CHAPTER 14

SPECIFIC ROAD SAFETY ISSUES IN PERTH

Lynn Meuleners, Michelle Fraser,
Matthew Govorko and Peter Palamara

ROAD SAFETY IN WESTERN AUSTRALIA

The decade-long mining boom in Western Australia (WA) has resulted in vast changes to the population and economy as detailed in chapter 3. It is estimated that the boom has attracted approximately 1,000 new arrivals to WA per week in recent years (Brueckner, Durey, Mayes, & Pforr, 2013). This rapid population growth brought with it increased urban sprawl, an influx of people born overseas, sharp increases in weekly earnings, increased cost of living (Brueckner et al., 2013) and a much higher volume of heavy-vehicle traffic on the roads, all of which impact on road safety.

Death and injury attributed to road crashes in WA are an enormous burden economically, physically and emotionally on our community and health care system. In the ten-year period from 2004 to 2013, a total of 18,949 people were killed or seriously injured in road crashes in the Perth metropolitan area, which equates to a rate of 115.6 killed or seriously injured (KSI) per 100,000 persons (Road Safety Commission, 2015). It has been estimated that this level of road trauma costs the community of WA $2.76 billion (2013) annually (Road Safety Council, 2015).

Although there has been an increase in the number of road users associated with the rapid population growth in WA over the last decade, there have been significant improvements in a number of road safety outcomes, such as an overall decreasing trend in fatality rates since 2001 (Office of Road Safety (ORS), 2015). Still,

there remain a number of key issues that need to be addressed in order to further reduce road trauma in WA. For instance, WA averaged 181 fatalities and 259 critical injuries associated with road crashes between 2009 and 2013, which is still unacceptable (ORS, 2015). Moreover, WA consistently has a road crash fatality rate higher than the national average. The Road Safety Commission (formerly the Office of Road Safety) reported 7.2 road crash fatalities per 100,000 persons in 2014, compared to the national fatality rate of 4.9 deaths per 100,000 (ORS, 2015). While the improvements should be celebrated, the battle to further reduce road trauma on WA roads and to subsequently maintain these levels will require a constant, concerted effort.

At present, the Western Australian Government has implemented the *Towards Zero: Getting there together 2008–2020* road safety strategy. This strategy uses a Safe Systems approach and is built on four cornerstones comprising safer road users, safer roads and roadsides, safer speeds and safer vehicles. Together the four cornerstones of the *Towards Zero* strategy are projected to save 11,000 people from being killed or seriously injured on Western Australian roads between 2008 and 2020 (ORS, 2009). In order to maximise road safety outcomes in WA, an important adjunct to this Safe Systems approach is furthering our understanding of crashes and risk factors. While improvements to road infrastructure that support the growing economy and population are essential for road safety, identifying road user groups at increased risk of crashes during the boom period and beyond is also important.

From the perspective of a road user, driving is a complex task that requires concentration, information processing, decision-making, alertness, an ability to perceive hazards and identify risk-taking behaviour and ongoing sensorimotor control in order to safely arrive at the intended destination and to avoid any adverse outcomes, such as committing traffic offences or being involved in a crash. As a result of this complexity, the risk of road crash involvement can be influenced by various physical, mental or

environmental factors affecting the driver's ability to operate the vehicle safely.

Alongside the population increase, there will be a subsequent increase in the number of licensed drivers and registered motor vehicles using the WA transport systems. Although the Safe Systems approach will undoubtedly continue to form a major part of the road safety strategy we, however, would like to address road safety in the boomtown and beyond from the perspective of a number of specific road user groups. Primarily, this chapter will centre its discussion on three groups of drivers that have been identified as of particular importance to road safety and policy currently and in the coming decades as 'Boomtown' comes into full effect. These three driver groups are: 1) long-distance heavy-vehicle drivers; 2) drivers under the influence of illicit drugs and/or alcohol; and 3) older drivers with dementia and visual impairment. These road safety issues provide challenges for Western Australia's licensing and road safety authorities, clinicians and policy makers when faced with an ever-increasing population in WA.

ROAD USER GROUPS IMPORTANT TO ROAD SAFETY IN WA

Heavy-Vehicle Drivers

With the growth in the mining and associated industries in WA also came substantial growth in the heavy-vehicle industry and fleet. Heavy vehicles are essential for the mining industry in WA, providing transport of commodities and construction materials. Over the last 15 years, WA has had the most significant growth in the heavy-vehicle industry of any state. For example, between 2010 and 2014, the tonne-kilometres travelled by freight vehicles in WA increased by 7,787 million (25.9%; ABS, 2015). In addition, WA has a unique road environment for heavy-vehicle drivers, compared with other states, with vast distances between locations, extreme temperatures and weather conditions and monotonous scenery posing challenges for road safety.

Heavy-vehicle crashes contribute significantly to the burden of death and injury on Australian roads and WA is no exception. Articulated heavy vehicles continue to account for over half of the crashes resulting in a fatality (Bureau of Infrastructure Transport and Regional Economics (BITRE), 2015). As a result, safety in the transport industry will continue to be a critical issue as it is expected that articulated heavy-vehicle freight will double in Australia by the year 2030 (BITRE, 2011).

Epidemiology of Heavy-Vehicle Crashes in Western Australia

A recent epidemiological investigation using data obtained from the Integrated Road Information System, which is maintained by Main Roads WA, found that over the thirteen-year period between 2001 and 2013, 7,964 articulated heavy-vehicle crashes had occurred on WA roads, involving 8,115 articulated heavy vehicles. In total there were 2,254 casualties of which 224 were fatalities, 862 were hospitalisations and 1,168 were injuries requiring medical attention but not hospitalisation (Zhang, Meuleners, Chow, & Govorko, 2014).

In WA, there was an overall decreasing trend ($p < 0.01$) in rates of articulated heavy-vehicle crashes with 734 crashes per 10,000 registered articulated heavy vehicles reported in 2001 compared to 456 crashes per 10,000 registered articulated heavy vehicles in 2013. However, the rate of articulated heavy-vehicle crashes was consistently higher than the rate of all vehicle crashes in WA throughout the study period (Zhang et al., 2014). This indicates that despite improvements, heavy-vehicle safety remains a priority road safety area for WA.

Behavioural, Health and Work Environment Related Factors and Risk of Heavy-Vehicle Crashes

A recent WA report revealed that behavioural factors may play an important role in heavy-vehicle crashes and fatalities. For example, speed was recorded as a factor in 11 per cent of crashes involving an articulated heavy vehicle and only 31 per cent of heavy-vehicle

drivers killed in crashes were wearing a seatbelt (Zhang et al., 2014). These represent important modifiable risk factors that should be targeted in order to prevent crashes and fatalities in WA during the boom.

Previous research has also found that heavy-vehicle drivers are at an increased risk of several health-related conditions and chronic diseases, namely obesity, diabetes mellitus, musculoskeletal disorders and cardiovascular issues including hypertension and hypercholesterolemia (Apostolopoulos, Sonmez, Shattell, Gonzales & Fehrenbacher, 2013; Dahl et al., 2009; Sieber et al., 2014). Mental health disorders including depression and anxiety are also prevalent in this occupational population (da Silva-Júnior, de Pinho, de Mello, de Bruin & de Bruin, 2009; Hilton, Staddon, Sheridan & Whiteford, 2009; Shattell, Apostolopoulos, Collins, Sonmez & Fehrenbacher, 2012).

Work environment related factors including distance travelled, vehicle type, employment type, payment method, driver training, scheduling practices, working hours and the safety climate within an organisation, have also been shown to impact crash risk (Edwards, Davey & Armstrong, 2014; Morrow & Crum, 2004). Inherent factors associated with driving a heavy vehicle can contribute to fatigue, which is a known risk factor for heavy-vehicle crashes. Hours worked, night driving, delivery window size, difficulty finding rest stops, difficulty achieving continuous sleep and insufficient recovery from previous work may lead to disturbance in sleep patterns and fatigue (Edwards et al., 2014; Morrow & Crum, 2004).

In Australia, new Heavy Vehicle Driver Fatigue Laws were introduced in 2008 in recognition of the importance of fatigue. However, WA and the Australian Capital Territory are the only states not to have adopted this reform, which sets laws that establish work and rest limits over specific periods of time and specifies the records that must be kept. Subsequently, WA has separate WA Fatigue Management Regulations that are run under occupational health and safety law. The regulations allow longer working hours

due to the unique geography and long distances between rest stops in WA. With an influx of new heavy-vehicle drivers and those from other states and countries to WA during the boom, it is important that fatigue regulations and training are adequate to protect heavy-vehicle drivers while driving on unfamiliar roads under the unique conditions they face in WA.

WA, along with New South Wales, was part of a large case-control study of long-distance heavy-vehicle drivers that investigated driver and work environment related risk factors for crashes using interviews and tests for obstructive sleep apnoea (OSA) (Meuleners, Fraser, Govorko & Stevenson, 2015; Sharwood et al., 2012; Sharwood et al., 2013; Stevenson et al., 2010; Stevenson et al., 2014). The WA component of the study included one hundred case participants who were long-distance heavy-vehicle drivers who had been involved in a police-reported crash in WA and one hundred control participants recruited from WA truck stops who had not been involved in a crash in the previous twelve months.

With respect to health-related risk factors, heavy-vehicle drivers diagnosed with OSA through the use of a Flow Wizard device were nearly three and a half times more likely to be involved in a crash than drivers without OSA (adjusted OR: 3.42, 95% CI: 1.34–8.72). The risk of a crash was significantly increased if heavy-vehicle drivers reported a diagnosis of depression (adjusted OR: 6.59, 95% CI: 1.30–33.24) or had not completed fatigue-management training (adjusted OR: 6.05, 95% CI: 1.80–20.24). This highlights the need for more rigorous screening and treatment of OSA and depression for heavy-vehicle drivers and also compulsory fatigue-management training.

Regarding work environment related factors, driving a heavy vehicle with an empty load was associated with close to a three times increased risk of crashing compared to driving a heavy vehicle carrying general freight. A four-fold increased risk of crashing was observed when driving a rigid heavy vehicle as opposed to driving an articulated heavy vehicle. It was found that

the risk of crashing was almost five times higher when driving more than 50 per cent of the trip between midnight and 5.59am, while a significantly increased risk of crash was found if the time between the last break on the index trip was greater than two hours. Drivers with more than ten years' driving experience or over the age of thirty-five years were 52 per cent and 74 per cent less likely to be involved in an articulated heavy-vehicle crash, respectively. These findings suggest that heavy-vehicle drivers would benefit from additional training surrounding driving rigid vehicles, empty vehicles and at night-time as well as additional training for younger drivers.

Drunk and Drugged Driving

Strong links have been reported between boomtown situations and high levels of alcohol and drug consumption (Ennis & Finlayson, 2015). There are a number of possible reasons for this including high disposable incomes (Carrington, Hogg & McIntosh, 2011; Goldenberg, Shoveller, Koehoorn & Ostry, 2010), social isolation, social dislocation on return to home communities, job insecurity and the effects of workplace and masculine cultures associated with the mining industry (Ennis & Finlayson, 2015). In addition, recent research suggests that around 47 per cent of all mining employees in WA work on a fly-in-fly-out (FIFO) basis (Gilmore, Liang & Chikritzhs, 2016). This group of workers have shown to be at an increased risk for high alcohol consumption. For example, a WA study examining 380 FIFO workers, 913 shift workers and 10,613 other employee types found that FIFO workers were significantly more likely to drink alcohol at risky levels (Joyce, Tomlin, Somerford & Weeramanthri 2013). It has also been found that many workers in the mining sector also drink heavily during leave cycles (Berry, Pidd, Roche & Harrison 2007). Furthermore, recent data suggests that WA has higher rates of reported illicit drug use compared to most other Australian jurisdictions (Australian Institute of Health and Welfare, (AIHW) 2014b). It is therefore likely that the increased consumption of alcohol and drugs in WA

will result in increased drunk and drugged driving.

It is undeniable that alcohol use can significantly impair driving performance with evidence of a decline in multiple driving skills in addition to alterations in decision-making, planning and risk-taking behaviour. Driving with alcohol in the body has been related to a greater risk of crash involvement and a higher risk of responsibility for the crash (Drummer et al., 2004; Kelly, Darke & Ross, 2004). While alcohol is well known to impair driving and play a significant role in fatal crashes, the role of illicit drugs in driver impairment, crashes and injuries is less clear than it is for alcohol and is somewhat more complex. This is because the presence of an illicit substance in a crash-involved driver does not automatically mean the crash was caused by the drug use. Moreover, for a number of illicit substances there is inadequate evidence to accurately describe the influence on driving performance associated with a specific level of a drug (Palamara, Broughton & Chambers, 2014).

Despite these difficulties, there is evidence that cannabis, amphetamines and certain combinations of psychoactive drugs significantly increase a driver's risk of a road crash. Previous research has demonstrated that the use of cannabis can negatively impact the driver's attention, concentration, hand-eye coordination, short-term memory, reaction time, tracking, time and distance perception, steering, speed and lateral positioning (Kelly et al., 2004). The presence of cannabis in a driver has been significantly associated with driver culpability and intoxication and may increase a driver's risk of dying in a road crash (Drummer et al., 2004).

Previous research examining the use of stimulants (amphetamines, cocaine, MDMA/ecstasy) and opioids on driving performance have shown inconsistent results with respect to driving impairment. Drummer et al. (2004) conclude that amphetamine consumption is significantly associated with an increased risk of a serious injury crash. Also, the increased feeling of alertness and confidence associated with taking certain stimulants can result

in the user falling into a false sense of security with respect to their driving ability and level of impairment (Degenhardt, Dillon, Duff & Ross, 2006). This may influence the user's decision regarding driving while intoxicated as well as the level of risk-taking behaviour.

Complicating the issue of drugs and driving is the fact that use is not always restricted to a single drug. Poly-drug use is commonly found with crash-involved drivers with evidence suggesting that drivers testing positive for multiple drugs are more likely to be culpable for the crash (Kelly et al., 2004). One of the most prevalent combinations is that of alcohol and illicit drugs (Drummer et al., 2003; Kelly et al., 2004). More specifically, an additive effect on the impairment of driving performance is apparent when alcohol and cannabis are taken in combination (Kelly et al., 2004), with research indicating that cannabis use will heighten driver impairment caused by alcohol (Drummer et al., 2004).

Regardless of the differences that arise with respect to each specific drug, it is apparent that high doses of illicit substances, poly-drug use and illicit substances used in combination with alcohol all present a significant threat to road safety (Kelly et al., 2004).

Illicit Drug-related Driving in WA

Palamara et al. (2014) recently investigated the incidence and characteristics of illicit drug-related driving in WA using two data sources: i) fatally injured drivers and motorcycle riders and ii) drivers convicted of an illicit drugs and driving offence as a result of roadside oral-fluid testing.

Toxicology records were linked to WA Police–reported crash records for fatally injured drivers/riders. A total of 1,375 fatal injury records were analysed for the period 2000 to 2012, representing approximately 90 per cent of the 1,523 drivers/riders killed over that time period.

Approximately 23 per cent (n=312) of drivers and riders who were fatally injured tested positive to one or more illicit substances.

For these 312 drivers/riders, there were a total of 383 positive tests, with THC (Δ9-Tetrahydrocannabinol) being the most frequently detected substance, accounting for 65 per cent (n=248) of positive tests. This was followed by methylamphetamine at 26 per cent (n=102) and MDMA (ecstasy) at 6 per cent (n=22). The majority of drivers/riders tested positive to one illicit substance (80 per cent, n=250) while 17 per cent (n=53) tested positive to two and 2.6 per cent (n=9) tested positive to three illicit substances. Annual rate of detection remained unchanged for the duration of the study period (Palamara et al., 2014).

The study also analysed WA Police records of drivers and riders charged with a Section 64AC offence (illicit substance in oral fluid) between 1 January 2008 and 31 December 2012. WA Police undertook 43,176 roadside oral fluid screenings that resulted in 1,630 drivers/riders (n=4 per cent) being charged with a total of 1,724 Section 64AC offences. The annual offence rate statistically increased significantly over the period from thirty-three offences per 1,000 screenings in 2008 to fifty-five offences per 1,000 screenings in 2012, which represents an approximate 66 per cent increase in offences per 1,000 screenings. Three illicit substances, THC, methylamphetamine and ecstasy, accounted for 97 per cent of positive tests, with the most frequent offences over the five-year period being issued for methylamphetamine, which accounted for 61 per cent (n=1,059), and methylamphetamine in combination with THC, which accounted for 22 per cent (n=378). Approximately nine in ten offences for the period occurred in the Perth metropolitan area (Palamara et al., 2014).

It is possible this increase in rates of illicit drug offences per screenings may be related to the social and economic effects of the boom in WA, as discussed above. This suggests that accurate surveillance of rates of drunk and drugged driving, education, enforcement and prevention initiatives specifically aimed at mining industry workers are important for reducing crashes involving drunk and drugged drivers in WA.

Older Drivers (65 Years and Older)

The recent population growth in Perth and WA has been dominated by younger and middle-aged adults employed in the mining and associated industries. However, looking beyond the boom into the future, these people will contribute to the ageing population of WA and, consequently, the number of older drivers on the roads.

It is estimated that by the year 2030, one out of every four drivers in Australia will be aged sixty-five years or older. Moreover, if no action is taken, fatal motor vehicle crashes amongst these drivers are expected to increase by as much as three times (Lyman, Ferguson, Braver & Williams, 2002). Currently the older driver age group is continuously over-represented in annual road-crash fatality statistics. For instance, in 2014 this age group represented 21 per cent of road-crash fatalities despite accounting for only 15 per cent of the Australian population (BITRE, 2015).

Previous research has found that cognitive ageing, in and of itself, does not impair driving or increase crash risk (Wagner, Muri, Nef & Mosimann, 2011). However, medical conditions such as visual impairment and dementia, as well as medication usage due to these conditions, increases with age and may contribute to poorer driving and an increased crash risk (Wagner et al., 2011). Additionally, the older driving population has a decreased tolerance to an injury, such that they often experience more serious injuries and longer recovery times when they are involved in a crash compared to younger road users. This means that this specific road user population should be the focus of future targeted road safety initiatives.

Dementia

In the absence of effective prevention, the number of Australians with dementia is estimated to triple by the year 2050 (Australian Institute of Health and Welfare (AIHW), 2012). Certain cognitive abilities essential for driving such as memory, visual perception, attention and judgement may be affected by dementia (Lloyd et al., 2001; Wagner et al., 2011). Dementia refers to permanent

changes in the normal brain activity that affect memory, speech, problem solving, judgement and the ability to undertake daily tasks (Dementia Care Australia, 2012).

In the early stages of dementia, the risks associated with driving may go unnoticed as the symptoms appear sporadically. This is due, in part, to the estimated average three-year lag that exists between the presence of symptoms of dementia and formal diagnosis (Gilley et al., 1991). However, as dementia advances past the early stages, it can have a severe impact on the numerous skills necessary for driving and will eventually result in the patient losing the ability to drive. The stage at which this happens will be different for each individual, however, previous research suggests that the majority of sufferers discontinue driving within two to three years after the first signs of the disease and in certain cases not until the most severe stages of the disease (Fox, Bowden, Bashford & Smith, 1997; Gilley et al., 1991).

Thus far, previous research has produced inconsistent results with respect to whether or not drivers diagnosed with dementia have a higher crash rate (Hakamies-Blomqvist, 1998; Man-Son-Hing, Marshall, Molnar, Wilson & National Library of Medicine, 2007). While certain studies have found no significant differences in crash risk between the dementia and control groups (Carr, Duchek & Morris, 2000; Trobe, Waller, Cook-Flannagan, Teshima & Bieliauskas, 1996), other studies have reported that drivers with dementia had between 2 and 10.7 times higher risk of crashes compared to cognitively intact older adults (Friedland et al., 1988; Marshall, 2008; Tuokko, Tallman, Beattie, Cooper & Weir, 1995) and that this risk increased with progression of the disease (Drachman & Swearer, 1993). Nevertheless, the discrepancies reported in the risk of crash are expected to be due to differences in study methodology and small sample sizes, as well as selection bias (Meuleners et al., 2011).

In a recent retrospective, population-based cohort study, the risk of a motor vehicle crash was more than double in the three years prior to an index hospital admission for dementia in adults

aged fifty years or older compared to a group without dementia, using data from the Western Australia Data Linkage System (WADLS). This finding indicates that older drivers with dementia may be at an increased risk of a crash long before they are formally diagnosed. These findings also suggest that older adults with early dementia may not recognise their symptoms, putting them at risk on the road (Meuleners, Ng, Chow & Stevenson, 2016). As the number of older drivers with dementia on WA roads increases beyond the boom, a comprehensive understanding of the specific effects of dementia on driving ability, the appropriate time for cessation of driving and cognitive tests to screen for fitness to drive will be essential for ensuring the safety of this group and other road users.

Psychoactive Medications

Due to the complexities of driving, with respect to continuously receiving, analysing and acting upon information, driving performance can be influenced by substances which impact brain function or the mental processes involved in operating a vehicle. Not only do these substances include alcohol and illicit drugs, but also legal drugs such as psychoactive drugs prescribed for medicinal purposes. These psychoactive drugs range from antipsychotics, antiepileptics, certain antihistamines, anxiolytic sedatives, antidepressants, opioid analgesics, benzodiazepines and certain medications for Parkinson's disease (Cooper, Meuleners, Duke, Jancey & Hildebrand, 2011).

Psychoactive medications are an issue particularly amongst the older population due to the higher prevalence of medical conditions seen in this age group (AIHW, 2014a). Consequently, polypharmacy is also more prevalent in older age groups as opposed to younger age groups (Fulton & Riley Allen, 2005). A South Australian study reported that psychoactive medications were prescribed to 16 per cent of the sample population aged sixty-five years and older (Goldney & Bain, 2006). Similarly, a community-based study in Sydney found that 17 per cent of the

337 elderly respondents used benzodiazepines on a long-term basis (Jorm, Grayson, Creasey, Waite & Broe, 2000). Furthermore, it is likely that an increasingly ageing population in WA will result in an increase in the use of such psychoactive medications.

The therapeutic effects of these medications have been shown to negatively impact driving performance, with the use of certain psychoactive medications increasing the risk of crash involvement (Engeland, Skurtveit & Mørland, 2007; Hebert, Delaney, Hemmelgarn, Lévesque & Suissa, 2007; Hours et al., 2008). However, the impact of psychoactive medications on driving ability can differ between individuals depending on the interactions of age, gender, health condition and prescription medication use (Cooper et al., 2011). Furthermore, multiple factors including dosage, polypharmacy, tolerance levels and the time since intake will also influence the medicines' effect (Kelly, et al., 2004).

In WA, a retrospective, population-based study was undertaken using the Western Australian Hospital Morbidity Data System and the Pharmaceutical Benefits Scheme which found an increased crash risk for adults aged sixty years and older using benzodiazepines, antidepressants and opioid analgesics from 1 January 2002 to 31 December 2008 (Meuleners et al., 2011). A major challenge for road-safety experts is improving our understanding of the extent to which driving performance is negatively affected by psychoactive medications. Attention needs to be focussed on this issue so that evidence-based information can be used to provide guidelines and education for the community of WA on the effects of these drugs on driving (Cooper et al., 2011).

Visual Impairment: Cataract

Not only does vision impairment, such as cataract, reduce quality of life and impact physical, social and emotional wellbeing (AIHW, 2005), it also has significant implications for road safety.

Cataract is a condition associated with increased opacification (clouding) of the crystalline lens of the eye and can negatively impact multiple aspects of vision including acuity, contrast

sensitivity and visual field sensitivity (Owsley, Stalvey, Wells & Sloane, 1999). The onset of cataract is insidious and is largely related to the ageing process (AIHW, 2005). Approximately 40 per cent of visual impairment in older Australians is associated with cataract, making cataract the leading cause of vision impairment nationwide (AIHW, 2005). Furthermore, the AIHW (2005) estimated that approximately 1.5 million Australians fifty-five years of age or older had untreated cataracts. This represents close to one third of this age group. In addition, it has been estimated that by the year 2021, 2.74 million Australians will be affected by cataract with only 500,000 having undergone surgery (Rochtchina et al., 2003).

Although surgery is an effective treatment for cataract and significantly improves driving performance (Subzwari et al., 2008), a large number of Western Australians must deal with cataract-related vision impairment over a long period of time while they are placed on waiting lists for surgery. In WA, individuals can wait upwards of one year for their first eye surgery and a further six months for the second eye surgery when they are on public waiting lists. These individuals may consequently continue to drive regardless of the fact that their visual impairment can impact their driving ability. As a result, they may suffer a serious injury or even death due to involvement in a road crash while waiting for surgery (Meuleners, Hendrie, Lee, Ng & Morlet, 2012).

Despite many drivers self-regulating their driving practices or habits as a result of their condition (Owsley et al., 1999), older drivers with cataract still experience difficulties driving (McGwin Jr, Chapman & Owsley, 2000), which result in declines in driving performance (Wood & Carberry, 2006) and an increased risk of crash involvement (Owsley et al., 1999). It has been demonstrated that older drivers with cataract are 2.5 times more likely to be involved in a motor vehicle crash compared to older drivers with no visual impairment (Owsley et al., 1999).

The combination of a disproportionate increase in the older population associated with increasing life expectancy, the current

and projected prevalence of cataract amongst the older population, the lengthy waiting lists for public surgery and the associated driving difficulties which manifest in declines in driving performance points to a critical issue that impacts the safety of road users in WA. There remains limited evidence in the literature on which road safety and licensing authorities in WA can base policy changes. However, a study is currently being conducted in WA called The Cataract Extraction and Driving Ability Research (CEDAR) study, which aims to measure vision impairment in older drivers with bilateral cataract and examine their driving performance and self-regulation practices before, between and after first-eye and second-eye cataract surgery using a driving simulator and naturalistic in-vehicle, driver-monitoring devices (Meuleners et al., 2015). It is anticipated that the findings of this study will contribute towards highlighting the need for more comprehensive visual testing of visually impaired drivers, such as those with cataract, by licensing authorities with respect to setting visual competence standards for 'fitness to drive'.

RECOMMENDATIONS

Heavy-Vehicle Drivers

While the rate of articulated heavy-vehicle crashes remains consistently higher than the rate of all vehicle crashes in WA, there is an urgent need for changes in policy to address the behavioural-, health- and work environment–related factors shown to be associated with an increased risk of crash for this group. Recommendations to improve heavy-vehicle safety during the boom and beyond include:

- More rigorous screening and subsequent treatment of OSA and depression among heavy-vehicle drivers. Currently, the Health Assessment for Fitness to Drive in WA only asks heavy-vehicle drivers to self-report any 'psychiatric disorders', which appears

to be inadequate in identifying and treating at-risk heavy-vehicle drivers.

- Compulsory fatigue-management training for heavy-vehicle drivers in WA. Further research is also required to determine the optimum content and frequency of training to prevent crash involvement.
- Additional heavy-vehicle driving training covering driving rigid vehicles, empty loads, night driving conditions, rest time and additional training for younger heavy-vehicle drivers.
- Investigation and implementation of emerging technologies such as GPS seatbelt monitoring systems that could improve seat belt usage rates among articulated heavy-vehicle drivers in WA.
- Enhancing the heavy-vehicle crash database and recording. The current WA crash database is lacking data to sufficiently identify causal factors leading to articulated heavy-vehicle crashes. It is recommended that an enhanced database to collect information for all truck crashes in WA be considered and implemented. It would be of benefit to include detailed information on vehicle characteristics, speeding, drug use and fatigue information.

Drunk and Drugged Drivers

Recent research has found that WA has higher rates of reported illicit drug use compared to most other Australian jurisdictions (AIHW, 2014b). There is a clear need for road safety researchers and policy makers to address current illicit drug use so that it does not further develop into a significant road safety issue in the future. Recommendations include the following:

- Further research to establish the prevalence of illicit drug use amongst non-crash involved drivers.
- Investigation to understand and quantify the impact specific drugs and drugs taken in combination have

on driving performance and crash risk with a focus on cannabis, methylamphetamine and ecstasy, as these account for the majority of positive roadside oral fluid tests.
- Exploration of the possibility of introducing legislation that mandates illicit drug testing of all drivers involved in a serious injury crash and not just of drivers who are fatally injured.
- Increasing roadside oral fluid testing in line with the growth of WA's population and the number of driver licences issued in order to deter drugged driving.
- Drunk- and drug-driving prevention strategies in WA to specifically target workers in the mining industry, in particular FIFO workers who are known to be at increased risk of risky alcohol consumption and drug use.

Older Drivers

Despite the high prevalence of disorders that affect driving ability among older adults, such as dementia and cataract, as well as high levels of psychoactive medication use among this group, there are substantial gaps in the evidence regarding their specific effects on driving. As the population of WA ages (see chapter 4), it is essential that further research is undertaken so that accurate recommendations surrounding safe driving and the transition to driving cessation can be made to older drivers and their families. Recommendations include the following:

- Further research to determine the specific effects of dementia on driving ability, the appropriate time for cessation of driving and cognitive tests to screen for fitness to drive among older adults with dementia.
- Additional research to determine the effects of different psychoactive medications and polypharmacy on driving ability among older adults.
- The recommendation of cataract surgery to older

drivers with cataract by clinicians and expedited surgery for those who drive.
- Further research to determine the impact of cataract and cataract surgery before, between and after surgeries and visual tests to screen for fitness to drive among cataract patients.

Implications for Planning and Policy

The implications for planning and policy of the road safety risk factors in WA raised in this chapter can be grouped in three categories (infrastructure and service planning, legislation, and education) and are summarised as follows:

- The requirement for housing for the growing elderly population to be adequately serviced with public or 'on-demand' transport to reduce older individuals driving through necessity, once these drivers are identifiable as unsafe due to age-related health conditions.
- Provision for truck arrester beds where a need is identified.
- Acknowledging the increased potential road safety impact on remote communities that experience heightened alcohol and drug use, rural-specific driving conditions and unmoved vehicle wrecks that can create road hazards.
- Efficient crash response to reduce other drivers being distracted by accidents.
- Supporting research and investment in technological advances in road safety including semi-automated vehicles, surveillance and driver identification.
- A revision of road-user safety-standard regulation to reflect the special conditions in rural WA that researchers have found to impact on crash incidents, namely climate and distance-induced fatigue.
- The planning requirement for rest facilities at regular

intervals on road routes with high use by heavy-vehicle and other drivers.
- Effective drinking/drug use driving education, precaution and prosecution strategies.
- Education for heavy-vehicle drivers in load safety.
- Continued analysis of accident statistics in both rural and urban WA to identify 'hot spots' and occurrence trends.

CONCLUSION

This review has brought to light a few of the driver-related areas which should be a focus for road-safety researchers in the face of growing numbers of licensed drivers and registered motor vehicles in WA. The growth of the heavy-vehicle fleet, the complexities of illicit drug use and driving and medical conditions or psychoactive medications that negatively impact driving ability for an ageing population are just a few of the issues placing increased demands on road-safety researchers, policy makers, police, transport and government authorities to keep road trauma at a minimum as the population of WA increases. These issues in road safety are a significant public health concern as these vulnerable groups not only risk their own lives, health and safety, but also place other road users at risk. The topics addressed in this chapter provide only a snapshot of the possible areas that can be targeted in order to reduce road trauma and improve road-user safety in WA during the boom and beyond. Accordingly, much work remains to be done in order to continue the overall downward trend in crash fatality rates that has occurred since 2001.

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