Introduction

In Australia there were around 1,600 road deaths in 2007 [1] and over 30,000 serious injuries in 2005-06 [2]. This means that approximately every 22 minutes someone is killed or seriously injured on Australia’s roads. The annual economic cost of road crashes is estimated to be at least $18 billion [3].

Within the Australian population between 2001 and 2006, Indigenous people were 2.9 times more likely to die from a road accident than non-Indigenous people and 1.4 times more likely to be seriously injured [4]. Recent figures from Queensland show that Indigenous people are up to six times more likely to be involved in a road crash than non-Indigenous people [5].
Impact of road injury

Road injury impacts on the community at multiple levels. Apart from the direct physical effects of road injury, which are reflected in mortality and morbidity data, there are also the psychological effects of a road accident, as families have to try and cope with the death or disability of a family member involved in a road crash [6]. This has a large impact in terms of emotional and also financial stress.

Other factors that are affected by the road injury toll are: lost labour; medical costs; quality of life; legal costs; workplace disruption; long-term care; vehicle repairs; travel delays; and insurance administration [6].

There has been a lack of research in the area of Indigenous road safety until quite recently. Quantification of the road injury problem in the Indigenous population has been difficult because of poor reporting of crashes and the complexity of ensuring the identification of Indigenous people in the various data collections [5, 7]. The standard procedure is that if Aboriginality is not stated the subject is given the default classification of non-Indigenous. Whilst this is likely to lead to an underestimate of actual numbers, there is some evidence suggesting the ascertainment of Indigenous status may be better in remote areas compared to urban areas [8].

The Indigenous numbers and ratios quoted in this section have not been adjusted for the likely under-identification of Indigenous people, such as in deaths registrations. Based on the estimated completeness of identification, accurate identification is estimated at between 52% and 92% across the four jurisdictions where description of Indigenous status is considered to be of acceptable quality - Western Australia, South Australia, Northern Territory, and Queensland [4]. This means the actual numbers could be up to 30% higher than reported.

Mortality

Motor-vehicle crashes, including car, motorcycle, and pickup trucks and vans, together with incidents involving pedestrians are the leading causes of death from injury for Indigenous people (see Table 1).

The most striking feature of the deaths information is the much greater contribution of pedestrian deaths among Indigenous people than among non-Indigenous people: the fatality rate for Indigenous pedestrians in Western Australia, South Australia, the Northern Territory and Queensland from 2001-02 to 2005-06 was 9.3 times higher than for non-Indigenous pedestrians.

Death rates from motor-vehicle crashes and incidents involving pedestrians were higher for Indigenous people than for non-Indigenous people in every age group (see Table 2). The greatest differences were for middle-aged adult pedestrians; for this group, the rates for Indigenous people were up to 27 times those for non-Indigenous people.

As well as the very much higher contribution of pedestrian deaths, greater proportions of Indigenous people (26%) than non-Indigenous people (9%) die from crashes where only one vehicle is involved (such as roll-overs) [4].

Crash statistics collected over 20 years show that pedestrian fatalities and single vehicle crashes have continued to cause the greatest number of Indigenous deaths relating to road transport [4, 5, 9-12].

Hospitalisation

The most recent published data on hospitalisation rates for Indigenous people due to transport accidents is for the period 2001-02 to 2005-06 [4]. This publication reports on data from WA, SA, NT and Qld, the only jurisdictions where there is a sufficient level of Indigenous identification. Sixty percent of the Indigenous population of Australia and 38% of the total Australian population reside in these areas.

The data show that 4,938 Indigenous people were hospitalised during this period due to land transport injuries (3,338 males and 1,600 females) of whom 35 died while in hospital (0.7%). The age-standardised rate per 100,000 population was 341.7 which was 1.4 times that of the non-Indigenous population.

Rates of hospitalisation for Indigenous people were highest among car occupants, pedestrians, and pedal cyclists. Indigenous people were 2.1 times more likely than non-Indigenous people to be injured as car occupants, 2.4 times more likely to be the occupant of a pickup truck or van, and 3.8 times more likely to be a pedestrian [4].

For those Indigenous people travelling in cars, passengers were more likely to be seriously injured than the drivers, or equally likely to be killed. By contrast, non-Indigenous drivers were more likely to be injured or killed than passengers.
Summary of road safety among Indigenous peoples

Table 1. Numbers of Indigenous and non-Indigenous deaths from transport injuries for WA, SA, NT and Qld (2001-02 to 2005-06)

<table>
<thead>
<tr>
<th>Cause of injury</th>
<th>Indigenous</th>
<th></th>
<th>Non-Indigenous</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Land transport</td>
<td>337</td>
<td>96.8</td>
<td>3215</td>
<td>91.1</td>
</tr>
<tr>
<td>Motor-vehicle crashes</td>
<td>204</td>
<td>58.6</td>
<td>2531</td>
<td>71.7</td>
</tr>
<tr>
<td>Pedestrians</td>
<td>117</td>
<td>33.6</td>
<td>408</td>
<td>11.6</td>
</tr>
<tr>
<td>Other land transport*</td>
<td>5</td>
<td>1.4</td>
<td>274</td>
<td>7.7</td>
</tr>
<tr>
<td>Unspecified</td>
<td>11</td>
<td>3.2</td>
<td>117</td>
<td>3.3</td>
</tr>
<tr>
<td>Other** transport</td>
<td>-</td>
<td>-</td>
<td>198</td>
<td>5.7</td>
</tr>
<tr>
<td>All transport</td>
<td>348</td>
<td>100</td>
<td>3530</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: [4]

* Small counts were omitted from original source so some columns may not add up
** Other transport

Table 2. Age-specific death rates* for motor-vehicle crashes and pedestrian deaths, by Indigenous status, and rate ratios,** for WA, SA, NT and Qld 2001-02 to 2005-06

<table>
<thead>
<tr>
<th>Age group</th>
<th>Motor-vehicle crashes</th>
<th>Pedestrian incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indigenous rate</td>
<td>Non-Indigenous rate</td>
</tr>
<tr>
<td>0-4</td>
<td>7.8</td>
<td>2.9</td>
</tr>
<tr>
<td>5-14</td>
<td>5.8</td>
<td>4.7</td>
</tr>
<tr>
<td>15-24</td>
<td>93.1</td>
<td>60.1</td>
</tr>
<tr>
<td>25-34</td>
<td>70.8</td>
<td>108.6</td>
</tr>
<tr>
<td>35-44</td>
<td>82.7</td>
<td>24.1</td>
</tr>
<tr>
<td>45-54</td>
<td>56.9</td>
<td>39</td>
</tr>
<tr>
<td>55-64</td>
<td>57.7</td>
<td>22.1</td>
</tr>
<tr>
<td>65+</td>
<td>37.3</td>
<td>12.9</td>
</tr>
<tr>
<td>All ages</td>
<td>25.3</td>
<td>13.4</td>
</tr>
</tbody>
</table>

Source: [4]

* Rates are per 100,000 population
** The ‘rate ratio’ is the Indigenous rate divided by the non-Indigenous rate

Factors contributing to road injury

Various reasons have been suggested for the overall differences between Indigenous and non-Indigenous people in the numbers of road injuries. For a start, higher proportions of Indigenous than non-Indigenous people live in remote or rural areas, where environmental risk factors are greater than in urban areas; over half of all fatal road crashes occur in rural or remote areas of Australia [3]. It has also been suggested that differences in lifestyle and culture in Indigenous persons may exacerbate existing risks by reducing the appropriateness of current safety education programs’ [13].

The particular travel needs of Aboriginal people include: the need to attend funerals and to be with family at critical times; the need to return to country to support those who live there and to care for the land; and the need to support family, including extended family, sometimes in far-flung areas [14]. These commitments often require long distance travel, at times of stress, to places where roads are hard on vehicles. Due to economic circumstances, transporting large numbers of people is often done using older vehicles not suited to rough roads or to carrying large numbers of people [14].

Brice [15] argued that the analysis of road injuries involving Indigenous people needs to go much deeper than the usual identification of proximate factors (for instance, seat belt use and intoxication). Brice attributed the consistently large proportion of Indigenous road injury deaths in South Australia to ‘significant social disturbance at the root of individual incidents’, with ‘road trauma among Aboriginal and Torres Strait Islander people ... as much a feature of class or social disadvantage as of culture or, for example, of popular notions of poor driving in sub-standard vehicles’ [15].
The following sections summarise a variety of factors contributing to road injury, grouped according to whether they are human, environmental or vehicle factors. A separate section summarises post-crash factors.

**Human factors**

Based on an analysis of research attempting to identify the causal factors behind the over-involvement of Indigenous people in road trauma, a report published in 2003 identified non-compliance with road laws (such as drink driving, non-wearing of seatbelts or restraints, overcrowding and illegal seating positions in vehicles, inappropriate speed, particular in rural areas) and carelessness about general road safety practices (especially by intoxicated pedestrians) as the major human factors involved [7].

A large proportion of Indigenous road crashes was characterised by alcohol involvement [7]. This applies particularly to fatal single-vehicle roll-over incidents and pedestrian fatalities.

A larger proportion of Indigenous people than non-Indigenous people dying from road injury had not used protective devices, such as helmets and seatbelts [7]. In particular, Indigenous children were more likely to be a serious casualty in a crash because of not wearing a seatbelt [16].

A study looking at rural and remote road safety in Queensland from 1998 to 2002 states that some of the known risk factors for road crashes for Indigenous Queenslanders include: alcohol use; unlicensed driving; overloading and roadworthiness of vehicles; and non-compliance with seatbelt and restraint wearing legislation [5].

Not much research has been done into the role of driving offences, but the available data suggest that Indigenous people are over-represented, in particular in unlicensed driving. In Western Australia in 1999, for example, the most frequent reason for imprisonment was driving offences, with 53% of those imprisoned identified as being Indigenous [7]. The two most common offences were drink driving and unlicensed driving. Analysis of the NSW prison population in 1999 gave similar results [17].

**Environmental factors**

Approximately 70% of Indigenous people live in non-metropolitan areas and are consequently exposed to environmental risk factors specific to rural and remote Australia [13]. These include: greater distances travelled (and consequently greater exposure to the risk of a road crash); higher speed limits; poor condition of the roads; poor availability of transport services; increased diversity in types and conditions of vehicles; and delays in retrieval and accessing medical treatment and rehabilitation [5, 14, 18]. There is also a higher risk of collision with livestock and wildlife [19]. Police enforcement of speed limits, alcohol use and seatbelt wearing is less on rural roads than in urban areas [6]. These factors can contribute to more motor-vehicle crashes and deaths. But, even when these factors are taken into account, it is likely that the risks of serious road injury are greater for Indigenous than for non-Indigenous people.

**Table 3. Land transport deaths of Indigenous people by remoteness area of residence (cases): NT, WA, SA and Qld, 2001–02**

<table>
<thead>
<tr>
<th>Area of residence</th>
<th>Male</th>
<th>Female</th>
<th>% Indigenous cases (per remoteness area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major cities</td>
<td>35</td>
<td>13</td>
<td>3%</td>
</tr>
<tr>
<td>Inner regional</td>
<td>22</td>
<td>7</td>
<td>3%</td>
</tr>
<tr>
<td>Outer regional</td>
<td>18</td>
<td>22</td>
<td>6%</td>
</tr>
<tr>
<td>Remote</td>
<td>35</td>
<td>24</td>
<td>25%</td>
</tr>
<tr>
<td>Very remote</td>
<td>114</td>
<td>43</td>
<td>64%</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>116</td>
<td>9%</td>
</tr>
</tbody>
</table>

Source: [4]

**Vehicle factors**

The contribution of vehicle factors to the incidence and severity of Indigenous road crashes is not clear, even though vehicle choices and defects appear to have a large effect on rural and remote road trauma [7]. The Rural and Remote Road Safety Study in Queensland [5] showed a higher proportion of vehicle-related fatalities and injuries in areas classified as rural and remote (particularly in the North West) than in Queensland as a whole. Vehicle related crashes are those where mechanical, external or other vehicle defects were deemed to have contributed to the crash.

The lower socio-economic status of Indigenous people, including those living in rural or remote areas, suggests the possession of older vehicles. In South Australia, Helps et al. noted evidence of poorly maintained and damaged vehicles being a common mode of transport in all communities they visited [14]. Lower socio-economic status may also cause a lower level of maintenance on vehicles, which is amplified in rural and remote areas from roads that are of poorer condition than in urban areas [7, 14].

**Post-crash risk factors**

Largely because of the greater distances, emergency responses are slower and retrieval times longer in rural and remote areas [19]. As well, there is some evidence suggesting that Indigenous people in rural areas are reluctant to use organised health care services even when these are available [7]. Factors contributing to this include cost, lack of insurance coverage, travel distance, transportation problems, difficulty in taking time off work, traditional values, reduced referrals, and a lack of knowledge about the potential...
benefits of specialised medical care. A number of historical and cultural factors influence the beliefs and perceptions Indigenous persons hold about health and injury treatment. This also has an influence on the reluctance to use organised health care services.

Prevention and management in Indigenous road safety

The development of road injury prevention projects and programs depends on a solid understanding of the various factors contributing to road injuries. Reflecting the diversity of disciplines and backgrounds involved in injury prevention, including road injury prevention, approaches investigating these factors range from the traditional epidemiological single-risk-factor approach to broad sociological methods [20].

Generally, recent approaches stress the importance of using a capacity-building process when working with Indigenous communities, and of embracing Indigenous perspectives on health and injury [7].

Initiatives that have been, or are currently being, undertaken to address Indigenous road safety issues include initiatives addressing general road safety, community development, licensing, alcohol, restraint wearing, and vehicle purchasing [10]. There is, however, a need for more thorough evaluations of programs and initiatives, which can be difficult with the limited resources available to many of the programs identified [10].

Most community-based Indigenous road safety programs have focused on alcohol abuse in order to reduce the number of alcohol-related road crashes. There is, however, not much information available on the impact on road trauma of the minimisation of alcohol use [7, 15].

Interventions designed to increase compliance with restraint use or open-load legislation have been minimal; legislation has been introduced in both the Northern Territory and Western Australia to make it illegal to ride in the back of all utilities, even those fitted with a roll-cage, but other states and territories are yet to follow suit.

In the past, the majority of Indigenous road safety programs have not been informed by local Indigenous knowledge or systematic research with Indigenous groups [7]. It is now generally accepted that ‘best practice’ examples of road safety programs for Indigenous Australians are most effective when led by a community-based road safety educator and involve group work and interactive learning [10].

Since 2000 several states have developed road safety programs and resources that are aimed at the Indigenous population, most of which have been developed in with advice from Aboriginal community members.

Examples include:

- ‘Keep our kids safe: buckle them up’ poster and brochures from Transport SA (2000);
- Corrugations to highways’ Aboriginal road safety video (2002) developed by the National Aboriginal Road Safety Video Project Team, shot in remote communities in Western Australia, South Australia and the Northern Territory;
- ‘Bring the mob home safely’ (2003) by the NSW Roads and Traffic Authority contains a range of resources targeting drink driving, seat belts, overcrowding, speeding, pedestrian and bicycle safety;
- Back of Trucks campaign (2003) by the Northern Territory Department of Planning and Infrastructure, was targeted at remote Aboriginal communities and included radio announcements in English, MurriinhPathaandDjamarrpyungu; as well as posters, bumper stickers and visits to communities.


Despite rural populations being over-represented in road transport related crashes, not many road safety policies and interventions have targeted rural and remote populations and problems [19]. For the most part, this is due to the widespread distribution of the rural population, making some of the interventions used in urban areas less relevant. Furthermore, the cost of conducting research and implementing strategies in rural areas is significantly higher [19].

In 2003 a program of research commenced to investigate factors contributing to serious road rural crashes in northern Queensland. The Rural and Remote Road Safety Research Program was a collaborative program between the Centre for Accident Research and Road Safety - Queensland (CARRS-Q) and the Rural Health Research Unit (RHRU) at James Cook University.

Recommendations from the program to improve rural and remote road safety include human factors (including specific recommendations for Indigenous people), environmental factors (for example speed limits and emergency services), improved data collection and educational programs [21].

Safe system principles

Human, environmental, and vehicle factors (discussed above) all have an impact on road safety, and as such it seems logical that ‘approaches to improving road safety should not exist in isolation’ [3] but should incorporate all the different factors.
The Safe System principles are a holistic approach to improving the safety of the road system, by looking beyond specific individual interventions to the overall management of the system. This requires cooperation between diverse groups such as transport agencies, urban planners, environmental agencies, industry, and regional development bodies [3].

The Safe System approach encourages a better understanding of the interaction between the key elements of the road system: road users, vehicles, roads and roadsides, and travel speeds. Exploring these interactions maximises the potential advantage of initiatives in reducing deaths and injuries from linking different road safety activities [22]. Road users are still ultimately responsible for their own safety under the Safe Systems approach, for complying with the road rules will ensure that they are acting within the limits of the road design. Ensuring that the community is made aware of the risks associated with road travel means they are able to make informed decisions about their own behaviour.

The Safe System principles continue to underpin Australia's approach to road safety improvement, however, there is still much to be done to embed the Safe System framework in practice [3].

**Policies and strategies**

**National Road Safety Strategy 2001-2010**

In November 2000, Australia adopted the National Road Safety Strategy 2001-2010, which provides a framework for coordinating and complementing the road safety initiatives of the various levels of government - Federal, State/Territory and local governments - and of others capable of influencing road safety outcomes [6]. The aim of the strategy was to reduce the annual number of road deaths by 40%, from 9.3 per 100,000 population in 1999 to no more than 5.6 in 2010.

The Australian Transport Safety Bureau develops Road Safety Action Plans on a biennial basis - these set out specific measures available to achieve the objectives of the Strategy [6]. The action plans are reviewed at the end of each two-year period. The National Road Safety Action Plan: 2009 and 2010 [3] is the final two-year plan presented under the 2001-2010 strategy. It identifies the main issues expected to affect road trauma levels in the foreseeable future, sets out priority areas for action in 2009 and 2010, and highlights measures which will lay the foundation for longer term gains in road safety [3]. It discusses the possibility that the 2010 target will not be achieved due to the lower than required average rate of reduction in national road deaths.

Road safety strategy and policy measures are mainly driven by the states, territories and local government, which conduct their own road safety programs. The role of the Australian Government and its agencies includes: funding major road programs and the treatment of black spots; regulating new vehicle standards; research; compilation and analysis of national statistics; and facilitating the sharing of ideas and information among stakeholders.

The National Road Safety Strategy 2001-2010 recognises road safety for Indigenous people as a particular issue of concern.

**Indigenous road safety forum**

The Federal Department of Infrastructure, Transport, Regional Development and Local Government, with assistance from the states and territories, chairs a biennial Indigenous road safety forum aimed at enhancing and building on existing strategies and initiatives relevant to Indigenous road safety. Delegates attending this forum comprise key stakeholders in Indigenous road safety from federal, state and territory transport, health, safety, corrective services and sport and cultural affairs agencies.

The 4th Indigenous Road Safety Forum was held in Cairns, Queensland, in October 2008, chaired by the Department of Infrastructure, Transport, Regional Development and Local Government and organised in conjunction with Queensland Transport. The forum aimed to enhance and build on existing strategies and initiatives relevant to Indigenous road safety and to provide a resource-sharing and networking opportunity to help empower communities to implement practical solutions to Indigenous road safety problems.

The forum covered a range of topics including: progress on addressing Indigenous road safety; information sharing related to Indigenous road safety through the Australian Indigenous HealthInfoNet; improvement of the collection of statistical data; communicating with communities; Indigenous road safety in rural areas; and licensing.

The forum confirmed the messages from previous forums that, although national statistical data on Indigenous road safety is seriously incomplete, the available data indicate that the Indigenous road fatality rate is much higher than the non-Indigenous rate.

Facilitated workshops covered the subjects of: statistical data; registration and licensing; drink driving and drink walking; incorporating Indigenous road safety into the national road safety strategy beyond 2010; and Aboriginal engagement in a community setting. The outcomes from these workshops are to be considered by the Indigenous Road Safety Working Group. The same Working Group will monitor progress on recommendations from the forum through twice-yearly teleconferences and at the next forum.

At this early stage there have been no published recommendations arising from the forum. However, a progress report on the
Concluding comments

To minimise the impact of road injuries in the Indigenous community, effective prevention and management programs are essential. To be successful, these programs need strong leadership and excellent coordination and collaboration between different government sectors and between different levels of government. The transportation sector (the sector with direct responsibility for road safety) will need to work closely with (at least) the police, local government, and the health sector [20].

The development and implementation of effective road safety programs will require a level of intersectoral and intergovernmental cooperation and collaboration not commonly seen in Australia. Of course, even the best intersectoral and intergovernmental cooperation will not be effective unless the Indigenous community plays a key role in the development and implementation of strategies and initiatives addressing Indigenous road injury. A model for this role, vital at all levels-national, regional, and local - is provided in the Agreement on Aboriginal and Torres Strait Islander Health, which facilitates joint planning between governments and Indigenous organisations in the area of Indigenous health. Cooperation between governments, sectors, and Indigenous communities will need to be supported by adequate funding for comprehensive road safety strategies and improvements to the road safety workforce. These requirements are, of course, common to many areas of Indigenous health and wellbeing [20].
References


Summary of road safety among Indigenous peoples

http://www.healthinfonet.ecu.edu.au/road_review
The Australian Indigenous HealthInfoNet is an innovative Internet resource that contributes to 'closing the gap' in health between Indigenous and other Australians by informing practice and policy in Indigenous health.

Two concepts underpin the HealthInfoNet's work. The first is evidence-informed decision-making, whereby practitioners and policy-makers have access to the best available research and other information. This concept is linked with that of translational research (TR), which involves making research and other information available in a form that has immediate, practical utility. Implementation of these two concepts involves synthesis, exchange and ethical application of knowledge through ongoing interaction with key stakeholders.

The HealthInfoNet's work in TR at a population-health level, in which it is at the forefront internationally, addresses the knowledge needs of a wide range of potential users, including policy-makers, health service providers, program managers, clinicians, Indigenous health workers, and other health professionals. The HealthInfoNet also provides easy-to-read and summarised material for students and the general community.

The HealthInfoNet encourages and supports information-sharing among practitioners, policy-makers and others working to improve Indigenous health – its free on line yarning places enable people across the country to share information, knowledge and experience. The HealthInfoNet is funded mainly by the Australian Department of Health and Ageing. Its award-winning web resource (www.healthinfonet.ecu.edu.au) is free and available to everyone.