there is significant opportunity to achieve reductions in injury severity through a safer vehicle fleet. Whilst the data collection program is continuing, these emerging insights can be used to explore opportunities to drive the development of innovative road safety measures.

References

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Acknowledgements

MUARC acknowledges the funding and logistical support provided by the Victorian Transport Accident Commission (TAC). We would like to acknowledge the support of Renee Shuster (TAC) and Jacinta Evans (TAC) for assistance in the control arm of the program.

ECIS Study team

In addition to those named in the author by-line, the ECIS team consists of: Research Nurses: Sarah Bullen, Marnie Reilly, Emily Robertson, Karen Vlok; Technical Officers: Rai Curry, Robin Jackel, Lindsay Lorrain, Tandy Pok Arundell, Geoff Rayner; Data Coordinators: Debra Judd; Project Support Officer: Caitlin Bishop, Hayley McDonald; Data Entry: Daniel Machell.