



Vehicles and Vulnerable Groups

18 are white cars safest?

Why would vehicle colour be expected to affect safety?

Do red cars have more crashes? Are white or yellow cars more safe? What about the night-time visibility of black cars?

Vehicle colours are often a topic of conversation. It is a widely held belief that the higher visibility of vehicles of light and bright colours makes them less likely to be involved in road crashes. But what does the research find?

Studies across various academic disciplines suggest that vehicles of certain colours are better perceived by motorists than vehicles of other colours. This phenomenon has two components:

- *Physical conspicuity.* Light and bright colours such as yellows, whites and fluorescent colours tend to stand out. Some colours, such as shades

of red, are subject to poor peripheral detection by people.

- *Cognitive conspicuity.* Certain colours tend to make a vehicle's shape more immediately obvious. Some colours, such as reds, are known to cause a driver to have sharper attention and increased heart rate in contrast to relaxing colours such as blue.

*Any customer can have a car painted
any colour that he wants
so long as it is black.*

The relationship between vehicle colour and road safety is not, however, straightforward. The time of day, weather conditions (bright sunshine, rain, fog) and landscape (trees, desert, concrete) can all have a marked effect on the conspicuity of a given colour. The high conspicuity of whites under moderate lighting deteriorates, for example, in bright sunlight or fog. One would expect the safest colours to be those having the best combination of physical and cognitive conspicuity over a wide range of commonly-encountered weather conditions, landscapes and lighting.

Lime yellow has become the mandated colour for fire and emergency vehicles in many jurisdictions because of its high visibility over a range of environmental conditions.

Vehicle conspicuity is likely to assume greater importance as Australia's motoring population becomes progressively older and more motorists face the challenges of reduced visual acuity and reduced colour contrast sensitivity.

ATSB research

The ATSB has undertaken a preliminary study of Australian road crash data to determine whether there is any basis for vehicle conspicuity as a factor in crash involvement. The colour profile of passenger vehicles involved in fatal multiple-vehicle and pedestrian road crashes, for which vehicle conspicuity might be expected to play a part, was compared with the colour profile of the overall registered passenger vehicle fleet.

Ideally, such a comparison should include data on non-fatal road crashes, as vehicle conspicuity effects would be expected to be more prominent in these crashes because of greater involvement of factors other than high-risk road use. The analysis was, however, restricted to fatal crashes as national information on the colour of crashed vehicles is available to the ATSB only for fatal crashes.

In this preliminary study, no controls were applied for potential confounding effects such as the average time spent on the road each week by vehicles of a given colour, vehicle age, driver

demographics and the environmental conditions at the time of the crash. The study was limited to four jurisdictions: NSW, Victoria, Western Australia and the Northern Territory.

The results are given in table 8. They show a variation in fatal crash involvement rates with vehicle colour that cannot be readily aligned with everyday notions about colour conspicuity, in particular:

- a significantly elevated rate for yellow vehicles
- a slightly elevated rate for white vehicles
- a slightly low rate for black vehicles, and
- significantly low rates for grey and silver vehicles.

For comparison, crash involvement rates were calculated in the same manner for vehicles involved in fatal single-vehicle crashes. The results corresponded closely with those shown for multiple-vehicle and pedestrian crashes.

Table 8:
Involvement of passenger vehicles in fatal multiple-vehicle and pedestrian crashes in Australia by vehicle colour

<i>Vehicle colour</i>	<i>Number of registered passenger vehicles^(a)</i>	<i>Number of passenger vehicles involved in crashes^(b)</i>	<i>Crash involvement rate^(c)</i>
Brown/bronze	146 687	68	46.4 (<<0.001)
Yellow, gold	330 469	84	25.4 (<0.020)
Maroon	156 338	37	23.7
Other colours	73 243	17	23.2
White	1 836 323	380	20.7
Blue	1 098 232	224	20.4
Green	677 913	134	19.8
Beige/fawn/cream	218 049	41	18.8
Black	159 702	29	18.2
Red	959 039	168	17.5
Silver	807 939	109	13.5 (<<0.001)
Grey	244 129	33	13.5 (<0.050)
Total	6 708 063	1 324	19.7

(a) Number of passenger vehicles registered in New South Wales, Victoria, Western Australia and the Northern Territory at October 2001. *Source:* National Exchange of Vehicle and Driver Information System (NEVDIS).

(b) Number of passenger vehicles registered in New South Wales, Victoria, Western Australia and the Northern Territory that were involved in fatal multiple-vehicle and pedestrian road crashes between January 1998 and June 2000. *Source:* ATSB Fatal Road Crash Database.

(c) Number of vehicles involved in fatal road crashes between January 1998 and June 2000 per 100 000 registered passenger vehicles of that colour in October 2001.

The numbers shown in parentheses for brown, yellow, silver and grey vehicles indicate the probability (on a scale of 0 to 1) of obtaining such involvement rates solely by chance.

What conclusions can be drawn from the research?

A 2002 study of Spanish road crash data found that light coloured vehicles (white and yellow) had slightly less involvement in daylight road crashes than vehicles of other colours, particularly in poor weather. A 2003 New Zealand study found that dark colours (brown, black and green) were slightly more likely than white vehicles to be involved in serious injury crashes, but silver cars were significantly less likely than white vehicles to be involved in such crashes.

The New Zealand Land Transport Safety Authority (LTSA) reports that a study of 31 000 crashes in Sweden found that black cars were involved in 22.5 per cent of crashes, though black cars comprised only 4.4 per cent of the vehicle population. This finding suggests that black cars are five times more likely to crash relative to cars of other colours. According to this study, the safest colour was pink.

The LTSA also reports the results of a study in the US involving postal vehicles and a study by Daimler-Benz. US postal vehicles painted red, white and blue were involved in 27 per cent less crashes than postal vehicles painted drab olive. According to Daimler-Benz, in their study white was the easiest colour to be seen. White (86 per cent), light ivory (71 per cent), aqua blue (71 per cent) and yellow (70 per cent) were at the top end of their visibility ratings, while black, dark red and dark blue were at the bottom end, with 4 per cent each.

The ATSB's analysis of fatal multiple-vehicle and pedestrian crashes in Australia showed a variation in fatal crash involvement rates with vehicle colour that could not be readily aligned with everyday notions about colour conspicuity. Similar results were obtained in an analysis of fatal single-vehicle crashes, even though vehicle conspicuity is not an issue there. This correspondence of results suggests

the dominance in both groups of crashes of factors associated with vehicle colour other than conspicuity. The study did not control for such factors.

These factors might include the average age of vehicles of a given colour and the age, gender and lifestyle of the drivers of such vehicles. The elevated crash involvement rates of yellow vehicles and brown vehicles may, for example, reflect the fact that yellow and brown are currently unfashionable colours more associated with older vehicles and, in consequence, more associated with younger drivers. Similarly, the low crash involvement rate of black vehicles may reflect the inclusion within this group of many prestige vehicles having advanced safety features.

Vehicles of some colours may simply have greater risk exposure through more time spent on the road. The slightly elevated crash involvement rate

for white vehicles may, for example, reflect the inclusion within this group of many hire cars and fleet vehicles. Research suggests that fleet vehicles in Australia travel, on average, about three times the distance travelled by the average private motorist. White, the colour of more than one in four passenger vehicles in Australia, tends to be particularly favoured by fleet owners because of relatively low repair costs.

Significantly low crash involvement rates were observed for silver coloured vehicles in both the analysis of multiple-vehicle and pedestrian crashes and the analysis of single-vehicle crashes. This matches the finding in the 2003 New Zealand

study, mentioned earlier, of silver cars being significantly less likely to be involved in serious injury crashes than white cars, after controlling for major confounding factors such as the colour spread of cars on the road, the prevailing weather conditions, the vehicle's speed and insurance status, and the driver's age, ethnicity, alcohol consumption, seat belt use, average driving time each week and licence status.

The authors of that study speculated that their surprising result might be due to a combination of light colour and high reflectivity. The Porsche in which the young American actor James Dean died was silver in colour, and there is some conjecture

that its visibility was a contributory factor to the crash (see facing page). Further research is clearly warranted in view of persistent anecdotal comment about the poor conspicuity of silver-coloured vehicles over a wide range of road and weather conditions.

Overall, given the mixed nature of available research findings on the relationship of vehicle colour and crash involvement, it is difficult to draw firm conclusions.

The life you save may be your own

On 17 September, 1955, James Dean made a 30-second commercial for the National Highway Committee to promote driving safely. He ad-libbed the last line: 'Take it easy driving. The life you might save might be mine.'

On 30 September, 1955, at 5.45pm, Dean was driving his sleek, low, silver Porsche Spyder 550 toward the setting sun on the road to Chalame, California. He collided with another car at the intersection of routes 466 and 41.

Dean's Porsche had right of way. The other car was making a left turn across the intersection. According to Dean's passenger, Rolf Wütherich, Dean's last words were: 'That guy has got to see us. He's got to stop.'

The reported speed of the Spyder at the time of the crash was 80–85 mph (129–137 kilometres per hour). Dean had been booked for speeding earlier in the afternoon.

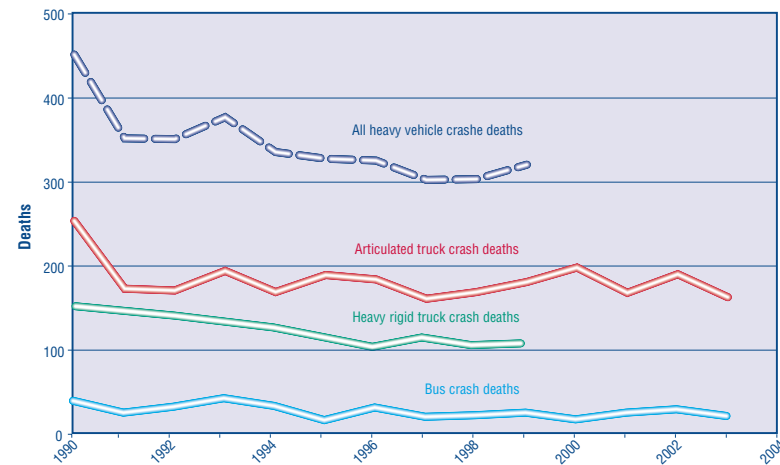
In 1968, Thomas Schelling, an American professor of economics published a paper on people's willingness to pay for changes in risk to their lives. The sobering title of the paper was: *The life you save may be your own*.

19 heavy vehicles

Total domestic freight in Australia has increased significantly and will continue to do so. Some estimates put growth at around 70 per cent over the past 20 years. It is estimated that trucks deliver up to 72 per cent of the total freight task in Australia.

Growth in the heavy vehicle fleet is often seen as a precursor of increased heavy vehicle crashes, fatalities and hospitalisations. However, growth in the heavy vehicle sector does not necessarily mean an increase in the road toll. In fact, over the past decade, deaths have remained relatively stable despite significant increases in fleet size, distance travelled and freight carried.

FIGURE 37:
Road crash deaths involving heavy vehicles, 1990 to 2003



Note: Heavy rigid truck data are currently available only to 1999, while articulated truck and bus data are up-to-date. Heavy rigid trucks are defined as having a gross vehicle mass greater than 4.6 tonnes. Buses included are those with 12 seats or more that are used for hire and reward purposes.

Source: Australian Transport Safety Bureau

Keep on truckin'

CATCH-PHRASE USED BY AMERICAN CARTOONIST ROBERT CRUMB

Recent negotiations by the ATSB with state and territory road transport authorities should result in up-to-date rigid truck crash data being available in the near future.

The majority of deaths in road crashes involving heavy trucks or buses are either pedestrians or occupants of other vehicles, rather than the occupants of trucks.

Deaths involving articulated trucks

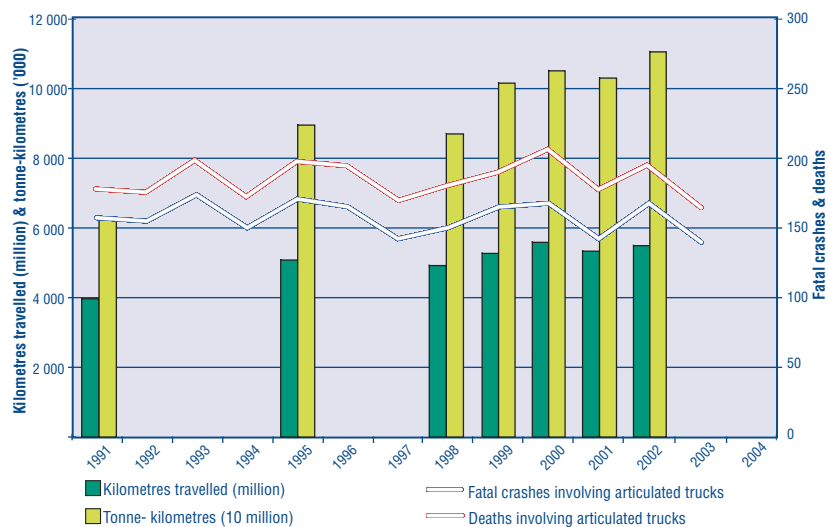
Data relating to fatal crashes and deaths involving articulated trucks are up-to-date. However, 2002 is the most recent year for which Australian Bureau of Statistics data on distance travelled, tonne-kilometres and truck numbers are available.



Fatal crashes and deaths involving articulated trucks have remained relatively stable since 1991 (figure 37), with the numbers for 2003 being the lowest recorded to date. However, over the same period, articulated truck numbers increased by 18 per cent, kilometres travelled increased by 37 per cent, and tonne-kilometres increased by 70 per cent (figure 38). These figures clearly reflect improvements in articulated truck safety since the early 1990s.

The total freight task is expected to almost double in the next 20 years.

FIGURE 38:
Fatal crashes and deaths involving articulated trucks, articulated truck kilometres travelled, and tonne-kilometres 1991 to 2003



Note: Prior to 1998, Australian Bureau of Statistics data on articulated truck numbers, kilometres travelled and tonne-kilometres were not available for consecutive years.

Source: Australian Transport Safety Bureau and Australian Bureau of Statistics

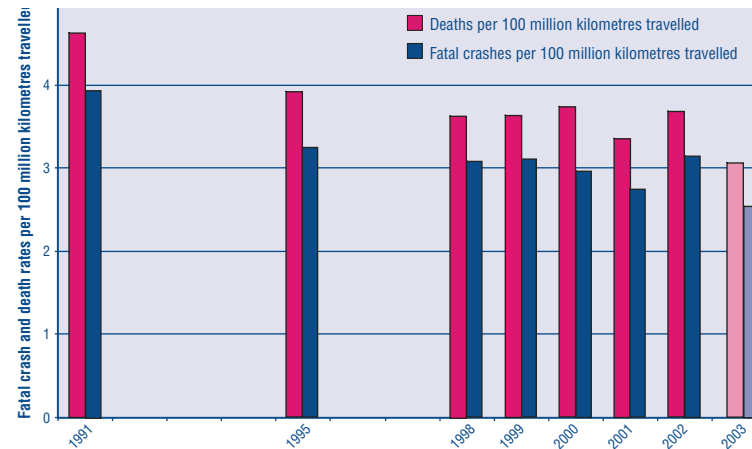
The 70 per cent increase in tonne-kilometres compared with the 18 per cent increase in the number of articulated trucks over the 1991 to 2002 period clearly indicates a substantial increase in the size of articulated trucks now used in the road freight sector.

Fatal crash and death rates per 100 million kilometres travelled

Figure 39 shows the improvement in fatal crash and death rates per 100 million kilometres travelled by articulated trucks between 1991 and 2003. As data for kilometres travelled in 2003 are not yet available, an estimate was calculated using the previous four years of data.

Over the period, the fatal crash rate fell from 3.9 to 2.5 per 100 million kilometres travelled (36 per cent decrease), while the death rate fell from 4.6 to 3.0 (34 per cent decrease).

FIGURE 39:
Rate of fatal crashes and deaths involving articulated trucks,
per 100 million kilometres travelled, 1991 to 2003



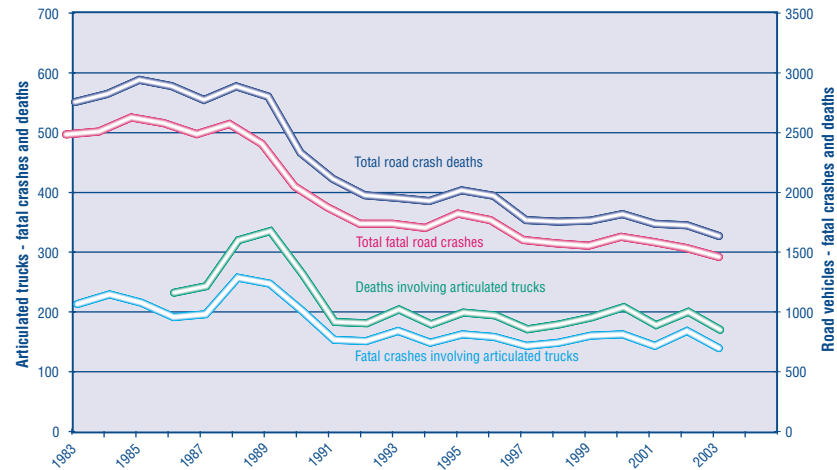
Note: The 2003 rate was calculated using an ATSB estimate of kilometres travelled.

Source: Australian Transport Safety Bureau

Fatal crashes and deaths

Figure 40 compares fatal crashes and deaths involving articulated trucks with fatal crashes and deaths involving all road vehicles. Between 1989 and 1991, both sectors had significant decreases. Thereafter, while fatal crashes and deaths involving articulated trucks remained relatively stable, the numbers for all vehicles generally continued to fall, albeit at a considerably slower rate than at the beginning of the 1990s.

FIGURE 40:
Fatal crashes and deaths, 1983 to 2003



Note: Data on deaths involving articulated trucks were not available prior to 1986

Source: Australian Transport Safety Bureau

Articulated truck crash characteristics

The majority of fatal crashes involving articulated trucks were in non-urban areas and occurred between a truck and another vehicle. In 2000, single-vehicle crashes accounted for approximately 25 per cent of fatal crashes involving articulated trucks.

Data for 1999 indicate that articulated truck drivers were assessed by coroners as being fully responsible for the crash in about 20 per cent of multiple-vehicle fatal crashes, and either fully or partially responsible in about 25 per cent of multiple-vehicle crashes.

Between 1991 and 2003 the fatality rate per kilometre travelled (based on the ATSB estimate of kilometres travelled in 2003) fell by about 34 per cent, and the death rate per tonne-kilometre fell by about 48 per cent.

In summary, the number of fatal crashes and deaths involving articulated trucks has remained relatively stable since the early 1990s. However, the fatal crash and death rates per distance travelled and tonne-kilometres have declined significantly as a result of substantial increases in trucking activity over the same period.

Articulated truck drivers are fully or partially responsible for only about 25 per cent of crashes involving articulated trucks and other vehicles.

National Heavy Vehicle Safety Strategy

Crashes involving trucks and buses are estimated to account for about \$2 billion of the \$15 billion total annual cost of road crashes. About 330 people are killed each year in crashes involving heavy vehicles. Additionally, many more people are seriously injured.

The Australian Transport Council – which comprises Ministers with transport responsibilities from the Australian Government and the states and territories, and an observer from local government – has adopted the *National Heavy Vehicle Safety Strategy 2003–2010* and *National Heavy Vehicle Safety Action Plan 2003–2005*.

The strategy has been designed by the National Transport Council (NTC) and the ATSB to complement the *National Road Safety Strategy 2001–2010* and to focus on factors critical in reducing fatal and serious injury crashes involving heavy trucks. Like the National Road Safety Strategy, the National Heavy Vehicle Safety Strategy is a framework document recognising the safety plans of all levels of government and other industry and associated organisations.

The heavy vehicle strategy aims to make an appropriate contribution to the targeted 40 per cent reduction in the population death rate of the

national strategy. A complementary objective is to bring the Australian heavy vehicle crash rate down as close as possible to the lowest international rates. The current Australian rate is 2.5 fatalities per 100 million truck kilometres travelled, whereas the lowest overseas rate is 1.7.

The strategy has eight objectives: increased seat belt use by heavy vehicle drivers; safer roads; more effective speed management; reduced driver impairment; safer heavy vehicles; enhanced driver and industry management; effective enforcement; and targeted research and education. The strategy is supported by two-year action plans.



20 four-wheel drive vehicles

In recent years there has been a considerable increase in the popularity of four-wheel drive vehicles (4WDs) – also known as sports utility vehicles (SUVs). In 2002, 17 per cent of all new cars sold in Australia were 4WDs compared with 10 per cent in 1997. With this increase in popularity, there has been increased debate over their safety and suitability as common passenger vehicles.

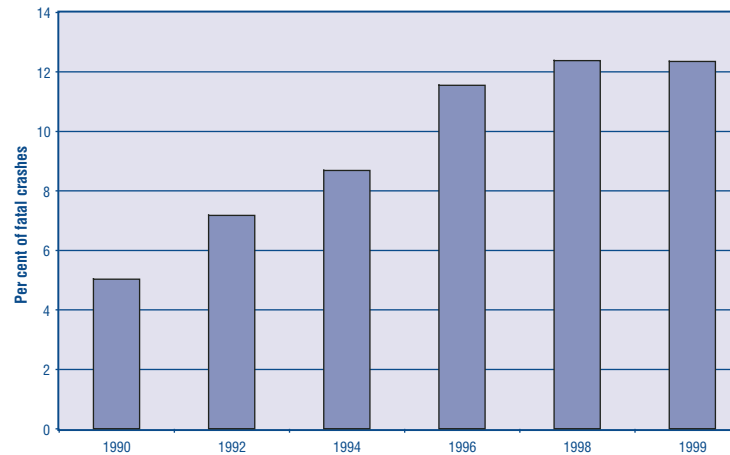
An increase in 4WDs in the Australian vehicle fleet has been accompanied by an increase in crashes involving 4WDs.

4WDs have a fatal crash involvement rate comparable with passenger vehicles.

What is the extent of 4WD involvement in fatal crashes?

The number of fatal crashes involving 4WDs has increased considerably from 101 in 1990 to 182 in 1999 – an increase of 80 per cent. To put this in perspective, between 1990 and 1999 the number of fatal crashes for all vehicles decreased by 24 per cent (from 2 050 to 1 553), whereas the proportion of all fatal crashes involving at least one 4WD increased from 5 per cent to over 12 per cent (figure 41).

FIGURE 41:
Proportion of all fatal crashes involving at least one 4WD, 1990 to 1999



Source: Australian Transport Safety Bureau

It is likely that this increase in fatal 4WD crashes is mainly due to the large increase in 4WD activity, rather than a decrease in vehicle safety. Australian Bureau of Statistics data show that between 1995 and 1999 (the only years for which this information is currently available) the number of kilometres travelled by 4WDs increased by 136 per cent – from 8 608 million kilometres to 20 304 million kilometres. By comparison, over the same period, the number of kilometres travelled by all vehicles only increased by 4 per cent – from 166 514 million kilometres to 177 635 million kilometres.

Table 9:
Number and rate of vehicles involved in fatal crashes per 100 million kilometres travelled, 1998 and 1999

<i>Vehicle type</i>	<i>Number of vehicles involved in fatal crashes</i>	<i>Rate of vehicle involvement per 100 million vehicle kilometres travelled</i>
Motorcycles	364	15.5
Heavy trucks	511	2.4
4WDs	376	1.0
Passenger cars	2567	1.0

Source: Australian Transport Safety Bureau and Australian Bureau of Statistics

Are 4WDs relatively safe?

4WDs have a fatal crash involvement rate comparable with other passenger cars. Table 9 shows that when taking into account the level of activity, 4WDs had a lower involvement in fatal crashes than motorcycles and heavy trucks.

However, aggregate fatal crash involvement rates only provide part of the picture. There are three important aspects when considering vehicle safety:

primary safety (features of the vehicle that make crash involvement less or more likely) and two-aspects of secondary safety – if a crash does occur, the level of safety of vehicle occupants and the level of safety of other road users, including pedestrians and occupants of other vehicles.

Primary safety: 4WD rollovers

For 4WD vehicles, the major primary safety issue is roll-over risk. 4WDs are more likely to roll-over than passenger cars because they have a higher centre of gravity relative to their wheel-base. Roll-overs are more likely to result in serious injury and death than most other crash circumstances. Even in low energy crashes, a roll-over can lead to serious injury or death due to the high risk of a vehicle occupant being partially ejected. Table 10 shows a significantly higher proportion of 4WD roll-overs in fatal crashes (35 per cent) compared with passenger cars (13 per cent).

Table 10 also shows that the proportion of 4WD roll-overs in fatal crashes without a previous collision (17 per cent) was over four times the proportion for passenger cars (4 per cent). 4WD roll-over crashes not involving a prior collision were mostly single vehicles that had driven off a straight or curved road and rolled over.

The number of 4WD roll-overs where at least one occupant was killed is even more alarming. In

1999, 57 per cent of 4WDs where an occupant was killed had over-turned, compared with only 20 per cent of passenger cars.

These counts relate to on-road crashes, so it is unlikely that the increased incidence of roll-overs can be explained by more difficult terrain and roads used by 4WDs.

Table 10:
Roll-overs in fatal crashes by vehicle type, 1999

	4WD		Passenger cars	
	Number	Per cent	Number	Per cent
<i>Vehicle roll-overs</i>				
Post-collision	33	18	115	9
No prior collision	31	17	55	4
<i>Total roll-overs</i>	64	35	170	13
<i>No roll-overs</i>	121	65	1115	87
<i>Total fatal crashes</i>	185	-	1285	-

Source: Australian Transport Safety Bureau

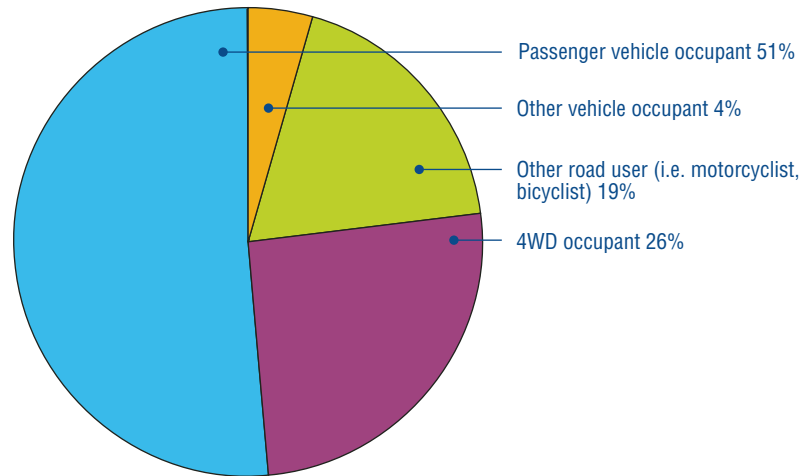
Secondary safety: vehicle crashworthiness and aggressivity

The extent to which a vehicle provides occupant protection in the event of a crash is called *crashworthiness*. Occupant protection or crashworthiness has traditionally been the focus of vehicle safety design. However, it has been recognised that when two vehicles crash, differences in their size, geometry and stiffness are all important determinants of the overall severity of the crash. The risk a vehicle poses to another vehicle occupant in the event of a crash is called *aggressivity*.

In multiple vehicle crashes involving 4WDs, a greater proportion of occupants of other vehicles involved are killed than 4WD occupants. In 1999, 113 road users were killed in multiple vehicle crashes involving 4WDs. Passenger car occupants accounted for the largest proportion of people killed (51 per cent), while 4WD occupants accounted for 26 per cent of all people killed (figure 42).

Twice as many passenger car occupants as 4WD occupants are killed in crashes involving 4WDs.

FIGURE 42:
People killed in multiple vehicle crashes involving 4WDs, 1999

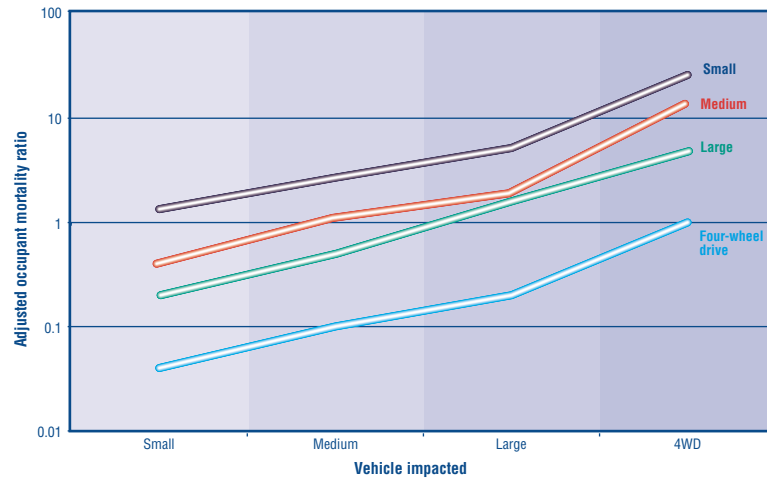


Source: Australian Transport Safety Bureau

Although these data have not been adjusted for the number of people in each vehicle type, it is expected that the average number of occupants in 4WDs and passenger vehicles are similar.

Further analysis of fatal crashes reveals that there is a relationship between the difference in vehicle size between two vehicles and the risk to occupants. This relationship is clearly illustrated for front-to-front collisions in figure 43. The graph shows the occupant mortality ratio for occupants of different vehicle types when crashing with another vehicle. The occupant mortality ratio is defined as the ratio of the total number of deaths in one class of vehicle to the total number of deaths in another class of vehicle. The ratio was adjusted for the number of people in each vehicle.

FIGURE 43:
Relative risk of death in front-to-front collisions between passenger vehicles according to vehicle size
estimated by occupant mortality ratios with adjustment for number of occupants



Source: Federal Office of Road Safety

4WD occupants are safer in the event of front-to-front or front-to-side collisions, but at the cost of the safety of other passenger vehicle occupants.



Research published by the former Federal Office of Road Safety shows that the mortality ratio increases with an increase in difference between the size of the two crashing vehicles. For occupants of a small car, the occupant mortality ratio increases from 2.5 when crashing with a medium size car to 24.0 when crashing with a 4WD vehicle. A similar effect was found for front-to-side crashes.

4WD occupants are safer in the event of front-to-front or front-to-side collisions, but at the cost of the safety of other road users.

It should be noted the study used crash data for 1988, 1990, 1992 and 1994. The severity of this effect may have been reduced in recent years, with

the recognition by vehicle manufacturers of the importance of vehicle compatibility and subsequent changes in vehicle design, particularly geometry and stiffness. However, more recent analysis of crash data by the Monash University Accident Research Centre (MUARC) has found that, as a group, 4WD vehicles are the most aggressive of all vehicle types.

This issue is very relevant in Australia with the sales of small cars, large cars and 4WD vehicles expanding, while sales of medium size vehicles decline.

Substitution of 4WD vehicles for other passenger vehicles also increases risk for unprotected road users such as pedestrians. A recent US study found

that pedestrians are more than twice as likely to die in a crash with a large 4WD-style vehicle than a passenger car. The study also found that pedestrians are more likely to receive head injuries from a crash with a 'light truck or van' (most of which are 4WD-style vehicles) than a passenger car.

A study commissioned by the ATSB found that more than half the incidents involving passenger vehicles causing death to children in driveways of homes between 1996 and 1998 were large 4WDs (see chapter 26). These deaths are not included in road death statistics because they are regarded as 'off-road' incidents.

If you own a 4WD or are considering buying one, remember...

4WDs do not handle exactly like passenger cars:

- Keep plenty of space between you and the car in front. 4WDs are heavier than passenger cars and may need longer stopping times and distances.
- Reduce your speed to slower than a passenger vehicle when travelling around corners because 4WDs have a greater tendency to roll over.
- Drive carefully and defensively. Do not put yourself in a position where you have to perform evasive manoeuvres.
- Always wear a seat belt.
- Remember that a 4WD can more severely injure other road users than a passenger car.
- If you do not really need a bull bar, do not fit one – they endanger other road users.

21 fleet and work-related road safety

Fleet safety or work-related road safety, is an issue of increasing importance in Australia and other countries because of its impact on business effectiveness, workplace health and safety, and road safety. In Australia, 'fleet safety' is a term generally associated with light vehicles such as cars and vans that do not exceed 3.5 tonnes fully laden. Work-related drivers are defined more broadly as those who drive for work-related purposes at least once per week. Work-related drivers include police and emergency service drivers, couriers, truck drivers, sales people, drivers of fleet vehicles and executives who drive salary-sacrificed vehicles for both work and non-work purposes.

An ATSB-sponsored study found that, in Queensland, crashes involving fleet vehicles accounted for 25 per cent of road fatalities, 43 per cent of work-related fatalities, and cost businesses more than \$1 billion per year. These indicative costs for a single jurisdiction would suggest that

national costs are very substantial. Improvements in work-related road safety will therefore have benefits in terms of meeting targets to reduce road deaths, improve occupational health and safety, and enhance the competitiveness of Australian industry.

The term 'work driver effect' conveys the notion that work drivers may be more risk-prone than other drivers.

An Australian study has found that business travel accounts for about a third of all travel, and over half of travel if travel to and from work is included. According to another Australian study, 37 per cent of travel is for business, 20 per cent for commuting and 43 per cent for personal purposes.

Work vehicles are typically larger, newer, faster and travel longer distances than the average vehicle. Most work vehicles are not owned by those who drive them. These factors could lead to less care, more risk-taking and a greater likelihood of driver fatigue, particularly among shift workers. Although difficult to definitely establish, researchers speculate that this ‘work driver’ effect may be caused by time pressure, the characteristics of the vehicles, the nature of the drivers, and the fact that

costs associated with driving are generally not borne by the driver.

Research has shown that there is a common perception that, relative to the general population, company car drivers are more likely to speed, drink drive, follow other vehicles too closely, have less lane discipline (show a tendency to use the outside lane on higher-speed roads), be aggressive, use mobile phones and other devices, park illegally, take risks, and lose concentration. However, surveys have shown that many company car drivers consider that they have better driving skills than other drivers.

Data on work-related fatalities and injuries in Australia are very limited, making it difficult to estimate the magnitude of the work-related road

safety problem. Available estimates indicate that work-related vehicles comprise about 30 per cent of registered vehicles in Australia. This amounts to over three million vehicles, about half of which are cars. Fleet vehicles travel an average of about 30 000 km per year – about three times the average for private motorists.

About half of new vehicles in Australia are purchased for commercial purposes and most of these vehicles will be assimilated into the wider Australian vehicle pool two to three years after purchase. The specification of more safety features by fleet buyers is therefore one means by which the safety of the general Australian vehicle fleet can be improved more rapidly.

Tips for safe and fuel-efficient driving

The following driving tips are based on advice from the Australian Greenhouse Office and 'eco-driving' principles developed in Europe:

- Minimise vehicle use by planning to do several things in one trip.
- Avoid warming up time when the car is first started.
- Minimise fuel wastage due to idling by stopping the engine when held up for an extended period.
- Change up to higher gears as soon as practical before the revs reach 2 500 rpm. Use higher gears as much as possible and keep engine speeds down.
- Look and plan ahead to coast to traffic lights or intersections and avoid unnecessary braking and sudden stops. Maintaining a longer gap between the car in front will help in travelling smoothly with the flow of traffic.
- Drive at moderate speeds. At 110 km/h fuel consumption is about 25 per cent greater than when cruising at 90 km/h.
- Minimise aerodynamic drag by reducing air resistance due to roof racks, open windows, etc.
- Maintain correct tyre pressure.
- Minimise use of air conditioning.
- Do not increase vehicle weight by carrying unnecessary items.
- Keep the engine well tuned by regular servicing.

Why is work-related road safety important?

There are a number of reasons why work-related road safety is of increasing importance. Legal requirements concerning duty of care, occupational health and safety (OHS), and corporate manslaughter issues are becoming increasingly relevant in the transport sector. Vehicles are considered part of the workplace in all Australian jurisdictions. This means that there is a requirement to ensure that vehicles are used in a manner that is safe and minimises health risks.

Improved fleet safety provides business benefits including better productivity and quality, improved staff relations, and reduced costs. The benefits of better driving in the work context can flow through into private driving and result in greater social benefits. Company safety programmes can enhance public image and avoid the negative publicity generally associated with crashes. There are cost and safety benefits for

companies in purchasing vehicles with better safety features.

In Australia, road crashes are the most common cause of work-related death, injury and absence from work. Australian studies suggest that as much as 50 per cent of work-related deaths may involve driving or commuting for work. Australian data show that the cost of work-related road crashes is shared by the employee (40 per cent), the employer (30 per cent), and the community (30 per cent). Work-related road crashes result in substantial workers compensation claims. In Queensland in 1999–2000, about \$17 million was paid in workers' compensation claims for injuries and illnesses due to work-related road crashes, including work-related commuting. Compensation costs averaged about \$20 000, including medical costs and costs relating to rehabilitation, staff replacement and property damage.

Work-related crash costs exhibit an 'iceberg' effect: besides the apparent insured costs of vehicle repair, there are various other hidden or uninsured costs that in aggregate are quite substantial. These hidden costs include down time, legal fees, higher insurance premiums, substitute vehicle hire, administration, lost business, absence from work, medical and rehabilitation expenses, and inconvenience. These indirect costs can be as much as ten times the average cost of vehicle repair. The benefits of maintaining good safety standards (and the high avoided costs) are pithily expressed in the well-known adage: if you think safety is expensive, try having an accident. Crash costs are a part of business costs and reducing these costs can improve competitive advantage and enhance public profile.

Given the increasing importance of fleet safety, there has been an increasing focus on integrating fleet safety into OHS programmes.

*If you think safety is expensive,
try having an accident.*

Fleet safety initiatives

Governments can provide leadership by example and provide various strategies for improving fleet safety. Similarly, insurers can play an important role in influencing fleet safety improvements.

There are a number of fleet safety initiatives in Australia. These include the reports of parliamentary road safety committees such as *Staysafe* in NSW and *Travelsafe* in Queensland; the Fleet Safety Forum (a group of jurisdictional road safety practitioners and others who meet periodically to discuss fleet safety issues); and initiatives of government fleets, insurers, the heavy truck sector and the Australasian Fleet Managers Association.

Fleet safety initiatives tend to focus on the following key areas:

Fleet safety policy, programme and guidelines, including organisational and OHS fleet safety

policy to ensure management commitment and necessary resources to implement good practice.

Driver recruitment, selection and management programmes that aim to recruit drivers based on safe driving records and safety awareness.

Induction programmes that introduce new recruits to fleet safety concepts and principles.

Fleet vehicle selection and maintenance that conform to best practice.

Vehicle crash monitoring by having in place an efficient system of recording, monitoring and investigating crashes and establishing targets for safe operation of the fleet.

Communication and awareness to keep drivers informed of company safety requirements and practices.

Training and education to ensure continuing improvement.

Continuing evaluation to learn from experience.

These components of good practice have been expressed in the acronym PROACTIVE – an approach promoted by the University of Huddersfield in the United Kingdom.

The Haddon Matrix is a useful tool for classifying, assessing and implementing measures to improve fleet safety. A basic example of the use of the matrix is presented in table 11, with one measure provided as an example in most cells of the matrix. Other measures could be added to expand the options for improving safety.

The benefits of better driving

Road safety and the environment are both affected by the extent of motor vehicle use and the manner in which vehicles are driven.

Fuel consumption results in the production of vehicle emissions, comprising air pollutants which affect health, and greenhouse gases which affect the environment. Fuel consumption also reduces the stocks of non-renewable fossil fuels. Total fuel consumption can be reduced by reducing vehicle

travel or by reducing the rate of fuel consumption (improving fuel economy). Community attitude surveys indicate that there will be greater support for measures that improve fuel economy than measures that aim to curtail vehicle travel. Better driving can help in reducing fuel consumption and vehicle operating costs.

Driver behaviour that affects fuel consumption rate and safety include: choice of travel speed,

smoothness of driving, choice of travel route, and use of air conditioning and cruise control. Smoothness of driving and choice of travel route affect fuel consumption rate by modifying the speed profile.

Reductions in travel speeds result in lower crash-related costs, because of reduced crash risk as well as reduced crash severity if a crash occurs (see chapter 13). The cost reductions may be greatest in urban areas because of the presence of unprotected road users such as pedestrians, motorcyclists and cyclists and because vehicles are more effective in protecting occupants at lower speeds. In urban areas, some fuel consumption and emission reductions will occur at lower speeds, but the majority of benefits will be in road safety. For travel on open roads, the crash savings resulting from lower speeds will be significant, and the fuel consumption savings will be greater than at urban speeds.

Table 11:
Haddon Matrix approach for improving fleet safety

	Culture	Trip	Human	Vehicle	Environment
Pre-crash	Safety policy	Route	Training	Maintenance	Risk assessment
At-crash	Emergency		Procedures	Crashworthiness	Site management
Post-crash	Reporting and investigation	Debrief	Counselling Support	Inspection Repair	Investigate Improve

Source: Adapted from *Evaluating and Improving Fleet Safety in Australia*, 2002

The PROACTIVE approach to fleet safety

Policy – do it rather than just have it

Risk assessments

Occupational Health and Safety (OHS) integration

Assess managers, supervisors and drivers

Crash investigation and data analysis

Train, managers, supervisors and drivers

Implementation and change management

Very enthusiastic champion

Evaluate – proactive, quantitative, costs and qualitative
key performance indicators (KPIs)

The crashworthiness of larger vehicles is generally greater than that of smaller vehicles. However, larger vehicles generally consume more fuel than smaller vehicles. A case study by the Monash University Accident Research Centre (MUARC) found that the fuel consumption rate of crash-involved vehicles was higher than that of vehicles not involved in crashes. This finding suggests that there is likely to be a link between driving style and safety. Driving style therefore provides a means of reducing fuel consumption and improving safety (see next page).



Is saving five minutes worth the cost?

In 2000 the Royal Automobile Club of Victoria (RACV) implemented a trial to compare the effects of vehicle size and driving style on fuel consumption. The trial involved driving from the RACV's offices in Noble Park to the Melbourne city centre and back to Noble Park along a defined route of 61 kilometres which included over 80 sets of traffic lights. The vehicles traversed the course twice with three different drivers. One trial was carried out with aggressive acceleration away from stops, but without exceeding speed limits. The other trial involved a smoother and more flowing style.

The test vehicles were a 4 litre Ford Falcon wagon and a 1.8 litre Mazda 323 Astina automatic sedan (both current models when the trial was conducted). The trial was conducted at the same time each morning and afternoon to avoid peak traffic.

The average time to complete the route was 94 minutes and the variation in time taken between the smooth and aggressive driving styles was less than five minutes. The expected gains in accelerating to get in front of traffic after stopping at traffic signals were virtually lost in the overall trip.

For the Falcon, the fuel consumption with smooth driving was 30 per cent less than with aggressive driving (13.9 l/100km down to 9.6 l/100 km). For the Mazda 323, smooth driving reduced fuel consumption by 29 per cent (11.6 l/100km down to 8.4l/100km).

The RACV also compared their results with results obtained in a similar trial conducted in 1990. They found that the 2000 Falcon driven aggressively had a rate of fuel consumption (13.9 l/100 km) similar to the 1990 Falcon.

The important finding of this trial is that a large vehicle driven smoothly can perform better in terms of fuel consumption than a small vehicle driven aggressively.

Apart from the higher fuel costs and lack of any meaningful time savings, the increased crash risk of an aggressive driving style would tilt the benefit-cost equation heavily in favour of smoother driving.



22 motorcycles

Improvement in motorcycle rider safety has been lagging that of other road users.

Motorcyclists make up a significant proportion of those killed and injured on the roads each year. In 2003, 189 motorcyclists were killed and in 2001, the latest year serious injury data are available, 4 348 were seriously injured. Motorcyclists make up around 14 per cent of all people killed on the road and around 19 per cent of seriously injured each year.

Motorcyclists are vulnerable road users in that they are unprotected in the event of a crash. Unlike other vulnerable road users, such as pedestrians, motorcyclists are capable of travelling at very high speeds.

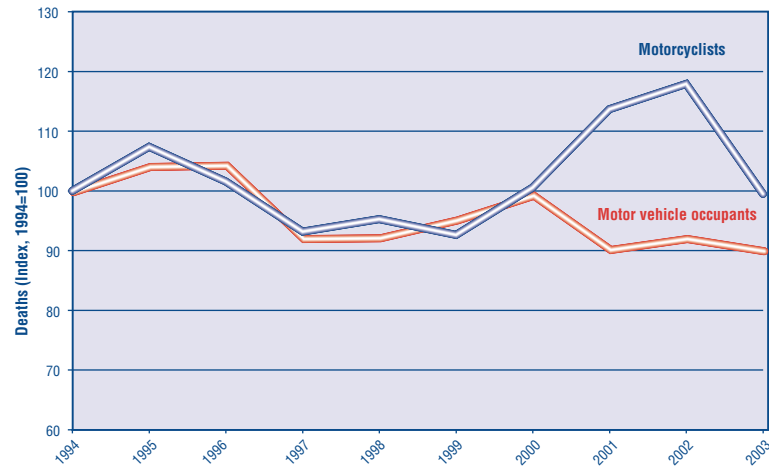
Trends

Trends in motorcyclist deaths suggest improvements in motorcycle rider safety have been lagging improvements for other road users. There has been little change in the number of motorcyclist deaths over the last ten years. In 1994, there were 190 motorcyclist deaths compared with 189 in 2003, a reduction of only one death.

Figure 44 compares the number of motorcyclist deaths with the number of motor vehicle occupant deaths over the decade to 2003. It shows there has been no significant overall change in motorcyclist deaths since 1994, although there was a significant increase in 2000 and 2002, followed by a significant decrease in 2003. In comparison, motor vehicle occupant deaths have been trending downwards, although there has been considerable fluctuation in the numbers. There were 1 310 motor vehicle occupant deaths in 1994, compared with 1 180 in 2003, a 10 per cent decrease.



FIGURE 44:
Motorcyclist deaths compared with other motor vehicle occupant deaths, 1994 to 2003



Source: Australian Transport Safety Bureau

*The popularity of motorcycling
is increasing but death rates
are still high.*

Table 12:
Motorcyclist and motor vehicle occupant deaths per 100 million kilometres travelled, 1998 to 2002

	<i>Motorcyclists</i>	<i>Motor vehicle occupants</i>	<i>Ratio of motorcyclist rates to motor vehicle occupant rates</i>
1998	13.0	0.7	18
1999	17.9	0.7	25
2000	16.8	0.7	24
2001	14.9	0.6	24
2002	13.3	0.6	21

Source: Australian Transport Safety Bureau

The decrease in motorcyclist deaths in 2003 (16 per cent fewer deaths than in 2002) is encouraging, although it will be some time before it can be determined whether this is the beginning of a long term downward trend or a temporary fluctuation. It is worth noting that the number of motorcyclist deaths in 2003 was still higher than the lowest figure for the decade to 2003 (176 in 1999).

Part of the reason for lack of progress in reducing motorcyclist deaths may be the increased popularity of motorcycling. In the decade to 2003, the number of registered motorcycles increased by

29 per cent – from 291 800 in 1994 to 377 300 in 2003. At the same time, all other registered motor vehicles only increased by 23 per cent – from 1 069 200 in 1994 to 1 316 300 in 2003.

The popularity of motorcycles is increasing – the number of registered motorcycles increased by 29 per cent in the decade to 2003.

Motorcycle kilometres travelled increased from 981 million kilometres travelled in 1999 to 1 681 million kilometres travelled in 2002, an increase of 71 per cent.

However, the death rate for motorcyclists is still very high. Table 12 shows that in the period 1998 to 2002, motorcyclists had a risk of death per 100 million kilometres travelled of between 18 and 25 times that of motor vehicle occupants.

Women motorcyclist safety – an emerging safety issue?

There is anecdotal evidence from motorcycling organisations that the number of women involved in motorcycling has been increasing in recent years. Licences held by women in New South Wales increased from 35 804 in 1999 to 38 569 in 2003, an increase of 8 per cent. Although, an increase in motorcycle licences does not necessarily directly translate to an increase in motorcycle use, the data suggest some increase in the popularity of motorcycling among women.

What are the implications for road safety?

The number of women motorcyclists killed and injured each year is relatively small compared with other road user groups. Each year, women motorcyclists represent around 9 per cent of all motorcycle deaths and around 8 per cent of seriously injured motorcyclists. Around half of women motorcyclists killed each year are pillion passengers.

Increases in activity can potentially lead to an increase in crashes. However, there has been no measurable increase in women motorcyclist deaths in recent years. Due to the relatively small numbers of women motorcyclist deaths and the large fluctuations from year to year, it is very difficult to determine whether there is any decrease or increase in the trend.

International trends

Australia's motorcycle safety record compares relatively poorly with Organisation for Economic Cooperation and Development (OECD) member countries. In 2001, there were 6.2 motorcyclist deaths per 10 000 registered motorcycles, compared with the OECD median of 3.4. This is significant considering Australia ranks favourably in its overall road safety record. In 2001, there were 1.4 road deaths per 10 000 registered vehicles, compared with the OECD median of 1.8.

Australia's motorcycle safety record is poor compared with other OECD member countries.

Why are death rates for motorcyclists so high?

The evidence points to two major reasons why motorcyclists have such high death rates compared with other road users.

Risk-taking behaviour

Firstly, motorcycle riders involved in fatal crashes are significantly more likely to have been involved in risky behaviour at the time of the crash than drivers of other motor vehicles.

Figure 45 shows that, in fatal crashes occurring between 1998 and 1999:

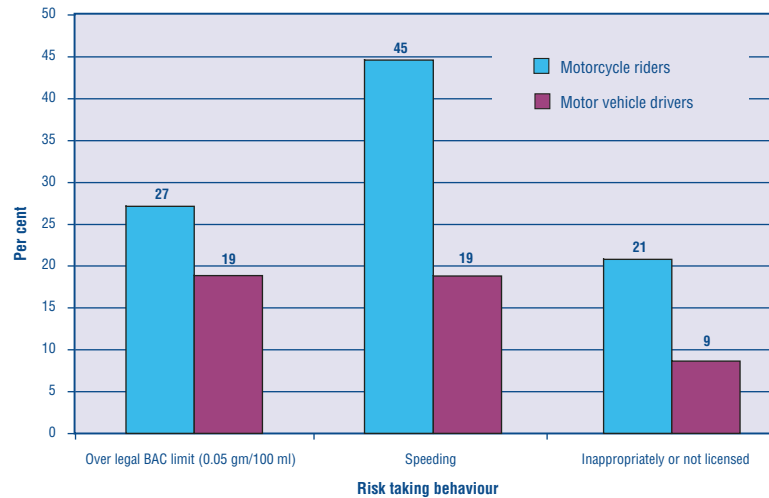
- twenty-seven per cent of motorcycle riders involved were over the legal driving blood alcohol level, compared with 19 per cent of motor vehicle drivers
- forty-five per cent of motorcycle riders involved in fatal crashes were speeding or driving too fast for conditions compared with 19 per cent of motor vehicle drivers
- twenty-one per cent of motorcycle riders were unlicensed or held an inappropriate licence compared with 9 per cent of motor vehicle drivers.

Overall, 55 per cent of motorcycle riders involved in fatal crashes between 1998 and 1999 were speeding, intoxicated, inappropriately licensed or unlicensed, compared with 27 per cent of motor vehicle drivers.

*For someone who fought with a sword,
thundering into battle on a camel,
it's perhaps ironic that [Lawrence of Arabia]
died in a motorcycle accident.*

ANDY CONWAY

FIGURE 45:
Proportion of motorcycle riders and motor vehicle drivers involved in
risk-taking behaviour at the time of a fatal crash, 1998 to 1999



Note: Due to the difficulty in determining crash causes, these figures should be treated as indicative rather than as quantitatively accurate.

Source: Australian Transport Safety Bureau

Unprotected road users

The second factor is that motorcyclists are unprotected. In the event of a crash they are significantly more vulnerable to serious injury than motor vehicle occupants because, with the exception of a helmet, they do not have protection. Although this does not increase the overall number of crashes, it does increase their severity.

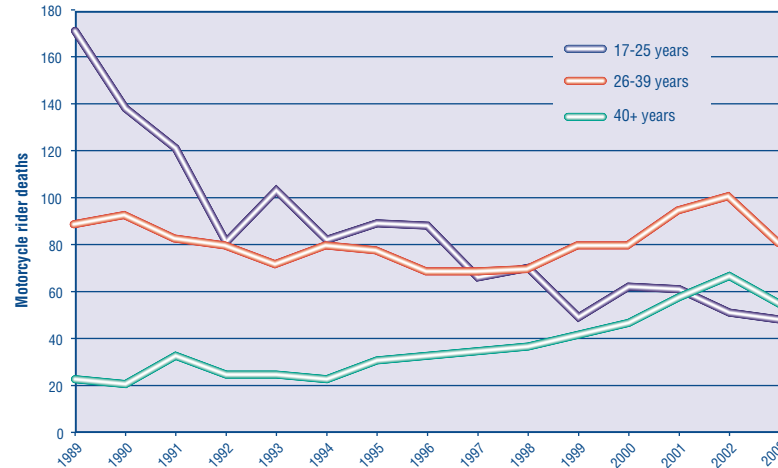
Deaths among motorcycle riders aged 40 years and over have more than doubled in the decade to 2003.

Older motorcycle riders – a demographic shift

There has been a significant demographic shift among motorcycle riders in recent years. The popularity of motorcycling among older riders has been increasing. This ageing of the riding population has led to changes in the demographics of motorcycle deaths.

Figure 46 shows the number of deaths among motorcyclist riders aged 40 years and over more than doubled in the ten years to 2003. There were 22 motorcycle riders killed aged 40 years and over in 1994, compared with 54 in 2003.

FIGURE 46:
Motorcycle rider deaths by age groups, 1994 to 2003



Source: Australian Transport Safety Bureau



The trend in deaths among the 26–39 year age group is not quite as clear. There has been very little overall change in the decade to 2003, although there were significant increases in 2000 and 2001, followed by a significant decrease in 2003.

Motorcycle rider deaths in the 17–25 year age group have been steadily declining. In 1994 they accounted for the greatest proportion of motorcycle rider deaths (45 per cent) while in 2003 they accounted for the lowest (26 per cent).

A similar phenomenon has been observed in the US. Sales data from the US suggest that, increasingly, the typical motorcycle buyer is not

the stereotypical over-enthusiastic young male or bearded biker but an affluent, professional male. If the growth in popularity of motorcycling in the older age groups continues, it is likely that

motorcycle deaths in these age groups will continue to rise. Future road safety programmes may need to focus more on older riders in order to improve the safety of motorcycling.

Motorcycle riders involved in fatal crashes are significantly more likely to have been involved in risky behaviour than drivers of motor vehicles.

23 bicycles

Cycling is an important mode of transport and form of recreation for many Australians. It is an accessible form of transport and has significant health and environmental benefits for the community.

A national cycling strategy, *Australia Cycling: The National Strategy* has been endorsed by the Australian Transport Council. The safety of cycling is an important consideration when choosing to cycle. One of the objectives of the national strategy is that 'safety for cyclists, on and off road, is continuously improved'.

*The car inhibits human contacts.
The bicycle generates them;
bikes talk to each other like dogs,
they wag their wheels and tinkle their bells,
the riders let their mounts mingle.*

DANIEL BEHRMAN

*Around 35 cyclists are killed
and 2 500 seriously injured each year.*

Cyclists killed and seriously injured each year

From 1999 to 2003, around 177 cyclists were killed on Australian roads. The number of deaths of cyclists is low relative to other road user groups. Cyclist deaths account for between 1.6 and 2.6 per cent of all road deaths each year. On the other hand, the number of cyclists seriously injured in road crashes is relatively high. Table 13 shows there are an average of 35 cyclists killed and around 2 500 cyclists seriously injured each year.

Table 13:
Number of killed and seriously injured cyclists, 1999 to 2003

	<i>Deaths</i>	<i>Seriously injured</i>
1999	40	na
2000	31	2 599
2001	46	2 389
2002	34	na
2003	26	na

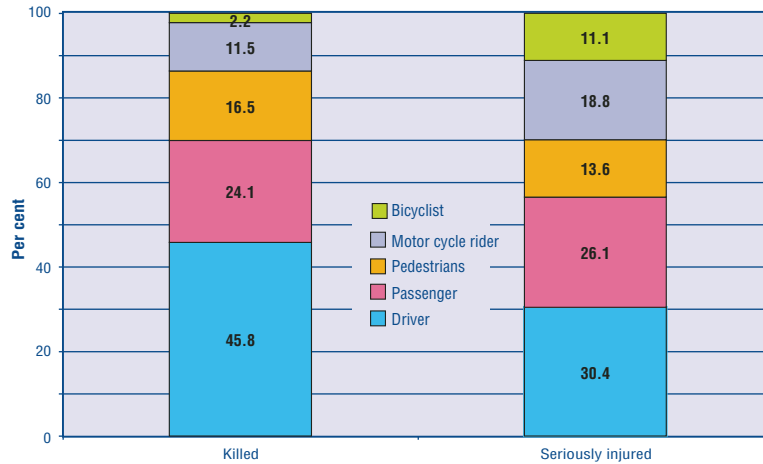
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Source: Australian Transport Safety Bureau

Figure 47 shows that cyclists are represented significantly more in the serious injury figures than in the fatality figures. It shows that cyclists accounted for 2.2 per cent of road deaths between 2000 and 2001, while they accounted for 11.1 per cent of seriously injured during the same period. This is an important issue, given the personal and community burden of medical care, on-going disability and costs resulting from serious injury.

*For every cyclist killed,
65 were seriously injured.*

FIGURE 47:
Road deaths and seriously injured – road user groups, 2000 and 2001



Source: Australian Transport Safety Bureau

The ratio of seriously injured to deaths is high among cyclists. For the two years that serious injury data are available, it can be seen that for every cyclist killed on the road, there were around 65 seriously injured. Among motor vehicle occupants and pedestrians, the ratio is around one

death for every ten seriously injured. There were 2 586 seriously injured pedestrians recorded in 2001. To put these figures in perspective, while there are more than seven times the number of pedestrians killed than cyclists each year, the

number of seriously injured cyclists and pedestrians is about the same.

The situation in the United Kingdom is similar: with over three times the population of Australia, about 140 people are killed each year while riding a bicycle. The British Medical Association (BMA) has noted that many people who would like to cycle, but do not, are concerned about safety. A BMA study has shown that, while about 140 people are killed each year while cycling, around 20 000 others die prematurely due to a lack of exercise. The BMA has estimated that regular cycling provides a net benefit to personal health that outweighs its risk of injury by a factor of 20 to 1.

*Dr Strabismus (Whom God Preserve)
of Utrecht has patented a new invention.
It is an illuminated trouser-clip for bicyclists
who are using main roads at night.*

JB MORTON, BRITISH JOURNALIST, *MORTON'S FOLLY*, 1933



Bicycle helmets

Australia was the first country to introduce compulsory bicycle helmet legislation in the early 1990s. New Zealand followed in 1994. Only some jurisdictions in the USA have equivalent legislation.

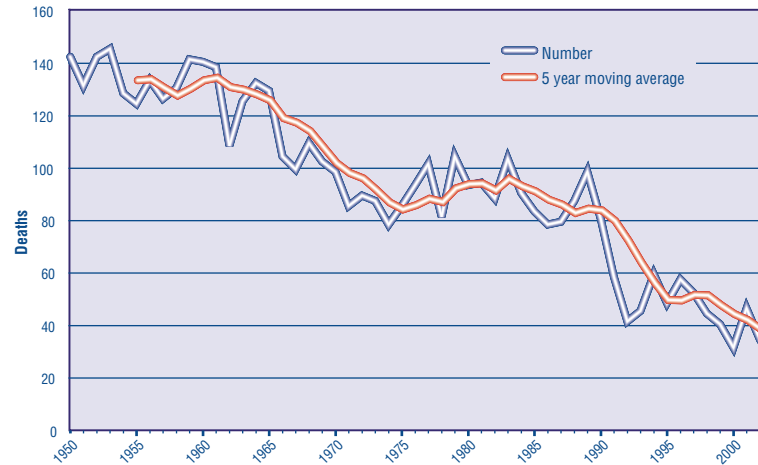
A recent ATSB study, which reviewed numerous epidemiological studies published during the period 1987–1998, found 'overwhelming evidence in support of helmets for preventing head injury and fatal injury.'

Trends in cyclist deaths

Cyclist deaths have been trending downwards since 1997, despite a large increase in 2001. The number of cyclist deaths during 2003 was the lowest number since 1950, the first year data were available Australia-wide.

Figure 48 shows cyclist deaths have decreased significantly. In 1955 there were 134 cyclist deaths, while in 2003 there were 26, an 80 per cent decrease.

FIGURE 48:
Cyclist deaths, 1950 to 2003



Source: Australian Transport Safety Bureau

The demographics of seriously injured cyclists

A significant number of children are seriously injured on cycles. Figure 49 compares the age of seriously injured cyclists and all road users seriously injured. It shows that 43.8 per cent of seriously injured cyclists are aged between 0 and 16 years, compared with 8.2 per cent of seriously injured vehicle occupants.

The high proportion of children seriously injured is most likely in part due to the number of children who cycle relative to the rest of the population, increasing their potential risk of a serious crash. However, without suitable data on the level of use of cycles by children compared with the population as a whole, this possible explanation cannot be tested.

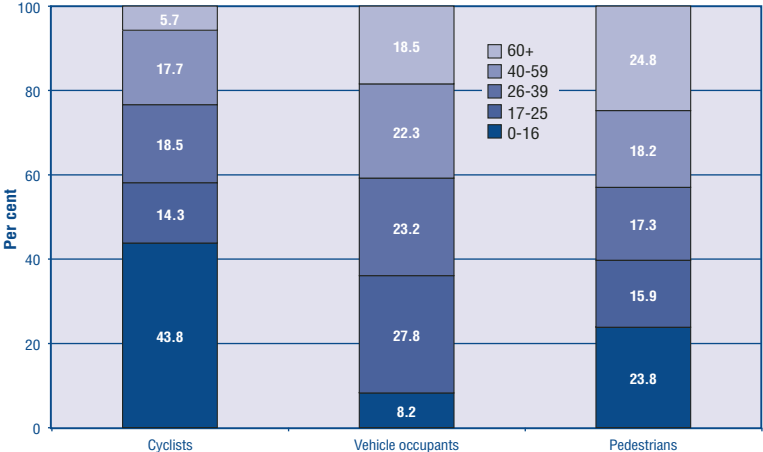
These figures may also reflect children’s relative vulnerability on the roads due to their level of cognitive development and lack of experience as road users.

The popularity of cycling

In order to properly understand the trends in cyclist safety, a measure of cycling activity is required. Unfortunately, there are no data available at a national level to directly measure this.

In the absence of more suitable data, counts of the number of journeys to work collected by the Australian Bureau of Statistics in the 1996 and 2001 censuses may give some indication of cycling activity. It should be noted that these data do not capture any information relating to recreational riding or any information relating to the length of journeys. The data are also biased towards older riders, as the majority of cyclists aged under 16 do not work.

FIGURE 49:
Distribution of age groups for seriously injured cyclists, motor vehicle occupants and pedestrians, 2000–01 and 2001–02



Source: Australian Transport Safety Bureau

How should you cycle on the roads safely?

Cyclists have the right to use the public road system in all states and territories in Australia. With this right comes some common sense responsibilities.

Use the right equipment:

- Wear a well-fitting Australian Standards approved cycle helmet. Helmets have been repeatedly shown to have protective effects in the event of a crash. Make sure your helmet is properly fastened.
- Ensure your cycle has reflectors fitted.
- Wear bright reflective clothing.
- Use bright lighting at night so that motorists can see you and you can see the road surface.

When you cycle:

- Ensure your intentions are clear to other road users by using clear hand signals when turning.
- Use a bell when approaching pedestrians.
- Ride cautiously and defensively, particularly in bad weather.
- Do not ride in the gutter. Riding a significant distance out from the kerb will improve your visibility to motorists and avoid debris and other hazards.

Table 14 shows that in 1996 there were 82 822 journeys to work completed which included at least one bicycle leg, while in 2001 there were 90 794 – an increase of 9.6 per cent. Over the same period, the number of total journeys to work increased by 8.8 per cent – from 6 232 897 in 1996 to 6 779 729 in 2001.

The number of journeys to work involving at least one bicycle leg as a proportion of all journeys to

work has remained around the same. Journeys to work involving at least one bicycle leg made up 1.33 per cent of all journeys to work in 1996 and 1.34 per cent in 2001.

Cyclist deaths decreased by 54.4 per cent between 1996 and 2001. No data are available to assess the change in the number of seriously injured over this period.

Table 14:
Journeys to work and cyclist fatalities, Australia 1996 and 2001

	1996	2001	Per cent change
Journeys including at least one bicycle leg	82 822	90 794	9.6
Total journeys	6 232 897	6 779 729	8.8
Bicycle journeys as a percentage of all journeys	1.33	1.34	0.8
Fatally injured cyclists	57	26	54.4

Source: Data provided by VicRoads based on Australian Bureau of Statistics 1996 and 2001 Census data



24 pedestrians

Pedestrian safety is of interest to almost everyone. For most people, walking is an essential part of personal mobility. Even the most dedicated motorist needs to walk at some point, if only to cross the road from work to the local cafe.

Pedestrians, along with cyclists and motorcyclists, are classified as 'vulnerable road users' as they are unprotected in the event of a crash. While pedestrians can change their behaviour, they cannot protect themselves in the event of a crash.

Pedestrians make up a significant proportion of people killed and seriously injured on our roads every year. More than one in seven people killed and one in eight seriously injured on our roads are pedestrians.

There were 232 pedestrians killed in 2003. In 2001, the latest year for which hospitalisation data are available, 2 654 pedestrians were seriously injured. This trauma is a significant burden on the family, friends and community of the deceased and injured.

About one person out of every seven people killed on the roads is a pedestrian.

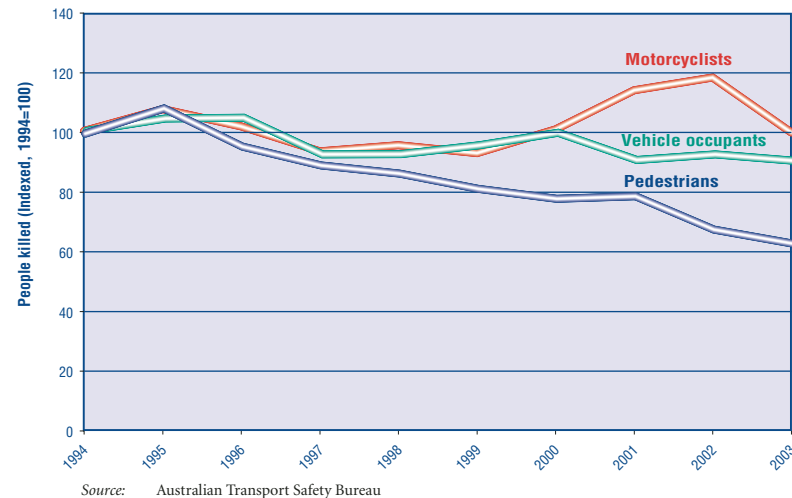
*[There are] only two classes of pedestrians
in these days of reckless motor traffic –
the quick, and the dead.*

LORD THOMAS DEWAR, BRITISH INDUSTRIALIST, 1864–1930

Trends

Pedestrian deaths have decreased substantially over the decade to 2003. Figure 50 shows the steady decrease in pedestrian deaths from 1994 to 2003. The graph has been indexed in order to more easily compare changes within each road user group. Over the ten years to 2003, pedestrian deaths decreased by 37 per cent, compared with 10 per cent for vehicle occupants and less than 1 per cent for motorcyclists. Even in the late 1990s, when a reduction in road deaths among other road user groups appeared to have stalled, pedestrian deaths continued to decline.

FIGURE 50:
Pedestrian, motorcycle and vehicle occupant deaths, 1994 to 2003

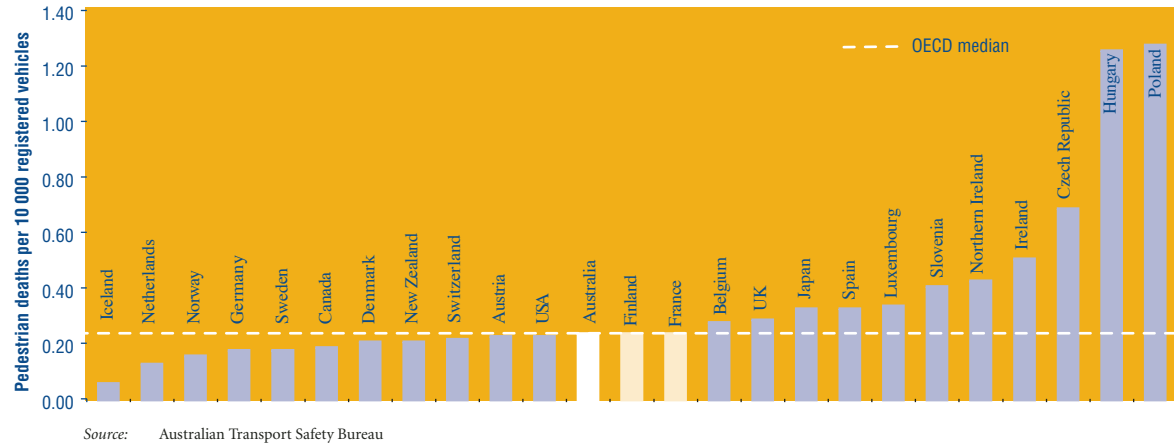


Australia's pedestrian safety record compared with other countries

Compared with other member countries of the OECD, Australia's pedestrian safety record is about average. In 2001, Australia's rate of pedestrian deaths per 100 000 people was 1.5, which was equal to the OECD median.

Australia being a highly motorised society, pedestrians have a much greater chance of exposure to risk due to motor vehicles than pedestrians in less motorised countries. A death rate relative to the number of registered vehicles is used to take into account different levels of motorisation. In 2001, there were 0.23 pedestrian deaths per 10 000 registered vehicles in Australia (figure 51). This was equal to the OECD median rate and equal to the rate for Finland and France.

FIGURE 51:
Pedestrian deaths per 10 000 registered motor vehicles, OECD countries, 2001



Pedestrian deaths decreased substantially in the decade to 2003.



In 2001, Australia was below the OECD median in terms of all road deaths per 100 000 people, per 10 000 registered vehicles and per 100 million vehicle kilometres travelled. Given Australia's relatively good overall road safety record, the pedestrian record is surprising. It may indicate different patterns and amount of walking in Australia compared with other countries.

Pedestrian groups and factors of particular concern

People walk for a diverse range of reasons, and the patterns of walking are particularly varied. For some, such as the young and the old, walking is often the primary mode of transport. For others,

walking can be more irregular. Some pedestrian groups – children, older pedestrians and those affected by alcohol – are of particular concern.

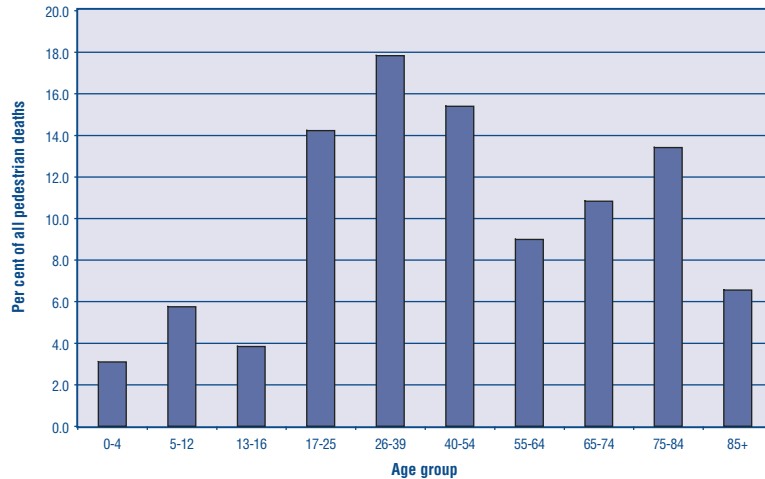
People aged 65 and older represent about one-third of pedestrian deaths but only one-eighth of the population.

Age

Patterns relating to circumstances of pedestrian deaths are strongly related to age. Figure 52 shows that those 65 years and older account for 31 per cent of pedestrian deaths.

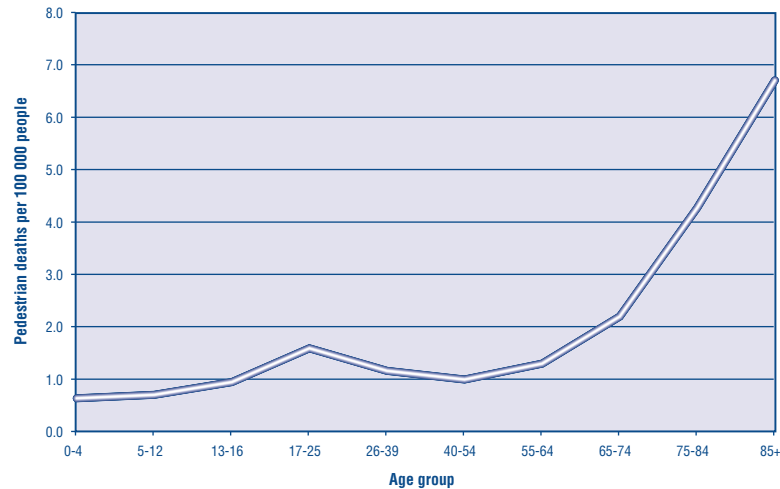
Figure 53 clearly illustrates the increased risk of pedestrian deaths with age. It also illustrates an elevated risk for pedestrians aged 17–25 years.

FIGURE 52:
Proportion of pedestrian deaths by age group, 1999 to 2003



Source: Australian Transport Safety Bureau

FIGURE 53:
Pedestrian deaths per 100 000 people by age group, 1999 to 2003



Source: Australian Transport Safety Bureau

Elderly pedestrians

Although people aged 65 and older represent less than one-eighth of the population, they contribute about one-third of total pedestrian deaths. There were 1 356 pedestrians killed between 1999 and 2003, and 418 of them were aged 65 or older.

Elderly pedestrians have a higher risk of collision with road vehicles due to the perceptual, cognitive and physical deterioration associated with ageing. In the event of a crash, they have a higher risk of death due to their relative frailty. Many elderly people also have a greater reliance on walking and are therefore more likely to be exposed to traffic as pedestrians.

Deaths among older pedestrians could grow substantially as Australia's population ages. Recent Australian Bureau of Statistics data indicate that the share of Australia's population aged 65 years and older will double to about 24 per cent by the year 2041. Reducing the number of older pedestrians killed is therefore a significant issue and challenge for road safety.

Patterns of elderly pedestrian deaths

Assessments by police and coroners indicate the primary responsibility for fatal collisions mostly lies with elderly pedestrians. Between 1996 and 1999, 72 per cent of collisions resulting in the death of an elderly pedestrian were fully attributed to the pedestrian and partly attributed to the pedestrian in an additional 14 per cent of cases. (These figures are similar to those recorded for pedestrians in other age groups.)

Only a small proportion of the deaths (5 per cent) were recorded as being due to risky road use on the part of a vehicle driver. There was little evidence of deliberately risky road use on the pedestrian's part, other than in cases involving alcohol intoxication. About 11 per cent of pedestrians had a blood alcohol concentration that would have made them ineligible to be in control of a motor vehicle, a much lower incidence than among their younger adult counterparts (around 60 per cent).

The deaths were predominantly attributed to unexplained, unintentional errors on the

pedestrians' part. Although difficult to prove, perceptual, cognitive and physical deteriorations were probably involved in many of these pedestrian errors.

The deaths tended to be associated with complex traffic environments. They occurred predominantly in urban areas (96 per cent of cases), commonly took place on carriageways with undivided streams of opposing traffic (64 per cent of cases), and were mostly at locations subject to speed limits of 60 kilometres per hour or less (81 per cent).

More serious consequences of pedestrian errors would be expected in conditions of reduced visibility. While deaths of older pedestrians occurred predominantly on straight stretches of road (86 per cent) and in fine weather (88 per cent), about one-third occurred at night, dawn or dusk, mostly in circumstances of poor street lighting or in the absence of street lighting. Given that the majority of travel by older pedestrians occurs during daylight hours, the proportion of deaths occurring outside these hours is high.

Children

While children aged 16 years and under account for the smallest proportion of pedestrian deaths of all age groups (13 per cent), they make up around a quarter of all road deaths in this age group. Children aged 16 years and under account for 24 per cent of serious pedestrian injuries. Each year, around 34 children aged 16 years and under are killed and around 640 are seriously injured as pedestrians.

Patterns of child pedestrian injury

Child pedestrian deaths and injuries increase with age, particularly following the commencement of schooling, as children begin to undertake independent pedestrian travel and increase their potential contact with the road environment.

Statistics extracted from the ATSB's detailed fatal crash database indicate that most fatal child pedestrian crashes are a result of an error made by the child. In 1999, 28 of 33 pedestrians killed aged 16 years and under were assessed as solely

responsible for initiating the crash. The children's actions leading to the collision commonly displayed a lack of awareness of traffic conditions at the time of the crash. Child pedestrian deaths are commonly associated with some misjudgment or failure to see some critical aspect of road conditions.

The deaths usually occurred on low-speed urban roads, but occasionally on high-speed urban arterial roads. In 1999, 52 per cent of child pedestrians killed (17 out of 33) were on 60 km/h roads at the time of the crash.

Chapter 25 discusses issues relating to the safety of school children and chapter 26 deals with child safety in driveways of homes.

Alcohol

Pedestrian alcohol intoxication is commonly associated with pedestrian deaths. In 1999, in instances where a blood alcohol reading (BAC) was taken, 38 per cent (77 out of 205) of pedestrians killed were over the legal driving limit (0.05 gm/100 ml), and 31 per cent were over 0.15 gm/100 ml.

*By all means, let's breath-test
pedestrians involved in road accidents –
if they're still breathing.*

THE BISHOP OF ELY, REPORTED IN THE BRITISH NEWSPAPER *THE OBSERVER*, 1967

Alcohol intoxication is highest among males aged between 15 and 54. From 1997 to 1999, 70 per cent of male pedestrians killed within this age group had a BAC that would have made them ineligible to be in control of a motor vehicle. Five out of every six of these alcohol-affected pedestrians had a BAC of 0.15 gm/100 ml or greater.

Heavy intoxication is reflected in the manner in which many of the pedestrians came into collision with a vehicle. About one in every three intoxicated pedestrians had been struck while simply standing or lying on the road.

The extent of prevalence of other drugs is difficult to determine due to lack of suitable tests and routine testing. However, for about one in every three pedestrians killed aged between 15 and 54, a significant incidence of some drugs was apparent. These included cannabinoids (detected in 24 per cent of those tested); benzodiazepine tranquillisers (five per cent); amphetamines (four per cent) and heroin/methadone (four per cent).

Reducing urban travel speeds

The statistics cited in the previous section suggest that pedestrian behaviour is the main cause of pedestrian fatalities. However, there is also evidence that small reductions in urban travel speeds can markedly reduce the number of fatal pedestrian crashes (see chapter 13).

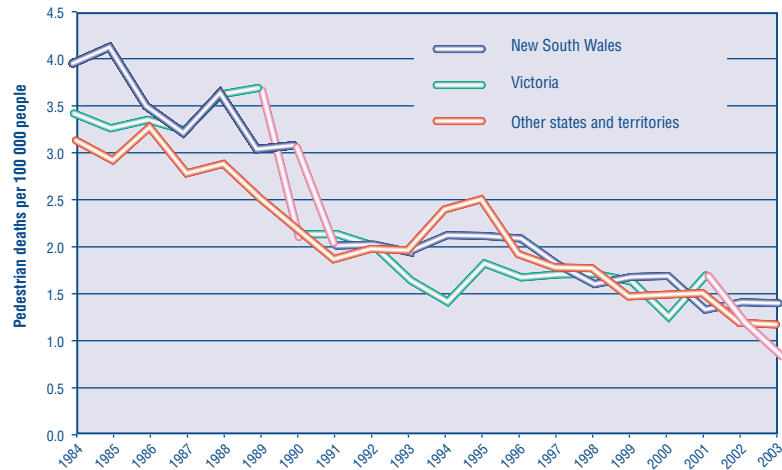
A detailed study of fatal pedestrian crashes in Adelaide found that 32 per cent of pedestrians who died would probably have survived if the vehicle that hit them had been travelling 5 km/h slower before the emergency; one in ten would not have been hit at all (the driver would have been able to stop in time).

Effects of anti-speeding programmes show up clearly in the historical data on pedestrian deaths.

Victoria started intensive speed camera enforcement, accompanied by intensive publicity, in 1990. There was a 42 per cent reduction in pedestrian deaths in Victoria in 1990, and a 33 per cent reduction in New South Wales a year later, when that state introduced speed cameras (figure 54).

Although the drop in Victorian pedestrian deaths in 1990 also coincided with intensification of random breath testing (RBT), this would have had relatively little effect on pedestrian deaths, since very few pedestrians are hit by drink drivers. New South Wales increased RBT substantially in 1989–90, and non-pedestrian deaths began to decline in that state, but the sharp reduction in pedestrian deaths occurred in 1991.

FIGURE 54:
Pedestrian deaths per 100 000 people, New South Wales, Victoria and the other states and territories, 1984 to 2003



Source: Australian Transport Safety Bureau

If drivers adopted safer driving practices, and allowed larger margins of safety, ... such a behaviour change would spare large numbers of individual drivers the burden of having to claim, with legal correctness, that the six-year-old child was killed because it was the child's fault.

LEONARD EVANS, 1991

In 2002, Victoria announced reduced tolerances for speed enforcement, and other measures to deter speeding. Figure 54 shows the reduction in pedestrian deaths in 2002 and 2003.

In 1989 there were 159 pedestrian deaths in Victoria. In 2003 there were 41.

Progressive implementation of traffic calming measures and, since 1997, increasing use of 50 km/h speed limits in urban areas have also contributed to reductions in urban travel speeds and pedestrian deaths.

Which way to look?: overseas-born pedestrians

Individuals generally take for granted the fact that they first look to the right for traffic when crossing a road in Australia. However, for people born in right-side driving countries and emigrating to Australia, this is not so instinctive.

Analysis of fatal crash data for 1994 to 1997 and serious injury data for 1995 to 1997 revealed that, for people born in a non-English speaking and right-side driving country, the risk of death as pedestrians was around 5 times that of Australian-born pedestrians, while risk of serious injury was over three times as great. This effect was found to increase with age.

Pedestrians born in non-English speaking, left-side driving countries, or drivers born in non-English speaking countries of either driving orientation were not found to be at higher risk.

These results suggest that driving orientation in country of birth is an important influence on pedestrian safety. People may learn pedestrian behaviour at an early age and it may be difficult to change later in life.

The reason this heightened risk is not present for vehicle drivers born in non-English speaking, right-side driving countries may be because drivers obtain cues, such as their seating position relative to the curb and the position of other traffic, to help them orientate correctly. These cues are not available to pedestrians.

Road safety issues relating to international visitors are discussed in chapter 29.

25 safe travel to school

Each year over 200 children are killed or seriously injured on Australian roads while travelling between home and school. Most are hit by a motor vehicle while walking or riding a bicycle.

A large proportion of school travel casualties – including three-quarters of fatalities – involve children of primary school age (5–12 years). Compared with the enormous number of school-related trips each year, these statistics should not be unduly alarming to parents. But they are a reminder that school travel exposes children to serious risks and needs to be managed responsibly.

Walking or cycling to school can be a healthy part of a child's daily routine. In addition to the important benefits of physical exercise, it can help to broaden their understanding of the world around them. The problem is that young children are not naturally well-equipped to handle the traffic environment:

- they have under-developed peripheral vision
- they lack the ability to accurately judge the speed and distance of moving vehicles
- they are very easily distracted

- their small stature can make it harder to see, and to be seen by, approaching traffic.

On the positive side, there are some important factors that make young children safer than teenagers and young adults, who have a much higher pedestrian death rate – particularly among males. Young children generally try hard to obey the rules they are taught; they are less likely to engage in deliberate risk taking; and much less likely to be impaired by alcohol or recreational drugs. Teenagers have much better developed skills than young children, but worse safety outcomes, because of increased exposure and risky choices.

Each year over 200 children are killed or seriously injured on Australian roads while travelling between home and school. Most are hit by a motor vehicle while walking or riding a bicycle.



Management strategies

It is commonly accepted that there are four broad strategies available to manage the safety of child pedestrians and cyclists: segregation, traffic management, supervision, and education.

Segregation

In principle, the safest environment for young walkers and cyclists is one completely separated from the movement of motorised traffic. This is a must for unsupervised children who have not yet developed the skills required to safely negotiate moving traffic. Unfortunately, when it comes to

travelling between home and school, such segregation is rarely an option, and other strategies must be relied on.

Traffic management (and planning)

Well-planned access to schools and related facilities can minimise the exposure of children to traffic, for example by avoiding the need to cross busy roads. Potentially hazardous situations in the vicinity of schools can also be addressed through a range of traffic management or engineering solutions. These can include:

- school crossings

- school crossing supervisors
- pedestrian-operated traffic signals
- signage warning of child pedestrians and cyclists
- small-scale infrastructure improvements, such as traffic calming devices
- large-scale infrastructure improvements, such as overhead walkways
- reduced speed zones on all roads with school access points.

Tips for supervising children in road use

<p><i>Children up to 5 years old:</i></p> <p>Always have physical control over your children in traffic situations. They are too young to cope alone.</p>	<p>Hold your child's hand when you are near traffic.</p> <p>Encourage your child to turn their head with you and look both ways for traffic.</p> <p>Explain what you are doing when you cross the road together.</p> <p>Make sure you get your child in or out of the car on the kerb side.</p>
<p><i>Children 5 to 9 years:</i></p> <p>Supervise your child at all times near traffic.</p>	<p>Teach your child how to cross roads.</p> <p>Make the trip to school together along the safest footpaths and use safe crossing places.</p> <p>Arrange for your child to be supervised on the way to and from school and during after school activities.</p> <p>Ensure that your child always wears an approved bicycle helmet that is properly fitted and securely fastened.</p>
<p><i>Children 9 to 13 years:</i></p> <p>Children of this age can cope more safely in traffic on their own, but parents and carers should still provide guidance.</p>	<p>Remind your child to always stop, look, listen and think when crossing the road.</p> <p>Plan safe routes to school and elsewhere together.</p> <p>Go for rides and walks together.</p> <p>Talk about where your child can safely ride.</p> <p>Insist that your child always wears an approved bicycle helmet that is properly fitted and securely fastened.</p>

Supervision

Where exposure to traffic is unavoidable, road safety and health experts agree on the need for close adult supervision of children up to at least nine years of age. Guidelines for managing children in traffic typically emphasise precautions like always holding the hand of a very young child and actively teaching them how to cross roads as they get older.

Guidelines such as these are very broad because there is no consensus on the precise elements that define effective child supervision. Nor is there clear direction on the developmental stages and milestones a child needs to progress through to become a competent, independent traveller. In practice, these details are largely left to the judgement of individual parents and supervisors.

Chapter 34 describes some community road safety programmes relating to the safety of school children and chapter 26 sets out issues relating to child safety in driveways.

The Walking School Bus

Of course, parents do not always have the luxury of being able to accompany their children on the journey between home and school. An alternative to parent-supervised travel that has been well received overseas is known as the walking school bus. In a typical example of this scheme, each 'bus' of up to 10 children walks along a set route with at least two adult volunteer leaders, picking passengers up at designated stops and taking them to school. The process is reversed at the end of the day. This community-based approach is already being trialled in some Australian jurisdictions and is expected to become more widely available as interest grows.

Traffic sign near school: Use your eyes and save the pupils.

Education (and training)

Most jurisdictions run road safety education programmes for students, focusing on pedestrian education in pre-school and early primary years, and bicycle education in later primary and early secondary years. Examples of these are briefly described below:

- *RoadSmart* is a Victorian traffic safety education programme for primary schools, which includes teacher guides, discussion prints and an interactive CD-ROM. It aims to engage children in understanding the problems associated with using the road environment and to develop skills to keep themselves and others safe.
- The Queensland *Roadsafe* programme comprises a series of teaching kits designed for different age groups, from pre-school to years 6

and 7. Each kit includes a detailed teacher's guide and a range of supporting visual and activity resources.

- In New South Wales, *Move Ahead with Street Sense* provides a similar range of teacher's resource packages targeting each primary school learning stage.

- *Bike Ed* is a bicycle education programme designed for children aged 9 to 13. It was developed as a national programme by the then Federal Office of Road Safety (now the ATSB) and aims to provide practical instruction in a safe and controlled learning environment.

Pedestrian safety education can improve children's knowledge of the road crossing task and can change observed road crossing behaviour, but whether this reduces the risk of pedestrian-motor vehicle collision is unknown.

Safe Routes to School

Programmes introduced under the banner of *Safe Routes to School* seek to combine elements of the strategies described above. They generally focus on measures to separate children from traffic, supported by appropriate educational initiatives and adult supervision. While the administrative and procedural elements of these programmes vary between jurisdictions, they tend to be delivered by jurisdictional road authorities in conjunction with local government, the school community and the police.

Safe Routes programmes commonly involve four stages:

- school selection and establishment of links with the relevant municipality
- investigation of local issues and needs, often using surveys and observation methods to explore common travel routes and child behaviour patterns
- development and implementation of an action plan which may comprise aspects of engineering, education, enforcement and encouragement
- maintaining, monitoring and evaluating the programme.



How effective are these programmes?

School-based road safety programmes commonly feature education and training components to ‘teach’ children safe travel behaviour. However, attempts to assess the effectiveness of road safety education have generally failed to show actual reductions in child pedestrian or cyclist casualties.

This does not necessarily mean that education has no safety value. Researchers have noted that many programmes have been trialled or established without adequate evaluation processes to determine their effectiveness. When controlled studies have been set up, they have often measured

effects which were only assumed to be linked to injury outcomes.

There is evidence that educational approaches can bring about desirable changes in children’s knowledge and behaviour – but without proven reductions in crash outcomes, it remains difficult to endorse any particular programme or method of training.

And while it might be argued that any education is better than no education, some commentators have warned against measures that might lead to an increase in unsupervised travel among young children.

Car and bus travel

It may be a sign of the times that parents are increasingly choosing to drive their kids to school themselves. Sometimes this is the most practical transport option available, but for many parents it also provides the greatest sense of security. Surveys confirm that most parents believe their children are safer travelling to school by private car than by any other means.

Such faith in the safety of the car, however, is not entirely supported by crash and injury statistics. According to research findings published by Austroads, travelling to school in a private car is safer than walking or cycling, but not as safe as taking a bus – in fact, school bus travel is estimated to be around seven times safer than the

family car. And the net safety advantages of buses are not limited to the kids travelling in them. As an alternative to car travel, buses reduce the overall number of traffic movements around schools and contribute to a safer environment for everyone.

But a note of caution: while casualty statistics demonstrate the excellent safety record of school buses, they also show that kids become especially vulnerable as soon as they stop being bus passengers and become pedestrians again.

An investigation by the ATSB found that nearly all child deaths in Australia associated with school bus travel occurred when a child was attempting to cross the road after alighting from the bus (table 15). In 80 per cent of these cases, the incident occurred on the trip home from school at the end of the day.

Table 15:
Children aged 5–17 years killed during bus travel to and from school, 1992–1998

As a pedestrian crossing the road:	
to board bus	1
after alighting from a bus	22
As a bus passenger:	
while alighting	2
in a collision with another vehicle	2
other	1
Total	28

Source: ATSB Fatality Crash Database 1992, 1994, 1996, 1997 and 1998

What to make of it?

If all of this sounds confusing, that is because school travel decisions, like most decisions concerning children’s welfare, involve complex judgements and trade-offs. All school travel options have advantages and disadvantages, and the choices made by each family are influenced by a host of personal circumstances.

Certainly, we need more research on the actual safety outcomes associated with different management strategies, and perhaps greater attention to infrastructure – as opposed to behavioural – solutions.

But in the meantime, the important message for parents is to think about the kinds of risks their children might be exposed to and take sensible measures to minimise the dangers.

26

watch out!

death in the driveway

Tragically, the driveways of homes can be death traps, particularly for very young children.

On average, one child, usually a toddler, is killed or seriously injured in the driveway of an Australian home each week.

The ATSB commissioned research into driveway deaths covering the period 1996–1998. Incidents in driveways involve low speeds and are different from pedestrian deaths occurring at normal traffic speeds. They typically involve very young children, mainly toddlers. In addition to driveways, these events sometimes occur in related locations such as the yard or street in front of the child's house, in caravan parks, camping areas and carparks.

Deaths of young children during the period 1996–1998 averaged 12 annually throughout Australia with some year-to-year variation. There were 17 deaths in 1996, 10 in 1997 and nine in 1998. Additionally, about 40 children are hospitalised each year as result of being run over in driveways and related areas. As they commonly occur on private property, these deaths and

injuries are primarily of a non-traffic nature, but a number of the events occur on public streets.

The ATSB's research was based on coronial records on each death. Details of the age, height and gender of the child and the circumstances of the events were studied to identify patterns that may help in understanding how future events might be avoided.

Every week, a child is killed or seriously injured in the driveway of an Australian home.

What are the common characteristics of driveway deaths?

Several common features were identified in the cases studied. Most of the cases involved toddlers who had positioned themselves close to a stationary vehicle. These children were old enough to be mobile, but too small to be easily visible from the driving position. In a few cases the child had been partially or fully underneath a stationary heavy truck.

Most of the events happened at or near the child's home, where parents are likely to have felt that the child was safe. Children also tend to feel safe in the vicinity of their homes. The most common location of the tragedy was the driveway of a suburban home. The driver of the vehicle was most likely to be male and was generally a family member or friend of the family. None of the cases involved a shared driveway.

Most vehicles involved tended to be large, the majority being large 4WD passenger vehicles, large utility vehicles, delivery vans or heavy trucks. Sedans and station wagons were involved in only one-fifth of the cases studied. In contrast, sedans and station wagons account for about two-thirds of pedestrian traffic deaths in Australia.

The events involving passenger vehicles predominantly involved vehicles reversing in driveways. More than half of the passenger vehicles involved were large 4WDs, but the reason for this over-representation is not clear. The relatively high sitting position of the driver in large 4WDs tends to counteract any reduction in the driver's field of view resulting from the high window sills in such vehicles. However, the benefit is substantially reduced in some models due to the fitting of a spare wheel high on the rear door.

It is possible that the high ground clearance of 4WDs contributes to the risk, making it more likely that a small child will be crushed by a wheel rather than pushed clear by the body of the vehicle. Off-road vehicles are designed to drive over obstacles in their path.

Commercial vehicles such as heavy trucks, large utilities and delivery vans were also over-represented in the statistics. The incidents involving such vehicles occurred in various locations, apart from driveways, and involved vehicles moving forwards as well as rearwards. The driver's all-round field of view is an important issue when trucks are manoeuvred in places where there are young children. Some incidents involved children who had positioned themselves under the truck or between the truck and its trailer.



How can these incidents be avoided?

There are essentially three ways in which these incidents can be avoided: increasing public awareness, modifying the driveway environment and enhancing vehicle safety.

In many cases, the child without being seen had followed an adult from a house into the driveway. It is therefore critical to supervise children whenever a vehicle is to be moved. It is also important that parents are vigilant about the use of door locks when children become mobile.

A number of cases involved heavy trucks garaged at home. Those who drive large vehicles and park at home need to exercise extra care and vigilance.

Modifying the driveway environment and creating safe play areas for children is an option with cost implications for families.

The vehicle improvement option would involve enhancing drivers' visual ergonomics and using technological measures such as proximity sensors, additional mirrors, wide-angle lenses and video systems. The New South Wales Motor Accidents Authority has prepared a ten-step guide for parents considering fitting reversing aids at: www.maa.nsw.gov.au/pdfs/tips_reversing.pdf However, these measures are not substitutes for proper care and vigilance by drivers.

NRMA Insurance has compiled a Reversing Visibility Index – the first of its kind in the world – which measures how well a driver can see out the back of a car. A key finding was that the reversing visibility of 4WDs are no worse than many cars – the lowest rated vehicle was a sedan. The NRMA work has found that all cars have a blind area – the best car in the study had a blind area of about three metres that could easily hide a child. The index can be accessed at: www.nrma.com.au/pub/nrma/motor/car-research/reversing-visibility/index.shtml

The facts about risk in your driveway

- Young children often do the unexpected. They require constant supervision to keep them safe.
- More than one-third of pedestrians aged under six years killed in motor vehicle crashes were killed 'off road' in yards, carpark and driveways.
- Children aged under three years are the most likely to be killed or injured in home driveways, often by a reversing vehicle driven by a parent, relative or friend.
- Many of the young children who are not killed sustain severe and permanent injuries.
- Even when drivers use mirrors while reversing, visibility behind the car is limited.



Watch your kids!

What you can do to prevent a tragedy in your driveway:

- Always supervise your children whenever a vehicle is to be moved – hold their hands or hold them close to keep them safe.
- If you are the only adult at home and need to move a vehicle, even only a small distance, place children securely in the vehicle with you while you move it.
- A driveway is actually a small road – discourage children from using it as a play area.
- Make access to the driveway from the house difficult for a child, possibly using security doors, fencing or gates.
- If you are about to drive a vehicle, approach it from the direction in which it will be driven.

27 young drivers

The over-representation of young drivers in fatal and serious injury crashes is a major issue in Australian road safety. Young people aged 17 to 25 years account for over a quarter of all drivers killed and seriously injured each year (tables 16 and 17).

Over a quarter of all drivers killed and seriously injured each year are aged between 17 and 25.

Drivers aged 17 to 20 are over eleven times more likely to be killed than drivers aged 40 to 44.

Young drivers account for around 28 per cent of all drivers killed and seriously injured, but only 17 per cent of people old enough to drive.

Table 16:
Drivers aged 17 years and over killed in road crashes, 1999–2003

	17–25 years	All deaths (all ages)	17–25 age group as a per cent of all deaths
1999	229	817	28.0
2000	226	849	26.6
2001	217	771	28.1
2002	212	781	27.1
2003	204	753	27.1

Source: Australian Transport Safety Bureau

Table 17:
Drivers seriously injured in road crashes, 2000–2002

	17–25 years	All injured (all ages)	17–25 year age group as a per cent of all injured
Jul 2000 – Jun 2001	1797	6641	27.1
Jul 2001 – Jun 2002	1989	7030	28.3

Source: Australian Transport Safety Bureau

The size of the young driver problem

In 2003, there were 204 drivers aged 17 to 25 years killed on the roads, representing 27.1 per cent of all drivers killed.

Young drivers accounted for a similar proportion of the seriously injured in road crashes. Between July 2001 and June 2002, 28.3 per cent of all drivers seriously injured in a road crash were aged between 17 and 25.

Young drivers have much higher death rates

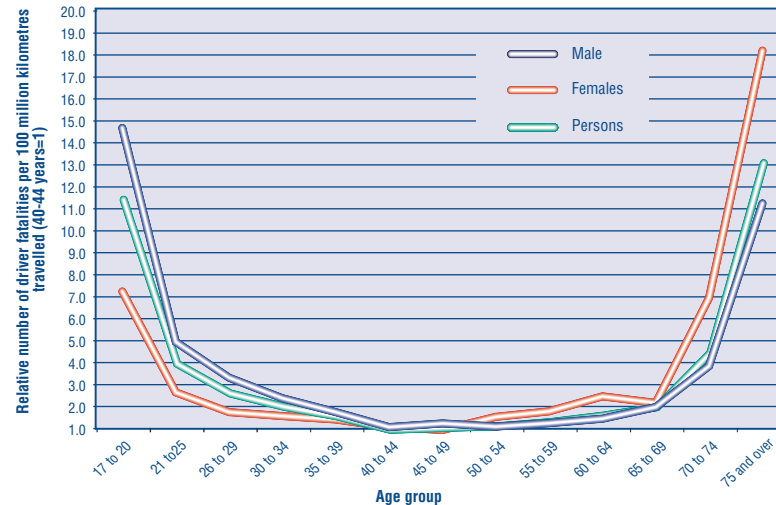
While drivers aged 17 to 25 accounted for 28 per cent of all drivers killed and seriously injured, they only accounted for 17 per cent of people old enough to drive (17 years and above).

Young drivers have significantly higher risk of death relative to the number of kilometres driven. Figure 55 illustrates the relative risk of death to young drivers compared with other age groups. It illustrates the steep decline in risk of death with

age. Drivers in the youngest age group, 17 to 20, are over eleven times more likely to be killed than drivers aged between 40 and 44. Figure 55 also shows that males are at significantly higher risk than females in the younger age groups.

These figures are conservative, as they do not take into account the increased tendency of older drivers to be killed in the event of even a relatively minor crash.

FIGURE 55:
The relative risk of death per kilometre travelled by age group, 1998 to 2000



Source: Australian Transport Safety Bureau

What kinds of vehicles do young drivers crash in?

ATSB analysis of fatal crashes shows that most young drivers involved in fatal crashes were driving fairly ordinary cars. Although coroners' records indicate that around 26 per cent of the young drivers involved in fatal crashes were sober but speeding, very few of those who were speeding were driving high performance vehicles.

Of the 176 vehicles driven by young drivers involved in fatal crashes in 1998 and 1999 who were identified as speeding, only six could be identified from model descriptions as 'high performance' vehicles.

It is worth noting that virtually all modern cars are capable of reaching speeds well in excess of legal and safe limits.

Other vehicle factors (apart from power-to-weight ratio) that influence fatality risk include crashworthiness and vehicle mass. Young drivers often drive older, cheaper vehicles that are likely to have fewer primary and secondary safety features than newer models. However, an older large car can offer better protection than a new small car as size and mass make a big difference, particularly in two-vehicle crashes.

Why are young drivers more likely to be involved in fatal crashes?

Controlling a motor vehicle is a complex task that requires the operator to complete a number of simultaneous tasks. It requires both technical ability and good judgement. Young drivers have an elevated crash risk due to the interaction between their driving inexperience and age-related characteristics. Inexperienced drivers of all age groups have an elevated crash risk; however, the youth factor further elevates the risk.

Risk taking

Research has repeatedly found that young drivers, particularly males, are more likely to indulge in risk-taking behaviour such as racing, speeding and alcohol use.

The crash statistics support this finding: in 1998 and 1999, 26 per cent of drivers involved in fatal crashes under the age of 25 were intoxicated,

compared with 16 per cent of drivers aged over 25. Twenty-eight per cent of sober young drivers were speeding or driving too fast for the road conditions, compared with 10 per cent of sober drivers aged over 25.

Perception of hazards

Evidence suggests that young drivers and riders have not fully developed the skills to assess potential hazards appropriately. Young drivers are more likely to place themselves in risky situations such as driving too fast for the conditions, not allowing appropriate space between vehicles and running more red lights, because they have not developed the skills to adequately judge the risk involved in these behaviours.

*Youth and inexperience elevates
the road crash risk of young drivers.*

Night driving

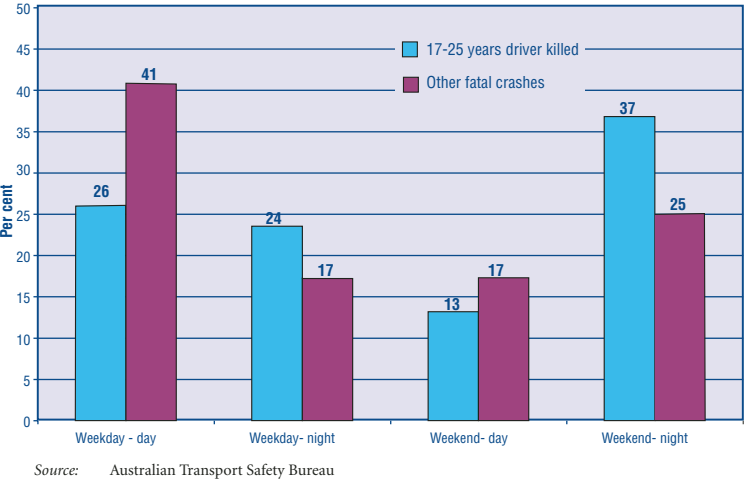
Young drivers are more likely to drive at night and on weekends than older drivers. Figure 56 shows that 60 per cent of crashes where a young driver was killed occurred during the night, compared with 42 per cent of all other fatal crashes. Fifty per cent of these crashes occurred during the weekend, compared with 42 per cent for other fatal crashes.

Driving at night has unique hazards and requires certain perceptual skills to be developed. All drivers have an elevated crash risk at night; however, this risk is accentuated in younger drivers because of their under-developed driving skills and their propensity to be involved in risky behaviour.

Passengers

The risk of young drivers crashing increases when carrying peers in the vehicle. There is evidence that this risk increases dramatically at night and with each additional peer in the vehicle.

FIGURE 56:
Proportion of fatal crashes by time of day and age group, 1999 to 2003



It is likely that the increase in risk is due to a combination of driver distraction by passengers and the propensity of young drivers to more readily react to peer pressure than older drivers.

28 indigenous people

A high risk group

Along with diabetes and stroke, road crashes represent a major cause of death for indigenous Australians. Available data suggest that the number of road deaths involving indigenous Australians is rising. Australian Bureau of Statistics records show a substantial increase in indigenous road deaths – from 59 in 1997, to 92 in 1998. There were 62 deaths in 1999 and 68 in 2000.

In the period from 1997 to 2000, Western Australia and the Northern Territory had the highest number of indigenous road deaths. Car occupants and pick-up/utility occupants make up over half of

Indigenous Australians are a high-risk road user group and have a death rate about 3.5 times higher than non-indigenous Australians.

road deaths (57 per cent), with pedestrians also accounting for a large proportion of deaths (40 per cent). In the same period, male deaths were predominant, with the 15–24 age group particularly over-represented, followed by the 25–39 age group. Of the female deaths, the 35–39, 20–24, and 0–4 age groups are most represented.

New South Wales and Queensland have the highest proportions of the total indigenous population (28.4 per cent and 27.7 per cent respectively), following by Western Australia and the Northern Territory (14.4 per cent and 13.2 per cent respectively). Statistics for indigenous fatality crashes in urban versus rural areas are not available Australia-wide.

A classification of ‘indigenous’ is typically obtained through self-reported means, with definitions broadly including: persons of Aboriginal and Torres Strait Islander descent; persons who identify as indigenous; and persons who are accepted as such by the community in which they live.

Problems with data quality

Analysis of crashes involving indigenous people is limited by the availability of data that adequately and consistently identifies indigenous casualties. The data available contain considerable inconsistencies, mainly because of difficulties in identifying people who are indigenous in the crash statistics.

Queensland, the Northern Territory and Western Australia are the only jurisdictions to identify indigenous involvement in road crash data. In addition, most health, transport and policy crash data systems have not been linked, and therefore details connecting injury outcome with the crash-related cause are not easy to extract.

Road safety trends

The most common types of crashes are generally characterised by alcohol involvement, over-loaded vehicles, and lack of use of seat belts. Other road safety risk factors identified for indigenous Australians include riding in the open load-space of vehicles and unroadworthy vehicles. The data also suggest that indigenous Australians are over-represented in driving offences, particularly unlicensed driving.

It is estimated that about 70 per cent of indigenous Australians live in non-metropolitan areas and are therefore exposed to numerous cultural and environmental risk factors specific to rural and remote Australia. These include increased exposure through greater distances travelled, higher speed limits and poorer road quality (often unsealed), increased diversity in types of vehicles, and delays in accessing medical treatment and rehabilitation (see chapter 31). Road safety statistics may fail to capture the extent of off-road travel and its risks,

because statistics are not collected for crashes which occur on un-gazetted roads.

Research has identified vehicle choice and defects, and lower vehicle ownership (resulting in overcrowding) as significant contributors to rural and remote road trauma. There is also some evidence suggesting that indigenous Australians in rural areas are reluctant to use health care services even when they are available. Some possible reasons for this could be lack of insurance coverage, long travel distances to services, problems with transport and getting time off work, traditional rural values such as self-reliance, and a lack of knowledge about potential benefits.

The two most common types of crashes involving indigenous Australians are single-vehicle crashes (as vehicle occupants) on remote roads and crashes involving pedestrians both in and out of towns.

Research has highlighted the importance of following a community capacity-building and engagement process when working with indigenous communities and allowing for indigenous perspectives in health education initiatives.

Road safety interventions

Many community-based indigenous road safety programmes have focused on alcohol abuse, probably due to it being a major risk factor. In contrast, interventions to address the other known risk factors have been more limited. In addition, few indigenous road safety programmes are informed by local indigenous knowledge or systematic research with indigenous groups.

Some examples of interventions that address the known road safety risk factors for indigenous Australians are described below.

General Road Safety

A video, *Corrugations to Highways*, was produced as a joint initiative between Western Australia, the Northern Territory and South Australia, with funding and marketing assistance provided by the ATSB. The video was developed with the participation of indigenous Australians, as a resource for teachers, driving instructors, police, community and health workers. It shows indigenous Australians providing messages about road safety and contains information on how to use the roads safely.

The Northern Territory Department of Transport has developed a programme targeting indigenous road users called ‘Kick a Goal for Road Safety’. Indigenous police officers present road safety messages to schools and clinics. Workshops are also run with indigenous night patrol staff to identify practical solutions to both crime-related and road safety related problems (e.g. pedestrians falling asleep on the roadway).

Community development programmes

A CD-ROM Community, Action Planning and Information Resource has been developed in Queensland to address community health issues. It complements a resource being developed which provides an inventory of road safety information and contacts and encourages communities to draw on both internal and external resources to solve local problems.

Licensing programmes

A licensing programme for prison inmates is being trialled in Queensland, which involves the provision of training for an oral licensing test instead of the standard written test.

Alcohol

The Office of Aboriginal and Torres Strait Islander Health has worked with the National Health and Medical Research Council to develop Australian Alcohol Guidelines (available at

www.health.gov.au). These guidelines specify safe levels of alcohol consumption for special groups.

Restraint wearing

A campaign in South Australia targets indigenous communities and provides information on child restraints. It includes brochures and stickers featuring indigenous artworks and illustrations to facilitate road safety messages.

Pedestrian safety

A project in a remote Western Australian location targets indigenous pedestrians. Its activities include the distribution of reflective wrist bands to hotel patrons to increase their visibility at night, dissemination of education materials, erection of WalkSafe signs, broadcasting pedestrian awareness messages on local and tourist radio, and installation of lighting on the main roads.

Vehicle purchasing and condition of vehicles

A project has been developed in New South Wales to assist indigenous car buyers to understand their basic consumer rights when purchasing or financing vehicles. It involves practical demonstrations of basic mechanical and safety checks and information sessions on purchasing pitfalls, guarantees and warranties for new and used vehicles, licensing procedures, options for borrowing money to finance a car, how to shop for the best deal, and consumer rights and responsibilities.

Legislation

There is strong evidence to suggest that restrictive legislation, coupled with enforcement, has the potential to greatly reduce the number of injuries sustained by passengers travelling in the open load-space of vehicles. For example, the Northern Territory Department of Transport has reported that open load-space legislation in the Territory resulted in a 75 per cent decrease in the number of serious injuries/fatalities in the Kimberley region.

Recommendations for the future

Research sponsored by the ATSB recommends that priority action be taken by jurisdictions that will:

- Develop consistent and reliable road safety data.
- Research historical and cultural factors influencing beliefs and perceptions about health and injury; and develop protocols for undertaking research in indigenous communities and coordinate research knowledge nationally.

- Develop tailored education and community change strategies which include community participation, conduct formal evaluations of local level road safety initiatives, and improve communities' road safety knowledge and training.
- Legislate to address known risky practices.

The Indigenous Road Safety Working Group, which is chaired by the ATSB, organises forums to progress indigenous road safety initiatives. Members of the working group include

representatives from the police and road safety authorities in the Northern Territory, Queensland, South Australia and Western Australia.

The National Road Safety Action Plan 2003 and 2004 includes an action to develop an Internet-based clearing house to allow the national sharing of information about indigenous road safety activities. This is being progressed under the leadership of Western Australia.

29 international visitors

Since the mid-1990s, international visitors to Australia have increased by about 20 per cent – from 3.8 million to 4.4 million. International visitors peaked at 4.5 million in 2000 – the year of the Sydney Olympic Games – and have since plateaued at about 4.4 million per year, generating earnings of over \$17 billion. International visitor numbers are expected to grow by about 10 per cent per year, reaching 7.8 million by 2012.

The most common form of transport for international visitors is private and company cars, driven by 26 per cent of all international visitors during 1999–2002. A further 4 per cent used a rental car, 0.2 per cent used vans, motor-homes

and campervans and 0.02 per cent used four-wheel drive vehicles. All international visitors use the road system as either drivers, riders, pedestrians, passengers or cyclists.

Road safety is an important aspect of the overall experience of international visitors and their safety is important for Australia's reputation as a safe and attractive tourist destination.

*Driving in unfamiliar conditions
is a key risk factor
for international visitors.*

Crash trends and characteristics

During the mid-1990s, about 40 international visitors were killed on Australian roads each year – about 2.5 per cent of total road deaths. ATSB data indicate that international licence holders represented 0.7 per cent of the drivers and motorcycle riders involved in fatal crashes between 1996 and 1999 and 0.79 per cent of drivers and riders killed.

Crash involvement has been particularly high in the Northern Territory, where international visitors have represented over 13 per cent of total road deaths and about 8 per cent of total injuries during the period 1998 to 2002. These data do not include international passengers, pedestrians, and cyclists. The full extent of injuries sustained by international visitors is difficult to establish because most jurisdictional databases only record details of international visitors who were driving or riding a vehicle at the time of the crash.

In the eastern states (particularly Queensland and New South Wales) the involvement of

international visitors in road crashes steadily increased during the late 1990s and peaked during 2000–2001. This was not surprising, given trends in the overall number of international visitors and the impact of the Olympic Games. However, the peak in crash involvement of international visitors occurred earlier in South Australia, Western Australia and the Northern Territory, where crashes have declined since 1998. This decline has taken place despite overall increases in visitor numbers.

Understanding the international visitor profile and crash causal factors are important in determining strategies to reduce crashes. Most visitors come from countries such as New Zealand, Japan, the United Kingdom and Singapore, where driving is on the left side of the road as in Australia. However, almost one-third come from countries where driving is on the right side of the road, such as the USA, Canada and Germany. This can cause disorientation for both drivers and pedestrians (see chapter 24).

Research conducted by the then Federal Office of Road Safety (now the ATSB) in 1995 found that crashes involving international visitors were more likely to involve fatigue, non-use of seat belts and overturning of vehicles. The findings also highlighted issues relating to driving in unfamiliar surroundings. More recent research has found that 52 per cent of international drivers killed were not wearing a seat belt compared with 38 per cent of local drivers killed.

The key factors contributing to crashes involving international drivers have not changed over time. Alcohol and speeding contribute to many crashes involving international drivers, but these factors tend to be involved to no greater extent than in crashes involving Australian drivers. Traffic infringement information indicates that the most common offence of international drivers is speeding. However, this appears to be due to enforcement practices, rather than any particular difference between the driving behaviour of international drivers and local drivers. Evidence

Better information will reduce risk to international visitors.

from Queensland does not support the common assumption that international visitors are less likely to pay traffic infringement notices. In total, 67 per cent of infringement notices issued to overseas licence holders in Queensland were paid, compared with 64 per cent of notices issued to local drivers.

For international visitors, a key crash causal factor is driving in unfamiliar conditions.

Particular issues of concern are failure to wear seat belts; driver fatigue; overturning of vehicles (possibly indicating driving unfamiliar vehicles in unfamiliar conditions); and incidents which appear to involve disorientation, such as head-on and angle crashes, and failure to keep left (particularly among drivers from right side driving countries).

Are international visitors at higher risk?

As noted earlier, research by the Federal Office of Road Safety suggested that unfamiliar driving conditions represent a key causal factor in crashes involving international visitors due to a lack of familiarity with Australian driving conditions and road rules. Testing this proposition rigorously requires accurate exposure data relating to the amount of road travel undertaken by international visitors.

The ATSB attempted to test this proposition another way – by using population-based data rather than distance travelled to determine the relative risk of being involved in a crash. Data relating to the annual number of international visitors visiting Australia and their average duration of stay were used to derive a death rate per 100 000 people for this group. Based on 1994

data, international visitors had a rate of 22 deaths per 100 000 people, compared with a rate of only 10.8 for Australians. This comparison may actually underestimate the risk faced by international visitors, since they are largely drawn from a middle-aged group (who traditionally are at lower risk of being involved in a crash compared with younger and older road users). While this may be true, other evidence suggests that people tend to engage in higher-risk activities (such as alcohol and drug use and involvement in outdoor sporting and recreational activities) while travelling than they do at home. There is also some evidence that crashes involving international visitors tend to be more severe than those involving local road users. The data from states and territories indicate that international visitor crashes, particularly severe crashes, are more likely to occur in rural areas.

Strategies for addressing international visitor risk

A 1999 ATSB report identified a number of specific educational strategies including:

- provision of better information to tourists planning a trip to Australia, by means of the Internet and tourist agencies
- development of videos to be shown in-flight or in vehicle rental offices
- inclusion of more educational material on road maps
- wide availability of audio cassettes with information for international visitors to listen to while driving
- wider use of billboards displaying messages relevant to international drivers
- wider availability of safety information at service stations.

Australia now has a national strategy and action plan specifically for improving road safety for international visitors.

A national strategy for international visitors

Queensland Transport has facilitated the development of a national road safety strategy for international visitors and has prepared an action plan for 2004–2005. This initiative flowed from the recommendation of the Queensland Parliamentary *Travelsafe* Committee.

The *National Road Safety Action Plan for International Visitors 2004–2005* is to be presented to the April 2004 meeting of the Australian Transport Council for endorsement. The document is positioned as an action plan under the *National Road Safety Strategy 2001–2010* (see chapter 5).

The Action Plan has three strategic objectives:

1. Encourage international visitors to use our roads safely.
2. Provide a road environment that caters for the needs of international visitors.
3. Foster partnerships between government and industry that help protect international visitors on our roads.

Various actions are proposed under each strategic objective. Further biennial Action Plans will be implemented throughout the life of the *National Road Safety Strategy 2001–2010*.

These action plans aims to achieve a significant reduction in the number of deaths and serious injuries resulting from crashes involving international visitors. The plans will contribute to the *National Road Safety Strategy 2001–2010* target of reducing the number of road fatalities per 100 000 population by 40 per cent to no more than 5.6 by 2010.



