

# Pedestrian safety



- Pedestrians make up approximately 14% of the annual Australian road toll.<sup>1</sup>
- In Queensland in 2011, almost half of the fatally injured pedestrians were alcohol impaired at the time of the crash – 2 out of 3 were male and 1 out of 3 was aged 30-39 years.<sup>2</sup>
- Young pedestrians are prone to distraction from smartphones, with 1 in 3 18-30 year olds reporting texting while crossing the road in Queensland.<sup>3</sup>

## State of the Road A Fact Sheet of the Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

### THE FACTS

#### *Who walks and why?*

- We are all pedestrians. Walking is a common mode of transport world-wide.
- Virtually every trip begins and ends with walking. Walking may comprise the journey (be it a long hike or short stroll to a shop), or a person may walk for one or more portions of a trip (e.g. walking to and from bus stops, with a bus trip in between).
- Walking is a crucial mode of transport in low and middle income countries, whereas it is more likely to be seen as a recreational activity in high income countries, where the reliance on motor vehicles is higher.<sup>4</sup>
- Walking has well established health and environmental benefits, and many countries are implementing policies to encourage walking as a transport mode.<sup>4</sup>

#### *Who is killed and injured as pedestrians?*

##### **A global view**

- Pedestrians are a vulnerable road user group, comprising 22% of global road traffic deaths.<sup>4</sup>
- Pedestrians account for a much greater proportion of road traffic injury deaths in low- and middle-income countries,<sup>4</sup> comprising 55.3% and 39.2% respectively of global pedestrian fatalities per year.<sup>5</sup>
- Though pedestrians form a mixed group in age, gender and socioeconomic status, generally global statistics show that:<sup>4</sup>
  - Socioeconomic status is a significant determinant of pedestrian injury. In general, people from poorer communities tend to be at a higher risk.
  - Male pedestrians, both children and adults, are over-represented in pedestrian collisions.

- Pedestrian crashes affect people from different age groups, though some age groups may be represented more than others in certain settings. For example:<sup>4</sup> in the United States in 2009, the fatality rate for pedestrians older than 75 years was higher than that of any other age group, however in Hyderabad, India, 61% of pedestrians involved in road traffic crashes are aged 21-40 years.

##### **An Australian view**

In 2014:

- 152 pedestrians were killed (13% of the total road toll), a decrease of 61.8% from the 398 pedestrian fatalities of 1995. This reduction primarily occurred between 1995 and 2004, and since 2005 pedestrian fatalities as a percentage of all road fatalities have remained relatively stable.<sup>6</sup>
- In every year between 2008 and 2014, the pedestrian fatality rate for males was more than twice the rate for females.<sup>6</sup>
- Pedestrians aged 75 and older had the highest pedestrian fatality rate of any age group (2.31 per 100,000 people).
- Pedestrians aged 0-16 years had the lowest rate (0.34 per 100,000 people).<sup>6</sup>
- In Queensland, there were 19 fatalities (8.5% of the state road toll). This represents an average decrease of 8.1% per annum since 2005.<sup>7</sup>

**When crossing the street,  
stop, look and listen.  
Never assume a driver  
has seen you.**

#### *Why are pedestrians at risk?*

Due to the dramatic growth in the number of motor vehicles and the frequency of their use – as well as the general neglect of pedestrian needs in roadway design and land-use planning – pedestrians are increasingly susceptible to road traffic injury.<sup>4</sup> This is further heightened in settings where traffic laws are inadequately enforced.<sup>4</sup> Key risk factors for pedestrian traffic injury are:<sup>4</sup>

##### **Speed**

- Increased vehicle speeds are associated with increased injury severity and death for pedestrians and cyclists, influencing crash risk and consequences in three ways:<sup>4</sup>
  1. Stopping distance  
The higher the speed of a vehicle, the shorter the time a driver has to stop and avoid a crash, increasing the likelihood of impact. Taking into account the time needed for the driver to react to an emergency and apply the brakes, a car travelling at 50 km/h will typically require 36 metres to stop, while a car travelling at 40 km/h will stop in 27 metres.<sup>4</sup>
  2. Impact force and injury severity  
The probability that a pedestrian will be fatally injured if hit by a motor vehicle increases markedly with impact speed.<sup>4</sup> For a car/pedestrian collision, the chance of surviving a crash decreases rapidly above an impact speed of 30km/h depending on the collision.<sup>8</sup>
  3. Spatial judgement  
If a car is travelling unusually fast, a pedestrian may misjudge the speed of the approaching vehicle and mistakenly assume they have time to cross the road.

- A 50 km/h urban default speed limit was introduced in Australia from 1999. This was linked to a 20% reduction in casualty crashes, with greater reductions for crashes involving serious injuries and fatalities; some evaluation studies identified particular benefits for pedestrians and other vulnerable groups.<sup>8</sup>
- Safety outcomes in higher-risk pedestrian and school areas were improved through the introduction of 40 km/h and lower limits. For example, School Speed Zones adopted in Victoria in 2003 resulted in a 23% reduction in casualty crashes and a 24% reduction in all pedestrian and bicyclist crashes outside schools.<sup>8</sup>

#### Impairment from alcohol

- Like motor vehicle drivers, a pedestrian's risk of crash involvement increases with increasing blood alcohol content (BAC) due to the resulting impairment in judgement, reaction time, vigilance and visual acuity.<sup>4</sup>
- 'Drink walking' is a growing problem. One study showed that almost half the pedestrians killed in Australia (45%) were walking while intoxicated<sup>9</sup>, and approximately 1 in 3 had a BAC exceeding 0.08 to 0.1 g/dl.<sup>4,10</sup> More recent data from Queensland indicates that this situation has not changed.<sup>2</sup>
- Though there is no legal BAC limit for pedestrians in Australia, research tends to define 'drink walking' as occurring whenever a person walks in public with a BAC of 0.05mg/ml or above.<sup>11</sup>
- Based on Queensland statistics of fatally injured 'drink walkers', the following pedestrian groups are at heightened risk of being killed or seriously injured whilst drink walking:
  - Males (in 2011, 66.7% were male<sup>2</sup>);
  - 30-39 year olds (in 2011, 33.3% were aged in their thirties<sup>2</sup>);
  - Younger persons (in 2011, 26.7% were aged 17-20 years<sup>2</sup>). Due to their heightened risk of binge drinking engagement in drink walking<sup>11</sup>; and
  - Indigenous pedestrians. Pedestrian casualties show a disproportionate number of Indigenous people, and Indigenous pedestrians that are struck by a vehicle often have high BAC's. For the 2001/02 to 2005/06 Queensland data<sup>12</sup> period, of the 175 Indigenous people killed or hospitalised as a pedestrian, 53.7% were under the influence of alcohol (compared to 20.2% of the non-Indigenous people killed or hospitalised as a pedestrian).
- Pedestrian crashes involving alcohol are higher at night.<sup>4</sup>

#### Distraction by technology

- Due to the widespread use of smartphones that enable communication via social media and use of the internet, distraction by technology is an emerging risk factor for pedestrians, especially young people.

- Recent research in Queensland showed that 32% of 18-30 year olds reported texting and 27% used the internet at high frequency levels while crossing the road.<sup>3</sup>

#### Lack of pedestrian facilities in roadway design and land-use planning

- Infrastructure and traffic control mechanisms that separate pedestrians from motor vehicles are important mechanisms to ensure pedestrian safety.

#### Road design

- Roadway design has generally catered for the needs of motorized traffic, neglecting the needs of pedestrians.<sup>4</sup> Roadway designs in which facilities such as footpaths and signalized crossings are missing, inadequate or in poor condition create risk for pedestrians. Wider lanes and roads, with more traffic lanes and higher design speed, tend to increase traffic speed and are more dangerous to cross.
- Intersections (both signalised and unsignalised) are associated with high rates of pedestrian collisions and injuries because they include a large number of pedestrian and vehicle conflict points. The length of time allowed for pedestrians to complete the crossing is also a factor as vehicles sometimes start turning while pedestrians are still crossing.
- Vehicle-pedestrian collisions are 1.5 to 2 times more likely to occur on roadways without footpaths.<sup>4</sup> Footpaths separate pedestrians from vehicles and bicycles, and provide space for different types of pedestrians to walk, run, play and talk.
- Pedestrian crossings are commonly installed at signalized intersections and high-volume pedestrian locations. Evidence indicates that marked pedestrian crossings should not be implemented without additional safety measures.<sup>4</sup>

#### Broader land use<sup>4</sup>

- The frequency of pedestrian crashes in a given area is strongly influenced by the density of the resident population and the total population exposed to risk.
- Beyond design elements of the roadway itself, the design and use of the broader land for commercial, industrial, recreational, transport, conservation, agricultural, or a mix of purposes, can contribute to the occurrence of pedestrian injuries and fatalities.

#### Inadequate visibility

Inadequate pedestrian visibility arises from:

- Inadequate, or lack of, roadway lighting;
- Vehicles and bicycles without lights;
- Child pedestrians being obscured by parked cars or other objects due to their smaller stature;
- Pedestrians not wearing reflective accessories or brightly coloured clothes, especially at night, dawn or dusk.

Pedestrians tend to judge themselves as being more visible than they actually are at night;<sup>13</sup> and

- Pedestrians sharing road space with fast-moving vehicles.

## Avoid talking or texting on a mobile phone, or wearing headphones whilst walking.

#### How can pedestrian safety be improved?

Successful interventions to protect pedestrians and promote safe walking require an understanding of the nature of risk factors for pedestrian crashes, as well as the collection and analysis of local data.

#### Engineering and behaviour<sup>4</sup>

Several engineering and behavioural interventions have proven effective in improving pedestrian safety including:

- Through reduced exposure to vehicular traffic: provision of footpaths; installation of pedestrian signals, refuge islands and raised medians; vehicular diversion/restriction from pedestrian areas; installation of overpasses/underpasses.
- Through reduced vehicle speeds: speed limit reductions, speed management measures at intersections and high volume pedestrian areas e.g. school zones.
- By improving sight distance and/or visibility: crossing and lighting enhancements.
- By improving pedestrian and motorist safety awareness and behaviour: provision of education and training; enforcement of traffic laws.
- By improving care for injured pedestrians: organisation of pre-hospital trauma care systems and early rehabilitation services.

#### Impairment from alcohol

- In the attempt to reduce potential harm to intoxicated pedestrians, improvements have been made to roadsides around licensed premises (i.e. fencing and signalized crossings) and legislative changes for the safe service of alcohol.<sup>11</sup> However, individuals are still choosing to drink walk<sup>11</sup> and continued research is needed to understand the reasons for this and to develop effective interventions.

#### Distraction by technology

- With the increasing popularity and ownership of smart phones, more research is needed to understand why people walk and cross the road while using their mobile phone. Pedestrians aged 18-30 years should be targeted in interventions to address distracted walking.<sup>3</sup>



## Vulnerable road users

- Pedestrians are a group of diverse characteristics, capabilities and needs. The specific needs of children, elderly people and people with disabilities need to be considered and prioritized when designing pedestrian safety measures.

## Vehicle design

- There is an increasing effort to include vehicle design elements that reduce the likelihood of pedestrian collision and/or reduce the severity of pedestrian injury in the event of one. These include:<sup>4</sup>
  - 'Brake Assist' - now fitted as standard to most new cars, Brake Assist activates when a sensor detects an emergency situation, indicated by unusually fast or hard brake pedal actuation. A French evaluation found that cars equipped with Brake Assist had a 10% lower involvement in pedestrian fatalities than cars without Brake Assist.<sup>4</sup>
  - Autonomous Emergency Braking (AEB) - a more recent development in pedestrian protective vehicle design, cars with AEB have sensors that scan the road and roadside ahead of the car. If the sensors detect a risk of collision with a pedestrian (or vehicle) in front of the car, the driver is warned and/or the brakes are automatically applied.
  - Test procedures which assess the extent to which a vehicle protects a pedestrian in the event of a collision are now well established in both regulation and consumer advisory programmes.

## TIPS FOR STAYING SAFE

If you choose to travel on-foot, consider the following measures to reduce your risk of involvement in a pedestrian crash:<sup>14</sup>

- **Avoid walking in low light/night.**
- **Dress to be seen.** Wear high visibility light and bright coloured clothing and add reflective materials on backpacks, clothing and shoes. Fluorescent colours are ideal in the daytime, but not at night-time.<sup>15</sup>
- **Carry a torch** so you can still see the ground in headlight glare.
- **Never assume a driver has seen you.**
- **Maintain vigilance** in monitoring your surroundings and proximity to traffic.
- **Stop, look and listen** before crossing the street. Look to the right, left and right again, even on one-way streets. Always look right last because that is the direction closest traffic will be coming from.
- **Be responsible for yourself.** Do not follow others lead in crossing without first independently checking it is safe.
- Wherever possible, **cross roads at well-lit, marked crossings (pedestrian crossings, traffic signals or pedestrian refuges).** The location of these has been carefully chosen to provide the safest path for crossing in the area.



- **Take extra care when crossing at a pedestrian crossing.** Do not assume a driver will see you or the crossing. **Do not enter the roadway until you have made eye contact** with the driver and can see the vehicle is slowing.
- If there is no crossing within 20 metres, **cross by the shortest and safest route** which allows you room to wait safely
- **Be very cautious about traffic near crests of hills and curves.**
- **Choose routes** with well-populated and lit streets, lower traffic volumes, well-maintained footpaths or road shoulders, and pedestrian/bike paths).
- **Walk on footpaths and nature strips** where possible, however if there is none, **walk so you are facing the direction of the oncoming traffic**<sup>2</sup>.
- **Keep left on paths.**
- **At railway level crossings, wait for the boom to rise and bells to stop** before you cross – a second train may be approaching.
- **Accompany children aged less than 10 years on walking journeys.** Younger children have not yet developed the road skills or perception to judge vehicle speeds or maintain concentration. Teach children safe pedestrian and road safety skills and role model safe behaviours yourself.
- **Be predictable.** A sudden change of direction or activity may make it difficult for other road users to avoid a collision.
- If you are planning to consume alcohol, make safe travel arrangements home with a friend or taxi service. **Be aware of the dangers of drink walking.**
- **Avoid pathways obstructed** by parked cars, poles or gardens which may limit pedestrian visibility.
- Be especially careful in car parks or around parked cars. Watch for reversing lights and **listen for engine noise to alert you of moving traffic.**
- **Avoid talking or texting on a mobile phone, or wearing headphones whilst walking.** These activities reduce your awareness of your surroundings and concentration.

- If you require the use of a mobility aid (eg. wheelchair, mobility scooter or walker), choose well-maintained, wide foot paths with kerb ramps and visibility to the roadway and driveways. If using a motorised wheelchair/scooter, attach a flag to increase your visibility.
- **Learn and obey the road rules for pedestrians.**<sup>14</sup>

## CARRS-Q'S WORK IN THE AREA

- Distraction and attitudes towards safe pedestrian behaviour.
- Personality factors affecting pedestrian crossing behaviours.
- Drink-walking: An examination of the related behaviour and attitudes of young people in Queensland; and the factors which influence drink walking intentions.
- Understanding pedestrian behaviour on railway crossings.
- Older pedestrians: An investigation of their road crossing strategies; intended and actual avoidance of road use situations by older drivers and pedestrians, by gender and age; and improving the safety of older drivers, vehicle passengers and pedestrians, especially women, as the Australian population ages.
- Optimism about safety among pedestrians and cyclists in relation to road use in general and under low light conditions.
- Trends in cycling patterns and interactions with pedestrians in the Brisbane city centre; and interactions between cyclists and pedestrians on footpaths and off-road paths - an examination of the predictors of footpath riding by adults in Queensland.
- Acoustic hazard detection for pedestrians with obscured hearing.
- Parental beliefs about supervising children when crossing roads and cycling.
- Visual assessment of pedestrian crashes.
- An examination of driver, cyclist, motorcyclist and pedestrian situation awareness at intersections.
- The incidence and relative risk of illegal pedestrian crossings at signalised

intersections; and factors affecting pedestrian crossing behaviours at signalized crosswalks in urban areas in Beijing and Singapore.

- Why are pedestrian crashes so different in developing countries? An Ethiopian review.
- Low speed vehicle run-overs of young children: how to address them and the development of intervention guidelines for work-related drivers.
- Integrating policy approaches for vulnerable road users.
- Getting Queenslander's walking safely: literature review of national and international research, policy, and evaluation relating to the benefits of increased pedestrianization and improved road safety.
- Safe travel for school communities trial and evaluation.

## FUTURE DIRECTIONS

### Globally

- The literature on pedestrian crash risk in developing countries is at an early stage as the implementation of road safety interventions has only recently begun and rapid motorisation is taking place. Moreover, the focus of road safety interventions has generally been restricted to improving the safety of motorists rather than pedestrians. This neglect has stimulated a call by the World Health Organization (WHO) for a global focus

on pedestrians and the 2013 release of *Pedestrian safety: A road safety manual for decision-makers and practitioners*.<sup>4</sup> Future global directions may include:<sup>4</sup>

- Improved and consistent data collection relating to pedestrian injury.
- Education, outreach and training - safe road-user behaviour depends not only on knowledge and skills but also on community support, perception of vulnerability and risk, social norms and models, engineering measures and law enforcement;
- Development of effective interventions such as reducing vehicle speeds, separating pedestrians from other traffic, increasing pedestrian visibility, changing pedestrian and motorist behaviour through public education and law enforcement, improving vehicle design and improving care for the injured;
- Greater saturation of effective road design measures, pedestrian facilities and land-use strategies; and
- Prioritisation of the needs of vulnerable pedestrian groups in designing and implementing pedestrian safety measures.

**Dress to be seen in light, bright clothing and add reflective materials to backpacks and clothing if walking in low light.**

## In Australia<sup>4</sup>

- Much of Australia's past road safety effort has focused on countering illegal behaviours. While the benefits of this have been clear, it is now understood that to achieve substantially greater gains in the future, much greater emphasis needs to be placed on the inherent safety of the road transport system.
- The National Road Safety Strategy 2010-2020<sup>8</sup> based on the Safe Systems approach, recognises that a substantial benefit to pedestrian safety will be achieved through a strong focus on promoting Safe Roads and Safe Speeds, followed by a moderate benefit through the promotion of Safe Vehicles. Pedestrian safety is a major challenge for Safe System principles, and the focus on avoiding injury for vulnerable road users amounts to a focus on avoiding crashes and thus exposure to traffic above low speeds.<sup>16</sup>
- Future solutions for improving pedestrian safety include focused research, policy changes, reconsideration of benefits versus cost ratio factors, speed management and engineering of roads and roadsides.
- A combined approach that includes the 'three Es' (engineering, enforcement and education measures) is needed in order to comprehensively address the range of risks to pedestrians in different settings.<sup>16</sup>
- Engineers, law enforcement, designers, planners, educators, and citizens should all play a role in identifying and implementing effective countermeasures for improving pedestrian safety in the years ahead.

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STATE OF THE ROAD is CARRS-Q's series of Fact Sheets on a range of road safety and injury prevention issues. They are provided as a community service and feature information drawn from CARRS-Q's research and external sources. See the reference list for content authors.

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