



Australian Government

Australian Transport Safety Bureau

Road Safety in Australia

A Publication Commemorating
World Health Day 2004





Australian Government

Australian Transport Safety Bureau



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Road Safety in Australia

A Publication Commemorating World Health Day 2004

Published by the Australian Transport Safety Bureau

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Messages

message from Kym Bills



Message from Mr Kym Bills, Executive Director,
Australian Transport Safety Bureau

The Australian Transport Safety Bureau is privileged to be involved in the initiatives around the world to commemorate World Health Day 2004. World Health Day 2004 will no doubt focus worldwide attention on the need to effectively address one of the world's most important public health problems: the carnage on the world's roads. This publication is intended to augment that effort.

The ATSB is part of the Australian Government Department of Transport and Regional Services and the ATSB's objective is 'safe transport'. We therefore have a strong commitment to furthering the national road safety agenda and contributing to achieving ever higher levels of safety on Australia's extensive road system. The ATSB aims to improve national road safety by undertaking research projects; collecting, analysing and

*Since the advent of motorisation,
over 171 000 people have died
on Australia's roads.*

publishing data and statistics; coordinating the National Road Safety Strategy and Action Plans; and providing safety, education and information services.

Since the advent of motorisation, over 171 000 people have died on Australia's roads. In 2003, 1 634 people died on our roads and over 22 000 sustained serious injuries. The social and economic burden of road crashes is astounding. There is much that is being done and can still be done to mitigate this problem, and the ATSB seeks to remain in the vanguard of the national and international effort.

This publication essentially brings together some of the work of the ATSB and information from other related bodies. It is intended as a source of information and a reference document on a range

of key topics in road safety. The availability of this publication on the ATSB's website will further enhance its usefulness and make it more widely available. I thank my colleague, Joe Motha, and his team for the development of this very useful publication.

I hope that the motto of World Health Day 2004 *Road Safety Is No Accident* will reverberate around the world and create a fresh and powerful international impetus to contend with the vexing problem that has been described as the 'war on the roads'.

A handwritten signature in black ink, consisting of a large, stylized 'K' followed by a long, sweeping horizontal line that ends in a small upward flick.

KYM BILLS



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AMBULANCE



A Key Public Health Issue

world health day 2004: *road safety is no accident*

The significance of World Health Day

The World Health Organization (WHO) sponsors World Health Day (usually on 7 April) each year to celebrate the anniversary of its founding in 1946.

Each year the event focuses on a particular health issue and fosters awareness, understanding, discussion and debate about the issue. The event also mobilises action to address the issue through prevention or treatment.

In recent years, themes for World Health Day included healthy environments for children, physical activity, mental health, safe blood, active ageing, safe motherhood, emerging infectious diseases, healthy cities for better life, and global

polio eradication. In 2004, for the first time since World Health Day commenced in 1950, the day has been dedicated to road safety.

World Health Day attempts to involve a wide range of people at the local, national and international levels. These include health professionals, officials in government, industry and the international development community, and children.

The slogan for World Health Day 2004 – *Road Safety Is No Accident* – suggests that road safety does not happen accidentally, but requires a deliberate effort by governments and their many partners.



In 2001, the WHO hosted a meeting of road safety experts from all the regions of the world. The meeting developed a 5-year *WHO strategy for road traffic injury prevention*. The strategy has three objectives:

- to build better systems for gathering and reporting data on traffic injuries
- to make prevention of road traffic injuries a public health priority in all countries

- to advocate for prevention and promote appropriate prevention strategies for road traffic injuries.

Since this meeting, the WHO has been involved in various collaborative initiatives to promote these objectives in low- and middle-income countries.

The global launch of World Health Day 2004 will take place in Paris, France on 7 April. The event will include the release by WHO of the *World*

Report on Road Traffic Injury Prevention. The report is jointly sponsored by the WHO and the World Bank and contains recommendations for the consideration of national governments.

A discussion is planned on 14 April 2004 in the UN General Assembly on the 'global road safety crisis'. This will be the first time that the General Assembly discusses road safety issues. The resolution to hold the discussion was passed on 29 May 2003 as a result of an initiative by the Sultanate of Oman. The UN Secretary General issued a report on the *Global Road Safety Crisis* in August 2003.

Improving road safety requires strong political will on the part of governments. Countries should aim to ensure that sufficient resources are available, commensurate with the size of the road safety problem in their country.

KOFI ANNAN, UN SECRETARY-GENERAL, 2003



The focus of World Health Day efforts

Various initiatives and activities have been planned around the world to commemorate World Health Day. The WHO has asked that these events be articulated around the following key themes:

- Road traffic injuries are a major global public health and development concern, disproportionately affecting certain vulnerable groups of road users; their magnitude is expected to rise considerably in the years ahead.
- Road traffic injuries can be prevented, and their consequences can be alleviated.
- Strong political commitment is the key to prevention efforts, and governments have a particular role to play in creating enabling environments for road safety.
- Road safety is a collective responsibility; partnerships bridging many sectors of society can promote and facilitate efforts to prevent road traffic injuries.
- The health sector has a key role to play among other sectors in promoting and facilitating road safety.



2 road crashes – a major public health issue

The global dimensions of the problem

Road deaths and injuries are a global problem of massive proportions.

According to the WHO, road traffic injuries are the leading cause of death by injury worldwide (20.3 per cent of all deaths from injury) and the tenth leading cause of all deaths (2.2 per cent of all deaths). Road traffic injuries rank second to HIV/AIDS as the leading cause of ill health and premature death for adult men aged 15–44 years.

Road traffic injuries claimed an estimated 1 170 694 lives in 1998. Of this number, 1 029 037 (87.9 per cent) were in low-and middle-income countries and 141 656 (12.1 per cent) were in

high-income countries. Deaths per 100 000 people were 20.7 in low-and middle-income countries and 15.6 in high-income countries.

The average global death rate due to road traffic injuries was 19.0 per 100 000 people in 2002. The lowest rates were in affluent European countries (average of 11.0) with the United Kingdom having the lowest rate of 5.4. Average rates were highest in the low- and middle-income countries of Africa (28.3) and the Eastern Mediterranean (26.3). In 2002, low- and middle-income countries accounted for 90 per cent of all disability-adjusted life years lost due to road traffic injuries. The disability-adjusted life year (DALY) is an indicator

of the time lost by an individual in living with a disability and the time lost due to premature death.

Road traffic injuries involve issues of social equity, having a disproportionate impact on the poor in developing countries where most victims are vulnerable road users such as pedestrians, children, cyclists and passengers. As poorer members of society have less access to medical services, their chances of recovery after crashes are also relatively lower.

Road traffic injuries also have disproportionate effects on young people. Over 50 per cent of

deaths worldwide occur among young adults aged between 15 and 44. Males are almost three times more vulnerable than females: in 2002, the rates were 27.6 per 100 000 males and 10.4 per 100 000 females. As people in the age groups that are most

economically active are also most affected by road crashes, there is an increased burden on poorer countries attempting to tackle poverty and raise levels of economic growth.

Over 3000 people are killed in road crashes worldwide every day – the equivalent of seven 747 jumbo jets with a full complement of passengers. In Australia, on average, five people die every day in road crashes.



What are the costs?

The global cost of road crashes has been estimated at US\$518 billion in 1997 and typically account for between 1 and 3 per cent of a country's annual gross national product (GNP).

It is estimated that there are about 100 million families trying to cope with the death or disability of a family member involved in a road crash. The impact in terms of emotional and financial stress is enormous. Poverty, depression, physical illness and suicide are common consequences.

Apart from the direct physical and psychological effects of injury on victims of road crashes, there are substantial impacts on their families and friends and on the community in general. The fear of traffic and of being involved in crashes can lead to reduced social interaction and cohesion as people remain indoors. In many countries it has

'THIS MUST NEVER HAPPEN AGAIN'

On 17 August, 1896, Bridget Driscoll became the first person to die in a road crash. A 44-year old mother of two children, she had travelled to London with her teenage daughter and a friend to watch a dance performance.

Mrs Driscoll was hit on a terrace in the grounds of London's Crystal Palace by a car that was supposed to be travelling at 4 miles per hour (6.4 kilometres per hour). Witnesses reported that the car was travelling at 'tremendous speed'.

The car, owned by the Anglo-French Motor Car Company, was being used to provide free demonstration rides to the public. The driver of the car at the time of the crash was Arthur Edsell, a company employee. Mr Edsell had been driving for only three weeks. No licences or driving tests were required at that time.

Mr Edsell is reported to have tampered with the belt, resulting in a doubling of the speed of the car. The car is therefore likely to have hit Mrs Driscoll at about 8 miles per hour (12.8 kilometres per hour). Mr Edsell is also reported to have been in conversation with a young female passenger, possibly trying to impress her with his driving skills!

The inquest lasted six hours, after which the jury returned a verdict of 'accidental death'. The driver and the company were not prosecuted.

At the inquest, the Coroner said: 'This must never happen again'.

also resulted in more sedentary lifestyles, with consequent health effects such as obesity and cardiovascular disease.

Despite data limitations, the WHO has estimated that there were 38 848 625 disability-adjusted life years lost worldwide in 1998 due to road traffic injuries. As table 1 shows, road traffic injuries were the ninth leading cause of all disability-adjusted life years lost and accounted for 2.8 per cent of global disability. It is projected that, by 2020, disability-adjusted life years lost will rise from ninth place to third place.

What does the future hold?

The United Nations has noted that projected trends in motorisation indicate that the problem of road traffic injuries will worsen and become a global public health crisis.

Table 1:
Disease burden (DALYs lost) for 10 leading causes

<i>1998 Disease or Injury</i>	<i>2020 Disease or Injury</i>
1. Lower respiratory infections	1. Ischaemic heart disease
2. HIV/AIDS	2. Unipolar major depression
3. Perinatal conditions	3. Road traffic injuries
4. Diarrhoeal diseases	4. Cerebrovascular disease
5. Unipolar major depression	5. Chronic obstructive pulmonary disease
6. Ischaemic heart disease	6. Lower respiratory infections
7. Cerebrovascular disease	7. Tuberculosis
8. Malaria	8. War
9. Road traffic injuries	9. Diarrhoeal diseases
10. Chronic obstructive pulmonary disease	10. HIV/AIDS

DALYs (disability adjusted life years) lost is a measure of the burden of disease.

Source: CJL Murray and AD Lopez, 1996

The WHO projections indicate that, by 2020, road traffic injuries will account for about 2.3 million deaths worldwide contributing 27.4 per cent to all injury deaths, with over 90 per cent occurring in low- and middle-income countries.

On the basis of current trends, annual road traffic deaths and injuries in high-income countries may

decrease by up to 30 per cent by 2020. This decrease will be due to the substantial efforts these countries will continue to make to improve road safety. However, by 2020, there is likely to be a 60 per cent increase in the annual global number of road deaths and injuries. This means that the increase in the number of deaths and injuries in the low-income countries will be of such magnitude as to completely swamp the improvement in the high-income countries and raise the overall global burden by 60 per cent.

Why is the problem growing?

There are several reasons for the spiralling increase in the burden of road crashes in the low-income countries. The rates of population growth of these countries are outstripping those of the high-income countries. As populations grow, people move from rural to urban areas in search of employment opportunities and come to depend

more on motorised transport. With economic growth, more roads are built and increasing incomes enable greater motor vehicle ownership and use. Although these changes generate greater exposure to crash risk, they are not generally accompanied by commensurate improvements in road safety measures.

The UN attributes the growing problem to insufficient attention at the international and national levels. This inattention is attributed to a lack of information on the extent of the problem and its preventability, a fatalistic approach to crashes, and a lack of political responsibility and multi-disciplinary collaboration.

The WHO has identified three major gaps in road traffic injury prevention:

- inaccurate data on the magnitude of the problem, risk factors and economic consequences
- inadequate evaluation of prevention efforts in low- and middle-income countries
- limited awareness of the problem, particularly among policy-makers and donors.

...road traffic injuries now pose a global public health crisis that requires urgent action at the national and the international levels.

GLOBAL ROAD SAFETY CRISIS, REPORT OF THE UN SECRETARY GENERAL, 2003

Taking action for road safety

Is road safety too expensive for some countries?

The evidence suggests otherwise. Economic evaluation studies in many high-income countries indicate that road safety expenditure is a good investment. For example, an evaluation of the Australian Government's Black Spot Programme has shown that it generated benefits of about A\$14 for each dollar of expenditure. Apart from the humanitarian imperative to mitigate grief, pain and suffering, efforts to improve road safety provide sound economic benefits.

The WHO has formulated a five-year strategy (2001–2005) to reduce road traffic injuries worldwide, with special emphasis on low- and

middle-income countries. The objectives of the strategy are to:

- build capacity at a national and local level to monitor the magnitude, severity and burden of road traffic injuries
- incorporate road traffic injury prevention and control into public health agendas around the world
- promote action-orientated strategies and advocate for prevention and control of the health consequences of motor vehicle collisions.



Too often, road safety is treated as a transportation issue, not a public health issue... many countries put far less effort into understanding and preventing road traffic injuries than they do into understanding and preventing diseases that do less harm.

DR JONG-WOOK LEE, DIRECTOR-GENERAL, WHO, 2004



The WHO has provided the following list of actions that governments and various other groups can take in advancing road safety.

What governments can do

Institutional development

- Make road safety a political priority.
- Appoint a lead agency for road safety, give it resources and make it accountable.
- Set appropriate road safety targets and establish national road safety plans.
- Develop mechanisms that promote a multi-disciplinary approach to road safety.
- Support the development of safety advocacy groups.

Policy, legislation and enforcement

- Ensure that road safety is viewed to be a serious political issue.
- Set and enforce strong and uniform vehicle safety standards.
- Enact and enforce legislation requiring the use of seat belts and motorcycle helmets, speed limits and the control of alcohol impaired driving.

- Enforce safety laws already in existence.
- Ensure that road safety considerations are embedded in environmental and other assessments for new projects and the analysis of transport policies and plans.
- Establish data collection systems designed to collect, analyse and use these data to improve safety.
- Make funding of road infrastructure conditional upon compliance with safety standards.
- Create budget lines for road safety and increase investment in demonstrably effective road safety activities.
- Support the development of safety advocacy groups.
- Establish appropriate design standards for roads that promote safety for all.
- Manage infrastructure to promote safety for all.
- Provide efficient, safe and affordable public transport services.

- Encourage walking and the use of non-motorised two-wheelers.
- Set and enforce appropriate speed limits.

What public health can do

- Include road safety in health promotion and disease prevention efforts.
- Systematically collect health-related data on the magnitude, characteristics and consequences of road traffic crashes.
- Support research to increase knowledge about risk factors and the development, implementation, monitoring and evaluation of effective countermeasures.
- Promote capacity building in all areas of road safety and the management of survivors of road traffic crashes.
- Translate effective science-based information into policies and practices that protect vehicle occupants and vulnerable road users.
- Strengthen pre-hospital and hospital care as well as rehabilitation services for all trauma victims.

- Develop trauma care skills of medical personnel at the primary health care, district and tertiary health care levels.
- Promote the development of policies aiming at greater integration of health and safety concerns into transport policies and facilitate this by further developing methods and tools to this effect (e.g. for integrated assessments).
- Invest in medical research to improve the care of trauma survivors.
- Advocate for greater attention to road safety in view of the health impact and costs.

What vehicle manufacturers can do

- Ensure that all motor vehicles meet minimum safety standards, regardless of where a vehicle is made, sold or used, including the provision of seat-belts and other basic safety equipment.
- Begin to manufacture vehicles with safety vehicle fronts to reduce injury for vulnerable road users.
- Advertise and market vehicles responsibly by emphasising safety.

What donors can do

- Make funding for road safety part of grants for health, transport, environmental or educational programmes.
- Support road safety research, programmes, and policy in low-income and middle-income countries.
- Make funding for transport infrastructure projects conditional on the completion of a safety audit and follow up.
- Generate mechanisms for providing funding for knowledge sharing and safety promotion in developing countries.

What communities, civil society and individuals can do

- Encourage governments to make the roads safe.
- Identify local safety problems.
- Help plan safe and efficient transportation systems that accommodate drivers as well as vulnerable road users like cyclists and pedestrians.

- Encourage safety programmes for school children.
- Demand safety features, e.g. seat belts, in cars.
- Encourage strong enforcement of traffic safety laws and regulations, and advocate for strong and swift punishment for traffic offenders.
- Behave responsibly by:
 - abiding by the speed limit on roads.
 - never driving when over the legal alcohol limit.
 - always wearing a seat-belt, and properly restrain children, even on short trips.
 - always wearing a crash helmet when riding a two-wheeler.

Over 171 000 Australians have died in road crashes, compared with 100 000 Australians who have died in wars since the beginning of the twentieth century.

Road trauma in Australia

The scale of the problem

In recent years, there have been around 1 700 road deaths and over 22 000 serious injuries in Australia each year.

Over 171 000 lives have been lost in road crashes in Australia – compared with the 100 000 Australians killed in the wars in which Australia has been involved since the beginning of the twentieth century.

According to the Australian Bureau of Statistics, the road crash was the tenth leading cause of death in Australia in 2002 (2.6 per cent), after cancer (52.5 per cent), heart disease (36.3 per cent), stroke (17.5 per cent), respiratory disease (8.7 per cent), diabetes (4.6 per cent), Influenza (4.3 per cent), diseases of arteries, etc (3.7 per cent), heart failure (3.8 per cent) and suicide (3.2 per cent).

Road crashes contributed 22 per cent to deaths classified as being due to ‘external causes’ (accidents, poisonings and violence).

As in other countries, a key feature of deaths due to road crashes is their prematurity. A 1991 study by the then Federal Office of Road Safety (now the ATSB) found that although road crashes were responsible for just over 2 per cent of total deaths in Australia annually, they accounted for almost 7 per cent of years of statistical life lost through all causes of death – more than years lost through cerebrovascular disease or lung cancer. The study also found that, when only years of life lost before the age of 65 or during the working age span were considered, road crashes in Australia accounted for more years lost than years lost through all forms of

heart disease, and about three-quarters of years lost through all types of cancer.

The economic cost of crashes has been estimated by the Bureau of Transport and Regional Economics (BTRE), using a ‘human capital’ approach (see facing page) to be in the order of \$15 billion in 1996 – an amount equivalent to Australia’s total annual defence budget. This figure translates to over \$750 per year for each man, woman and child in Australia. More than half the total cost of crashes (56 per cent) are ‘human’ costs, meaning that they involve costs directly related to crash victims, such as lost output, long-term care and rehabilitation and lost quality of life. Every day, road crashes cost the Australian community over \$41 million, of which \$23 million represents human costs.



How is human life valued in estimating road crash costs?

To some people, the notion of putting an economic value on human life may appear distasteful or unacceptable. However, the decisions most people routinely make every day involve trade-offs that implicitly place a monetary value on risk to life. Some examples in the road safety context are decisions to increase travelling speed in order to save time, postponing the replacement of worn tyres, or attempting to cross a busy street instead of using a more time consuming pedestrian overpass or underpass.

Economic approaches to valuing 'life' do not in fact attempt to put a value on human life: they attempt to measure a proxy such as the value of human productivity or the value that individuals assign to changes in risk to their lives. Economic valuation provides an explicit and transparent approach to be used in benefit-cost analysis. The use of consistent values to represent the loss of human life enables estimates to be derived of the benefits of expenditure on specific life-extending programmes and also provides a means of making decisions about whether reallocating limited resources among such programmes would increase overall social benefits.

The 'human capital' and 'willingness to pay' methods are the two most common approaches to valuing human life and injuries for economic purposes, including estimating the human costs of road crashes.

The human capital method is currently used in Australia. It involves estimating the value of a victim's lost output or productivity due to injury or premature death. The value of lost output over the victim's statistically expected life span is converted to current dollar values using an appropriate discount rate. The lost output includes both paid work, usually measured in terms of the victim's work-related income, and unpaid work, which involves an estimate of the victim's contribution to household and community work.

Other elements of costs involved in crashes are estimated and aggregated to provide a total cost of all crashes and average costs per crash. The elements of cost relating directly to the victims ('human' costs) can be separated from the vehicle-related costs (such as vehicle damage and towing) and general costs (such as travel delays, insurance administration, and police and ambulance costs). The human costs include a component for the pain and suffering of crash victims and others.

The willingness to pay method is conceptually different from the human capital method and involves estimating what people are prepared to pay for a safer life (or are prepared to accept in compensation for bearing a greater risk to their lives). There are two broad approaches for estimated values: using survey techniques to ask people how they would trade-off money for risk, or observing their actual risk-taking behaviour.

The willingness to pay method yields a value for a 'statistical' life, meaning that it is the value attached to reducing the statistical risk of losing one human life or the value of preventing the death of a person. Some countries, including New Zealand, Sweden and the United Kingdom use values based on this method. Willingness to pay values are more difficult to estimate and the approach generally produces a range of values which, on average, are considerably higher than values obtained by applying the human capital approach.

A study by the Bureau of Transport and Regional Economics using the human capital approach has estimated the average cost of a death in a road crash at \$1.5 million in 1996 dollars. The cost of a seriously injured person was estimated at \$325 000 and a minor injury at \$12 000.

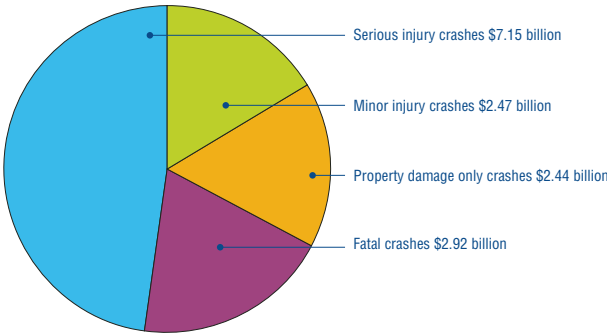
Economic estimates of the costs of road crashes are useful in understanding the general dimensions of the economic burden of crashes on the Australian community and on particular groups within the community. However, it is very difficult to meaningfully assess the full impact and magnitude of the grief, pain and suffering that crashes inflict on members of the community.

Reducing the number and severity of road crashes will release resources for use in more socially and economically beneficial areas, such as improving national productivity and reducing pressure on health and medical services.

*Every 22 minutes,
someone is killed or
seriously injured on
Australia's roads.*

The cost of crashes in Australia in 1996 by injury category are shown in figure 1.

FIGURE 1:
The economic cost of road crashes in 1996 by injury category

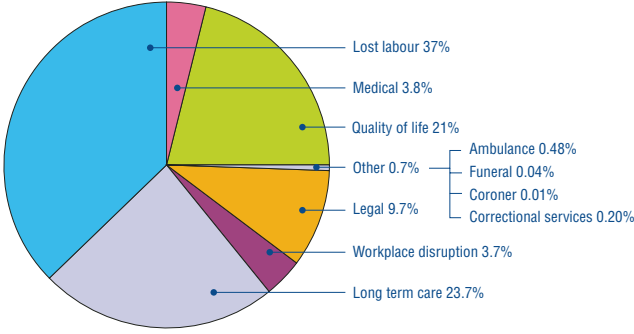


Source: Bureau of Transport and Regional Economics

It is important to distinguish between the cost of a fatal crash (comprising the human costs, vehicle-related costs and general costs) and the cost of a fatality or death (the human costs only). As a fatal crash can involve more than one fatality, the cost of a fatal crash, on average, will be higher than the cost of a fatality.

The human costs of crashes in 1996 are shown in figure 2.

FIGURE 2:
Summary of human costs of road crashes in 1996

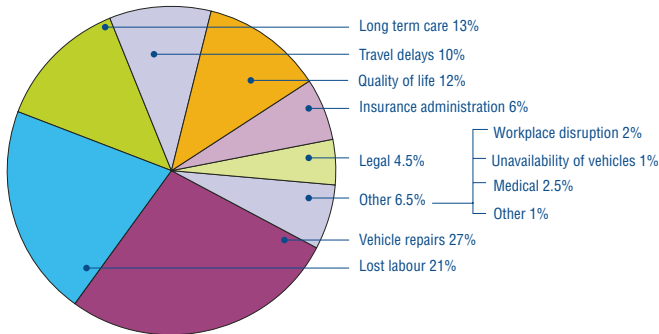


Source: Bureau of Transport and Regional Economics

The average cost of a fatal crash was \$1.7 million; serious injury crash, \$408 000; minor injury crash \$14 000; and property damage only crash \$6 000. The average cost per crash (all injury levels) was \$24 000.

The \$15 billion cost of road crashes disaggregated by cost category is shown in figure 3.

FIGURE 3:
Cost of road crashes by cost category, 1996



Source: Bureau of Transport and Regional Economics

Road crashes are by far the largest contributor to the overall cost of transport-related accidents in Australia. The BTRE's estimates of aviation accidents in 1996 (A\$112 million) and rail accidents in 1999 (A\$133 million) are much less significant than the A\$15 billion cost of road crashes.



*Road crashes cost each Australian
over \$750 per year and
cost the community over
\$41 million every day.*





Trends and Strategy

3 how risky is road travel?

Is travel in a light aircraft safer than a typical journey in a private car? What is the difference in risk between motorcycle riding and driving a car? The relative safety of different transport modes is a matter of common interest.

The terms 'safety' and 'risk' are often used interchangeably. Risk is the converse of safety: more safety implies less risk. Absolute safety is unattainable: all modes of transport involve some degree of risk, no matter how small.

Research shows that people generally overestimate the magnitude of low-probability events such as fatal motor vehicle crashes, floods, cancer, tornadoes and air crashes, and under-estimate high-probability risks such as heart disease, diabetes and stroke. In a 1978 study by

S Lichtenstein and others on how people perceive different types of risk, the perceived risk of motor vehicle crashes was found to be over six times the actual risk, whereas in the case of heart disease, the perceived risk was about half the actual risk.

To be alive at all involves some risk.

HAROLD MACMILLAN, FORMER BRITISH PRIME MINISTER

Overestimated risks are generally more sensational, whereas underestimated risks tend to be low-key events which claim one victim, or a few, at a time. The tendency of people to overestimate some risks is usually reinforced by media reporting, which generally provides disproportionate coverage of violent and catastrophic events.

An 'optimism bias' is commonly encountered in personal risk assessment: many people believe that their chances of experiencing a risky event is lower than average: it is quite possible to overestimate other people's crash risk and underestimate one's

own. Road crashes, for example, are commonly thought of as only happening to other people. Many people consider themselves better than average drivers, and despite the various risks they encounter on the roads, may have crash-free records for long periods. Such experience, together with actual observations of crashes experienced by others and news media reports of such crashes, reinforce the notion that crashes only happen to other people. Such a notion often leads people to underestimate their risks and to sometimes neglect precautionary action such as seat belt wearing.

*What is dangerous driving?
I have a tendency to believe that everyone's
driving is dangerous, except my own.*

GEORGE BERNARD SHAW





Comparing risk between transport modes is not straightforward

The numbers of deaths recorded over time in each transport mode are readily available, but limited data on consistent risk exposure levels (such as distance travelled) across modes makes reliable comparisons difficult. For example, one useful measure of risk exposure for aviation is hours flown, while for road travel, distance travelled measured by vehicle-kilometres is generally used.

Exposure data for road travel are usually gathered as part of surveys covering detailed travel patterns for individuals.

The death rate per 100 000 people is a commonly used population or public health measure, but it does not adequately take into account the extent of exposure to transport-related risk. The risk

On the basis of passenger distance travelled, general aviation is up to 6 times more risky than travelling by car, and motorcycling is over 20 times more risky. Travelling by bus, train, ferry and tram involve very low risk levels.

exposure aspect is more evident when making comparisons between countries. For example, in 1996 Australia had a road death rate of 11 per 100 000 people and 2 per 10 000 motor vehicles. By contrast, Tonga had a marginally better road

death rate of 10 per 100 000 people, but a much worse death rate of 52 per 10 000 motor vehicles. The use of a single risk measure could therefore provide misleading results.

There is also the question of risk weighting per passenger. For example, how can appropriate and accurate risk data for a train and a bus per kilometre of travel be obtained when the average bus may carry 20 to 30 passengers and the train several hundred? Deaths per vehicle kilometre, deaths per passenger kilometre, and fatal crashes per vehicle or passenger kilometre can give somewhat different perspectives of the relative safety of different modes. Yet another issue is that some risk exposure measures cannot be applied to all modes – for example, pedestrian activity and pedal cycling cannot be measured in terms of registered vehicles.

No single measure of travel risk exposure is ideal in all circumstances and the most useful information is generally a comparison of trends using various measures of exposure. Lack of data, however, generally restricts the types of comparisons that can be made.

Table 2:
Deaths per passenger distance travelled (based on car occupant = 1.0)

	<i>Australia</i>					<i>United Kingdom</i>
	1960s	1985–86	1988	1992	1993	1990–99
AIR						
High capacity RPT	0.03	0.00	0.00	0.00	0.00	0.01
Low capacity RPT		0.00		0.22	0.33	-
General aviation (fixed wing)	5.52	6.22	4.15	6.27	6.83	-
ROAD						
Car occupants	1.00	1.00	1.00	1.00	1.00	1.00
Motorcycles	12.15	24.18	15.99	10.29	26.67	31.52
Bus passengers	0.18	0.18	0.05	-	0.17	0.12
Pedestrians	-	15.36	-	-	-	18.79
Bicyclists	-	4.04	-	-	-	13.33
RAIL						
Passengers	-	0.23	-	-	0.17	0.15

RPT regular public transport

Note: The data in all columns in this table, except the last column, are from Australian studies.
For details on data sources, see www.atsb.gov.au/public/discuss/cross_modal.cfm

Source: Australian Transport Safety Bureau

Risk comparisons across modes

The ATSB has made comparisons drawing on the best data available and the results are very broadly comparable.

Inter-modal comparisons using available data are presented in table 2, in which risk is assessed in terms of passenger distance travelled. For each mode, the risk has been expressed as a ratio relative to car occupant safety, where car occupant safety is standardised at 1.0. Tram and ferry data are not available, but are likely to be similar to bus and train data.

The data in table 2 show that high capacity airline travel is the safest form of transport. There have been no deaths in high capacity airline travel in Australia since the 1960s, and there have never been any fatal accidents involving high capacity

passenger jet aircraft in Australia. High capacity air travel therefore remains the safest form of transport, irrespective of the measure of risk exposure used. The relatively low risk of the high capacity aviation sector is often expressed in statements such as: 'driving to the airport is more dangerous than catching a flight'.

Low capacity air transport involves relatively low numbers of fatal crashes, but one or two crashes can significantly affect the safety rating.

Table 2 shows that general aviation is significantly less safe than car travel. Some sectors of general aviation are particularly risk-prone, such as aerial agriculture which involves mustering and spraying.

Bus and rail are the safest forms of land transport and have very similar safety rates. Motorcycling is the least safe form of transport.

Table 2 shows that there is a significant degree of consistency among the results of Australian researchers and that the relative safety of different modes of transport in Australia is broadly in line with the United Kingdom. The exception is that bicycling in Australia appears significantly safer than in the United Kingdom. This may reflect the lower kilometres travelled per person for bicycles and all modes of land transport, other than rail, in the United Kingdom. A comparison based on a different measure such as deaths per trip may provide a more accurate picture of safety.



4 australian road safety developments and trends

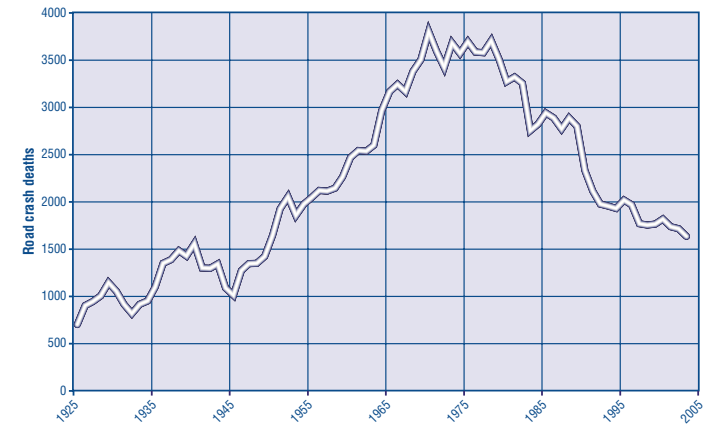
Historical perspective

Road crash deaths in Australia from 1925 to 2003 are shown in figure 4. Over this period, road deaths increased rapidly until 1970, when they peaked, and then remained relatively stable throughout the 1970s. Road deaths have decreased substantially since the 1970s.

The 1 634 road crash deaths in 2003 are comparable with those in 1950, when there were 1 643 deaths; however, current death *rates* are substantially lower. In 1950, the death rate per 100 000 people was 20.1 and the death rate per 10 000 registered vehicles was 11.8. In 2003, the death rate per 100 000 people was 8.2 and the death rate per 10 000 registered vehicles was 1.2.

*In 1970, 3 798 people
were killed in road crashes,
in 2003 the number had fallen to 1 634.*

FIGURE 4:
Road crash deaths, 1925 to 2003



Source: Australian Transport Safety Bureau

Programmes to reduce road crash deaths

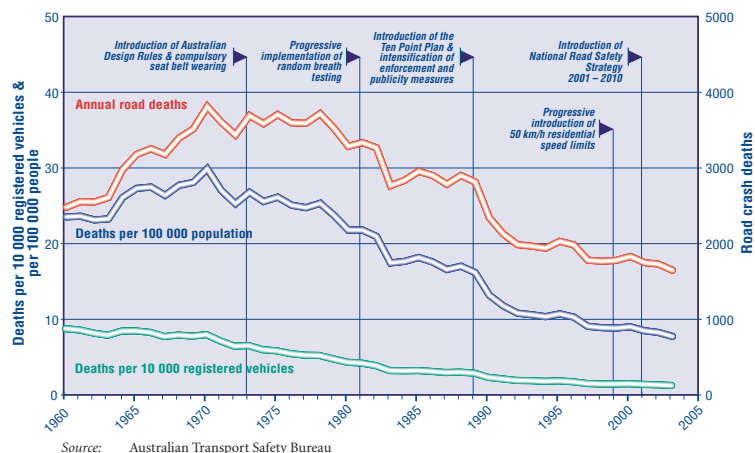
Figure 5 shows trends in deaths and death rates from 1960 to 2003, together with an implementation time-line of some major road safety initiatives during this period.

Following the introduction in 1969 of Australian Design Rules requiring seat belts in new vehicles and the law requiring compulsory seat belt

wearing in 1970, the climb in road deaths levelled out and the number of deaths remained fairly stable for the remainder of the 1970s. By 1979 – a few years into the progressive implementation of random breath testing – road deaths began to fall, and the decline has, by and large, continued up to the current period.

The *National Road Safety Strategy 2001–2010* and Action Plans are described in chapter 5. The strategy aims to reduce road deaths per 100 000 people from 9.3 in 1999 to no more than 5.6 by the end of 2010. At the end of 2003, the death rate per 100 000 people was 8.2 – slightly above the pro-rata rate of 8.0 required to reach the 2010 target.

FIGURE 5:
Trends in road deaths and major road safety initiatives, 1960 to 2003



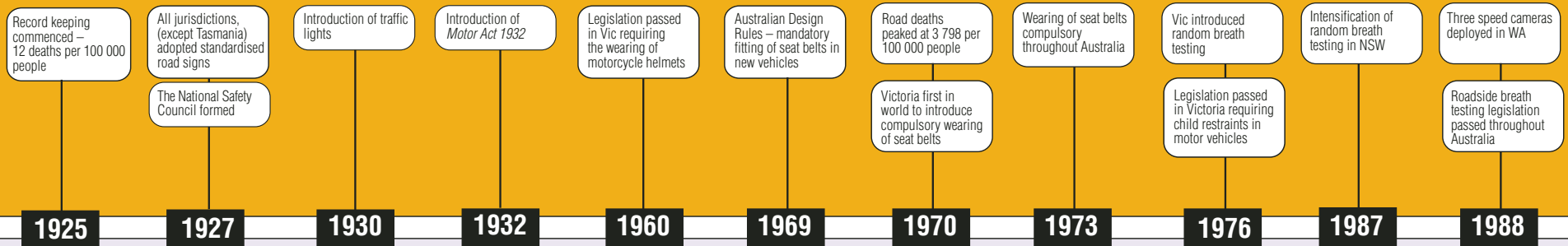
Victoria became the first jurisdiction in the world to introduce compulsory wearing of seat belts in 1970, and the first in the world to make bicycle helmets compulsory in 1990.

A chronology of developments in road safety

- 1925 Record keeping commenced and reported 12 deaths per 100 000 people.
- 1927 All jurisdictions, except Tasmania, adopted standardised road signs.
- 1927 The National Safety Council, the first road safety group in Australia, was formed.
- 1930 Introduction of traffic lights.
- 1932 *Motor Act 1932* required all vehicles to adhere to safety standards for maintenance of tyres, rear-view mirrors and vehicle horns.
- 1960 Legislation passed in Victoria requiring the wearing of motorcycle helmets.
- 1969 Australian Design Rules for mandatory fitting of seat belts in new passenger vehicles.

- 1970 Road deaths peaked at 3 798 or 30.4 deaths per 100 000 people.
- Victoria became first in the world to introduce compulsory wearing of seat belts. By 1973, legislation was passed throughout Australia for compulsory wearing of fitted seat belts in motor vehicles.
- 1976 Victoria introduced random breath testing. By 1988, similar legislation was passed in all Australian states and territories (breath testing technology having been employed by Australian police since the early 1960s).
- Legislation was passed in Victoria requiring child restraints in motor vehicles. By 1982, all Australian states and territories had passed similar legislation.

- 1987 Intensification of random breath testing in New South Wales.
- 1988 Three speed cameras deployed in Western Australia (following trials in 1986).
- 1989 Introduction of intensive road safety advertising (e.g. Transport Accident Commission).
- Intensification of random breath testing, particularly in Victoria.
- Motor Vehicles Standards Act 1989* set the standards vehicles must meet in order to be supplied to the Australian market. The national standards are known as the Australian Design Rules.
- Austroads launched on 1 July 1989.



1989 The Ten Point Plan (progressive implementation from 1990):

- 1 National 0.05 blood alcohol concentration limit
- 2 National licensing of heavy truck and bus drivers
- 3 National uniform speed limits so that no speed limits will exceed 110 km/h
- 4 Speed limiters for heavy vehicles
- 5 Zero blood alcohol limits for young drivers
- 6 Enforcement to ensure that one in four drivers is random breath tested annually
- 7 Graduated licensing system for young drivers
- 8 Compulsory bicycle helmet wearing for all cyclists
- 9 Daylight running lights for motorcycles
- 10 Enforcement of seatbelt and child restraint wearing.

1990 Introduction of speed camera programmes (e.g. Victoria in 1990, New South Wales in 1991, Queensland in 1996).

Victoria introduced legislation requiring compulsory wearing of bicycle helmets.

The Australian Government launched the highly successful Black Spot Programme.

1991 New South Wales introduced radar speed cameras.

1992 Legislation governing compulsory wearing of bicycle helmets in force in all Australian jurisdictions.

First National Road Safety Strategy (target of reducing the national road death rate to below 10 per 100 000 people by 2000).

1994 First National Road Safety Action plan.

1996 Australia's Rural Road Safety Action Plan launched.

Roads of National Importance scheme introduced.

1998 Progressive introduction of 50 km/h speed limits in urban residential areas (1998–2004).

1999 Uniform Australian Road Rules finalised by the National Road Transport Commission.

Australia Cycling – The National Strategy 1999–2004.

2000 National Road Safety Strategy 2001–2010 (implementation from 1 January 2001) aims to reduce the number of road deaths per 100 000 people by 40 per cent, from 9.3 in 1999 to no more than 5.6 in 2010.

2001 National Road Safety Action Plan for 2001 and 2002.

Roads to Recovery 2001–2005, launched on 1 January 2001 (extended to 2009).

South Australia introduced alcohol interlock devices.

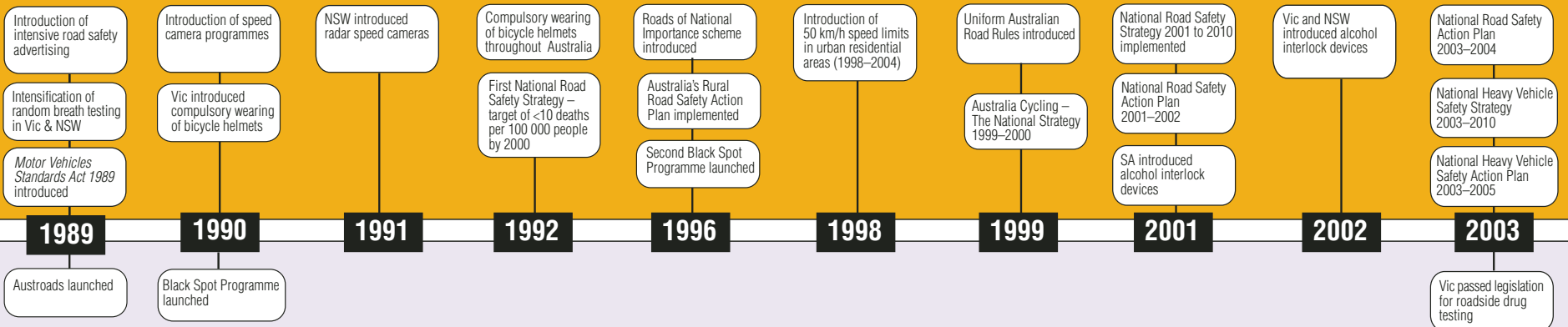
2002 Victoria and New South Wales introduced alcohol interlock devices.

2003 National Road Safety Action Plan for 2003 and 2004.

National Heavy Vehicle Safety Strategy 2003–2010.

National Heavy Vehicle Safety Action Plan 2003–2005.

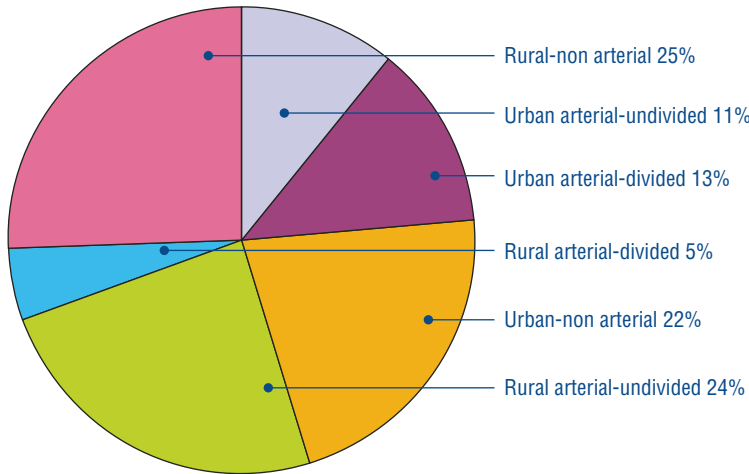
Victoria passed legislation for roadside drug testing.



Risk in urban and rural areas

For purposes of analysis, a rural area is defined as an area of fewer than 100 000 residents. Using this definition, figure 6 shows that over 50 per cent of road deaths occur in rural areas.

FIGURE 6:
Proportion of deaths by urban/rural location and type of road, 1999



Source: Australian Transport Safety Bureau

Road crashes are a major cause of death and injury for people living outside major cities and urban areas. There is a common perception that it is visitors and tourists rather than ‘locals’ who are involved in rural crashes, but in fact the majority of those who die on rural roads are rural residents. In

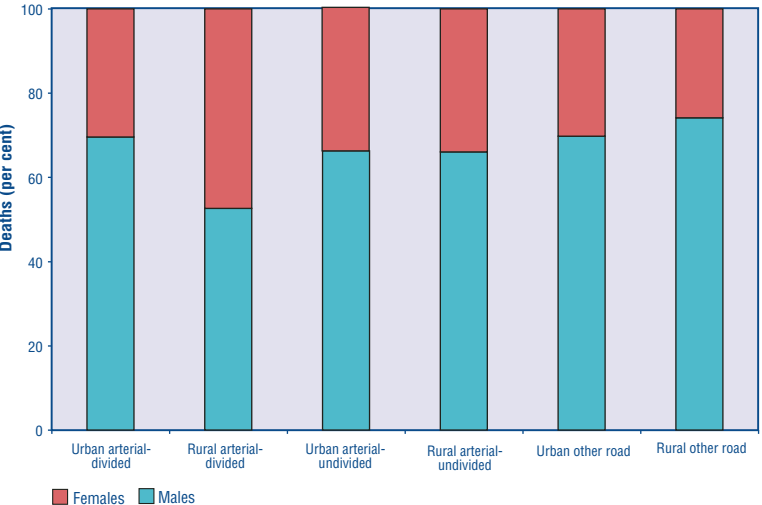
1999, around 70 per cent of people killed in rural road crashes lived outside a major urban area.

On average, people who live in country areas drive greater distances, are further from medical help and are less likely to wear seat belts compared with those residing in cities and major urban areas. Country residents also tend to drive longer distances on roads with speed limits of 100 km/h or more, and on roads with low design standards where police enforcement (speed, alcohol, seat belts) is relatively limited (see chapter 31).

Over half of all road deaths occur on rural roads.

Figure 7 highlights that, in 1999, about two-thirds of deaths on the different categories of roads were males. The only exception was on rural arterial-divided roads, where the proportions of males and females killed were roughly equal.

FIGURE 7:
Proportion of male/female deaths in urban/rural areas, 1999

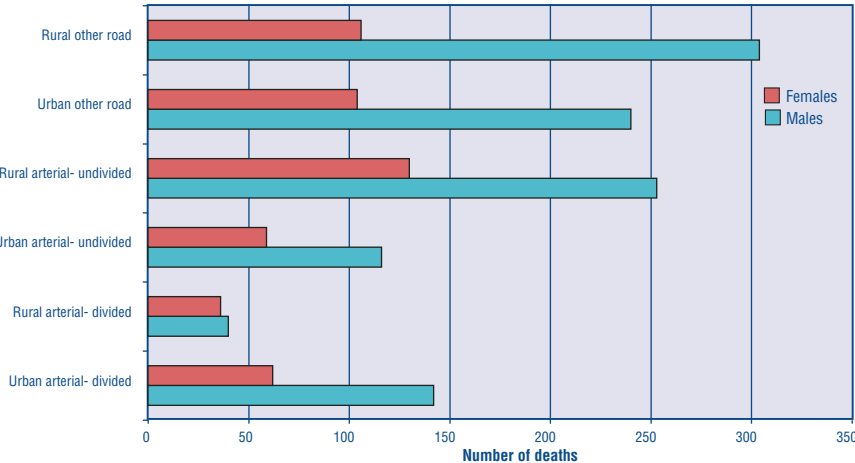


Source: Australian Transport Safety Bureau

Figure 8 shows actual male/female deaths on the different urban and rural roads. A comparison of deaths on the different roads is not strictly possible, as data on the overall length of the different roads are not available. However, the

much smaller number of deaths on rural arterial-divided roads were probably because of lower traffic densities on rural arterial divided roads compared with urban arterial divided roads.

FIGURE 8:
Male/female road crash deaths in urban/rural areas, 1999



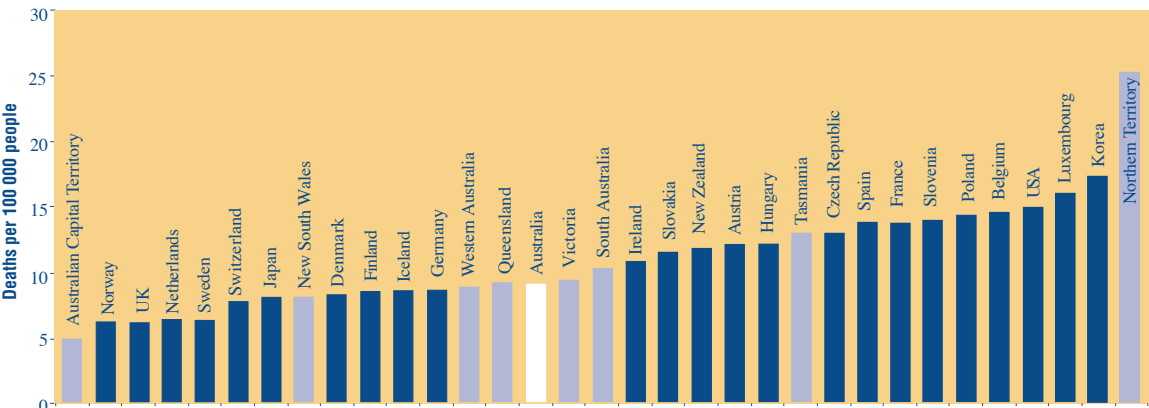
Source: Australian Transport Safety Bureau

International comparisons

The road death rates compiled by the Organisation for Economic Cooperation and Development (OECD) allow Australia’s road safety performance to be compared with other OECD nations, while taking account of the differing levels of population, motorisation and distances travelled.

Three rates are commonly used in assessing road safety performance. Deaths per 100 000 people is a measure of the public health risk associated with road use (figure 9). It enables road risk to be compared with the risk of death due to other causes. The number of deaths per 10 000 registered vehicles enables road deaths rates of countries with different levels of motorisation to be compared. The death rate per 100 million vehicle-kilometres travelled is a measure that takes account of different levels of risk exposure. Consistent data for this measure are not available in all OECD countries.

FIGURE 9:
Deaths per 100 000 people, OECD nations and Australian states/territories, 2001



Source: Australian Transport Safety Bureau

Australia's road death rates in 2001 (the most recent year for which OECD data are available) for population, motorisation and distance travelled, were all below the corresponding OECD median rates. Among the 25 nations comprising the OECD in 2001, Australia had:

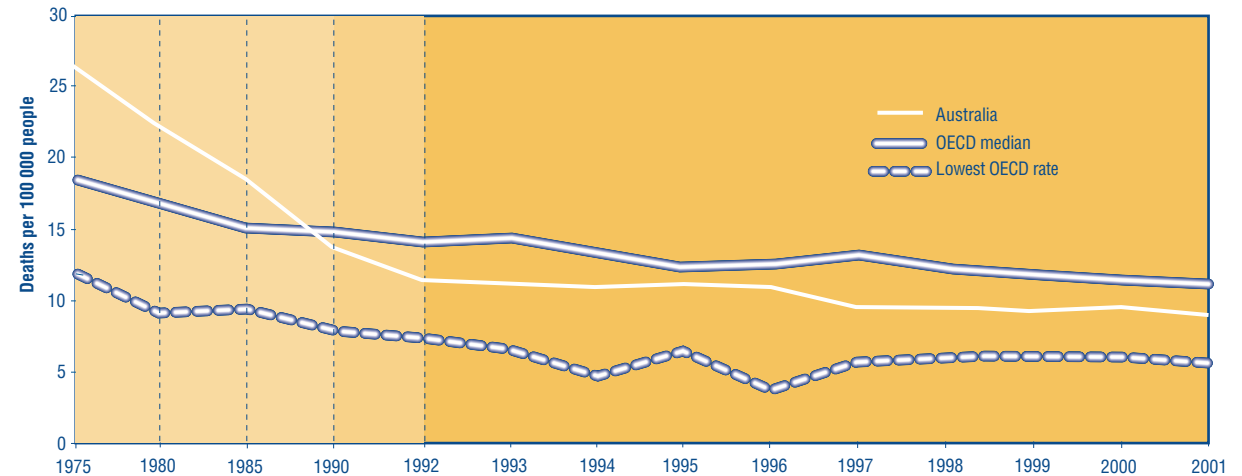
- the eleventh lowest rate in terms of deaths per 100 000 people
- the ninth lowest rate in terms of deaths per 10 000 registered vehicles
- the fourth lowest rate in terms of deaths per 100 million vehicle-kilometres travelled.

Of the OECD nations for which 2001 data were available, Norway recorded the lowest rate of 6.1 deaths per 100 000 people (of 25 nations), the lowest rate of 1.0 deaths per 10 000 registered vehicles (of 25 nations), and the lowest rate of 0.8 deaths per 100 million vehicle-kilometres travelled (of 12 nations). Within Australia, the

Australian Capital Territory recorded the lowest rate of 5 deaths per 100 000 people, and the Northern Territory recorded the highest rate (25).

As figure 10 shows, Australia's reduction in the rate per 100 000 people has reflected greater improvement than the OECD median. In 1975, the Australian rate was 44 per cent above the OECD median; in 2001, it was 22 per cent below the OECD median.

FIGURE 10:
Deaths per 100 000 people, OECD median, lowest OECD rate, and Australia, 1975 to 2001



Source: Australian Transport Safety Bureau

reducing road deaths and injuries: a national strategy

Australia's road safety strategy

*The road toll should
not be accepted as
inevitable.*

THE NATIONAL ROAD SAFETY STRATEGY 2001–2010

Several nations, including Australia, have national strategies and associated fatality reduction targets.

The target of Australia's strategy is to reduce the annual number of road deaths per 100 000 people by 40 per cent – from 9.3 in 1999 to no more than 5.6 in 2010 (figure 11). The target is expressed in relative terms (i.e. no more than) implying that road deaths are neither inevitable nor acceptable.

Achieving this target will save an estimated 3 500 lives by 2010 and reduce annual road deaths in 2010 by approximately 700.

The *National Road Safety Strategy 2001–2010* (NRSS) was adopted by the Australian Transport Council (ATC) in November 2000. The ATC comprises Ministers with transport responsibilities from the Australian Government and the states and territories, and includes an observer from local government.

In Australia's federal system of government, road safety strategy and policy measures are principally driven by the states, territories and local government who conduct their own road safety programmes. The role of the Australian Government and its agencies includes funding major road programmes and the treatment of

black spots; regulating new vehicle standards; research; compilation and analysis of national statistics; and facilitating the sharing of ideas and information among stakeholders.

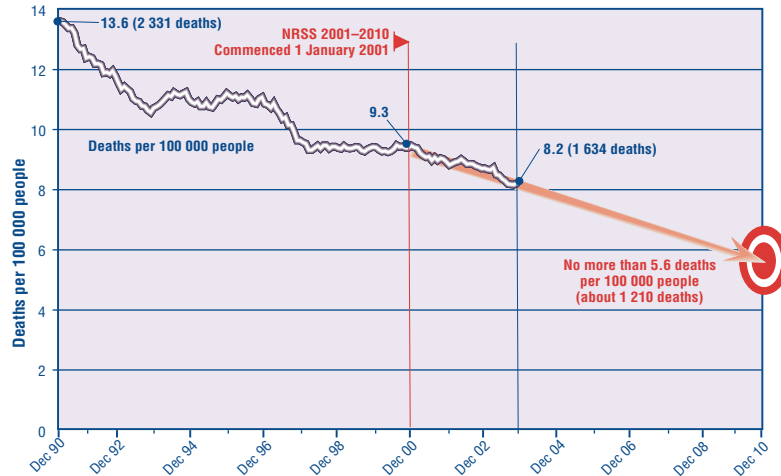
The strategy provides a framework for coordinating and complementing the road safety

initiatives of all levels of government and of others capable of influencing road safety outcomes.

Individual governments and others will continue to develop and implement their own road safety strategies and programmes consistent with this strategy, but reflecting local imperatives.

The ATC agreed that a series of biennial action plans should be developed, setting out specific measures available to achieve the objectives of the strategy. Each action plan was to be reviewed toward the end of its two-year period and a further action plan developed and submitted for the approval of the ATC. The development of action plans for 2001 and 2002 and for 2003 and 2004 was coordinated by the ATSB through the National Road Safety Strategy Panel (see chapter 38) and approved by the ATC.

FIGURE 11:
Road deaths per 100 000 people – moving 12-month total



Source: Australian Transport Safety Bureau



How was the target chosen?

There are different approaches to target setting. The top-down or idealistic approach is based on ideal or aspirational standards such as Canada’s vision of having the safest roads in the world or Sweden’s ‘Vision Zero’, which is about placing priority on preventing death and serious injury before all other considerations. The bottom-up or realistic approach adopted by Australia (and a few other countries including the United Kingdom and New Zealand) is based on research and analysis.

The bottom-up approach adopted by Australia meant that the target was not chosen arbitrarily: it was a research-based estimate by experts of what could be achieved with a concerted effort, taking into account the effects of known measures. The target-setting process was based on the proposition that there are viable options available to achieve a much safer road system.

After allowing for increases in vehicle use and for the overlap when different measures are implemented in combination, the following indicative estimates were obtained for the potential contribution of different types of measure to the overall target:

Safer roads	19%
Improved vehicle occupant protection	10%
Improved road user behaviour	9%
New technology to reduce human error	2%
Total reduction in population fatality rate	40%

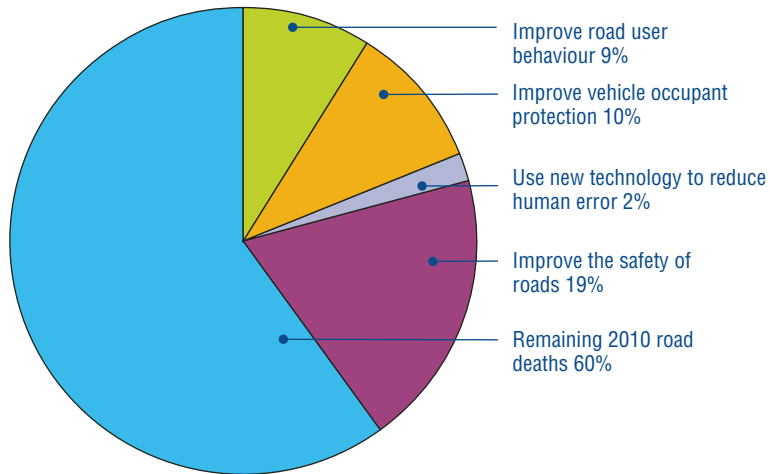
The estimates (figure 12) indicated that almost three-quarters of the targeted 40 per cent reduction in per capita fatality rates could be achieved by maintaining real funding for road measures and by the flow-through effects of vehicle safety improvements that were already implemented or scheduled. Most of the remaining improvement was expected to be achieved through

improved compliance with existing rules on drink driving, speed and restraint use (by extending and refining enforcement programmes, backed by public education and persuasion).

Translating the above estimates into lives saved (or deaths avoided) in 2010: 332 of the 700 lives saved could be attributable to better road infrastructure, 175 lives to safer vehicles, 158 lives to improved road user behaviour, and 35 lives to new technology.

Only a very small proportion of the total projected safety improvement was associated with measures that had inherently long lead times. The accumulation of road and vehicle improvements over the decade to 2010 was expected to be fairly uniform, and it was considered that changes through improved compliance with existing rules should be achievable sooner rather than later.

FIGURE 12:
Estimated effect of possible road safety measures by 2010 in terms of percentage reduction in deaths per 100 000 people



Source: Australian Transport Safety Bureau

How is the target to be achieved?

The strategy's vision is 'safe road use for the whole community'. Research indicates that many current road safety measures have not reached their full potential in terms of cost-effectiveness. The target of the strategy is to be achieved by:

- continuing existing effective measures
- enhancing and/or achieving wider implementation of measures with further potential
- introducing new measures.

The strategic objectives are:

- improve road user behaviour
- improve the safety of roads
- improve vehicle compatibility and occupant protection
- use new technology to reduce human error
- improve equity among road users
- improve trauma, medical and retrieval services
- improve road safety policy and programmes through research of safety outcomes
- encourage alternatives to motor vehicle use.

Whoever wants to reach a distant goal must take many small steps.

Areas of focus in the Action Plan for 2003 and 2004

The Action Plan for 2003 and 2004 was designed to provide a clear focus on priority action areas in road safety. These include areas where there is the potential to achieve a significant impact on road trauma within the next few years, and others that will lay the foundation for longer-term gains.

There was a strong consensus among officials in all jurisdictions, and among road safety experts consulted in the preparation of the Action Plan, that the number of road fatalities over the rest of this decade and beyond will depend critically on the action that is taken in two key areas:

- Speed management
 - improving compliance with speed limits, and selective reduction of limits on roads with a relatively high crash rate.
- Application of engineering measures to improve the safety of roads

- including both black spot programmes and targeted 'mass application' of cost-effective measures to improve the safety of larger sections of the road network.

The plan also identifies other areas where there is a prospect of substantial gains (or worthwhile gains at relatively low cost):

- driver impairment (alcohol, other drugs and fatigue)
- vehicle measures (including seat belt reminder devices; encouraging corporate and individual vehicle purchasers to select safer vehicles; and development of a National Heavy Vehicle Safety Strategy)
- licensing and driver management (including measures to reduce the incidence of unlicensed driving and motorcycle riding, and to enhance the effectiveness of licence suspension as a deterrent penalty)

*The most important problem of safety...
arises from its position in time. Safety rests in
the future... One has to act now if the promise
or hope is to be fulfilled later.*

JOHN POLYA, 1964

- special groups and issues

the National Strategy noted particular concerns about safety outcomes for a number of specific groups of road users, including cyclists, motorcyclists, pedestrians, elderly road users, youth and indigenous people. The Action Plan suggests that the most effective options for improving the safety of these groups include measures that are not specifically targeted at group members, such as improved speed management and safer road infrastructure. However, the Action Plan puts forward a small number of group-specific measures to supplement the general measures.

The mix of measures adopted in individual jurisdictions, and the details of specific measures, will vary to reflect local circumstances and priorities. The Action Plan cannot pre-empt the administrative or legislative processes required before implementation of many of these measures. However, all jurisdictions agreed that planning and implementation should focus on these priority areas.

The National Road Safety Strategy and current and future action plans provide a blueprint for achieving significantly better road safety outcomes in the period to 2010. However, as road safety is not just the responsibility of governments but should be everyone's concern, a concerted and sustained effort by the Australian community is necessary to achieve or exceed the target.



6 road safety performance of Australian jurisdictions

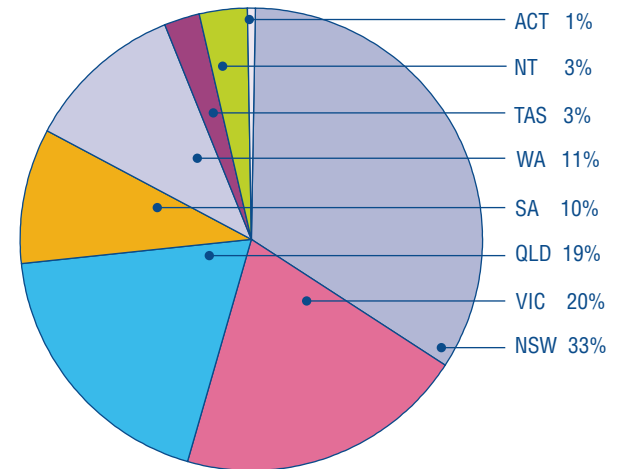
Performance by Australian states and territories

The Australia-wide rate of road crash deaths per 100 000 people was 8.2 in 2003. As would be expected on the basis of population, 72 per cent of road deaths occurred in the three eastern seaboard states of New South Wales, Victoria and Queensland (figure 13).

Table 3 outlines the deaths and death rate per 100 000 people for each state and territory in 2003. The death rates in the more populous states have the greatest impact on the overall death rate for Australia.

Almost three-quarters of all road deaths in Australia occur in New South Wales, Victoria and Queensland.

FIGURE 13:
Road deaths by state and territory, 2003



Source: Australian Transport Safety Bureau

Table 4 shows deaths per 100 000 people for each jurisdiction from 1999 to 2003, and the percentage changes between each year from 1999 to 2002 relative to 2003. The reduction in road deaths in Victoria in 2003 relative to 2002 (64 deaths, 17 per cent) accounts in large measure for the national

reduction of 81 deaths (6 per cent) in 2003. The downturn in Victoria began in 2002, and coincided with the introduction of stricter speed enforcement measures, including reduced enforcement tolerances.

Table 3:
Deaths and death rate per 100 000 people, by state/territory, 2003

	<i>Fatalities</i>	<i>Fatality rate per 100 000 population</i>	<i>Population ('000)^a</i>
New South Wales	554	8.2	6 695
Victoria	330	6.7	4 930
Queensland	310	8.1	3 787
South Australia	156	10.2	1 527
Western Australia	180	9.2	1 953
Tasmania	41	8.6	474
Northern Territory	52	26.0	199
Australian Capital Territory	11	3.4	325
AUSTRALIA	1 634	8.2	19 891

a. Populations are based on Australian Bureau of Statistics estimates. Figures do not add to total due to rounding.

Note: Deaths for any year are always subject to minor revisions throughout the following year as more accurate data are obtained.

Source: Australian Transport Safety Bureau



The Northern Territory has over three times the national death rate, while the ACT has less than half the national rate.

Table 4:
Deaths per 100 000 people, by state/territory, 1999 to 2003

	<i>NSW</i>	<i>VIC</i>	<i>QLD</i>	<i>SA</i>	<i>WA</i>	<i>TAS</i>	<i>NT</i>	<i>ACT</i>	<i>Australia</i>
1999	8.9	8.2	9.4	10.1	11.9	11.2	25.6	6.1	9.4 ^a
2000	9.2	8.5	8.8	11.0	11.2	9.1	26.0	5.7	9.4
2001	7.9	9.2	8.8	10.1	8.6	12.9	25.3	5.0	8.9
2002	8.4	8.1	8.6	10.1	9.2	7.8	27.9	3.1	8.7
2003	8.2	6.7	8.1	10.2	9.2	8.6	26.0	3.4	8.2
Change: 1999 to 2003	-8%	-18%	-14%	1%	-23%	-23%	2%	-44%	-13%
Change: 2000 to 2003	-11%	-21%	-8%	-7%	-18%	-5%	0%	-41%	-13%
Change: 2001 to 2003	4	-27%	-8%	1%	6%	-33%	3%	-32%	-8%
Change: 2002 to 2003	-2%	-17%	-6%	1%	-1%	11%	-7%	9%	-6%

^a At the time the National Road Safety Strategy was finalised, the death rate for Australia was calculated as 9.3. Over the following year, deaths were updated by the jurisdictions and resulted in the original rate of 9.3 increasing to 9.4.

Source: Australian Transport Safety Bureau



FIGURE 14:
State/territory road crash death rates per 100 000 people, 1990 to 2003

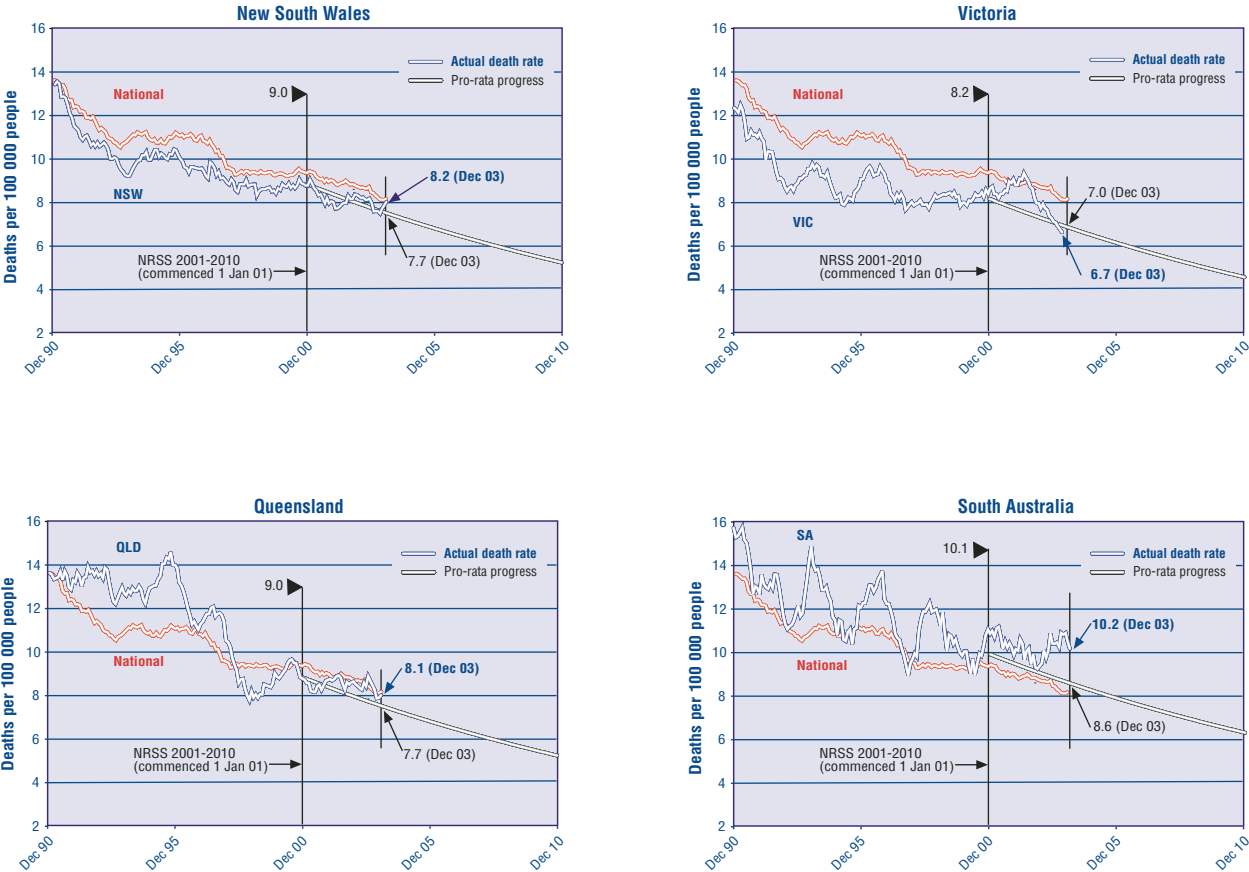
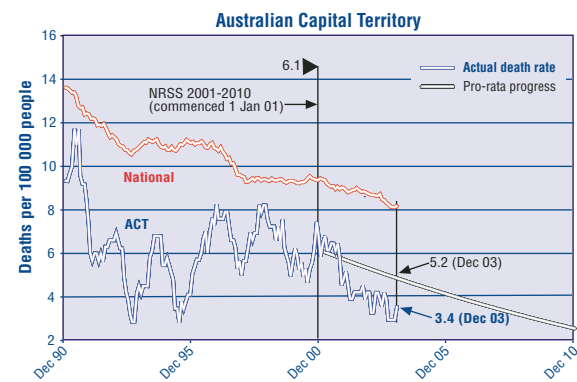
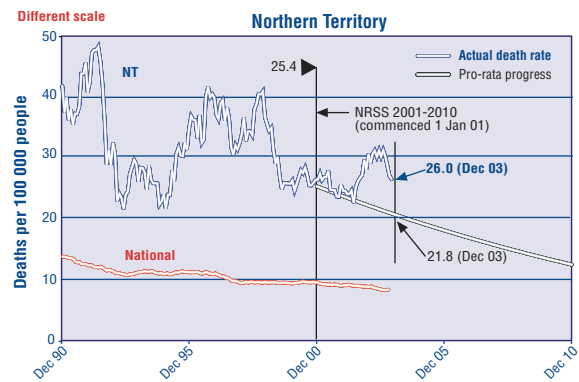
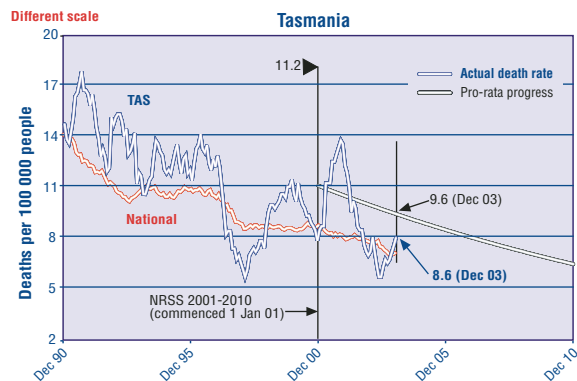
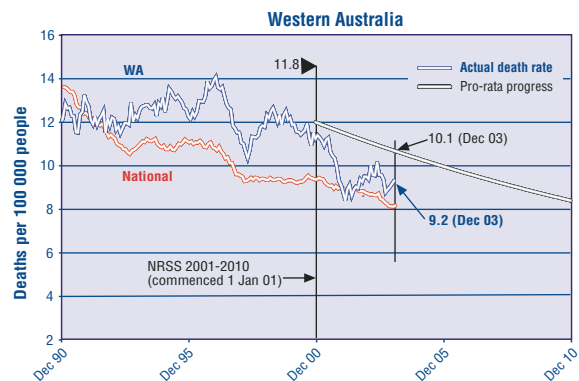


Figure 14 shows the performance of each jurisdiction. Although the National Road Safety Strategy involves a commitment to an overall national target by 2010 (not necessarily an equivalent progress target for each jurisdiction), the eight jurisdictional graphs have been generated assuming a uniform 40 per cent pro-rata reduction for each jurisdiction. The graphs are therefore indicative of performance of jurisdictions relative to overall national performance and to each other, but do not represent performance against a commitment to a specific target by each jurisdiction.



Notes:

1. The straight sloping line represents uniform progress towards a 40 per cent reduction by 2010.
2. 'Dec' refers to data as at 31 December.

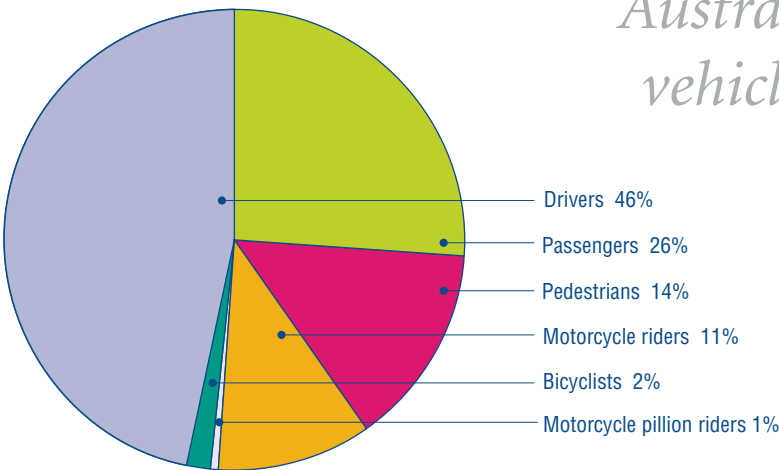
Source: Australian Transport Safety Bureau

7 safety performance of australian road users

Safety performance of road user groups

Over 70 per cent of the 1 634 road deaths in 2003 were occupants of vehicles (figure 15). Pedestrian deaths constituted half the remaining deaths, and a combination of motorcyclist and bicyclist deaths comprised the other half.

FIGURE 15:
Road crash deaths by road user, 2003

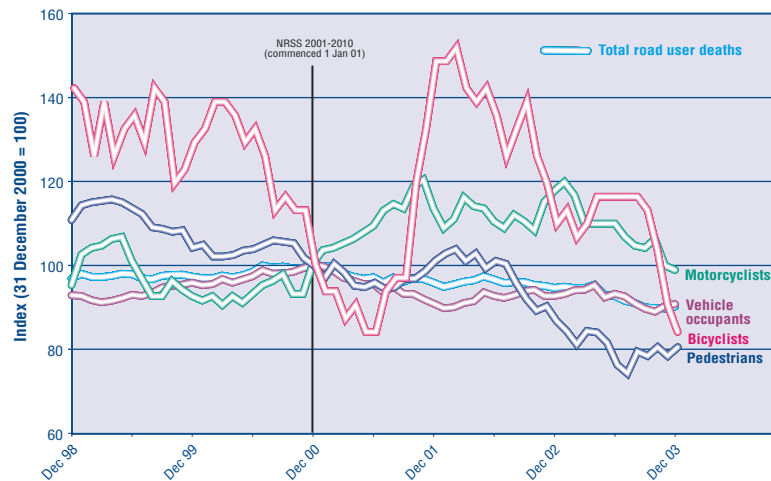


Source: Australian Transport Safety Bureau

Over 70 per cent of road deaths in Australia are motor vehicle occupants.

Figure 16 shows trends in road crash deaths by road user, indexed relative to the date of implementation of the National Road Safety Strategy 2001–2010.

FIGURE 16:
Index of road crash deaths by road user, using a moving 12-month total^a



a. Each point represents the index of the number of deaths in the preceding 12 months, with 31 December 2000 = 100.
'Dec' refers to data as at 31 December.

Source: Australian Transport Safety Bureau

(As at 31 December 2003, average monthly deaths over the preceding 12 months were: vehicle occupants = 99, pedestrians = 19, motorcyclists = 16, bicyclists = 2).

Using road deaths at 31 December 2000 (the day preceding the implementation date of the National Road Safety Strategy) as an index equal to 100, figure 16 indicates that, by the end of 2003, total road deaths had fallen by 10 per cent.

Disaggregated into the separate road user categories:

- vehicle occupant deaths had fallen by 9 per cent
- pedestrian deaths had fallen by 20 per cent
- motorcyclist deaths had fallen by 2 per cent
- bicyclist deaths had fallen by 16 per cent.

Vehicle occupant deaths represent over 70 per cent of total road deaths and consequently direct the course of the total deaths line in figure 16.

Because bicyclist deaths are low (averaging 2 per month during 2003), even a change of one death in this category will tend to make the bicycle index vary significantly.

Road crash death rates by gender

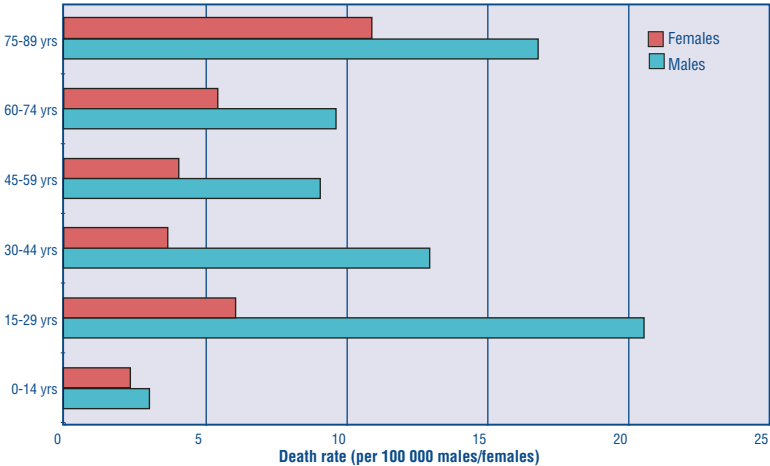
The road crash death rates in figures 17 and 18 are calculated using 2003 data for each age group/age and gender against the population per 100 000 within each age group/age and gender. For instance, the death rate for males in the 15–29 years age group in figure 17 was calculated using the number of 15–29 year old males killed as a result of road crashes in 2003, and the Australian Bureau of Statistics population estimate for 15–29 year old males in 2003. The figures includes deaths in all road user groups.

The demographic differences reflect age and gender differences in risk-taking behaviour; differences in the amount of travel and mode of travel (car, bus, motorcycle, walking); and the physical frailty of older road users.

In 2003, the overall male road death rate was almost two and a half times that of females. Figure 17 shows that death rates for males were higher than those for females in all age groups. The male and female death rates are similar in the under 15 age group; however, after persons are of an age to legally drive vehicles, the male death rate soars.

*A male in Australia
is two and a half times more likely
to be killed in a road crash
than a female.*

FIGURE 17:
Road crash death rate per 100 000 males/females by gender and age group, 2003



Source: Australian Transport Safety Bureau and Australian Bureau of Statistics

The death rate is particularly high for young males in the 15–29 year age group.

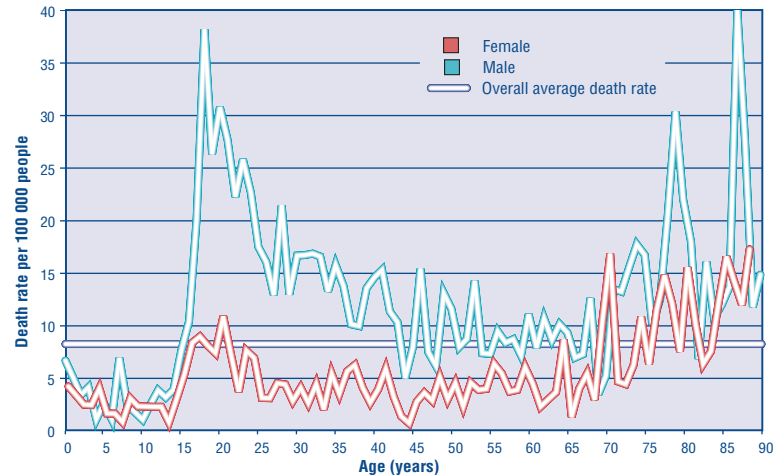
The female death rate is highest in the 75–89 year age group, and this age group also registers the second highest male death rate. Two things in particular must be remembered when considering the high elderly death rate. Firstly, the male population in the 75–89 year age group is less than a quarter of that for the 15–29 year age group, while the equivalent elderly female population is a third of its 15–29 year age group. Secondly, a relatively minor road crash which, to a young person, might cause no more than a few bruises, can be lethal to the frail or vulnerable elderly person. For the elderly, driving remains a critical aspect of mobility and independence beyond the home.

Figure 18 shows the 2003 death rate per 100 000 of the male and female populations on the basis of the ages of those killed. The figure also incorporates a straight line indicating the overall Australia-wide death rate of 8.2 for 2003.

The death rate for young males peaks at 17 years of age, and then decreases and begins to level out at about 30 years of age. There is a further reduction in the male death rate between 55 and 70 years of age, after which it begins to climb again.

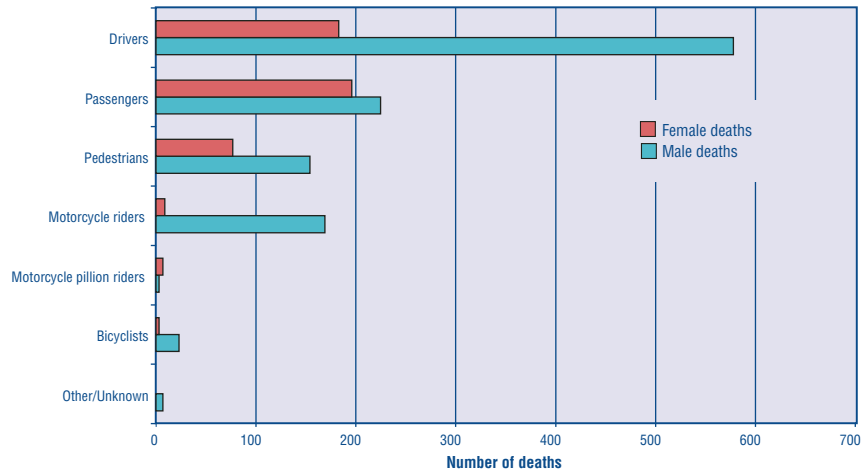
The death rate for females remains mostly below the national average until about 70 years of age. The female peak at 20 years of age is similar to the male death rate at 60 years; that is, during a period when the death rate for males of driving age is at its lowest.

FIGURE 18:
Road crash death rate per 100 000 males/females by gender and age, 2003



Source: Australian Transport Safety Bureau

FIGURE 19:
Road crash deaths by road user and gender, 2003



Source: Australian Transport Safety Bureau

*Half the male road crash deaths
in 2003 were vehicle drivers.*



In 2003, half the male deaths were vehicle drivers, and male drivers represented 35 per cent of total male and female deaths. Thirty-nine per cent of female deaths were vehicle drivers, and female drivers represented 11 per cent of total deaths.

A comparison of male and female road crash deaths within the different road user categories (figure 19) shows that:

- three times more male than female drivers were killed
- male pedestrians killed were twice the number of female pedestrians killed

- nineteen times more male than female motorcycle riders were killed
- eight times more male than female bicyclists were killed.

Passenger numbers killed were very similar for both genders, and female motorcycle pillion passenger deaths exceeded their male counterparts by a factor of two. The Other/Unknown category includes road users such as wheelchair users and skateboard riders.

The road crash death rate for 18 year old males is 37.8 per 100 000 males in that age group – over four and a half times the Australian average rate of 8.2.



8 what's different about the Christmas holiday period?

Road deaths during the Christmas/New Year holiday period

The Christmas/New Year holiday period has traditionally been associated with a public perception of increased danger on Australian roads. Police enforcement and road safety education are heightened and fatal road crashes are usually given increased attention by the media.

Each year between 58 and 77 people die on the roads during the Christmas/New Year Holiday period (table 5). Deaths during the five Christmas/New Year holiday periods to 2003–04 averaged 4.2 per cent of total annual deaths.

Figure 20 shows that fatal crashes occur at much the same rate throughout the year. From 1999 to 2003, an average of 4.8 people died each day during the holiday period and an average of 4.7 people died each day during the non-holiday period.

Table 5:
Road deaths during the Christmas/New Year holiday period, 1999–2000 to 2003–2004

Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Australia
1999/00	23	19	14	5	5	2	3	4	75
2000/01	38	12	9	5	5	5	0	1	75
2001/02	22	15	10	4	4	0	3	0	58
2002/03	16	20	11	12	6	1	1	0	67
2003/04	22	17	19	8	4	4	3	0	77

Source: Australian Transport Safety Bureau

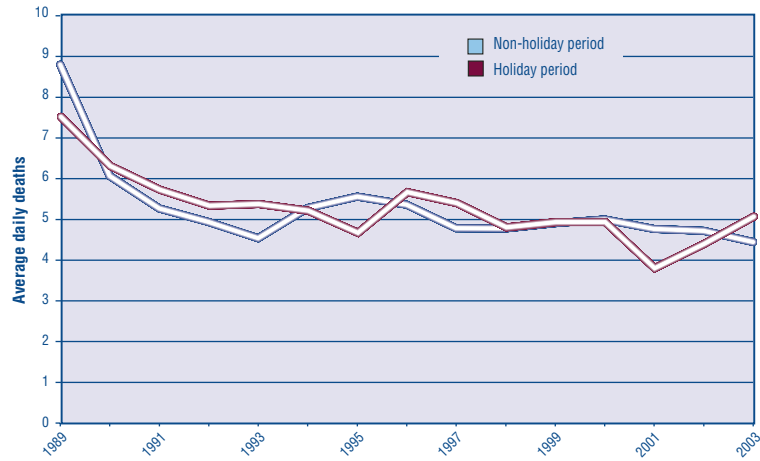
What is the official holiday period?

The official Christmas/New Year holiday road crash reporting period lasts for 15 days.

It extends from 00:01 am on the Friday before 25 December to 11:59 pm on the Friday after (or on) 1 January. This reporting period is accepted by all policing jurisdictions.



FIGURE 20:
Average daily road deaths during the Christmas/New Year holiday period and the remainder of the year, 1989 to 2003



Source: Australian Transport Safety Bureau

The average number of people who die on the roads each day during the Christmas/New Year holiday period is the same as at other times of the year.

Crash characteristics

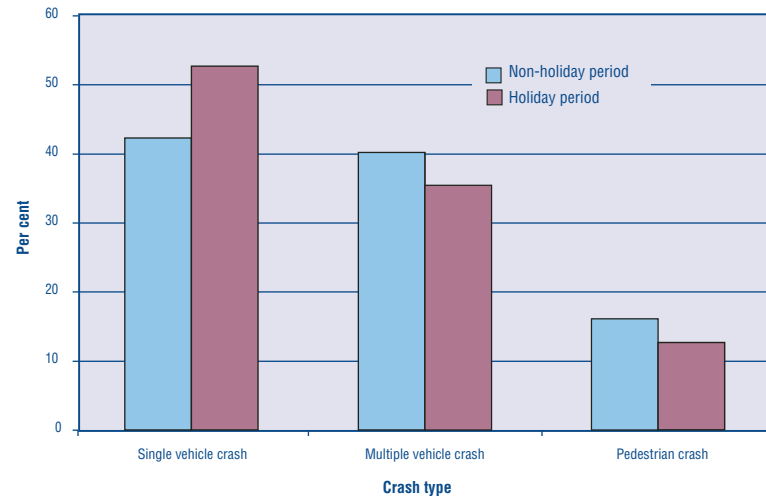
Crash type

Figure 21 shows that during the holiday period, compared with the non-holiday period:

- there was a higher proportion of single vehicle crashes (52 per cent compared with 43 per cent)
- there was a slightly lower proportion of multiple vehicle crashes (35 per cent compared with 40 per cent)
- there were fewer pedestrian crashes (13 per cent compared with 17 per cent).

FIGURE 21:

Percentage of fatal crashes by crash type, combined 2001–02, 2002–03 and 2003–04 holiday periods and remainder of the 2001, 2002 and 2003 calendar years



Source: Australian Transport Safety Bureau

Speed limit at crash zone

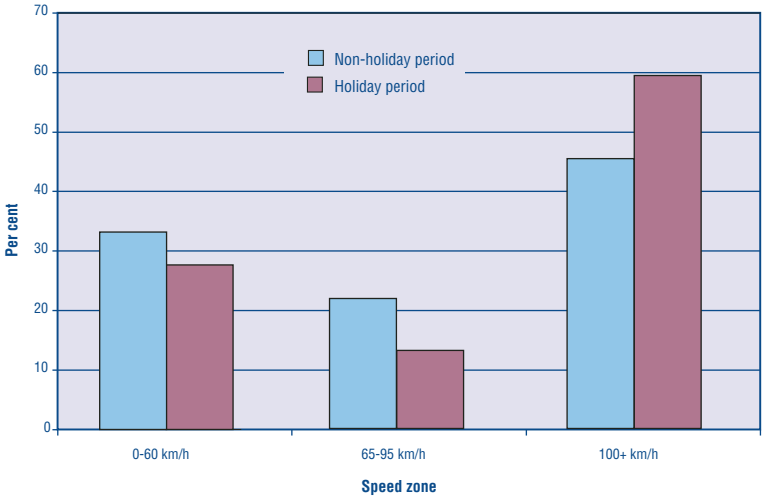
Figure 22 shows that during the holiday period, compared with the non-holiday period:

- a higher proportion of crashes occurred on roads with speed limits of 100 km/h and above (59 per cent compared with 45 per cent)
- fewer crashes occurred in speed zones up to 60 km/h (28 per cent compared with 33 per cent).

Location of crashes

More fatal crashes occur outside urban areas during the Christmas/New Year holiday period. As figure 23 shows, 60 per cent of fatal crashes in New South Wales and Queensland during the combined 2000–01, 2001–02 and 2002–03 holiday periods occurred in rural areas, compared with 43 per cent during the non-holiday period.

FIGURE 22:
Per cent of fatal crashes by speed limit at crash zone, combined 2001–02, 2002–03 and 2003–04 holiday periods and remainder of the 2001, 2002 and 2003 calendar years



Source: Australian Transport Safety Bureau

New South Wales and Queensland are used as an example due to their compatible definitions of urban and rural areas. A similar trend is evident in Victoria, where 63 per cent of crashes during the 2000–01, 2001–02 and 2002–03 holiday periods

occurred outside metropolitan areas compared with 52 per cent during the 2002 calendar year. However, in Victoria this difference was not found to be statistically significant.

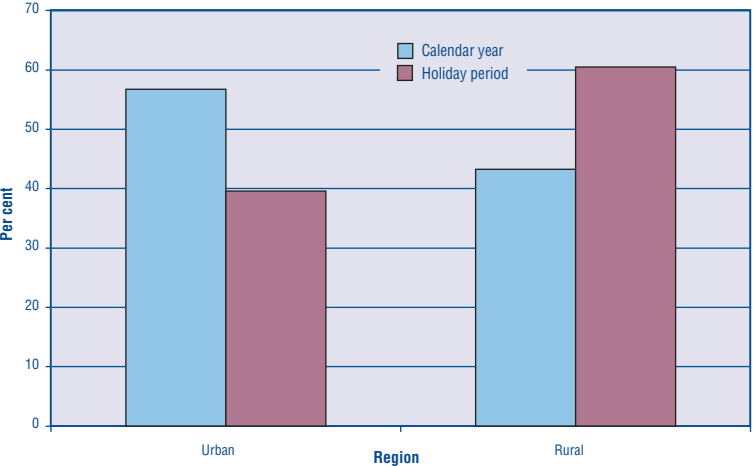
All remaining states and territories showed similar trends or no difference between the periods, with the exception of South Australia, where metropolitan crashes actually increased during the holiday period. The relatively low numbers of crashes in these states and territories make meaningful analysis difficult.

Heavy truck involvement

During 2000–01, 2001–02 and 2002–03, only 4 per cent of holiday period crashes involved articulated trucks, as opposed to 11 per cent of non-holiday period crashes. State and territory data suggest a similar trend: heavy trucks (articulated trucks and

heavy rigid trucks) were involved in only 8.6 per cent of holiday period crashes during the same three years as opposed to 17.4 per cent of non-holiday crashes during the 2002 calendar year. Reduced commercial traffic during the holiday period probably explains the trend.

FIGURE 23:
Fatal crashes by region, New South Wales and Queensland, combined
2000–01, 2001–02 and 2002–03 holiday periods and 2002 calendar year



Source: Australian Transport Safety Bureau

Road user characteristics

Figure 24 shows that during the holiday periods, compared with the remainder of the calendar years:

- there were fewer pedestrian deaths (11 per cent compared with 15 per cent)
- the incidence of passenger deaths was similar (24 per cent compared with 27 per cent)
- there were no significant differences in the incidence of motorcyclist or bicyclist deaths.

There were no significant differences in the age and gender of fatally injured road users compared with the non-holiday period and there was no evidence of different rates of seat belt use among people fatally injured in crashes between each period.

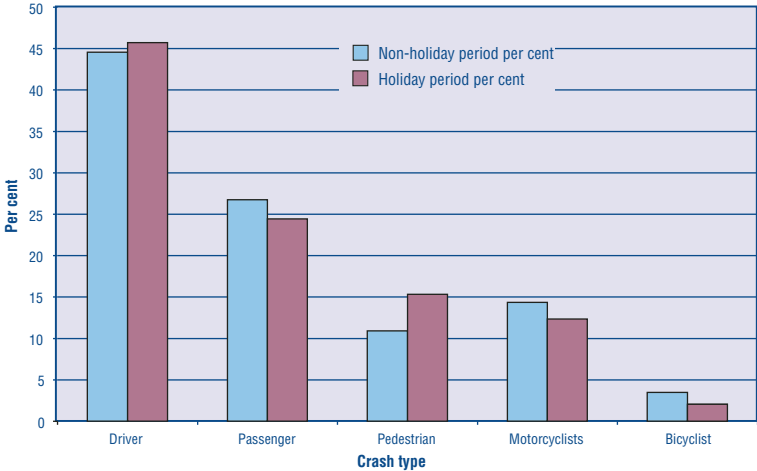
Fatal crashes in rural areas

The place of usual residence for the majority of drivers involved in fatal crashes occurring in rural areas is rural for both periods. Figure 25 shows

that across most states and territories (data on drivers' usual place of residence were unavailable for Queensland), the usual place of residence for 60 per cent of drivers involved in fatal rural crashes occurring within the holiday period was outside metropolitan areas (most of this 'other' category would be rural residents), compared with about 75 per cent during the calendar year.

A greater proportion of metropolitan or urban drivers were involved in rural crashes during the holiday period. Thirty per cent of drivers involved in fatal crashes occurring in rural areas during the holiday period were from a metropolitan area, compared with 17 per cent during the non-holiday period.

Figure 24:
Road fatalities by type of road user, combined 2001–02, 2002–03 and 2004–04 holiday periods and remainder of the 2001, 2002 and 2003 calendar years



Source: Australian Transport Safety Bureau

Factors contributing to crashes

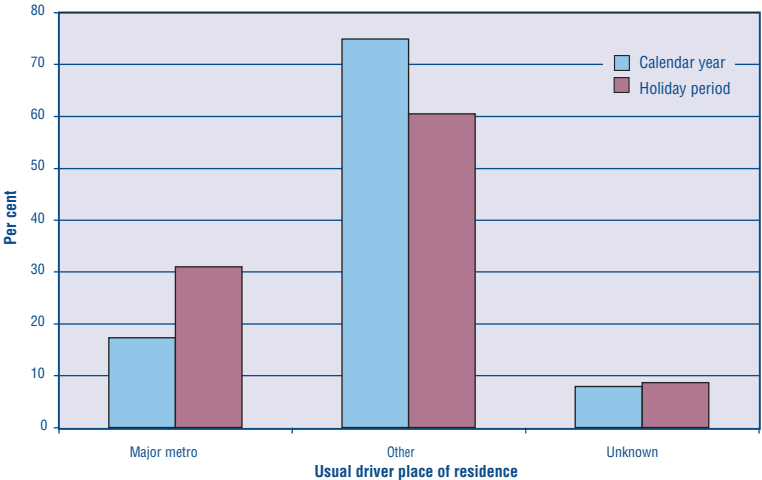
Figure 26 shows that the factors involved in fatal crashes during the holiday period are similar to those in the remainder of the year. The major difference is in the greater proportion of fatigue-related crashes during the holiday period.

Fatigue

During the holiday period fatigue was involved in 15 per cent of fatal crashes compared with 9 per cent during the non-holiday period. This difference was found to be statistically significant.

The contribution of fatigue to fatal crashes is difficult to determine. It is widely accepted that, because of lack of direct forensic evidence, crash reports underestimate fatigue as a causal factor.

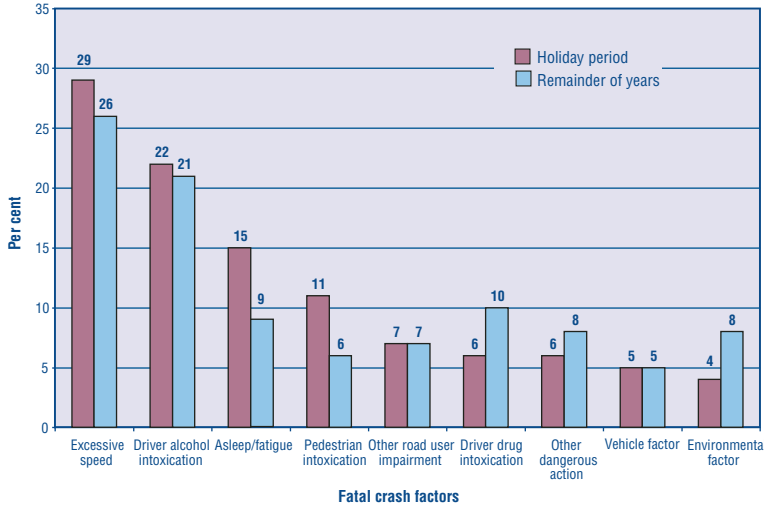
FIGURE 25:
Drivers involved in fatal rural crashes by usual place of residence, Australian states territories, excluding Queensland, Christmas/New Year holiday periods 2000 to 2003 and 2002 calendar year



The definition of 'rural' may differ among states/territories. The graph should therefore be viewed as indicative rather than as definitive. 'Other' may include some interstate and international drivers.

Source: Australian Transport Safety Bureau

FIGURE 26:
Percentage of factors involved in fatal crashes, Christmas/New Year holiday period, compared with remainder of the year, 1997 to 1999



Crashes are recorded in the ATSB database as having up to three causal factors. Categories are not mutually exclusive and the total of all factors will not equal 100 per cent.

Source: Australian Transport Safety Bureau

The numbers provided should only be used as an indicator of the differences between the two periods rather than an absolute indicator of the number of fatigue crashes. The number of fatigue-related crashes in both periods is likely to be greater than recorded.

Excessive speed

Figure 26 shows that ATSB data indicate excessive speed was a factor in around 29 per cent of fatal crashes occurring during the holiday period. This was higher than the number of speed-related crashes identified in the non-holiday period (26 per cent); however, this was not found to be statistically significant.

Due to the role of excessive speed in crash severity and the difficulty in identifying low-range speeding, data need to be interpreted carefully and treated as an indicator rather than as quantitatively accurate.

Driver/rider intoxication

Figure 26 shows an increase between the number of crashes involving driver/rider alcohol intoxication during the holiday period compared with the remainder of the year. Figure 26 also shows driver and rider drug/drug and alcohol intoxication decreased during the holiday period. Neither difference was found to be statistically significant, even though the sale of alcohol is high during the holiday period. This provides some indirect evidence of the efficacy of heightened drink driving enforcement measures over the holiday period.

Pedestrian intoxication

Crashes involving pedestrian intoxication were higher during the holiday period. Figure 26 shows that 11 per cent of crashes involved pedestrian intoxication during the holiday period compared with 6 per cent during the non-holiday period. This increase is statistically significant. This may be reflecting the fact that there is increased alcohol use during the period and road safety measures targeting pedestrians are not as heightened as those targeting other road users.

Overall assessment

There is clearly no significant difference in the daily death rate between the holiday period and the non-holiday periods. The number of deaths during the holiday period has followed a similar trend to that of the non-holiday periods. However, what cannot be known is the ‘counterfactual’ of how much worse the holiday death rate would be if additional enforcement and fatigue reduction measures were not implemented. The data provide some support for similar road safety measures being effective during both periods.

The data also indicate there are some differences between the characteristics of crashes occurring during the holiday period and the remainder of the year.

There was:

- an increase in the number of fatigue-related crashes, single-vehicle crashes and crashes occurring on roads with speed limits of 100 km/h and above
- a lower number of heavy trucks involved in fatal crashes, and
- a significant increase in the number of metropolitan drivers involved in fatal crashes in rural areas.

Despite these differences, the daily average fatality rates do not diverge significantly. This suggests there is likely to be a change in the pattern of road use and risk factors during the Christmas/New Year holiday period. For example, while there are

increases in private travel and travel in unfamiliar surrounds during the holiday period, there is a decrease in commuter travel and heavy vehicle travel as well as a greater public awareness of enforcement.

However, too much should not be made of these different characteristics. The analysis shows that the real problem areas for road safety are essentially the same during both periods. The major causal factors of fatal crashes during both the holiday period and the remainder of the year are:

- excessive speed
- driver and rider alcohol intoxication, and
- fatigue.

How to be safer on the roads during the holiday period

Plan your trip

Planning your trip is a good way to reduce your chance of experiencing fatigue. How far will you have to drive? Where will you rest along the way? Can you do it in one day or should you stop overnight? Can you share the driving?

Make sure you are well rested

The holiday period is a time for celebration, but if you have to drive in the morning, make sure that you are well rested. Alcohol can still affect you the next day by contributing to fatigue.

When celebrating, plan how you will get home

A high proportion of fatal crashes involve drunk drivers or drunk pedestrians. If you are going to drink, make sure you get a lift home with a sober designated driver or catch a taxi.

Road crashes don't take holidays!

*The major crash causal factors
during the holiday period are the
same as the rest of the year:
speed, alcohol intoxication and fatigue.*





The Australian Government's Road Safety Functions

9 the ATSB: working to make transport safer

The ATSB's objective is 'safe transport'.

The Australian Transport Safety Bureau (ATSB) is an operationally independent body within the Federal Department of Transport and Regional Services (DOTARS) and is Australia's prime agency for transport safety investigations. The ATSB is entirely separate from transport regulators and service providers. The ATSB's objective is 'safe transport' and its mission is to maintain and improve transport safety and public confidence through excellence in:

- independent transport accident and incident investigation
- safety data analysis and research

- safety communication and education.

The ATSB performs its investigation functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* (TSI Act). Section 7 of the TSI Act indicates that the object of the Act is to improve transport safety through, among other things, independent investigations of transport accidents and incidents and the making of safety action statements and recommendations that draw on the results of those investigations. ATSB investigations are not intended to lay blame or provide a means for determining liability.

The organisation

The ATSB was formed on 1 July 1999. The Bureau's Executive Director is supported by a Director, Safety Investigations and a Director, Safety Research and Education. Staff (approximately 100) include about 50 aviation, marine and rail safety investigators as well as human and organisational factors, flight-recorder and metallurgy specialists. Most are based in Canberra. Regional offices are located in Brisbane and Perth.

ATSB staff also include data notifications, analysis, statistical and research specialists, particularly in road safety and aviation safety.

The ATSB and transport safety

The ATSB contributes to transport safety by independently investigating, analysing and openly reporting on transport safety matters. All ATSB investigations are 'no blame' – the emphasis is on learning to improve future safety.

ATSB publications include reports on the facts and conclusions of investigations, safety research material, and statistics. Reports often contain recommendations for authorities and other parties to action in the interests of safety improvements.

Road safety

The ATSB coordinates the National Road Safety Strategy and biennial action plans for consideration and approval by Transport Ministers.

The ATSB's road safety activities also include research, national coordination and facilitation, and publication of road death and injury statistics and information.

The ATSB does not have a road safety investigation role, although some similar bodies such as the US National Transportation Safety Board (NTSB) have a selective road safety investigation mandate.



On safety policy matters, the ATSB assists the Department's two Ministers – the Deputy Prime Minister and Minister for Transport and Regional Services and the Minister for Local Government, Territories and Roads.

The ATSB's road safety publications are available for free downloading from www.atsb.gov.au. Some recent research publications include:

- Review of the literature on daytime running lights (DRL)
- Benefits of seat belt reminder systems
- Re-analysis of travelling speed and the risk of crash involvement in Adelaide, South Australia
- Potential benefits and costs of speed changes on rural roads
- Survey on speeding and enforcement

Legislative framework

ATSB transport safety investigators exercise statutory powers delegated by the Executive Director in accordance with the provisions of the *Transport Safety Investigation Act 2003*. The TSI Act allows the Executive Director to investigate transport safety matters in the aviation, marine and rail transport modes within the Australian Government's constitutional jurisdiction and to release transport safety information, including investigation reports that detail the findings and significant factors that led to a particular transport safety occurrence.

A comprehensive regime of provisions within the TSI Act is in place to maintain the confidentiality of, and legal protection for, a range of sensitive safety information obtained by ATSB investigators.

10 funds for roads: improving the national network

Improving the safety of roads is the single most significant achievable factor in reducing road trauma. Further investment in safer roads is highly justified on both social and economic grounds.

THE NATIONAL ROAD SAFETY STRATEGY 2001–2010

National funding

The Australian Government maintains a strong commitment to road funding through a number of road programmes, including: National Highways, Roads of National Importance, Roads to Recovery, Black Spot Programme and untied local road funding (table 6). Road funding overall was increased in the 2003–04 budget by \$43.3 million over the previous year.

All maintenance, rehabilitation and construction activity on the National Highway is funded by the Australian Government, with the aim of providing a safe, efficient means for the transport of

passengers and freight. The objectives for the National Highway relating to road safety include allowing safe and reliable access by a significant proportion of Australians to the services provided

by major population centres; minimising the cost of the National Highway to the Australian community; and contributing to ecologically sustainable development.

*Australian Government
funding for roads in
2003–04 amounts to
\$1.8 billion.*

Table 6:
Australian Government funding for roads, 2003–04

<i>Programme</i>	<i>NSW</i>	<i>VIC</i>	<i>QLD</i>	<i>WA</i>	<i>SA</i>	<i>TAS</i>	<i>NT</i>	<i>ACT</i>	<i>Other</i>	<i>Total</i> ¹
National Highway	309.5	70.0	184.1	54.9	42.7	10.0	28.5	0.6	4.4	704.6
Roads of National Importance (RONI)	85.8	68.2	40.9	16.7	8.4	3.6	1.5	2.0	-	227.1
Sub Total	395.3	138.2	225.0	71.6	51.0	13.6	30.0	2.6	4.4	931.7
Untied local road grants	134.2	95.4	86.7	70.7	25.4	24.5	10.8	14.8	-	462.7
Roads to Recovery ²	85.0	62.5	62.5	45.0	25.0	10.0	5.0	5.0	2.2	302.2
Black Spot Programme	14.3	10.4	8.9	5.0	3.5	1.1	0.7	0.6	0.5	45.0
Federation Fund	17.0	7.0	19.0	-	-	-	-	-	-	43.0
Total¹	645.8	313.5	402.1	192.3	104.9	49.2	46.5	23.0	7.1	1784.6

¹ Figures may not add to totals due to rounding.
² Includes \$2.2 million for Indian Ocean external territories and unincorporated areas.

Source: Department of Transport and Regional Services

AusLink: A national land transport plan

AusLink is the Australian Government's plan for the development of the land transport system. AusLink will provide a new framework for developing an integrated National Land Transport Network. AusLink is based on adopting a strategic approach to ensure funding is allocated where it best serves Australia's national interests.

AusLink's key elements include:

- an identified National Land Transport Network comprising both road and rail infrastructure links and their intermodal connections
- development and implementation of a National Land Transport Plan
- greater collaboration and cooperation with other levels of government and the private sector
- support for regional growth and development, and
- future development towards a National Transport Policy.

The Australian Government's primary focus in developing the AusLink proposal is to address the infrastructure challenges presented by forecast growth in the national freight task; and to recognise the value of an efficient land transport network to Australia's economic and social growth. Safety of the network is an important priority of the Government and will remain so under the new AusLink proposal.

The implementation of AusLink will not affect the current Black Spot Programme – it will continue in its current form until the end of 2005–06.

The Government announced on 22 January 2004 a \$2 billion Australian Government injection into Australia's local and national land transport network, especially in regional and outer metropolitan areas, as a down payment on the innovative AusLink programme.

The AusLink White Paper, to be released around the time of the 2004 Budget, will contain overall funding levels for AusLink, together with the Government's five-year National Land Transport Plan for developing Australia's National Land Transport Network.

*The British Royal Commission on
the Motor Car of 1908 saw the most
serious problem of this infant
technology to be dust thrown up
from untarred roads.*

DAVID COLLINGRIDGE, 1980

New works on the National Highway are designed to meet the latest safety standards and the National Highway is among the safest roads when traffic volume is taken into account. Well-designed roads, particularly those that separate traffic streams, are safer and save the community costs in terms of road trauma prevented.

The Australian Government has spent more than \$15 billion upgrading the National Highway during the past 25 years. This includes road improvements such as sealing shoulders, and increasing the number of lanes and divided highways, which undoubtedly save lives.

Safety concerns relating to the National Highway, such as the conflict between local and highway traffic, deteriorating road conditions endangering the safety of motorists, or deficiencies revealed by safety audits, can also be addressed through the National Highway Programme, particularly the Safety and Urgent Minor Works (SUMW)

component. For example, more than \$5 million in SUMW funding has been allocated for upgrading various Bruce Highway intersections with local roads around Cardwell, Tully and Innisfail following a safety audit that revealed that safety improvements were warranted.

A total of \$36.4 million in SUMW funding has been allocated nationally for 2003–04. However, not all identified works on each section of the

network can be funded under the SUMW component at any one time.

The Roads of National Importance (RONI) Programme is also directed at upgrading key road links and provides an important safety benefit. RONI funding for the Pacific Highway upgrading programme was largely in response to serious safety concerns with this highway.



While the Australian Government is not directly responsible for roads outside the National Highway, which are the responsibility of the relevant state/territory and local governments, funding is available to state/territory and local governments for the treatment of serious crash locations under the national Black Spot Programme (see chapter 11).

Existing legislation (the *Australian Land Transport Development Act 1988*) prevents the application of Black Spot Programme funding to the National Highway. Black Spot Programme funding is also not used for works on sections of declared Roads of National Importance (RONIs) where separate funding is available. This reflects the Government's concern to ensure that there is no 'double-dipping' from funds for road projects.

In addition to the national Black Spot Programme, road safety initiatives can be funded under the *Roads to Recovery* programme. The *Roads to Recovery Act* makes funding available to councils to use for the construction, upgrade or maintenance of roads over the life of the programme. The programme commenced in February 2001 and is due to expire on 30 June 2005. The \$1.2 billion *Roads to Recovery* programme has made significant improvements to local road maintenance and development, which represents the largest ever injection of funds into local roads by any Australian Government. Funding is provided directly to councils, which determine their own spending priorities.

Local roads funding mechanisms also operate under the *Local Government (Financial Assistance) Act 1995*. Identified local road Financial Assistance Grants (FAGs) are distributed between the states and territories based on historical shares. Councils are responsible for the bulk of the nation's road network (by length) and these grants contribute significantly towards maintaining these roads and other services provided by councils. Councils may use funds from its FAGs for road safety. Local government will receive over \$462 million nationally in FAGs funding for local roads in 2003–04.

11 black spot programmes: saving lives, reducing injuries

A black spot or area is a location with a particularly high frequency of crashes. Black spots are usually associated with certain characteristics of the road environment such as busy intersections and sharp curvature.

National and state black spot programmes have played a major role in reducing the number of people killed and injured on Australia's roads, together with other measures including increased enforcement of seat belt wearing, random breath testing, speed limits and continuing improvements in design rules for vehicle safety.

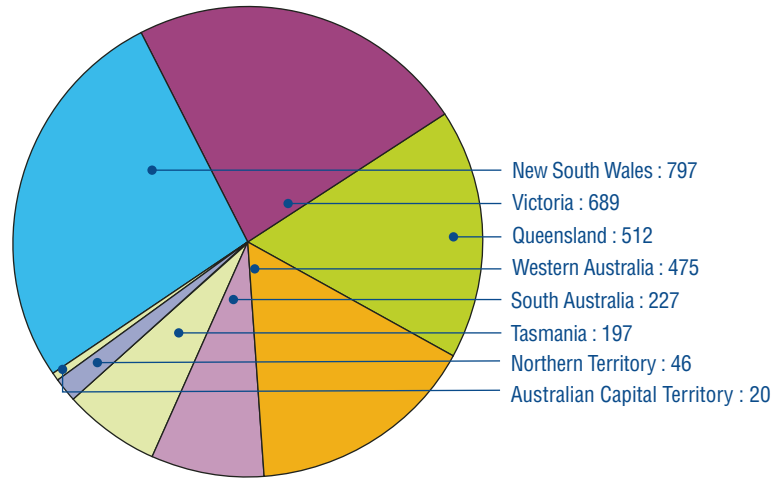
The *National Road Safety Strategy 2001–2010* estimated that black spot programmes would contribute over one-third of the 19 per cent targeted reduction in the national road death rate to be achieved through safer roads (see chapter 5).

The national Black Spot Programme

The Australian Government commenced a Road Safety Black Spot Programme in 1990, as a direct response to the unacceptable nature of road trauma statistics. The programme operated with a budget of \$270 million from 1990–91 to 1992–93. The current Black Spot Programme was initiated in 1996. The programme is now in its eighth year, having been twice extended.

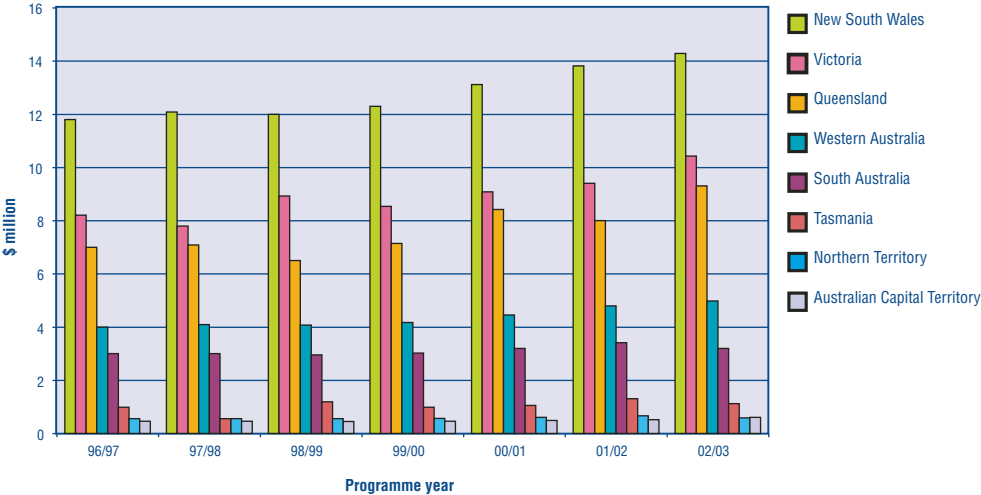
Since 1996, more than 2 900 projects at crash sites across Australia have been approved – an investment in road safety of more than \$320 million. The number of projects approved in each jurisdiction up to 2003–04 are shown in figure 27 and the amount spent in figure 28.

FIGURE 27:
Number of black spot projects 1996–97 to 2003–04



Source: Department of Transport and Regional Services

FIGURE 28:
Spending on Black Spot projects 1996–97 to 2002–03



Source: Department of Transport and Regional Services

Funding for black spot locations for each year through to 2005–2006 will be \$44.5 million. Each state and territory receives an annual allocation according to population and proportion of casualty crashes. Funding allocations to states and territories for each of the years 2002–03 through to 2005–06 are set out in table 7.

The national Black Spot Programme is directed at improving the physical condition or traffic management at locations with a high incidence of crashes involving death and serious injury, by implementing treatments such as roundabouts, traffic signals, improved warning signs and edge sealing. The purpose of the programme is to maximise lives saved per dollar spent.

Table 7:
National black spot funding allocations 2002–03 to 2005–06

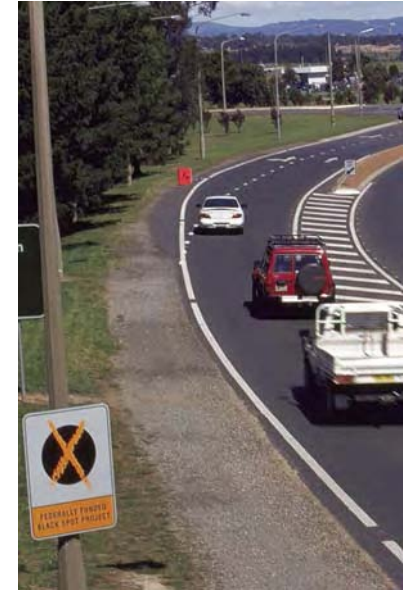
	<i>Dollars (millions)</i>
New South Wales	14.287
Victoria	10.428
Queensland	8.923
Western Australia	4.982
South Australia	3.490
Tasmania	1.116
Northern Territory	0.672
Australian Capital Territory	0.602

Source: Department of Transport and Regional Services.

Funding is mainly available for the treatment of black spot sites with a proven history of crashes. Project proposals must demonstrate a safety benefit-cost ratio of at least 2:1. Up to 20 per cent of proposals may also be considered on the basis of the recommendations of a road safety audit. Given that about 50 per cent of fatalities and serious

Overall, the evaluation provides very strong evidence that the [Black Spot] Program achieved its aim of improving safety at locations with a history of crashes involving death or serious injury.

BUREAU OF TRANSPORT ECONOMICS, 2001



injuries occur on rural roads, approximately 50 per cent of programme funds are reserved for projects in rural areas.

An evaluation of the Programme completed by the Bureau of Transport Economics (BTE) in 2001 estimated that it had prevented at least 32 fatalities

and more than 1 500 serious crashes in its first three years and returned an average \$14 in benefit for every \$1 invested. Further benefits will continue to accrue over the life of the black spot treatments that were applied. Before the end of the current funding allocation in June 2006, the national Black Spot Programme is expected to be

evaluated again to determine both its effectiveness in reducing crashes and the economic benefits and costs.

Jurisdictional black spot programmes

Since the introduction of the federally funded Black Spot Programme, total funding by state and territory governments for black spot treatment has increased, and several jurisdictions have introduced black spot programmes funded by them along similar lines to the national Programme.

Main Roads Western Australia has administered a state black spot programme since 2000. The Western Australian government has allocated \$6.5 million for highways and main roads and \$9.75 million for local roads annually for four years to June 2004. A total of 257 projects with high safety benefits have been approved, at a cost of \$17 million, most of which will be completed during 2003–04. Of these, 208 projects are located on local roads.

In 2002, South Australia also introduced a state black spot programme, with funding of \$3.5 million per year, supported by a comprehensive package of new safety regulations and education campaigns. Around 80 per cent of funding will be allocated to Transport SA roads and 20 per cent to council roads, given the proportion of casualty crashes that occur on arterial roads (maintained by Transport SA) and local roads (maintained by councils).

For four years until 2002–03, Victoria had a state black spot programme, administered by VicRoads. Funding was from a special dividend of \$240 million from the Transport Accident Commission. A total of 1 098 projects were undertaken across the state.

The New South Wales Roads and Traffic Authority (RTA) treats black spots within its other road programmes. For example, the current programme upgrading the existing Pacific Highway specifically aims to eliminate black spots to reduce crashes and save lives. The RTA offers several funding programmes for local councils to assist them with black spot treatment and road safety audits, but does not have a black spot programme with direct nominations from the public.

Other jurisdictions undertake black spot treatments as part of their general roads programmes.

Benefits of black spot programmes

Overall safety benefit-cost ratios of black spot programmes tend to be very favourable and there is no doubt that they contribute to the reduction of all types of road crashes. Most black spot treatments involve relatively low costs compared with benefits that accrue over time and therefore provide substantial economic returns.

The Bureau of Transport and Communications Economics evaluated the federal Black Spot Programme that operated between 1990–91 to 1992–93. The study found that fatalities at treated sample sites fell by one-third and injuries requiring hospitalisation by two-thirds. Overall, the decrease in crashes involving injury at sample

sites was over 2.5 times what would have been expected if the treatments had not been applied.

As noted earlier, the Bureau of Transport Economics evaluation of the Black Spot Programme between 1996–97 and 1998–99 showed that the programme had been highly effective in reducing casualty crashes and that some engineering treatments were consistently very successful.

Chapter 32 contains a more detailed survey of black spot treatment issues.



12

raising the standard: improving vehicle safety

The Vehicle Safety Standards (VSS) branch of the Department of Transport and Regional Services (DOTARS) is tasked with administering the *Motor Vehicle Standards Act 1989* and related activities. The functions of the branch include the certification of new vehicles, participation in the development of national and international standards and safety-related research.

...close to three quarters of the targeted 40 per cent reduction in per capita fatality rates [by 2010] could be achieved from maintenance of real funding for road measures...and the flow through effects of vehicle safety improvements that were already implemented or scheduled.

NATIONAL ROAD SAFETY ACTION PLAN 2003 AND 2004



The Motor Vehicle Standards Act 1989 (MVSA)

The MVSA and subsequent amendments provide a framework for uniform national vehicle standards. These standards are intended to make road vehicles safe to use, control emission levels of road vehicles, secure road vehicles from theft and promote the saving of energy.

The Australian Government has jurisdiction over motor vehicles up to the point of first supply to the market. Once a vehicle has been supplied to the market, it falls within the purview of individual states and territories. The states and territories are therefore responsible for regulation of vehicles that are 'in-service', including vehicle

registration, licensing and roadworthiness. Operational requirements for vehicles, such as axle mass limits, are also controlled by vehicle registering authorities in states and territories.

A range of standards are set under the MVSA, known as the Australian Design Rules (ADRs). Road vehicles (including trailers) are assessed against these standards before they can be supplied to the Australian market.

Supply of vehicles to the Australian market requires an authority from the Minister for Transport and Regional Services. For practicality,

this authority is delegated to the Administrator of Vehicle Standards. The authority is commonly referred to as 'Compliance Plate Approval' and gives a vehicle manufacturer consent to fit a valid Compliance Plate (or 'Identification Plate') to a vehicle before it is supplied to the Australian market. While this procedure generally applies to new vehicles, there are arrangements in place that also allow for fitment of identification plates to vehicles that have been used for transport in other countries before they are brought into Australia.

Vehicle certification

Australia employs a 'type approval' system of vehicle certification. Under this system, a vehicle or vehicles representing a vehicle 'type' (make/model/variant) is tested. The compliance of this vehicle then allows other vehicles that are of the same type to be supplied for use in transport. A vehicle model has to be tested and certified before it can be sold.

Vehicle testing is conducted by manufacturers, who subsequently submit a summary of the test results to VSS for certification. This process is followed up with an audit system to ensure that testing has been conducted correctly and that the test vehicles are representative of vehicles that are supplied to the market.

The Australian Design Rules (ADRs)

The ADRs cover a wide range of vehicle standards, including requirements for active and passive safety, noise and gaseous emissions, theft and labelling for energy consumption. The ADRs are subject to a progressive review process with a view to harmonisation with international standards where possible, and in particular with the vehicle regulations of the United Nations Economic Commission for Europe (UNECE).

Australia is a signatory to the '1958 Agreement' which allows reciprocal recognition of approvals against individual UNECE regulations. This is an option available to all UN member countries, but can only be used by countries employing a type approval system. A second agreement, the '1998 Agreement', provides for the development of internationally harmonised 'Global Technical Regulations' that do not contain an approval mechanism, and can therefore be used by countries such as the USA that employ a 'self-certification' system.

*Perhaps the reason so many people
are satisfied with our automobiles
is because we aren't.*

Being a signatory to the 1958 Agreement gives Australia voting rights on international standards for motor vehicles made under the UNECE. This also enables Australia to issue approvals to UNECE regulations. Australia is party to a World Trade Organization (WTO) agreement on technical barriers to trade. Harmonisation with international standards fulfils this WTO requirement.

Standards unique to Australia result in increased cost of vehicle development and production for the Australian market, and therefore increased cost to the consumer. Harmonisation with international standards can therefore provide consumers with more affordable vehicles.

In general, modern vehicles offer consumers higher levels of safety, as they incorporate newer safety technologies and meet more recent and stringent safety standards. Greater affordability of new vehicles has a flow-on effect through the national vehicle fleet with a greater number of more modern vehicles being purchased, and consequent safety benefits to the community. It is also important to ensure that where unique Australian standards are in place, they provide a net benefit to the community. This assessment has been included in the progressive review of the ADRs. In some cases, international standards are accepted as alternatives to an ADR, and manufacturers may choose to test to these requirements.



Performance requirements

Where possible, the ADRs are performance-based, that is, they specify a level of performance that a vehicle or system must achieve, rather than specific design features. For example, the ADR for passenger car braking requires a defined level of deceleration under prescribed test conditions, rather than requiring that brakes be of a specified size or material. In the same manner, the ADRs for the protection of occupants in a frontal crash do not require that airbags be fitted to any vehicle; rather, the ADR specifies an impact condition and dummy requirements and imposes limits on the loadings that can be recorded by instrumented dummies. Airbags may (or may not) then be used to achieve these results. This approach is less restrictive than a prescriptive requirement and is better able to accommodate new technologies.

Vehicle standards research

The International Harmonised Research Activities (IHRA) was formed at the 15th Enhanced Safety of Vehicles (ESV) conference held in Melbourne in 1996. The individual working groups that have been formed under IHRA provide a mechanism for the sharing of vehicle safety related research and collaboration at an international level. It is hoped that, through this process, the duplication of research effort can be avoided, and there would be an increased possibility of harmonisation of international standards.

There are five IHRA Working Groups: Biomechanics; Pedestrian Safety; Vehicle Compatibility and Frontal Impact; Side Impact; and Intelligent Transport Systems (ITS). Pedestrian safety, compatibility and side impact have been identified from crash statistics as priority research areas. These three IHRA working groups are all working towards test procedures aimed at improving road safety in each of these crash modes. The biomechanics working group

provides information on dummies and injury assessment to support the pedestrian safety, side impact and compatibility working groups. ITS has been identified as a fast-evolving area that will require research to ensure that safety benefits are obtained from these technologies and that unexpected safety risks do not arise (see chapter 39).

The IHRA working groups comprise government vehicle safety regulators from around the world. Australia chairs the IHRA working group on side impact and is regularly represented in working groups for vehicle compatibility, pedestrian safety and biomechanics. The IHRA working groups are overseen by a steering committee and report regularly to the steering committee as well as at ESV conferences.

The charter of the IHRA side impact working group is to coordinate research worldwide to support the development of future side impact test

procedures to maximise harmonisation with the objective of enhancing safety in real world side crashes.

The IHRA side impact working group has drafted a complementary set of test procedures to address the distribution of injuries and crash types observed in the crash data. This set of tests will cover a wider range of impact conditions, occupant sizes and seating positions than current regulations. The procedures include a mobile deformable barrier to car test using a small adult (female) dummy in a forward seating position, as well as a vehicle-to-pole test using a mid-sized adult male dummy seated in mid-position. In addition, interior headform testing is proposed, as this should reduce the risk of head injury in side impact crashes that diverge from the specific configuration in the vehicle crash tests. Out-of-position tests are also included to minimise the risk of injuries due to deploying airbags.

Vehicle compatibility refers to the crash interaction and consequent injury outcomes for occupants in two colliding vehicles. Vehicle mass, the geometric layout of the front structure of the vehicle and the stiffness of the structure of the vehicle have all been identified as significant parameters influencing frontal compatibility. Incompatibility is most easily observed between dissimilar vehicle types, such as trucks and passenger cars or large four wheel drive vehicles and small passenger cars. In these instances there is a large difference in the mass of the vehicles, as well as differences in the height of the vehicle structures from the ground.

Commercial vehicles and vehicles designed for off-road use tend to have stiffer structures than

passenger cars as a result of the need to meet load-carrying and off-road requirements. However, it is important to note that incompatibility also exists between vehicles of the same type. Passenger cars that may perform well in barrier tests designed to assess the injury risk to occupants in the vehicle do not necessarily perform as well in car-to-car collisions with other passenger cars.

Complex structural interactions occur between all colliding vehicles, with the degree of compatibility depending on the masses and structural designs of the individual vehicles involved in the collision. The IHRA Compatibility and Frontal Impact Working Group has been working towards the development of a test condition and assessment

criteria that would be capable of discriminating between compatible and incompatible vehicle designs. Since it is not feasible to crash each vehicle model into every other vehicle model to assess compatibility, it is intended that compatibility assessments would be done with a barrier test. However, the specification of a test procedure and performance requirement to ensure frontal compatibility of future vehicle designs is a difficult task requiring further research and development.

Vehicle safety research activity in VSS has focussed on three major causes of road deaths in Australia. These are frontal impacts (including vehicle to vehicle compatibility), side impacts and impacts

A car is not the only thing that can be recalled by its maker.

between vehicles and pedestrians. Some recent major projects undertaken by VSS include:

ANON

- *The dependence of side impact injury risk on mobile deformable barrier configuration.* This involved a parametric study of the effect of factors such as stiffness, geometry, mass and speed of an impacting ‘vehicle’ (represented by a mobile deformable barrier) on injury outcomes for a struck vehicle. This was a collaborative research project conducted with assistance from Transport Canada and supports research by the IHRA Side Impact Working Group. This work was presented at the 2001 Enhanced Safety of Vehicles Conference.
- *Australian research to support the IHRA Vehicle Compatibility Working Group.* The work involves a range of car-to-car and car-to-barrier crash tests to assess a proposed methodology for evaluating frontal crash compatibility of vehicles. This work is part of

the research being conducted within the IHRA Compatibility Working Group, and was presented at the 2003 Enhanced Safety of Vehicles Conference.

- *Vehicle design and operation for pedestrian protection – accident simulations and reconstructions.* This study details the reconstruction of a number of real-world impacts between pedestrians and cars in order to examine how injuries sustained by pedestrians in real life relate to the results of reconstruction tests using the methods chosen by the European Enhanced Vehicle-safety Committee (EEVC) for assessing pedestrian protection. This work was carried out in support of the IHRA Pedestrian Safety Working Group and was published as Vehicle Safety Standards Report 1 in 2003.

Vehicle recall

VSS has overall policy responsibility for monitoring the conduct and outcomes of motor vehicle safety recalls in Australia. This responsibility falls under the *Trade Practices Act 1974* and its requirement for suppliers to recall goods which ‘will or may cause injury’. VSS handles this responsibility under an arrangement with the Consumer Safety Unit of the Treasury.



**BREATH
TESTING**

**PREPARE
TO
STOP**



**BREATH
TESTING
PREPARE
TO
STOP**



Behavioural Factors: The Fatal Five

13 hasten slowly: speed and road safety

Why is speed an important issue?

The National Road Safety Action Plan 2003 and 2004 identifies speed as one of the most important issues in road safety – though certainly not the only issue requiring action.

Those refusing to comply with speed limits either don't believe in the influence of driving speed on impact speed or just don't care at all. Due to this 'rejection front' it must be proven in every country that the laws of Isaac Newton are true.

The rationale for speed management

Travel speed affects the severity of crashes, as well as the risk of involvement in a crash. There is evidence from an extensive body of research that even small reductions in vehicle speeds result in a marked reduction in the number of road fatalities and serious injuries.

Community attitude surveys show growing public understanding of speed risks, and majority support for quite strict approaches to speed management. However, this is still well short of the profound change in public attitudes to drink driving that developed over the last two decades.

There is still a widespread belief that it is only speeds well in excess of current limits (or prevailing speeds) that are risky – though this is now a minority view. Australian research has provided direct evidence that speeds just 5 km/h above average in urban (60 km/h) areas, and 10 km/h above average in rural areas are sufficient to double the risk of a casualty crash: roughly equivalent to the increase in risk associated with a Blood Alcohol Concentration of 0.05. The evidence also indicates that although ‘moderate’

speeding (within 10 or 15 km/h of the posted limit) is far less risky than more extreme speeds, it makes a comparable contribution to serious road crashes because it is so common.

Speed enforcement programs backed by extensive publicity were a major factor in the substantial reduction in road fatalities (37%) that occurred between 1989 and 1997. Compliance with speed limits is still far from perfect, and better compliance would cut road deaths significantly. The National Road Safety Strategy notes the need for enforcement and education initiatives to *promote the public perception that compliance ‘everywhere, all the time’ is the best way of avoiding penalties and improving safety.*

Further substantial road trauma reductions can be obtained by lowering speed limits. Australia has relatively high speed limits across most of its road network, compared with limits set by most other OECD countries on comparable roads. The only exception is freeway-standard inter-city roads, where our 110 km/h limits are mid-range, by international standards.

Why and how are speed limits set?

The main rationale for setting speed limits is to improve safety. Setting a limit on speed reduces both the incidence and severity of crashes and also reduces possible variations in speeds, which can increase the number of vehicle conflicts. In setting speed limits, an appropriate balance has to be struck between risk and travel time for a particular section of road. Speed limits may also be set at moderate levels for fuel conservation purposes, as they were in the US following the oil crisis in 1973, or to limit air pollution.

One commonly-cited method of setting speed limits is the 85th percentile method – the free speed at or below which 85 per cent of vehicles are driven. However, this method involves the dubious assumption that most drivers will make speed choices that produce good outcomes for society as a whole (see *Speed and driver experience: perception versus reality*, later in this chapter). There is also the question of why the 85th percentile speed, rather than the average or median speed, should be taken as representing the collective wisdom of drivers.

Australian jurisdictions generally use a combination of road characteristics, crash records and measured free speeds to set speed limits.

Criteria for setting speed limits are specified in *Australian Standard AS1742 Part 4: Speed Controls* but adherence to

the standard is voluntary. Most jurisdictions have their own version of the guidelines, with modifications on matters of detail.

Several jurisdictions use a computerised ‘expert system’ (LIMITS), developed by ARRB Transport Research, as a guide for setting speed limits. There are a number of versions of this system (for example, N-LIMITS in NSW, V-LIMITS in Victoria, Q-LIMITS in Queensland). Each LIMITS system incorporates all the rules and guidelines for setting speed limits in the relevant jurisdiction, and prompts the user to enter all the relevant data. Use of such a system promotes systematic and consistent application of speed limit guidelines within these states.

If conditions change frequently over the length of a road, then correspondingly frequent changes in the speed limit provide the most efficient balance between travel times and safety. However, authorities do make compromises between efficiency and simplicity, and generally set minimum link lengths for special speed zones.

Some jurisdictions use variable speed limits on specific roads depending on traffic and weather conditions during different times of day. The currently applicable and enforceable speed limits are displayed using variable message signs.

The *National Road Safety Action Plan for 2003 and 2004* proposes measures to improve compliance with speed limits, and selective reduction of limits on roads or sections with above-average crash rates.

There was a strong consensus among officials and experts involved in developing the Action Plan that improved speed management could make a substantial contribution to achieving the target of a 40 per cent reduction in the road death rate by 2010.

However, the focus on speed management remains controversial.

This chapter provides a summary of the results of research on speed risks, and related information. It includes a summary of results of new research on the negative and positive economic impacts of different travel speeds on rural roads in Australia, and the potential effects of variable speed limit systems on travel times and crash costs.

Why speed affects crash risk and severity

Speed affects both the risk of a crash, and the severity of any crash that occurs – including crashes caused by factors other than speed.

Research has shown that the average time taken by a driver to determine that a crash may occur, decide on avoiding action, and implement the action is about 1.5 seconds. The distance the vehicle travels during this time is directly proportional to the speed of the vehicle.

The braking distance, or distance needed to stop, is proportional to the square of the speed. If a crash occurs, the energy of the vehicle that must be dissipated is also proportional to the square of the vehicle's impact speed. These squared relationships mean that changes in vehicle travel speeds produce disproportionately large changes in emergency braking distances and in speed at the point of impact, if a crash occurs.

A small change in impact speed produces a larger change in impact energy, and the probability of death or severe injury in a crash increases very rapidly as impact energy increases.

Speed also increases the risk of losing control on curves, or when a driver brakes or swerves in an emergency.

*The minutes
Some folks
Save through speed
They never even
Live to need.*

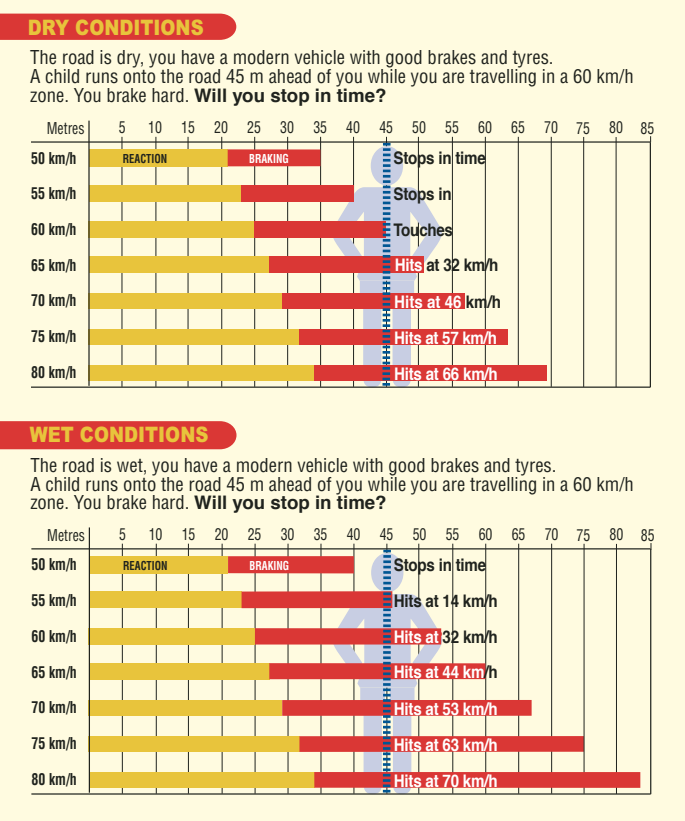
1940's BURMA SHAVE JINGLE IN US ROAD SIDE SIGN

The bottom line is that driving 10 km/h faster can make the difference between a near miss and a fatal crash.

For example:

- A 20 per cent increase in travel speed (e.g. from 50 km/h to 60 km/h) increases emergency braking distance by almost half (44 per cent).
- At the point where a driver braking from 60 km/h would stop completely, a driver braking from 70 km/h would still be travelling at about 46 km/h (figure 29) – a speed that could be fatal if the vehicle hits a pedestrian or the side of another vehicle.
- Most pedestrians struck by a car at 40 km/h survive; most pedestrians struck by a car at 60 km/h die (figure 30).
- All new cars sold in Australia must pass several occupant protection crash tests. In line with internationally agreed standards, these tests are conducted at impact speeds between 48 km/h

FIGURE 29:
Will you stop in time?



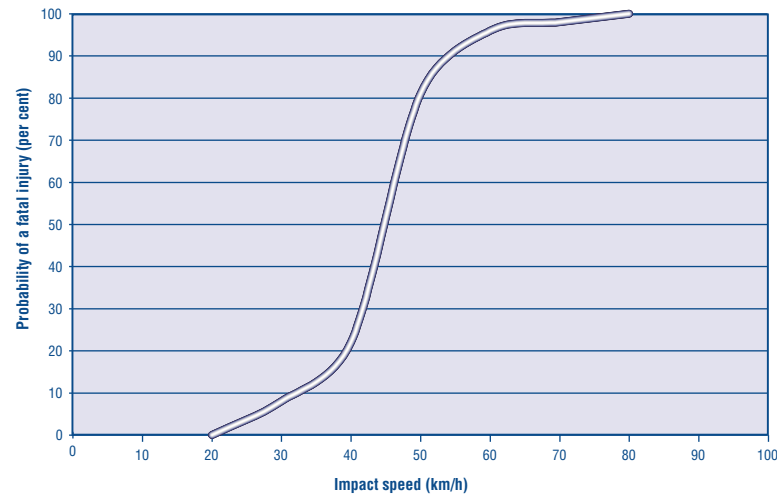
Source: Australian Transport Safety Bureau

*Person who drive like hell
bound to get there sooner.*

JOHN COLLIS, ATSB

and 56 km/h. Consumer information tests are conducted at speeds between 56 and 64 km/h. The higher speeds used in consumer tests involve roughly one-third more crash energy than the corresponding regulatory tests. Tests at 70 km/h would involve 56 per cent more energy than the standard regulatory offset frontal crash test and more than twice the energy of a standard full frontal crash test. But tests are rarely, if ever, conducted at these speeds. Designing vehicles to pass crash tests at such speeds would present major engineering challenges, and could compromise occupant protection at lower impact speeds, which are more typical of most injury crashes.

FIGURE 30:
Probability of fatal injury to a pedestrian, by impact speed



Source: Australian Transport Safety Bureau



- A few extra km/h can have the same effect on stopping distance as a few extra beers. Alcohol slows reaction times and increases effective stopping distances in an emergency. A driver 2–3 times over the maximum legal alcohol limit (0.05) has a decision reaction time about 50 per cent longer than a sober driver. At 60 km/h this additional reaction time increases total emergency stopping distance by about 28 per cent: this is roughly the same effect on total stopping distance as the difference between a sober driver travelling at 60 km/h, and a sober driver at 70 km/h.

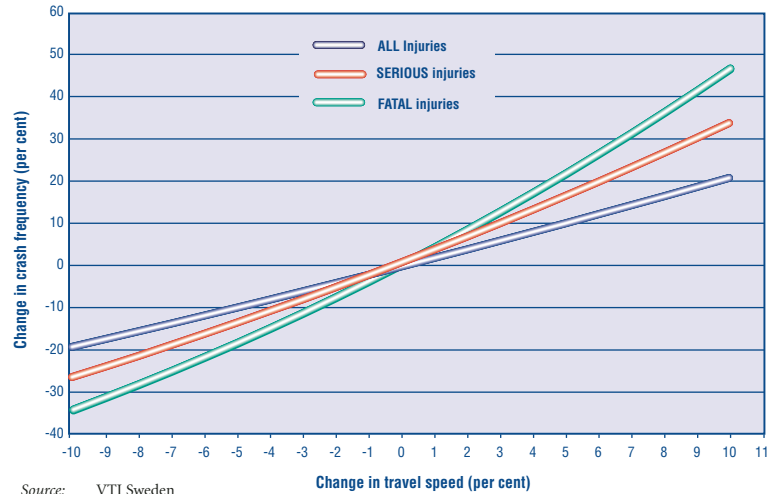
Speed and casualties: research evidence

There has been extensive research into the effects of travel speeds on safety. Several different research methods have provided consistent evidence that quite small changes in travel speeds result in very substantial changes in risk. Even a few kilometres per hour makes a difference.

The different research methods used to establish the results summarised here include:

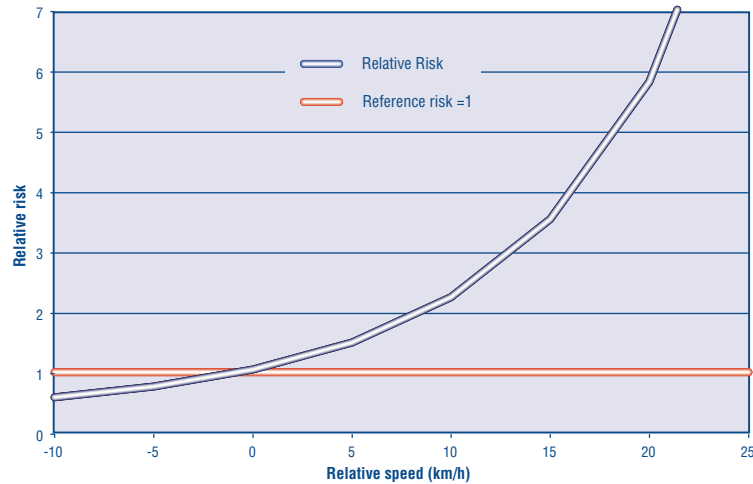
- before-and-after studies of the effects of changes to speed limits, and of speed enforcement changes
- correlational studies of crash rates on similar roads with different speed distributions
- detailed investigation and computer reconstruction of crashes (allowing travel speeds of crashed vehicles to be compared with the measured speeds of other vehicles at the same locations; the likely outcomes for different initial travel speeds can also be calculated).

FIGURE 31:
Effect of changes in average travel speed on casualty crash frequency



- A small percentage change in average travel speeds on a road typically results in a much larger percentage change in casualty crashes. This is the case even when initial travel speeds are substantially below the nominal 'design speed' of the road.
- Severe crashes (serious injuries and deaths) are more sensitive to speed changes than crashes in general (figure 31).
- For small speed changes, the typical result is approximately:
 - a two-fold percentage change in minor injury crashes
 - a three-fold percentage change in serious injury crashes
 - a four-fold percentage change in fatal crashes.
- An increase in average vehicle speed from 100 km/h to 110 km/h on a rural road can be expected to increase serious injury crashes by about one-third, and fatal crashes by about 46 per cent.
- Small reductions in urban travel speeds can markedly reduce the number of fatal pedestrian crashes: for example, a detailed study of fatal pedestrian crashes in Adelaide found that 32 per cent of the 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).

FIGURE 32:
Casualty crash risk and speed relative to other vehicles (rural roads)



Source: Australian Transport Safety Bureau

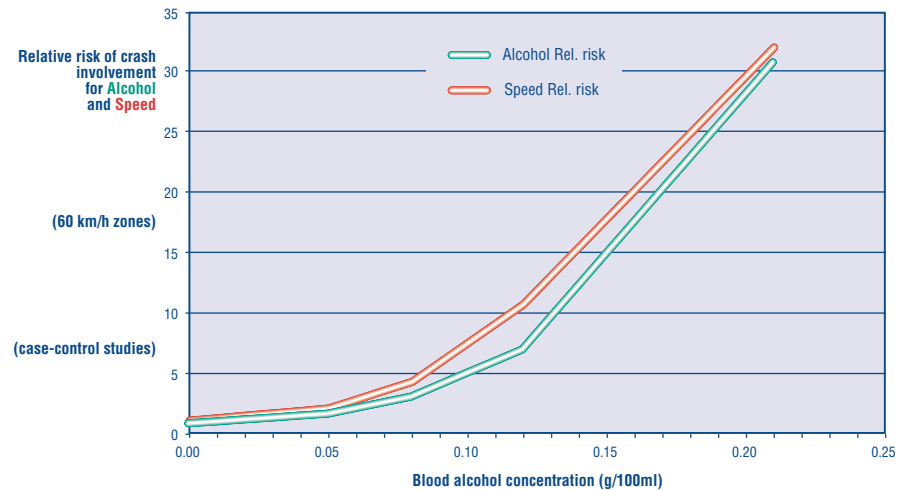
*His fuel was rich
His speed was high
He parked in a ditch
To let the curve go by.*

ANON

Risks increase very rapidly for individual vehicles travelling at above-average speeds.

- Speeds just 5 km/h above average in urban areas, and 10 km/h above average in rural areas, are sufficient to double the risk of a casualty crash (figures 32 and 33)
 - this is roughly equivalent to the increase in risk associated with a Blood Alcohol Concentration (BAC) of 0.05
 - at higher speeds, the risk increases exponentially: for example, vehicles travelling 20 km/h above the average on rural roads have about 6 times the casualty crash involvement of vehicles at the average speed
 - these risk increases reflect the combined effects of speed on crash risk and crash severity.

FIGURE 33:
Casualty crash risk and speed relative to other vehicles (urban 60 km/h zones)



Source: Australian Transport Safety Bureau

- Although 'moderate' speeding (within 10 or 15 km/h of the posted limit) is far less risky than more extreme speeds, it makes a comparable contribution to serious road crashes because it is so common.
- Coroners' records indicate that excessive speed is a causal factor in about 26 per cent of fatal crashes
 - this does not reflect the effects of speed on crash severity, and many cases of marginal speeding are probably unrecorded
 - 'excessive speed' includes speed that is not over the limit, but too fast for the location or conditions.
- Many people believe that they are safer at slightly higher speeds on rural roads because the speed keeps them more alert. However, Australian and overseas evidence clearly shows that this theory does not work in practice: higher speeds result in higher rates of fatal and casualty crashes. If speed does increase the alertness of some drivers, the effect is more than offset by the negative safety effects of higher speeds.

- For example, in 1973, the US set a national maximum speed limit of 55 mph (89 km/h), to reduce fuel consumption during the oil crisis. Average speeds on the rural interstate system dropped by about 9 km/h and deaths per distance travelled on these roads dropped by 34 per cent. In 1987 and 1988, 40 states raised limits to 65 mph (105 km/h). Evaluation studies showed road death increases of 11 per cent to 16 per cent. The average actual speed increase was around 3 per cent. In 1995, all federal controls on speed limits were abolished and limits of 70 or 75 mph (113–121 km/h) were introduced in many states. An early evaluation indicated a 9 per cent increase in deaths on affected roads. A more recent evaluation using a longer time

series found increases of 35 per cent and 38 per cent on 70 mph and 75 mph roads. The US rural interstate system is a series of high quality roads, covering long distances.

- Early research in the US appeared to show that vehicles travelling below the average speed on rural roads had a higher risk of involvement in a serious crash than vehicles at the average speed; this finding is still often quoted, despite a number of faults that have been identified in the early research designs. Recent well-designed research on Australian roads indicates that vehicles travelling at lower than average speeds have a lower risk of involvement in a casualty crash.





Speed and driver experience: perception versus reality

Personal experience is a poor guide to understanding the links between travel speed and risk.

Serious crashes are quite common events on our road system, but they are actually very rare in the experience of individual drivers. There is roughly one fatal crash per 100 million vehicle kilometres travelled. Injury and property damage crashes are more common, but it is still quite possible for an individual driver to engage in regular 'moderate' speeding for a long time without disastrous consequences.

If they do crash, they are unlikely to carry out detailed calculations to work out how the outcome might have changed if they had been travelling a few kilometres per hour slower, and it is often easy to find someone or something to blame for the crash.

Therefore, what a great many drivers erroneously learn from personal experience is that 'moderately' fast driving is 'safe'.

Balancing benefits and costs of different speeds

A recent research project conducted for the ATSB explores the potential economic costs and benefits of changes to speed limits on rural roads in Australia.

Higher travel speeds produce benefits through reduced travel times, but raise costs through higher vehicle operating costs (mainly fuel consumption), increased vehicle emissions, and more crashes.

Net costs and benefits were estimated over a range of travel speeds (80 to 130 km/h) for a number of road types, ranging from two-lane undivided roads to freeways. The economic 'optimum' was defined as the speed that minimises total social costs.

The study found that:

- Increasing truck travel speeds above 100 km/h would increase net costs on all road types, and

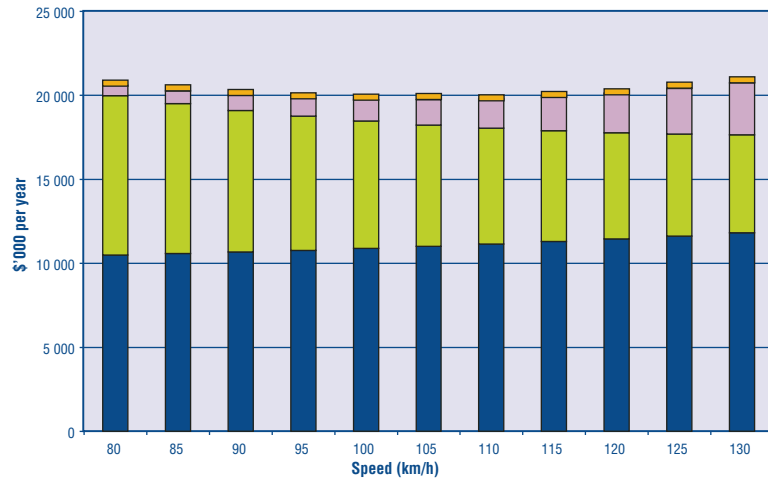
the optimum speed for trucks was below 100 km/h on lower standard roads.

- The economically optimum speed for cars and light commercial vehicles on freeways was between 115 and 125 km/h, depending on the method used to value travel time and crash costs.
- The economically optimum speed for cars and light commercial vehicles on undivided rural roads was up to 105 km/h for reasonably high standard roads (shoulder-sealed roads 8.5 m wide) but only if the road was straight and did not include intersections or towns
 - for undivided roads with curves and intersections, the optimum was 90 km/h for higher standard roads, and 85 km/h for sealed roads 7 m wide.

- A variable speed limit system on freeways, allowing speeds of 120 km/h for cars and light commercial vehicles during good conditions, but reduced to 100 km/h under adverse conditions including night driving, while limiting trucks to 100 km/h at all times, would keep total economic costs below current levels
 - however, all scenarios in which speed limits are increased for some vehicle types and circumstances would involve increasing road trauma to provide travel time saving benefits.

Figures 34 and 35 illustrate how the various cost components vary with travel speed on undivided rural roads. The results are combined cost estimates for light and heavy vehicles. 'Cruising speed' is the average speed of vehicles on parts of the road where speeds are not affected by curves or intersections.

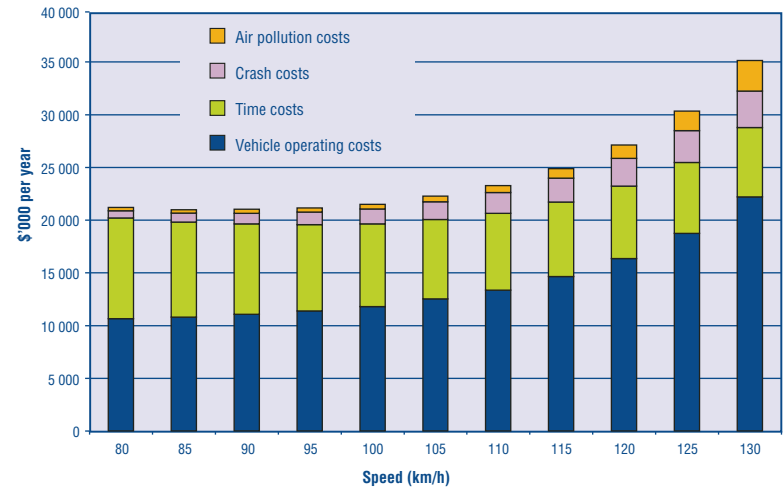
FIGURE 34:
Economic costs of different cruising speeds on rural roads (straight section)



Undivided 8.5 m shoulder-sealed road: straight, no intersections 100 km section, 1 000 vehicles/day, Austroads travel time and crash cost estimates, all vehicle classes (trucks and light vehicles combined)

Source: Australian Transport Safety Bureau

FIGURE 35:
Economic costs of different cruising speeds on rural roads (section with curves and intersections)



Undivided 8.5 m shoulder-sealed road with curves and intersections 100 km section, 1 000 vehicles/day, Austroads travel time and crash cost estimates, all vehicle classes (trucks and light vehicles combined)

Source: Australian Transport Safety Bureau

What do Australians think about speed?

In 2002, the ATSB commissioned a survey of Australian residents on a range of issues relating to speed. The survey was conducted with a sample of 2 543 people aged 15 years and over, residing in the mainland States of New South Wales, Victoria, South Australia, Queensland and Western Australia.

The main findings were:

- While most people say they normally drive within the speed limit, six in ten indicate that they sometimes drive at higher speeds.
- Many admit to exceeding posted limits by 10 km/h or more, in both urban 60 km/h zones (33 per cent of drivers) and rural 100 km/h zones (46 per cent of drivers).
- On average, one in five drivers has been booked for speeding in the past two years, though this varies between states: from a low in New South Wales (12%), to a high in Western Australia (30%).
- Three-quarters of the community assumes that speed limits are enforced with some degree of tolerance.
- Half the community believes the enforcement tolerance in 60 km/h urban speed zones is at least 5 km/h; and four in ten think the tolerance in 100 km/h rural zones is at least 10 km/h.
- New South Wales residents are more likely than others to assume the tolerance is 10 km/h or more, in both 60 km/h zones (20 per cent, compared with 9 per cent from other states) and 100 km/h zones (45 per cent, compared with 35 per cent from other states).
- Victorian residents tend to nominate lower permissible speeds than people who live elsewhere; many believe the enforcement tolerance is set at 3 km/h, particularly in urban 60 km/h zones.
- A majority of people in all jurisdictions think that speed limits should be enforced with a tolerance of 5 km/h or less; substantial minorities favour a zero tolerance approach, in both urban (29 per cent) and rural (24 per cent) speed zones.
- The community generally believes that enforcement intensities should either stay the same or increase; there is little support for any reduction in current enforcement levels, including the number of speed cameras and the severity of penalties.
- There is a strong view in the community that speed is given too much emphasis in television commercials for new cars.



14 belts, bags and headbands: the benefits of occupant protection measures

Occupant restraint systems, notably seat belts and airbags, have been proven to save lives and reduce injuries. This chapter surveys the benefits of these systems, including the potential benefits of a headband based on research commissioned by the ATSB.

The demand for seat belts is too low to justify seat belts being introduced as standard equipment and what demand there is could be satisfied by after market fitment.

AUSTRALIAN VEHICLE MANUFACTURER, 1967

Research shows that wearing a seat belt doubles your chances of surviving a serious crash.

Seat belts

The car seat belt evolved from the seat belts used to prevent ejection from aircraft during the early part of the 20th century. The potential benefits of seat belts for motor vehicles were realised during World War II and, by the late 1950s, seat belts were being provided in some new cars.

Australian Design Rules for seat belts and seat belt anchorages were introduced for new vehicles from 1 January 1969. This led to a steady increase in the proportion of motor vehicles fitted with belts. In Melbourne, the proportion of cars fitted with driver and front passenger seat belts rose from 50 per cent in 1969 to 76 per cent in 1971. Having a vehicle fleet in which the majority of vehicles were fitted with seat belts was an important factor in ensuring the success of seat belt wearing legislation.

In 1970, Victoria became the first jurisdiction in the world to introduce compulsory seat belt wearing. Seat belt wearing throughout Australia became compulsory in 1972. Seat belt usage rates increased markedly after the implementation of legislation. For example, in Melbourne, one month after the legislation was enacted, seat belt wearing rates increased from 25 per cent to 50 per cent. After a further one month of enforcement, wearing rates increased to 75 per cent. Recent studies have indicated that about 97 per cent of Victorian drivers wear seat belts.

It is widely accepted that the use of seat belts in motor vehicles substantially reduces the incidence of death and serious injury in crashes.

The US National Highway Traffic Safety Administration (NHTSA) has estimated that seat belts save 13 000 lives in the US each year and that

7 000 deaths would be avoided if the occupants had been wearing seat belts. NHTSA estimates that seat belts reduce the risk of death for front seat car occupants by around 50 per cent.

Australia has one of the highest seat belt wearing rates in the world – generally over 90 per cent. The wearing rate for front seat passengers is around 96 per cent, and slightly lower for rear seat passengers.

Given the weight of research evidence on the efficacy of seat belts, it makes good sense to wear a seat belt at all times while travelling in a motor vehicle. Yet, tragically, each year up to 33 per cent of fatally injured car occupants (about 300) and 19 per cent of those seriously injured are unbelted. These statistics reflect the effectiveness of seat belts, as well as the possibility that unbelted drivers tend to take higher risks.

Why are seat belts effective?

If a car travelling at 60 kilometres per hour hits a solid object like a large tree, the tree will bring the car to a sudden stop, but the speed of the occupants of the car will still be 60 kilometres per hour. In the absence of a seat belt, the occupants of the car will keep moving forward at that speed until they hit an object in front of them, such as the steering wheel or dashboard (or until they are ejected through the windscreen and hit the tree). This tendency of a moving object to keep moving, or of a stationary object to remain at rest, is called inertia.

A seat belt generally comprises a lap belt, which extends over the pelvis, and a shoulder belt, which straps across the chest. These two sections of the belt are fixed firmly to the chassis of the vehicle. If a crash occurs, the belt will apply most of the force to the shoulder, sternum and pelvis, which are relatively less vulnerable parts of the body. The webbing material used in seatbelts has some flexibility and reduces the sudden impact of the crash by allowing just a little stretching.

The force generated by the crash is also reduced by the vehicle's crumple zones, which are areas in the front and rear of the vehicle that are designed to collapse on impact, thereby reducing the energy transmitted to the occupant compartment. However, the protection afforded by crumple zones will only be fully effective if the occupants are securely fastened to the passenger compartment, so that they decelerate with the vehicle.

Seat belts in modern vehicles are designed to extend and retract, enabling occupants to lean forward. In a crash, the belt reel immediately locks, holding the occupant securely in place. There are various technologies being used to further improve the protection offered by seat belts, such pre-tensioners that reduce slack in the belt and load limiters that reduce the forces exerted by the belt on the body.

Almost everyone in Australia wears a seat belt – except the people most likely to crash.

Seat belt use by truck drivers

In crashes involving trucks, about 16 per cent of those killed are truck occupants. A key factor in truck crash deaths is low seat belt wearing rates by truck drivers. Research has shown that seat belt wearing rates among truck drivers killed in crashes are as low as 10 per cent. Around 40 unbelted truck drivers are killed each year.

A study was undertaken by the New South Wales Roads and Traffic Authority (RTA) between 1995 and 1998 involving 225 drivers of prime movers with trailers, involved in crashes in New South Wales. The study showed that 205 drivers (91 per cent) were not wearing a seat belt. Of the 20 wearing a seat belt, none was killed or seriously injured and 30 per cent had minor injuries. Of those not wearing a seat belt, 45 per cent were killed or injured. It is estimated that 40–50 per cent of heavy vehicle driver deaths could be prevented if seat belt wearing rates of truck drivers were similar to wearing rates in cars.

Truck drivers are reportedly reluctant to wear seat belts because of discomfort, inconvenience and the mistaken belief that an unbelted driver will be able to avoid injury by jumping out before a crash. Another widespread misconception is that wearing a seat belt will increase the chances of being trapped in the vehicle; however, a study of the effects of seat belts in crashes into water found that the reverse occurs. Belted drivers were more likely to survive the initial crash impact and get out of the sinking vehicle, and in fact, more unbelted drivers ended up trapped.

The *National Heavy Vehicle Safety Action Plan 2003–2005* aims to improve belt wearing rates by a combination of initiatives: regulations for fitting integrated lap/sash seat belts in new and existing vehicles, education programmes for drivers, improved management practices by operators of fleets, and increased enforcement by police.

Seat belt reminder systems

A study conducted in 1990 by the then Federal Office of Road Safety (FORS) found that a seat belt warning system in vehicles would be warranted on the basis of economic analysis. In 1995, the then federal Department of Transport introduced a new Australian Design Rule 69 (ADR 69) which required manufacturers to meet specified crash performance criteria in a crash involving full frontal impact. The new rule also required the mandatory fitment of a seat belt reminder system, comprising a warning light that remained on for five seconds after the ignition was switched on. In most cars, this system is easy to ignore or deactivate.

Some manufacturers have introduced devices to remind vehicle occupants to fasten their belts. These devices usually involve a flashing light or audible warning or a combination of both. The effectiveness of these devices depends on how occupants respond to them. The target group for these devices comprise those who forget to wear their belts, rather than ‘hard core’ non-wearers (a minority of non-wearers).

*The airbag is not a substitute for the seat belt.
The airbag increases the benefit of a seat belt.
Australian tests have shown that an
airbag at least halves the chance of
a serious head injury.*

Recent research commissioned by the ATSB has examined more stringent seat belt warning devices than the system mandated by ADR 69. Three devices were evaluated: a simple flashing light and warning tone; the simple design with an increasing intensity with higher speeds; and a complex two-stage model where the hazard lights flash after a set period of non-compliance. The results of the economic analysis suggested that a regulation requiring manufacturers to provide a more aggressive seat belt reminder system than is currently provided by ADR 69 would be appropriate and beneficial.

As noted earlier, there are about 300 road deaths a year involving people who have a seat belt available but do not wear it. If they all wore belts, it is probable that about half would survive. Even if only 40 per cent of these non-wearers buckled up, there would be about 60 fewer road deaths each year.

Compared with their potential benefits, seat belt reminder systems are relatively inexpensive to install. The research sponsored by the ATSB indicated that the cost range for these systems would be from about \$10 to about \$150 for the more complex systems.

The *National Road Safety Strategy Action Plan 2003 and 2004* includes the action item: 'Introduce an ADR for intrusive audible seat belt warning devices.'

The Vehicle Safety Standards (VSS) branch of the Department of Transport and Regional Services is preparing a regulation impact statement to assess the need for an Australian Design Rule mandating

the introduction of audible seat belt reminders. However, it appears that manufacturers are voluntarily introducing these devices, and that they will increasingly appear in the Australian motor vehicle fleet over time.

The ATSB has also commissioned research on retrofitting existing vehicles up to ten years of age in the Australian passenger fleet with a more aggressive seat belt warning device. This research shows that it would be worthwhile to fit such a device in the driver's seat if the device produced a minimum 20 per cent improvement in seat belt wearing and cost no more than \$45, including installation. This cost criterion might be difficult to meet.



Airbags

Head injuries are a major cause of death and serious injury in crashes. Head injuries to car occupants account for nearly half of all injury costs associated with passenger car crashes in Australia, representing a total cost to the community of about \$3.7 billion per year.

The concept of a rapidly inflatable cushion to prevent crash-related injuries, including head injuries, was first developed in aviation. A patent for an inflatable device to enable the crash-landing of aircraft was filed in the US during World War II. The technology of airbags for use in vehicles was initially introduced into vehicles in the 1980s.

The airbag is a supplemental restraint system (SRS) and is not a substitute for a seat belt. Airbags are meant to be used in combination with seat belts.

If a crash occurs, the airbag is meant to reduce the vehicle occupants' speed to zero, while minimising injury. If a vehicle is airbag-equipped, the driver

airbag is located in the hub of the steering wheel, while the passenger airbag is usually in the dashboard above the glove compartment. Side airbags and side curtain airbags are being introduced in some vehicles. Side airbags are in the door panel or seat, and curtain side airbags are located above the side doors. The airbag operates under extreme space and time constraints, deploying in a fraction of a second in the space between the occupant and the steering wheel, dashboard or doors.

During impact, sensors in the vehicle detect sudden deceleration. If the crash is severe enough, there is a flow of electricity to the inflator, which ignites the gas generator. The crash severity for airbag deployment depends on the type of system used. Deployment also depends on the type of crash (frontal or near-frontal in the case of frontal airbag systems) and the object that is struck. Most airbags in the Australian market have a high deployment threshold, which reduces the risk of airbag-induced injuries in minor crashes. This threshold would typically be equivalent to a collision with a rigid object at 25 km/h or higher,

but in 'softer' collisions (such as rear-end crashes) these speeds may be considerably higher.

Typically the airbag is inflated by the combustion of a propellant material (such as nitro-cellulose, sodium azide or 'non-azide' compounds) which produce inert nitrogen gas. Some systems also use stored pressurised gas for inflation. Ignition of the inflator instantly fills the bag, causing it to burst out of its storage container at a speed of over 300 km/h. The deployment of an airbag takes a few milliseconds – faster than the eye can blink. The bag then deflates quickly by allowing the gas to escape through vent holes or through the weave of the fabric, absorbing the energy of the occupant while this occurs. A powder (talcum powder or corn starch) may be used to lubricate the bags during deployment.

Some later generation airbag systems use a two-stage inflator – which allows the control module to vary airbag inflation rate and pressure – tailoring the deployment to the severity of the crash. This helps improve the protection of occupants in a range of crash severities and reduces any risk from deployment in low-severity crashes.



Headbands for vehicle occupants: safety with fashion?

Research commissioned by the former Federal Office of Road Safety and the ATSB has demonstrated that headwear in the form of bicycle-style helmets or padded headbands would be almost as effective in reducing head and brain injuries as driver airbags, but at a fraction of the cost.

Protection of this type would be particularly beneficial for occupants of older vehicles that are not equipped with the latest safety devices, but would provide additional protection even for drivers of cars equipped with airbags.

The research has found that helmets would be substantially more effective than many vehicle design options, including improved interior padding, side-impact airbags and advanced restraint systems. As head injuries to car occupants

in Australia cost about \$3.7 billion per year, helmets could save the community as much as \$950 million, or about 25 per cent of annual head injury cost.

While full helmets would approach the ideal form of occupant head protection, an analysis of impact patterns among brain injury cases has shown that specially designed headbands could provide a practical alternative. To be effective, the headband would cover the front and sides of the head, where a large proportion of the impacts have been found to occur. The headband would have energy absorbing properties to provide the wearer with real protection, but would be lighter, cooler and less bulky than a conventional helmet. Protective headbands would offer about half the total benefits of a full helmet.

Prototype headbands have been tested using a variety of materials, including expanded polypropylene sandwiched between a styrene outer shell and a cloth liner.

The ATSB is of the view that the use of protective headwear for car occupants would be a voluntary market-driven safety option. Preliminary market research has found that the concept would have very limited acceptance across the wider community, at least in the short term. Similar consumer resistance was demonstrated in the early stages of the introduction of seat belts and helmets. However, the headband could be of considerable interest to certain groups such as young families. With some imaginative designing, the headband might well be developed as a fashion accessory.



Safety tips

- Always use seat belts and child restraints, even if your vehicle is equipped with air bags.
- Replace frayed and damaged seat belts promptly.
- The rear seat is the safest seating position for children.
- Read the owner's manual to understand the operation of the vehicle's air bag system.
- If the steering wheel can be tilted, position it so that the air bag will deploy towards the chest and not the head.
- Drivers should be positioned at least 30 centimetres (1 foot) from the airbag by adjusting the seat. Front passenger seat occupants should move the seat as far back as possible.

driving high: substance abuse and road trauma

Alcohol

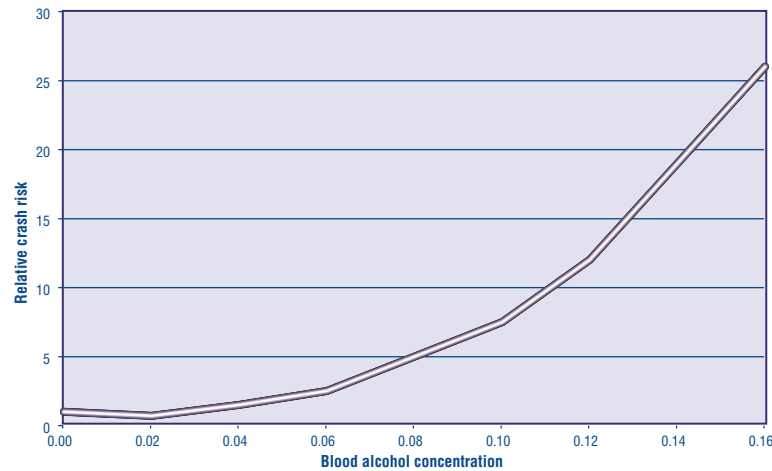
Research has consistently shown that driving skills are impaired at blood alcohol concentration (BAC) of around 0.05 gm/100 ml. Performance impairment has been shown in the laboratory for alcohol on tasks such as concentration, divided attention and reaction time. Similar results have been shown in driving simulator studies, with alcohol leading to a dose-related increase in risk-taking behaviour, number of simulated crashes, and an increase in the number of speedometer, accelerator, brake and indicator errors. On-road tests at a level of

0.05 gm/100 ml have also shown a significant impairment in city driving, with impairment of vehicle handling and manoeuvring in traffic.

Research on crash involvement has shown that at 0.05 BAC, a driver has double the risk of a serious crash than at zero, and at 0.08 the risk is double that at 0.05, as indicated in figure 36.

*At a blood alcohol concentration
of 0.05, a driver has double the risk
of a serious crash than at zero.
At 0.08 the risk is double that at 0.05.*

FIGURE 36:
Crash risk at different blood alcohol concentrations



Source: Australian Transport Safety Bureau

In Australia, alcohol remains one of the biggest single causes of road deaths and injuries, although significant reductions in drink driving have been achieved over the past decade. In 1999, 28 per cent of driver and motorcycle rider fatalities had a BAC

over the legal limit (0.05gm/100ml). Alcohol involvement for this group had been as high as 44 per cent in 1981.

The reduction in drink driving in Australia has resulted from the application of an integrated package of measures which combine to produce, in most drivers, the perception that driving above the legal blood alcohol limit has a high probability of detection, and of swift, certain and severe consequences.

The integral elements of the package include: the use of legislated, defined low blood alcohol limits; intensive and highly visible enforcement of these limits supported by a reasonably high level of publicity; and a graduated series of penalties of increasing severity dealing with progressively higher detected BACs or with repeated offences. Each measure depends on perceptions of consequences and each component of the package reinforces the others.

Alcohol limits

Victoria introduced the first statutory BAC in Australia of 0.05 gm/100 ml in 1966.

Alcohol is the drug which makes the single biggest causal contribution to road crashes, and priority should continue to be given to a comprehensive approach to preventing alcohol-related road trauma and to the provision of resources to combat drink driving.

Cannabis and other drugs present less of a problem than alcohol, but this does not mean that they are no problem.

AUSTROADS DRUGS AND DRIVING WORKING GROUP, 2000

All Australian states and territories now enforce a general BAC limit of 0.05, with a lower limit of zero or 0.02 for young novice drivers, and for drivers of heavy vehicles and public passenger vehicles drivers. These special lower limits reflect the high crash risk of young drivers, the potential severity of heavy vehicle crashes, and the standards of responsibility expected of all professional drivers. Some jurisdictions apply a small enforcement tolerance on a nominal 'zero' limit for these groups. This acknowledges the difficulties in definitively enforcing a zero BAC.

Random breath testing

Random breath testing (RBT) enables police to administer a screening breath test to drivers without their having reason to suspect the driver has been drinking. RBT is essentially a general deterrence program aimed at discouraging potential drink drivers from committing the offence through their fear of detection and consequences. This differs from specific deterrence, which relates to ways of deterring convicted offenders from re-offending by

imposing sanctions. The use of the word 'random' in RBT is intended to convey the notion that it is possible for any driver to be picked for testing, even if the driver has not been involved in a crash and has done nothing to attract the attention of the police.

RBT was first introduced in Victoria in July 1976, where it enjoyed only limited success in deterring drink driving due to the style in which it was implemented. This was initially at rather low levels of enforcement interspersed with periods of high intensity ('blitzes'). Evaluations tended to show that although night-time serious crashes (a surrogate measure for alcohol-related crashes) fell, this effect was not lasting.

It was the 1982 introduction of RBT in New South Wales at high enforcement levels that saw real, sustained and significant gains.

After considerable public discussion, RBT was introduced in New South Wales initially for a trial period of three years. During that period, police carried out more than 3 million breath tests. Evaluations of road crash statistics for that time

indicated that RBT was a very cost-effective measure.

Research carried out for the then Federal Office of Road Safety concluded that the long term deterrent effect of RBT depends mainly on maintaining a high level of continual, visible police enforcement; also integral to this is the support of suitable penalties and publicity about the existence of RBT.

RBT is now carried out in all Australian jurisdictions, and enjoys an extremely high level of public support (97 per cent approval nationwide). It is interesting to note that public support for this measure has increased dramatically since its introduction, a phenomenon that has also been observed for other road safety measures.

RBT has not been carried out in a uniform manner nationally, a fact which is reflected in the varying degrees of success of the programmes at particular points in time. For example, some jurisdictions did not always maintain a high level of continual police enforcement, particularly in the 1980s.

Through various forums over the past fifteen years, target rates of RBT have been set as a way of improving results nationally. In 1989, the Prime Minister's Road Safety Initiative stipulated that RBT enforcement be increased to ensure that at least 1 in 4 drivers were tested each year. Subsequent national initiatives have encouraged higher testing rates.

All jurisdictions are now testing at very high rates, and in Victoria, New South Wales, Western Australia and Tasmania the rate is more than five tests per ten licensed drivers per year. The most recent evaluation of RBT confirmed the effectiveness of this measure when carried out in a highly visible manner at very intensive levels, and recommended increasing testing rates to a level equivalent to one test per licence holder per year.

One well-known and long established approach to RBT is designed to maximise its visibility and the number of people tested. It involves several police officers with a 'booze bus' (a special bus or mini-

van containing evidentiary breath analysis equipment) with highway patrol or other vehicles for pursuit and general transport duties.

In more recent times other methods of implementing RBT have also been employed to counter any possible waning of its effects. For example, in response to perceptions that some drivers were evading RBT by using back streets, a more mobile form of RBT (whereby police patrolling in cars can stop any driver and administer a breath test) was introduced in New South Wales, and subsequently other jurisdictions. Often, booze buses and mobile patrols are used in combination.

Penalties

Although research indicates that the certainty of appropriately severe penalties is integral to the functioning of RBT, determining what these should be is not simple. The whole question of deterrence and effectiveness of penalties is very complex, with the evidence of specific deterrent effects also remaining largely unclear.

Licence withdrawals have been found to have a uniformly positive effect in reducing collisions and traffic offences. Among the other penalties imposed on convicted drink drivers, the use of imprisonment has consistently been shown to be

*The driver is safer when the roads are dry;
the roads are safer when the driver is dry.*

ANON

*It's best for
One who hits
The bottle
To let another
Use the throttle.*

1940s BURMA SHAVE JINGLE IN US ROADSIDE SIGN

of marginal value and in some studies the results support a view that longer periods of imprisonment increase, rather than decrease, the probability of re-conviction for drinking and driving.

However, it is believed that the value of jail terms and fines lies in their role in general deterrence, and some research suggests that the advertising of such penalties has greater overall impact than the punishment.

In addition, there is some evidence to suggest that required drink driving rehabilitation treatments as a supplement to licence suspensions may have a positive effect on recidivism.

In Australia, the level and extent of penalties for drink driving offences varies among jurisdictions.

Most jurisdictions have set different and escalating penalties according to the perceived seriousness of the drink driving offence. For example, in New South Wales different penalties apply if the offender's BAC is in the 0.02 to 0.05 range, 0.05 to 0.08 range, 0.08 to 0.15 range and over 0.15. Most jurisdictions have stricter penalties for a second or subsequent offence.

Some jurisdictions apply licence suspensions automatically and immediately for offenders whose blood alcohol level is deemed to be 'high', that is, usually over 0.15 gm/100ml, and in some jurisdictions any drink driving offence attracts an immediate 24-hour suspension.

A number of jurisdictions also require disqualified drivers to undergo an assessment or undertake a treatment or rehabilitation programme as a

condition of re-licensing, and in some cases as a condition of sentencing.

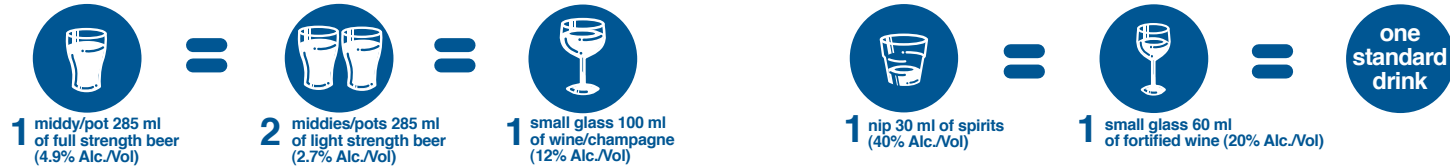
There have been a number of moves in recent years to improve the extent to which penalties for drink driving reflect the seriousness of the road safety risk, and to achieve greater uniformity between jurisdictions. The 1997 National Road Safety Package called for jurisdictions to introduce provisions to allow for licence suspension for a minimum period of at least three months for driving with a BAC of 0.05 or higher.

Where not already in place, jurisdictions were encouraged to introduce provisions for licence suspension and for a minimum period of at least six months for driving with a BAC of 0.15 or higher. Jurisdictions were also asked to review their enforcement and penalty regimes taking into account national best practice. There has been movement towards these requirements, with jurisdictions in general setting and reviewing penalties with an aim of achieving a level of penalty consistent with a strong deterrent effect.



Any drink containing 10 grams of alcohol is a standard drink

These are **standard** drinks



Source: Australian Transport Safety Bureau

Public education campaigns

Considerable efforts are made to inform the driving public of their responsibilities and the consequences of drink driving. In New South Wales, advertising campaigns supporting and reinforcing RBT have been conducted regularly since its introduction in 1982. In Victoria, the Transport Accident Commission (TAC) has provided funding for very intensive campaigns. Evaluations have determined that this kind of publicity has been important in maintaining the perceived level of risk of detection.

Other related public education activity provides information about how to stay below the legal BAC limit. Some years ago, the then Federal Office of Road Safety ran a campaign titled 'Rethink your

second/third drink'. This campaign provided simple 'rule of thumb' guides for male and female drivers. It warned men that more than two standard drinks in one hour can put them over the 0.05 limit, and for women, more than one standard drink can do the same.

As part of this campaign a credit-card sized memory jogger was developed containing this basic information on one side, with 'standard drink' information on the reverse. This card is used by numerous organisations Australia-wide in a variety of public education activities aimed at preventing drink driving. There are many other examples of drink driving publicity campaigns.

Future directions

Continuation of RBT: The application of RBT and its associated components has had considerable success in reducing the incidence of drink driving in Australia. RBT remains important, and there is still scope for further enhancement of RBT efficiency and effectiveness.

Rural drink driving: There is some evidence that RBT has been less effective in rural than in urban areas. The *National Road Safety Action Plan 2003 and 2004* calls for development of specially adapted programmes to reduce drink driving in rural areas.

Alcohol Ignition Interlocks: There is increasing focus on those drivers who remain undeterred by current measures. Many of them drive with very

high BACs, even after being detected and punished. They are a small proportion of the total population, but are a significant proportion of drivers involved in serious crashes.

One countermeasure targeted at recidivist drink drivers which has some potential is the compulsory installation of alcohol ignition interlocks into the vehicles of drivers found guilty of multiple and high BAC category offences. Such schemes have been evaluated in a number of jurisdictions in the US and Canada.

There is some evidence from studies in these countries that interlocks on their own may only delay recidivism, and do little to directly address the personal factors contributing to repeat drink driving. However, there is some promise offered by the Canadian experience to support the use of interlocks with rehabilitation.

South Australia introduced Australia's first alcohol ignition interlock programme in 2001. Under this legislation, motorists with licences suspended for

drink-driving offences can return to the road early, provided they have alcohol interlocks on their vehicles. The driver pays for installation and monthly rental of the ignition device. Courts may give people who have received the minimum licence disqualification of six months the option to join the interlock scheme after three months. They have to keep the interlock devices on their vehicles for double the remaining period of suspension (six months). Participants receive a conditional licence (which includes displaying 'P' plates), and are required to attend an alcohol awareness counselling session at their own cost.

Two other Australian jurisdictions (New South Wales and Victoria) have now introduced interlock programmes, and Queensland is conducting a large scale trial in conjunction with an already quite successful rehabilitation programme.

Server Intervention: Another approach with the potential to contribute to reducing alcohol-related road trauma involves server intervention or responsible service programmes. These

programmes are intended to educate those who sell and serve alcohol of their responsibilities towards their patrons, in order to help ensure their safety. Ideally, elements of such programmes should include an understanding of the server's legal rights and obligations, knowing how to control alcohol consumption and how to manage intoxicated patrons. Education programmes of this kind may assist in dealing with the drink driving problem, as well as other situations, including reducing the numbers of alcohol-affected pedestrians involved in road crashes.

However, it may be overly optimistic to expect that server intervention programmes alone could prevent a patron from exceeding the legal limit of 0.05 (in the case of a driver) or being endangered as a drunken pedestrian. A more strategic approach to serving alcohol would involve not just training staff in responsible serving practices and identifying 'at risk' patrons, but also include a range of activities and initiatives. These could include installation of public breath testing machines, ensuring venues are well served with

access to taxis or public transport, discouraging 'happy hours', provision of meals or complimentary bar snacks, and marketing low-alcohol or non-alcohol beverages.

Low-alcohol beer: Since the introduction of lower legal blood alcohol limits and intensive anti-drink driving enforcement strategies, the market share of low-alcohol beers has increased to around a quarter of all beer sold. There is some anecdotal evidence suggesting that the mid-range low-alcohol beer (2.5 per cent) appeals to people who would otherwise be drinking regular strength beer.

There is evidence that the price of alcoholic beverages, and the price differentials between low-alcohol and high-alcohol beverages, both have effects on alcohol consumption, which impacts on

road safety. Addressing pricing issues may therefore be a useful strategy to consider in the context of server intervention programmes.

Other initiatives

The following measures have been implemented in some, but not all, jurisdictions.

Compulsory blood testing of all road crash victims taken to hospital, and testing of all crash-involved drivers and those who commit serious traffic offences.

Alcohol assessment and/or rehabilitation programmes for repeat offenders: a number of jurisdictions also require disqualified drivers to undergo an assessment or undertake a treatment

or rehabilitation programme as a condition of re-licensing, and in some cases as a condition of sentencing. There is some evidence to suggest that such treatments as a supplement to licence suspensions may have a positive effect on recidivism.

Alcohol is a bigger problem than all other drugs combined. It has been estimated that there would be a 24 per cent reduction in fatal crashes if no drivers used alcohol, and a 13 per cent reduction if no drivers used other drugs.



Other drugs

There are a number of drugs (both legal and illegal) that have the potential to increase the risk of road crashes. The list includes cannabis, benzodiazapines, hallucinogens, antihistamines, amphetamines and opiates.

Many of these drugs have been shown to impair performance on driving-related tasks in laboratory tests, driving simulators, 'off road' and 'on road' studies. There are also concerns that some drugs, including amphetamines, can be associated with aggressive driving, and (when used to combat extreme fatigue) with the risk of quite sudden onset of sleep.

In Australian studies, drugs other than alcohol have been detected in a substantial proportion of crash-involved drivers.

However, available evidence suggests that alcohol is a bigger road safety problem than all other drugs combined.

Figures quoted for detection of drugs in crash-involved drivers often include:

- drivers using alcohol as well as other drugs (in recently published Australian data for drivers and riders killed in crashes, about 4 in 10 of the drug-positive drivers also had a BAC over 0.05)
- drivers who have traces of other drugs in their blood, but were not necessarily drug-impaired at the time of the crash (for example, traces of cannabis can often be detected some days after use)
- drivers using drugs that increase crash risk, but to a lesser extent than alcohol.

An Austroads report published in 2000 provided estimates of the contribution of alcohol and other drugs to road crashes. These estimates took into account available evidence on the level of crash risk associated with different drug groups, as well as the proportion of crashes in which alcohol and other drugs (both licit and illicit) are detected.

The report estimated that:

- If no drivers used alcohol, the number of fatal crashes would be reduced by about 25 per cent, and the number of serious injury crashes by 9 per cent.
- If use of all other drugs by drivers could be eliminated, the number of fatal crashes would be reduced by up to 11 per cent, and the number of serious injury crashes by about 1 per cent.
- The potential crash reductions associated with drivers who had used drugs but not alcohol were estimated at about 8 per cent of fatal crashes, compared to 20 per cent for drivers who had used alcohol but no other drugs.

The estimates of potential crash reductions presented by Austroads are lower than the total proportion of crash-involved drivers in whom alcohol or other drugs are detected. Data on the association between drug presence and culpability in crashes were used in deriving the crash

reduction estimates. In essence, if a substance is strongly linked to culpability (as is the case with alcohol) the estimated crash reductions will be higher than if the link to culpability is weak. The results are based on research published by a group headed by the Victorian Institute of Forensic Medicine at Monash University.

The research used to estimate drug involvement in non-fatal crashes tested for a more limited range of drugs than the data on fatal crashes. However, the Austroads report indicated that involvement of drugs in non-fatal crashes is probably significantly less than in fatal crashes. This is consistent with research findings for alcohol.

More recent data on drug involvement and culpability among fatally injured Australian drivers

have been published since the Austroads report was prepared. Application of the Austroads analysis to this more recent data gives an estimated 24 per cent fatal crash reduction if no drivers used alcohol, and 13 per cent if no drivers used other drugs (compared with the original Austroads estimates of 25 per cent and 11 per cent).

Cannabis is the drug most commonly detected in fatally injured drivers and riders in Australia. Testing in recent years identifies the active ingredient of cannabis (THC), separately from inactive forms that can persist in the body for some days after use. THC has been detected in 8.5 per cent of drivers and riders tested, including 4.1 per cent who had used cannabis without alcohol or other drugs. For the THC-only group, the odds of involvement as the culpable driver in a

fatal crash were 2.7 times those of drug and alcohol free drivers. This odds ratio rose to 6.6 for drivers and riders with a THC concentration over 5 mg/ml (3 per cent of those tested). This compares with a culpability odds ratio of 6.0 for drivers and riders with a BAC over 0.05 (29 per cent of those tested, with 20 per cent testing positive to alcohol only).

Stimulants, benzodiazapines and opiates (without other drugs or alcohol) were each detected in between 1 and 2 per cent of drivers and riders tested.

Heavy vehicle drivers

On available evidence, use of stimulants by truck drivers to combat fatigue is fairly common.

Surveys and roadside tests indicate that about one in five drivers use stimulants on at least some trips. There is some evidence that usage rates have declined since the early 1990s. Stimulants used include both over-the-counter or prescription medications and illegal stimulants, particularly methamphetamine.

Use of other psychoactive drugs by Australian truck drivers in conjunction with driving is quite rare, and their drink-driving involvement is substantially lower than other drivers.

In contrast to most other forms of drug use by drivers, truck drivers take stimulants with the specific intention of improving their alertness and driving performance, and avoiding crashes (or, from another perspective, attempting to cope with extremely demanding work schedules). There are,

however, concerns about sudden loss of alertness as stimulant effects wear off in a fatigued driver, and about long term health effects of sustained or excessive use.

Australian research published in 2003 found that 32 of 139 truck drivers killed in road crashes (23 per cent) had used some form of stimulant; 22 (16 per cent) had used only stimulants, without alcohol or other drugs, and these drivers were more likely to be responsible for their crash than alcohol and drug free drivers.

The main focus of current effort is on measures to reduce driver fatigue, rather than measures aimed directly at detecting and deterring the use of stimulants or other drugs. However, new Victorian legislation will make it possible to detect and penalise drivers who have used any quantity of methamphetamine.

Enforcement

All Australian states and territories have legislation that prohibits driving while under the influence of drugs, but the provisions and enforcement practices vary.

Generally, these laws require evidence of observable driver impairment, as well as evidence of the presence of a drug, before a driver can be penalised. This avoids the difficulties involved in relying solely on a test for the presence or concentration of a drug in the driver's body to establish that a driver was actually impaired by the drug.

RBT for alcohol is based on a quick, reasonably unobtrusive roadside test that can reliably distinguish between drivers likely to be impaired and those who have no alcohol in their system, or a trivial amount, which is unlikely to have significant consequences for road safety.

In the case of other drugs, the situation is more difficult. There are a large number of drugs that can affect driving performance. Reliable research on the relationship between dosage levels and degree of impairment is not available for most drugs. Many legal therapeutic drugs can make drivers safer if used in appropriate doses to treat their illness, but can increase risk when abused. Highly sensitive laboratory tests can detect most drugs in blood or other body fluid samples, but these tests can produce positive results when a drug is present in minute quantities that have no effect on crash risk. These tests are also expensive. Roadside drug tests that are currently available detect only a limited number of drugs, and are less accurate than the laboratory drug tests. They are cheaper than laboratory tests, but much more expensive than roadside breath tests for alcohol.

An impairment-based approach to drug enforcement removes many of these difficulties. A common approach is to test first for alcohol (the most common source of impairment) then, if that

test is negative but there are still suspicions that the driver might be impaired, to make a systematic assessment of observable impairment, and then take a sample for laboratory analysis. Drivers are then prosecuted on the basis of the combined evidence of impairment and presence of a relevant drug.

New legislation that will come into effect in Victoria in July 2004 will enable drivers to be prosecuted on the basis of a positive test for an illicit drug, without direct evidence of impairment and regardless of the amount detected. This will apply to THC and methamphetamine. This new enforcement model will operate in parallel with existing impairment-based enforcement.

16 fatigue – the hidden killer

The perils of fatigue

Driver fatigue or tiredness contributes to hundreds of deaths and injuries on our roads each year. Driver fatigue can be just as deadly as drink driving or excessive speed. Some estimates suggest that driver fatigue is a factor in up to 30 per cent of fatal crashes and up to 15 per cent of serious injuries requiring hospitalisation. However, the extent of the effects of fatigue involvement in crashes is difficult to quantify because, unlike alcohol and drugs, post-mortem examinations cannot identify fatigue as a causal factor.

Fatigue is usually associated with long distance driving, particularly by commercial truck drivers. However, any driver can be affected by fatigue.

Fatigue may be the cause of many crashes described as ‘cause unknown’. They are generally characterised as crashes where a vehicle ran off the road and/or collided with another vehicle or object, witnesses reported lane drifting before the crash, or there are no brake or skid marks. Other circumstances surrounding fatigue-related crashes include crashes that:

- occur late at night, early morning or mid-afternoon

- result in high levels of severity
- involve a vehicle leaving the roadway
- occur on a high speed road
- involve the driver not attempting to avoid the crash or the driver being the sole occupant in the vehicle.

The problem with fatigue is that it often develops slowly, and drivers may not realise that they are too tired to drive safely. But it is possible to learn to remain alert for the warning signs and take a break before it is too late.

What is fatigue and how is it caused?

There is no universally accepted definition of fatigue. Fatigue generally refers to a combination of symptoms such as impaired performance and subjective feelings of drowsiness. The term can also refer to contributory factors such as prolonged activity, inadequate sleep and disruption of circadian rhythms (see below).

Fatigue involvement in a road crash can therefore be due to a range of factors including drowsiness, falling asleep at the wheel and inattention to the driving task. It is important to note that fatigue can cause cognitive impairment, including a lack of perception and inattention, without accompanying feelings of drowsiness.

Although there are a range of factors that can cause fatigue, the three main causes are: lack of sleep; time of day or circadian factors; and time performing a task.

Lack of sleep

Adequate sleep is vital for the proper functioning of the human body. The amount of sleep an individual needs generally varies between seven and nine hours per day, with eight hours being fairly common. Research has shown that, when the body is deprived of sleep, it builds up a 'sleep debt' much like a monetary debt which has to be paid back. Sleep debt is the difference between the

minimum amount of sleep required to maintain alertness and the actual amount of sleep obtained. Accumulated sleep debt of even small amounts such as two hours can have serious effects on alertness and reaction time.

A study by the Centre for Sleep Research in South Australia has found that a person who drives after being awake for 17 hours has a risk of crashing equivalent to being at the 0.05 blood alcohol level.

When I die, I want to die like my grandmother, who died peacefully in her sleep. Not screaming like all the passengers in her car.

ANON

Driving after 24 hours without sleep increases the risk to a level equivalent to a blood alcohol concentration of 0.10.

Broken sleep or too little sleep at night and sleep disorders can contribute to fatigue. Sleep apnoea is a medical condition involving brief interruptions in breathing during sleep and often affects people who are overweight. Untreated sleep apnoea can result in dozing off during the day and increases the risk of falling asleep at the wheel. A US study of 6 000 patients with sleep apnoea found that 15.6 per cent had been involved in at least one car crash compared with 6.7 per cent for drivers in the non-apnoea control group. This means that people with sleep apnoea could be twice as likely to be involved in a car crash in the course of their lifetime as people without apnoea.

Narcolepsy is a sleep disorder characterised by extreme daytime sleepiness and sudden, brief attacks of muscle weakness. Insomnia – a symptom rather than a disease – is some sort of sleeping difficulty. Any of these conditions can increase the risk of crash involvement

considerably, particularly if they are undiagnosed and untreated and can result in a driver being tired even before getting into a car.

Time of day

The neurobiological sleep-wake cycle in human beings is called a circadian rhythm or body clock. During the 24-hour circadian cycle, there are two periods when the level of sleepiness increases: night and early morning and afternoon. During these periods, many functions such as subjective mood, performance and alertness are reduced.

Research has shown that fatigue-related road crashes tend to correspond to the effects of circadian rhythms. Such crashes tend to peak in the night and mid-afternoon.

Time on task

Extended periods of physical activity without adequate rest results in muscular fatigue. Prolonged mental effort produces similar effects on mental alertness. Research shows that as time spent on a task increases, the level of fatigue also increases.

*Sleep in a chair
Nothing to lose
But a nap at the wheel
Is a permanent snooze.*

1940s BURMA SHAVE JINGLE IN US ROAD SIDE SIGN

*Once you notice the warning signs,
take the safe option and rest up
sooner rather than later.*

Other factors

General health, age, alcohol, drugs, illness, medicines, stress, demanding physical or mental work, shift work, caring for children and the demands of daily living can all contribute to fatigue, drowsiness or inattention while driving.

A comfortable or monotonous driving environment can also induce fatigue. The high interior comfort level of modern cars, cruise control and good road engineering can lead to reduced vigilance. Dull scenery and repetitive patterns such as headlights, trees, utility poles and highway markings can contribute to ‘highway hypnosis’ – a trance-like condition that dulls the senses, affects judgement and reduces reaction time.

Fatigue warning signs

When you do not get enough sleep, the cerebral cortex, which governs what you think and say, begins to shut down. Several easy-to-recognise

warning signs show when you are becoming fatigued. They include any combination of the following:

- you keep yawning
- you have difficulty keeping your head up or your eyes open
- your eyes feel sore or heavy
- your vision starts to blur or dim
- you start ‘seeing things’
- you find you are daydreaming, thinking of everything else but your driving
- you have difficulty in maintaining a conversation
- you become impatient and make rash decisions
- you feel hungry or thirsty
- your hands feel sweaty
- your reactions seem slow
- you feel stiff or cramped
- your driving speed creeps up or down
- you start making poor gear changes
- you wander over the centre-line, or into another lane or onto the road edge
- you hear a droning or humming in your ears
- you do not notice a vehicle until it suddenly overtakes you
- you miss exits or turns
- you do not remember driving the last few kilometres.

ATSB fatigue research

The ATSB commissioned research on fatigue-related crashes in Australia and published the results in 2002. The study used an operational definition of fatigue which:

- includes single vehicle crashes that occurred during ‘critical times’ (midnight–6 am and 2 pm–4 pm)
- includes head-on collisions where neither vehicle was overtaking at the time
- excludes crashes that occurred on roads with speed limits under 80 kilometres per hour and crashes that involved pedestrians, unlicensed drivers and drivers with high levels of alcohol (over 0.05 g/100ml).

The operational definition, while useful, has some limitations. It will inevitably fail to identify some fatigue-related crashes and include some crashes caused by other factors.

Using this definition, the study found that 16.6 per cent of fatal crashes in 1998 involved driver fatigue. Between 1990 and 1998, the proportion of fatal crashes involving driver fatigue increased from 14.9 per cent in 1990 to 18.0 per cent in 1994, after which there was a decline to 16.6 per cent in 1998.

More single-vehicle crashes occurred in the early morning (midnight–6am) than afternoon (2pm–4pm). However, the incidence of head-on

crashes was highest between midday and 6 pm and lowest between midnight and 6am. This finding may be related to traffic densities: higher traffic densities during the day would increase the likelihood of fatigue-related crashes involving multiple vehicles in head-on collisions and lower traffic density during the early morning would increase the likelihood of fatigue-related crashes involving single vehicles.

After all the research I’ve done on sleep problems over the past four decades, my most significant finding is that ignorance is the worst sleep disorder of them all.

DR WILLIAM C DEMENT, SLEEP RESEARCHER, 1999

Most early morning fatigued drivers and riders were under 29 years of age. Fatigued drivers and riders over 50 years of age were involved in more afternoon crashes than in early morning crashes.

The proportion of fatal articulated truck crashes (29.9 per cent) involving driver fatigue in 1998 was almost twice the proportion of all fatal crashes involving fatigue (16.6 per cent). However, when only speed zones of 80 km/h or over were considered the difference was smaller: 34.5 per cent of fatal articulated truck crashes involved fatigue, while 24.9 per cent of all fatal crashes involved fatigue. Although fatigue is more highly represented in articulated truck crashes, this does not necessarily imply that the truck driver was always the fatigued driver in a crash involving more than one vehicle. In head-on fatigue-related crashes involving an articulated truck, truck drivers were estimated to be the fatigued driver in only 16.8 per cent of crashes, while passenger car drivers were fatigued in 66 per cent of crashes.

Myths and facts

There are many myths about driver fatigue:

Myth: I will be safer if I make the trip overnight because I will avoid the daytime traffic.

Fact: Your body has a normal 24-hour rhythm pattern built into it. If you are driving when you would normally be sleeping, you will be fighting yourself to stay awake. The chances of falling asleep at the wheel after your normal bedtime, especially in the early hours of the morning, are very high.

Myth: It is a good idea to start the trip after work.

Fact: This is the worst time to begin your trip. You have been using your mental and physical energies all day and you will be tired already, even though you do not realise it. The safest thing to do is to get a good night's sleep (about 7 to 8 hours of undisturbed sleep) and start your journey the next morning.

Myth: Loud music will keep me awake.

Fact: This might help for a while but it will not help for long. Loud music might also distract you from the driving task or even send you to sleep!

Myth: A flask of coffee or a caffeine drink will keep me awake.

Fact: Caffeine is only a short-term solution and will have less and less effect the more often you use it. It might make you feel more alert, but it will not keep you going for long. The long-term solution is to get some sleep.

Myth: Plenty of fresh air through the window will keep me awake.

Fact: This might give you a boost and help for a while, as might turning the air-conditioning on to cold. But if you are tired, sleep is the only solution.

Reducing fatigue-related crashes

Road design changes that can help in mitigating fatigue-related crashes include shoulder sealing, audio-tactile edge-lining (rumble strips), provision of adequate rest areas and facilities, using medians or barriers to divide highways and removing roadside hazards such as utility poles and trees.

There are many in-vehicle technological aids purported to combat driver fatigue, but there are concerns about the reliability of these devices. Excessive reliance on these devices could be dangerous, as they may not work as intended. The use of these devices may also encourage drivers to rely on them to provide warnings when situations become quite dangerous, whereas drivers should get adequate sleep before driving and plan their journeys to include rest breaks.

Research has shown that the only measures that have some effect in reducing drowsiness while driving are taking a 'powernap' of about 15 minutes or consuming at least 150 mg of caffeine.

But these measures cannot fully substitute for adequate sleep. Only taking proper precautions against fatigue (see facing page) will foil the hidden killer.

...most people claim that they can drive sleepy and handle it. Their attitude is akin to someone being happy to sit on a time bomb every day, complacent because it hasn't gone off yet.

DR WILLIAM C. DEMENT, SLEEP RESEARCHER, 1999



Tips for avoiding fatigue

Once fatigue sets in, there is little you can do except to stop and take a break. A safer solution is to avoid becoming tired in the first place. Here are some strategies for staying fresh and alert on a long trip:

- Be sure to have 7 to 8 hours of uninterrupted sleep before your trip. The worst time to begin your trip is after work. You have been using your mental and physical energies all day and you will be tired already, even though you do not realise it.
- Aim not to travel for more than 8 to 10 hours each day.
- Take regular 15-minute breaks at least every two hours. With each break, get out of the car, take some deep breaths and get some exercise.
- If possible, share the driving. Listen to your passengers if they tell you that you look tired or that you are showing signs of tiredness.
- Eat well-balanced meals at your usual meal times. This will also ensure that you take proper breaks. Avoid fatty foods, which can make you feel sluggish.
- Avoid all alcohol before driving or during rest breaks. Similarly, avoid taking any prescription medicines that can affect your alertness or cause drowsiness. Check with your doctor or pharmacist to see if you can safely do without them during your trip.
- Arrange overnight accommodation in advance so you can avoid driving into the night. Your chances of crashing are much higher at night, and especially in the early morning hours. If you drive when you would normally be sleeping, you will find it harder to stay awake.

17

driven to distraction: the dangers of inattention

Driving is a complex task and requires the use and coordination of various skills including those in the physical, cognitive and sensory areas. However, despite the obvious need for high levels of concentration and attention while driving, drivers engage in various activities while driving, including smoking, conversing with passengers, adjusting the controls of audio equipment, using mobile phones, shaving, applying cosmetics, reading and writing.

The BBC reported, on 5 December 2003, that US police stopped a driver who was breastfeeding her child while travelling at 110 km/h. Before pulling up, she also managed to phone her husband for advice while taking notes on the steering wheel.

Driving in London's my pleasure

I prize it above any other

One hand on the wheel

The fingers like steel

And the A–Z clenched in the other.

PAM AYRES, A–Z: THOUGHTS OF A LATE-NIGHT KNITTER, 1978



Even a fly can kill

The Courier-Mail of 3 October 2002 reported a crash involving a four-wheel drive vehicle on the Condamine Highway 200 kilometres west of Toowoomba. The vehicle had left the highway and rolled several times before coming to rest in a paddock over 100 metres away.

The driver, a 20-year old university student, survived the crash, but her four friends who were travelling in the vehicle were killed.

The driver had lost control of the vehicle when she attempted to swat away a fly.

Driver distraction is part of the broader issue of driver inattention. Distraction occurs when a driver experiences a delay in recognising information that is required for safe driving because of the influence of something (such as a person, event or activity) that occurs inside or outside the vehicle. The occurrence of an event or activity differentiates distraction from the more general issue of inattention.

This chapter focuses mainly on sources of distraction inside the vehicle (as opposed to outside the vehicle) and surveys some Australian and international research on distraction.

The National Highway Traffic Safety Administration (NHTSA) has identified four types of driver distraction: visual (things you see), auditory (things you hear), biomechanical or physical (things you do with your hands) and cognitive (things you think about).

Visual distraction can occur in different ways. It may involve focusing on a roadside object or

object in the vehicle for too long. Another form of distraction is a lack of visual attention, where the driver looks at something but does not really see it for what it is.

Auditory distraction occurs when drivers focus attention on sounds instead of the road environment. Common forms of auditory distraction are conversing with passengers, listening to the radio, tapes or CDs and using mobile phones.

Biomechanical or physical distraction refers to the removal of one or both hands from the steering wheel to perform tasks such as tuning the radio, eating or drinking.

Cognitive distraction involves thoughts that occupy the mind of the driver to the extent that they interfere with concentration on the driving task. Having a conversation using a mobile phone is an example of cognitive distraction.

Some activities can involve more than one form of distraction. For example, using a mobile phone can involve all four types of distraction.

As opposed to the four types of distraction, sources of distraction can be classified into two broad groups: technology-based (such as mobile phones, in-vehicle navigation systems, audio and video equipment) and non-technology based distractions (such as smoking, conversation, eating and drinking).

*Sign at a cemetery along a busy road:
Drive carefully – we can wait.*

Ergonomic design of the human-machine interface is the most effective means of reducing in-vehicle distraction.

In the case of young drivers, research has found that the presence of passengers increases crash risk, particularly because of distraction (verbal and physical interaction) and peer pressure.

An issue in assessing driver distraction is the frequency of events that cause distraction. An activity that is less distracting but occurs more frequently (such as conversation with passengers) has to be weighed against an activity that is more distracting but is performed occasionally (such as shaving). The extra exposure to the more frequent

The use of hand-held mobile phones is banned in all Australian states and territories and penalties apply for non-compliance. Hands-free mobile phones can be as distracting as hand-held phones.

*Beneath this slab
John Brown is stowed.
He watched the ads
and not the road.*

OGDEN NASH, AMERICAN HUMORIST, 1942

activity can increase crash risk relative to the less common activity.

Given the increasing availability of in-vehicle information, communication and entertainment systems, driver distraction is likely to become an increasingly important road safety issue in the future.

Technology-based distractions

Mobile phones

Irrespective of whether the phone used is hand-held or hands-free, drivers have to focus some of their attention on the call, and will often take their eyes off the road to make a connection by dialling a number or answering a call. Hand-held phones involve additional physical distraction by requiring the driver to use only one hand in steering the vehicle. Auditory distraction can occur due to the driver being startled by the initial ringing of the phone as well as by the conversation.

Conversing with a passenger is generally less distracting than using a mobile phone because passengers, being aware of the road environment, can control the conversation by lapsing into silence and allowing the driver to concentrate on the driving task when facing a hazardous situation. Conversations using mobile phones while driving could tend to be more distracting if the driver is talking to certain people (such as clients or

superiors) or if the conversation is particularly stressful, thereby not allowing the driver to refocus on the driving task when facing a hazardous situation.

A 2002 British study conducted by the Transport Research Laboratory using an advanced driving simulator compared the use of a hand-held and hands-free mobile phone while driving with driving over the United Kingdom legal alcohol limit (80 mg per 100 ml or 0.08). The study found that reaction times to hazards were on average 30 per cent slower when conversing on a hand-held phone than when driving under the influence of alcohol and 50 per cent slower than under normal driving conditions. The study also found that there was reduced control of speed while a mobile phone was being used. The conclusion of the study was that the use of a hand-held mobile phone while driving significantly impairs driving performance.

A Canadian study conducted in Toronto found that the risk of involvement in a crash while using a mobile phone was four times greater than the risk among the same drivers when they were not using a phone. The study also found that there were no safety benefits of using a hands-free phone compared with a hand-held phone while driving. Several other studies have also found that using a hands-free phone while driving is no safer than using a hand-held phone.

Mobile phone use usually involves other tasks such as checking diaries or writing down information that further increases distraction.

A survey conducted in the United Kingdom showed that drivers considered sending a text message to be the most distracting activity and this was ranked more distracting than reading a map, using a hand-held or hands-free phone, eating fast food or changing a tape. An Australian survey conducted by the University of Sydney found that

30 per cent of people surveyed had sent text messages while driving. Another Australian survey, conducted by Telstra, found that one in six drivers regularly sent text messages while driving. These findings are a cause for concern as text messaging involves more distraction than talking on a mobile phone.

A US simulation study found that talking on a mobile phone is more distracting than holding a conversation with a passenger, but no more distracting than eating a cheeseburger.

Route guidance systems

The most distracting task in using route guidance systems is entering destination information. Using voice input technology reduces the distraction in using these systems. Systems that provide navigation instructions audibly are less distracting than those that use visual display of information. The most useful and least distracting systems are those that provide turn by turn instructions.





Entertainment systems

Listening to the radio is one of the commonest in-vehicle activities. Tuning a station is likely to involve physical and visual distraction due to the need to look away from the road, while listening to the radio would involve cognitive and auditory distraction.

Studies have shown that mere listening to radio programmes while driving can impair driving performance (as measured by deviation from the driving lane), but tuning the radio is less distracting than dialling, talking on a mobile phone or operating route guidance systems. Adjusting audio equipment while driving can also adversely affect driving performance. Operating a CD player while driving has been found to be more distracting than dialling a mobile phone or eating.

Non-technology distractions

A US study has shown that a greater proportion of drivers involved in crashes are distracted by eating or drinking (1.7 per cent) than by talking on a mobile phone (1.5 per cent). Another US study has found that eating a cheeseburger was as distracting as using a voice activated dialling system, but less distracting than continuously operating a CD player.

There is evidence from several studies that smoking while driving increases the risk of being involved in a crash. Smokers remove their hands from the steering wheel to light a cigarette, hold it in their hands for a few minutes and put it out. Research shows that there are three factors that could influence the increased crash risk of smokers: distraction caused by smoking, behavioural differences between smokers and non-smokers, and the toxic effects of carbon monoxide.

*Radio tuning or CD player operation
can be more distracting while driving than
using a hands-free mobile phone.*

The Australian NRMA/MUARC study

A study commissioned by NRMA and undertaken in a driving simulator by the Monash University Accident Research Centre (MUARC) investigated the effects of different types of distraction on driver behaviour.

The study examined the driving performance of 30 drivers across three age groups. Distraction within the vehicle and visual clutter in the road environment were examined in 60–80 km/h speed zones. The distractors used were:

- operating the car audio system (adjusting volume, loading cassettes)
- conducting a simulated hands-free mobile phone conversation
- driving in a complex road environment with many advertising billboards, signs and traffic.

The study employed a hazard perception task, which assessed the effects of distraction in terms of drivers' reactions to pedestrians and other hazards in the roadway.

The study found that the negative effects of distraction were more pronounced for the audio system tasks than for the mobile phone tasks:

- When people were distracted by the audio system, they slowed between 9 and 11 km/h less when there was a pedestrian crossing the road or standing in the roadway than when they encountered the same hazards without being distracted.
- When they were distracted by the mobile phone conversation, they slowed between 5 and 7 km/h less than when there was no distraction.

- When distracted by the audio system, drivers' vehicle position on the road deviated up to 0.8 metres more than when they were not distracted. This means they wandered over the road more when they were distracted by the audio system than when they were not.
- Drivers were told to maintain a constant speed. When they were distracted by the audio system, their speed varied from the target speed by 1.5–1.7 km/h more than when they were not distracted. This means they were less able to concentrate on maintaining a constant speed while operating the audio system.
- Overall, the results found that the distractors reduced overall driving performance (poorer speed control and lane-keeping); reduced drivers' ability to detect and respond safely to unexpected hazards; and increased drivers' feelings that they were under pressure. The results were relatively consistent across different age groups and environmental complexities.
- The negative effects of distraction were observed in both simple and complex highway environments – light traffic with fewer distractions as well as situations with heavier traffic and more environmental distractions such as pedestrians and signage.
- An important finding was that the audio system distractor had the greatest negative impact on performance, suggesting that common activities such as radio tuning or CD player operation can be more distracting while driving than using a hands-free mobile phone.





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.

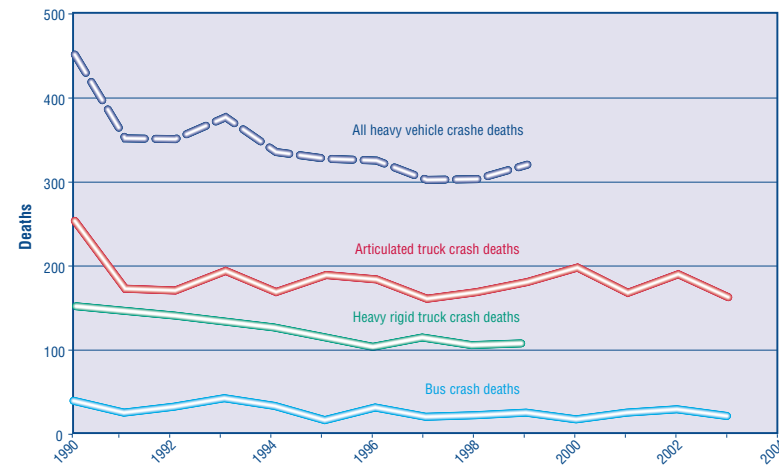
In 1968, Thomas Schelling, an American professor of economics published a paper on people's willingness to pay for changes in risk to their lives. The sobering title of the paper was: *The life you save may be your own*.

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

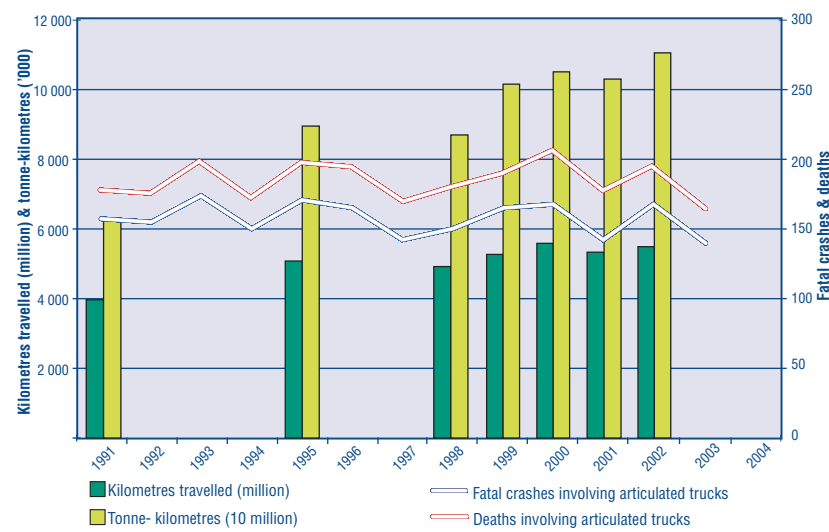
Data relating to fatal crashes and deaths involving articulated trucks are up-to-date. However, 2002 is the most recent year for which Australian Bureau of Statistics data on distance travelled, tonne-kilometres and truck numbers are available.



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

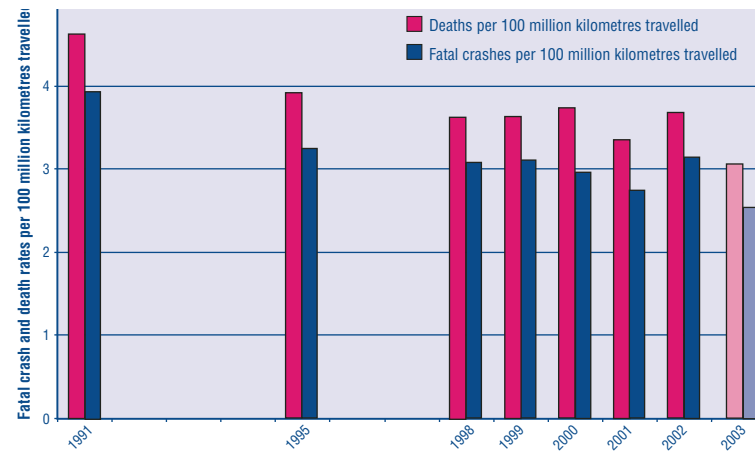
The 70 per cent increase in tonne-kilometres compared with the 18 per cent increase in the number of articulated trucks over the 1991 to 2002 period clearly indicates a substantial increase in the size of articulated trucks now used in the road freight sector.

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



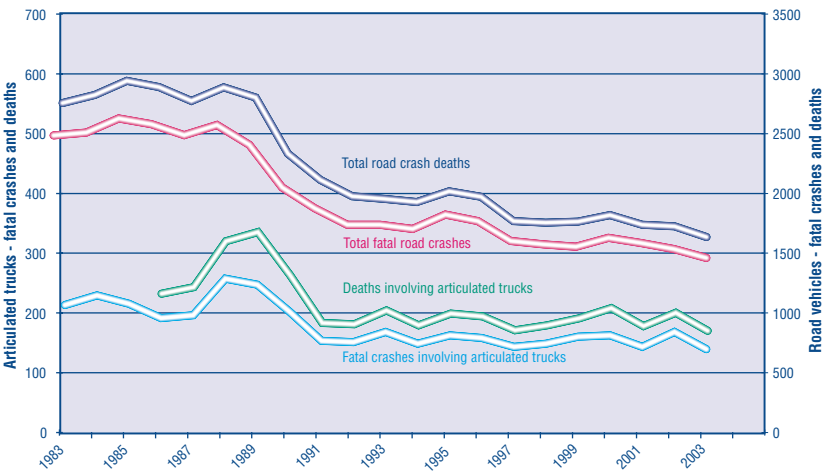
Note: The 2003 rate was calculated using an ATSB estimate of kilometres travelled.

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.

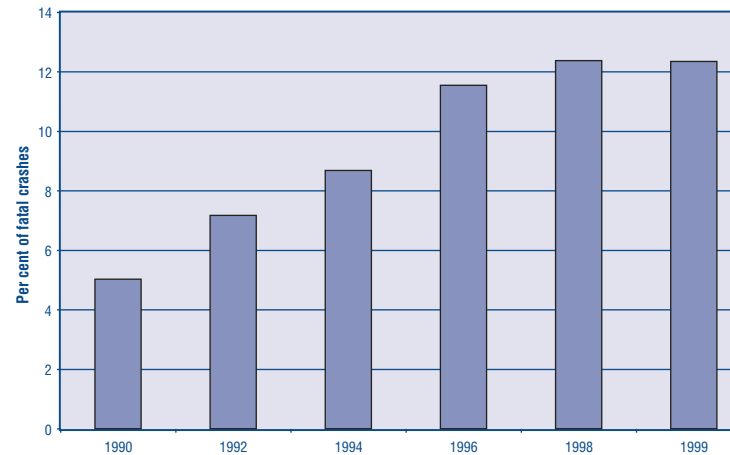
*An increase in 4WDs in the
Australian vehicle fleet has been accompanied
by an increase in crashes involving 4WDs.*

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. Rollovers 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.

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).

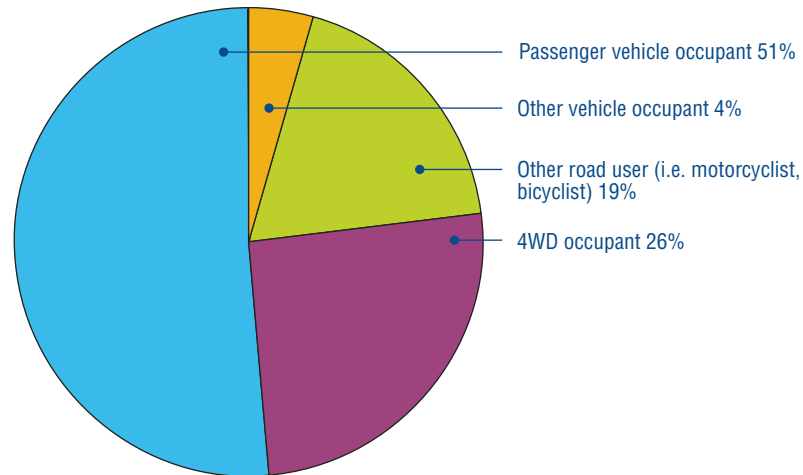
Table 10:
Roll-overs in fatal crashes by vehicle type, 1999

	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

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

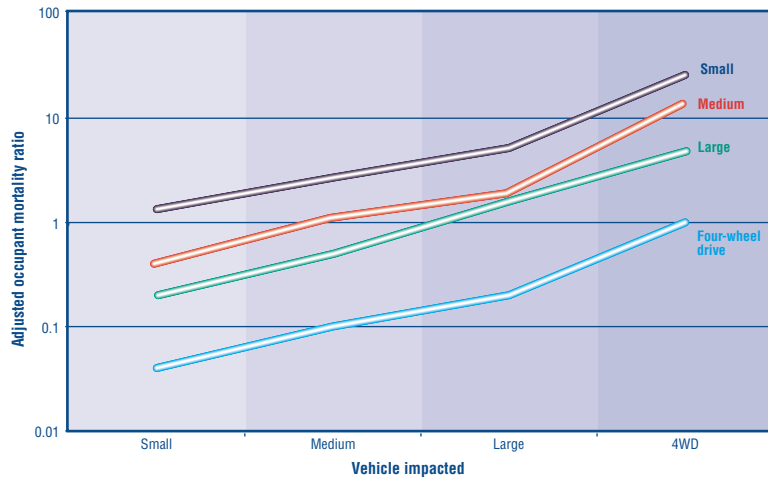


Source: Australian Transport Safety Bureau

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.

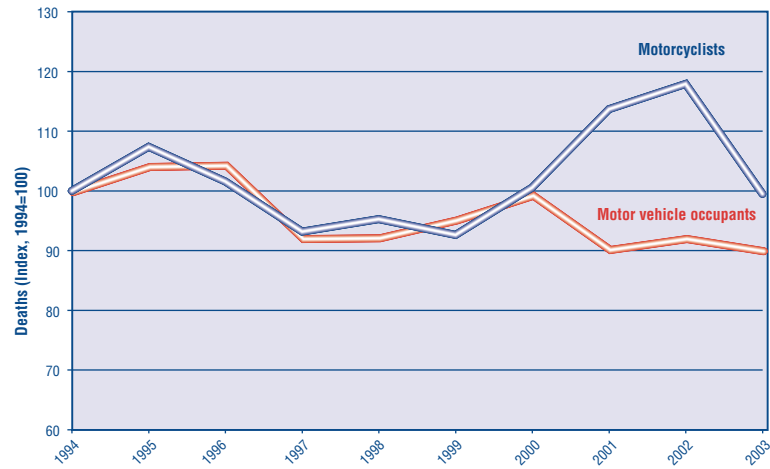
Trends

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.

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.

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

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:

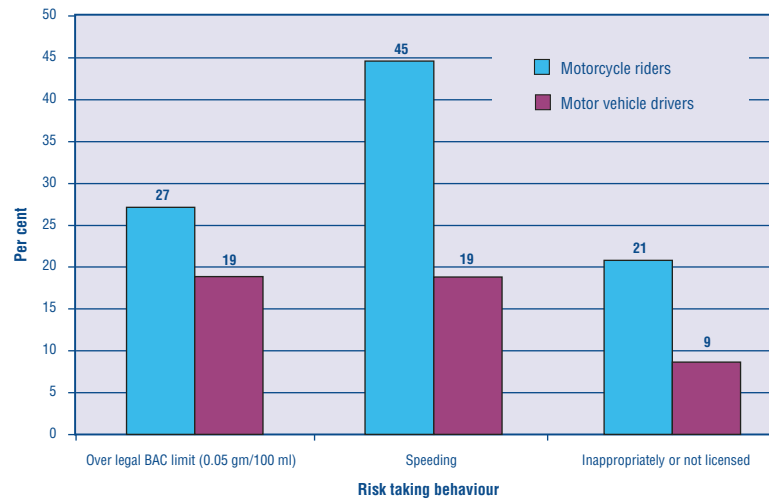
- twenty-seven per cent of motorcycle riders involved were over the legal driving blood alcohol level, compared with 19 per cent of motor vehicle drivers
- forty-five per cent of motorcycle riders involved in fatal crashes were speeding or driving too fast for conditions compared with 19 per cent of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

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

ANDY CONWAY



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.

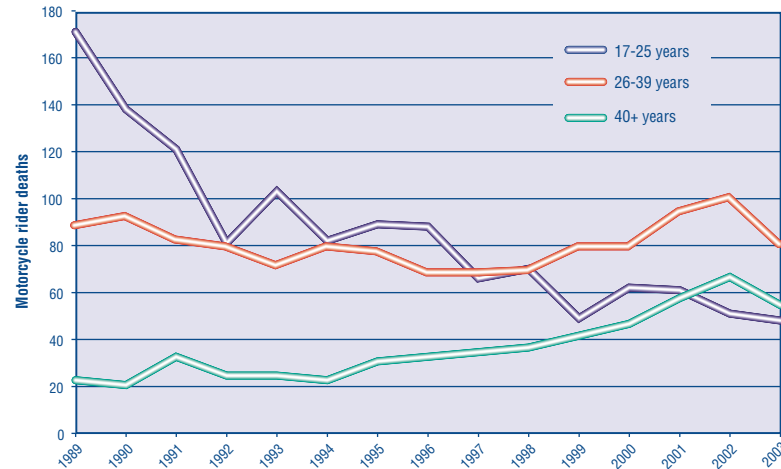
Deaths among motorcycle riders aged 40 years and over have more than doubled in the decade to 2003.

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

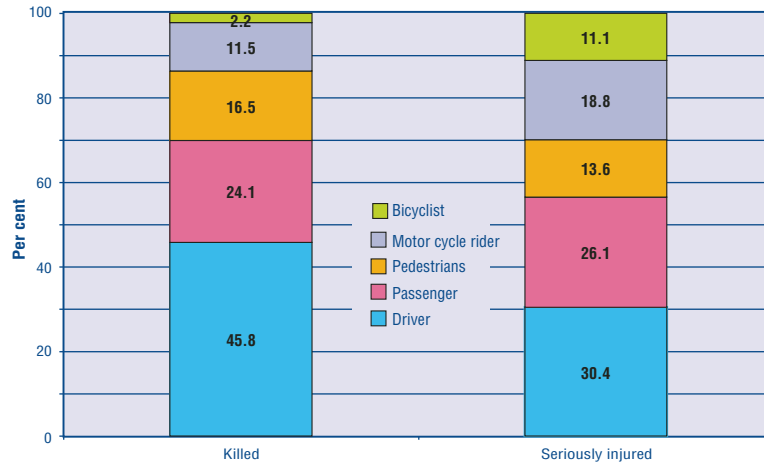
na: not available

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

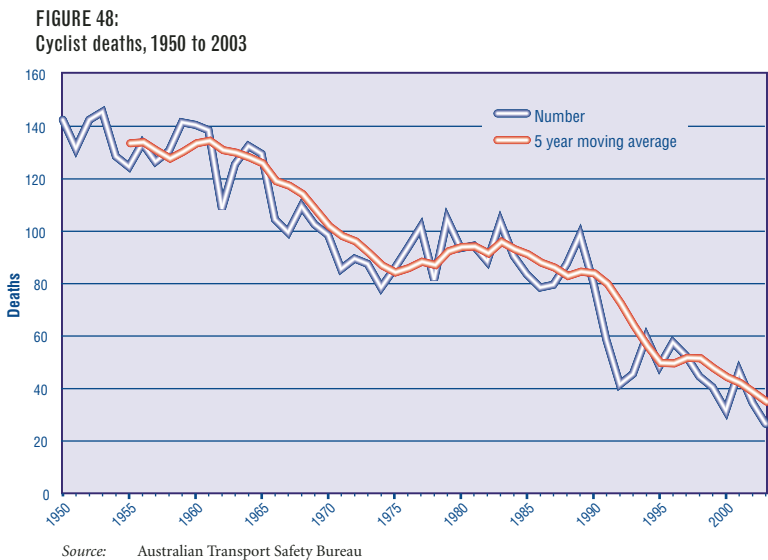
Australia was the first country to introduce compulsory bicycle helmet legislation in the early 1990s. New Zealand followed in 1994. Only some jurisdictions in the USA have equivalent legislation.

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.



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.

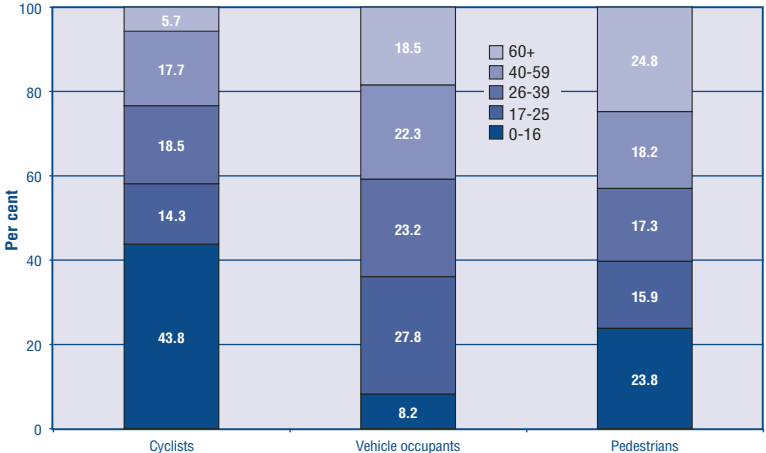
These figures may also reflect children’s relative vulnerability on the roads due to their level of cognitive development and lack of experience as road users.

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.

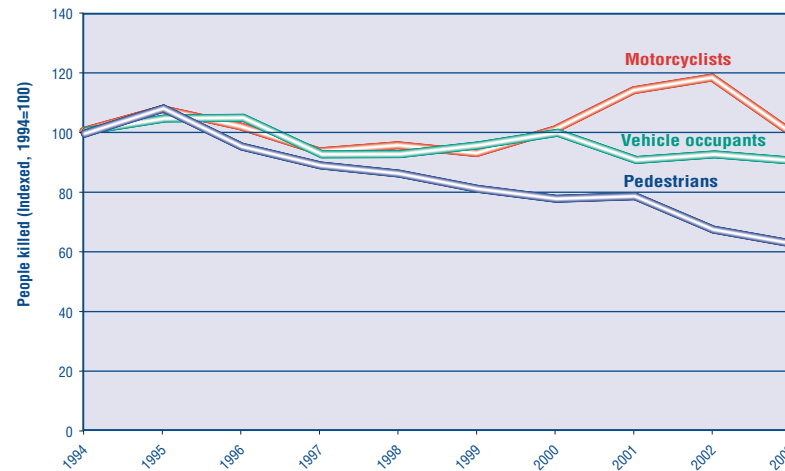
*[There are] only two classes of pedestrians
in these days of reckless motor traffic –
the quick, and the dead.*

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



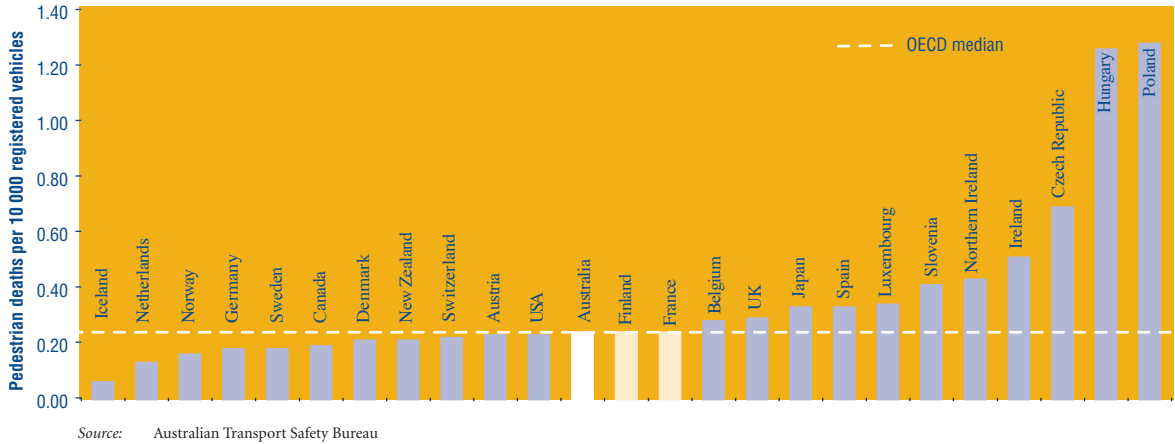
Source: Australian Transport Safety Bureau

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

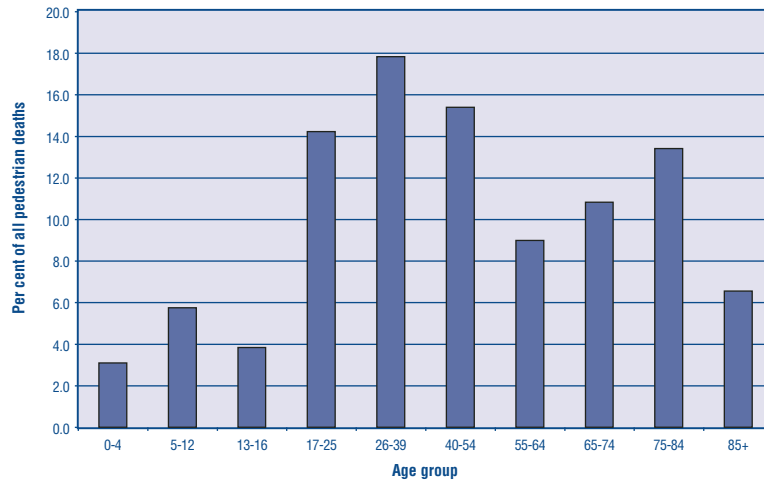
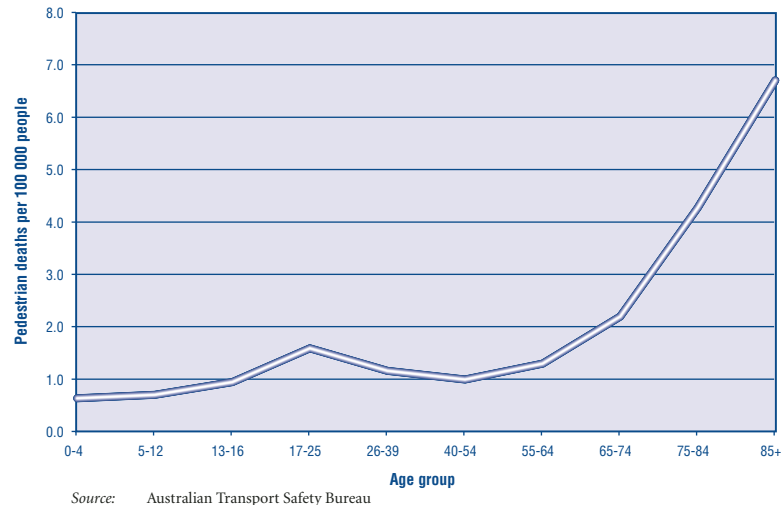


FIGURE 53:
Pedestrian deaths per 100 000 people by age group, 1999 to 2003



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).

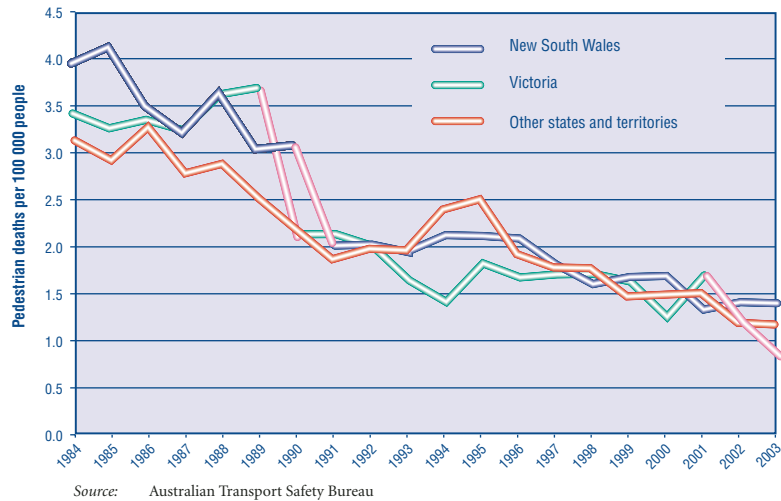
A detailed study of fatal pedestrian crashes in Adelaide found that 32 per cent of pedestrians who died would probably have survived if the vehicle that hit them had been travelling 5 km/h slower before the emergency; one in ten would not have been hit at all (the driver would have been able to stop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



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.

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

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

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

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: 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

	<i>17–25 years</i>	<i>All deaths (all ages)</i>	<i>17–25 age group as a per cent of all deaths</i>
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

	<i>17–25 years</i>	<i>All injured (all ages)</i>	<i>17–25 year age group as a per cent of all injured</i>
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

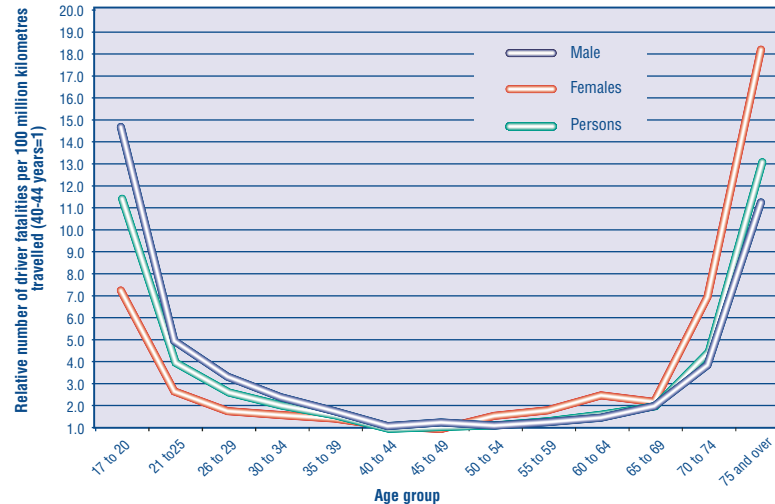
While drivers aged 17 to 25 accounted for 28 per cent of all drivers killed and seriously injured, they only accounted for 17 per cent of people old enough to drive (17 years and above).

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

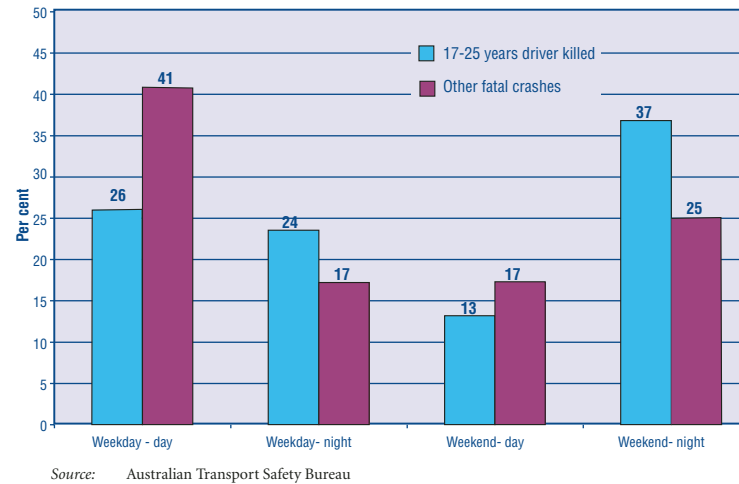
Young drivers are more likely to drive at night and on weekends than older drivers. Figure 56 shows that 60 per cent of crashes where a young driver was killed occurred during the night, compared with 42 per cent of all other fatal crashes. Fifty per cent of these crashes occurred during the weekend,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







Risky Areas

30 level crossings

Crashes between trains and motor vehicles at railway level crossings claim relatively few lives, generally less than one per cent of the total number of deaths due to road crashes each year. Crashes at level crossings, like the one involving an interstate passenger train and a school bus in October 2002 in South Australia investigated by the ATSB, highlight the risks involved at the interface between trains and road vehicles.

Deaths at level crossings

From 1997 to 2002, there were 74 deaths in Australia due to collisions between trains and motor vehicles at level crossings (table 18).

From 1997 to 2002, there were seven motorcycle riders, four heavy truck occupants, three bus occupants, three train occupants and one other person (mode of transport unknown) killed in collisions between trains and motor vehicles at level crossings. On the other hand, there were 56 car occupants killed in collisions with trains at level crossings (table 19).

Nearly 70 per cent of motor vehicle occupants who died as a result of level crossing crashes from 1997 to 2002 were males, but no particular age group stands out.

Most fatal level crossing crashes occur during daylight, in good weather, and on straight, dry and level roads.

Table 18:
Deaths due to collisions between trains and motor vehicles on public roadways at level crossings, year of death by state/territory of registration of death, 1997 to 2002.

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas</i>	<i>NT</i>	<i>ACT</i>	<i>Australia</i>
1997	6	9	5	1	2	0	0	0	23
1998	6	4	4	0	0	0	0	0	13
1999	2	3	0	0	0	0	0	0	5
2000	1	2	2	0	3	0	0	0	8
2001	6	2	1	0	2	0	0	0	11
2002	3	4	1	4	1	0	1	0	14

Source: Australian Transport Safety Bureau

Table 19:
Occupants of motor vehicles on public roadways killed due to being hit by a train at a level crossing, year of death by state/territory of registration of death, 1997 to 2002.

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas</i>	<i>NT</i>	<i>ACT</i>	<i>Australia</i>
1997	4	48	2	1	1	0	0	0	16
1998	5	3	4	0	0	0	0	0	12
1999	2	2	0	0	0	0	0	0	4
2000	1	1	2	0	3	0	0	0	7
2001	5	2	1	0	2	0	0	0	10
2002	3	1	1	1	1	0	0	0	7

Source: Australian Transport Safety Bureau



Deaths at level crossings average about 12 per year.

Circumstances surrounding level crossing crashes

The ATSB has conducted a study of 87 fatal crashes between trains and motor vehicles at level crossings that were among those that occurred in the period 1988–1998. The analysis found that:

- The point of impact was more often the front of the train rather than the side of the train.
- Eighty-three per cent of crashes occurred in daylight (excluding dawn and dusk) and 63 per cent on a weekday (as opposed to a weekend) during the day.
- Eighty-five per cent of crashes occurred in fine weather and 84 per cent on a dry road; the road was straight in 89 per cent of cases and level in 77 per cent of cases.
- Sixty-seven per cent of crashes occurred in a rural area or urban centre away from a capital city.
- Ten per cent of crashes occurred at crossings with boom gates, 41 per cent occurred where the warning system in place was some other type of ‘active’ warning system (other than boom gates) and 44 per cent occurred where the warning system was ‘passive’. ‘Active’ warning systems employ devices such as flashing light signals, gates or barriers, or a combination of these. ‘Passive’ systems employ signs, road humps or other non-electric devices.
- Unintended road user error was more common in level crossing crashes than in other fatal road crashes. Forty-six per cent of level crossing crashes appeared to be due to unintended road user error compared with 22 per cent of other fatal road crashes. That is, in these level crossing crashes, the road user did not see the train, or did not observe or was unable to heed the warning system, or for some other reason was unable to avoid the train.
- The influence of alcohol or drugs was less common in level crossing crashes than in other fatal road crashes.
- The influence of excessive speed was less common in level crossing crashes than in other fatal road crashes.

*Most fatal level crossing crashes
occur during daylight,
in good weather,
and on straight, dry
and level roads.*



31 rural areas

In Australia, over half of all road deaths occur on rural roads, although less than half the population resides in rural areas. The death rate among young rural drivers is over twice the rate of young urban drivers.

Standard definitions of 'rural' and 'remote' areas do not exist. One classification uses population as the basis for differentiating between areas. For example, a small rural centre is defined as one with a population of 10 000 to 24 999, and a large rural centre is one with a population of 25 000 to 99 999.

Statistics on rural road crashes are provided in chapter 4.

Australian data suggest that the risk of road crash injury increases with remoteness from metropolitan centres. A 1988 study found that the rate of rural road crash injury is about double that of urban areas and a 1979 study found that rural crashes are over ten times more likely to result in death than urban crashes.

The majority of crashes in rural areas are single vehicle run-off-road crashes, head-on collisions and intersection collisions. A 1998 VicRoads report characterised a typical rural road crash as involving an unrestrained young male driver (16–25 years) in a single-vehicle run-off-road crash (hitting a pole or tree) or overturning vehicle, on a Friday or weekend between 6 pm and

6 am, under the influence of alcohol or drugs, and driving too fast for the conditions or while fatigued.

There is a common perception that 'locals' are not generally involved in rural crashes. However, the reality, borne out by the statistics, is that it is mostly rural residents who die on rural roads. For example, out of 211 rural road deaths in Victoria in 2002, 152 or 72 per cent were rural residents. The same proportion (72 per cent) of rural residents died in rural road crashes in NSW in 2001–2002. As noted in chapter 28, indigenous people who mostly live in rural areas have a death rate about 3.5 times the rate for non-indigenous people.



Why is rural crash risk higher?

There are a number of factors that individually, and in combination, result in increased risk of serious injury in rural areas.

Speed: As discussed in chapter 13, the frequency and severity of crashes are both influenced by increases in travelling speed. The higher speeds commonly involved in rural areas are associated with more serious injury. Speed is a probable cause of about 25 per cent of serious rural road crashes in Australia. Australia has higher rural speed limits compared with the US and Europe.

ATSB-sponsored research on travelling speed and crash involvement on rural roads (with speed

limits of over 80 km/h) has shown that the risk of a casualty crash increases more than exponentially with increasing free travelling speed above the mean traffic speed. There is a lower casualty crash risk at speeds below mean traffic speed. The crash risk is twice as great at 10 km/h above average speed and six times as great at 20 km/h above

average speed. The study also showed that a 5 km/h reduction in speed would lead to a 31 per cent reduction in casualty crashes. Lowering the speed limit to 80 km/h on undivided roads would result in a 32 per cent decrease in casualty crashes.

*Contrary to popular opinion,
the majority of people who die on rural roads
are rural residents, not city dwellers.*

Figure 57 shows that excessive speed was involved to about the same degree in fatal crashes in urban and non-urban areas.

Alcohol: Intoxication is a major factor in rural crashes. Social interaction involving alcohol consumption may be one of the few means of entertainment and relaxation in rural areas.

In 1998, 24 per cent of drivers who died in crashes in rural Victoria had a blood alcohol concentration greater than 0.05 gm/100 ml. Figure 58 shows that the proportion of fatal crashes involving alcohol intoxication was higher in rural areas than in urban areas. Intoxicated drivers are also often involved in speeding or driving while fatigued.

A study of 149 drink-driving offenders in regional Queensland in 1997 found that they were more likely to change their driving habits (such as taking

a taxi or travelling with a designated non-drinking driver) than their drinking habits.

Research has shown that some rural enforcement activity can result in an increase in crashes. This is because highly visible enforcement activity on relatively good quality roads results in drivers using alternative, and generally poorer quality, roads. The combination of alcohol-affected driving and poorer road quality tends to increase risk.

Seat belt use: Seat belt wearing rates in rural and remote areas are generally lower than in urban areas. Seat belt wearing rates in Australia are quite high (about 96 per cent in the front seat and a bit lower in the rear seats). However, over 300 people who die in road crashes in Australia each year are unbelted (see chapter 14).

*Speed, alcohol, non-wearing of seat belts
and fatigue are the key factors in
rural and remote area road crashes
involving death and serious injury.*

FIGURE 57:
Involvement of excessive speed in fatal crashes, by region of crash, 1997–1999



FIGURE 58:
Involvement of alcohol in fatal crashes, by region of crash, 1997–1999



FIGURE 59:
Seat belt use among vehicle occupants involved in fatal crashes, by region of crash, 1997–1999



FIGURE 60:
Involvement of fatigue in fatal crashes, by region of crash, 1997–1999

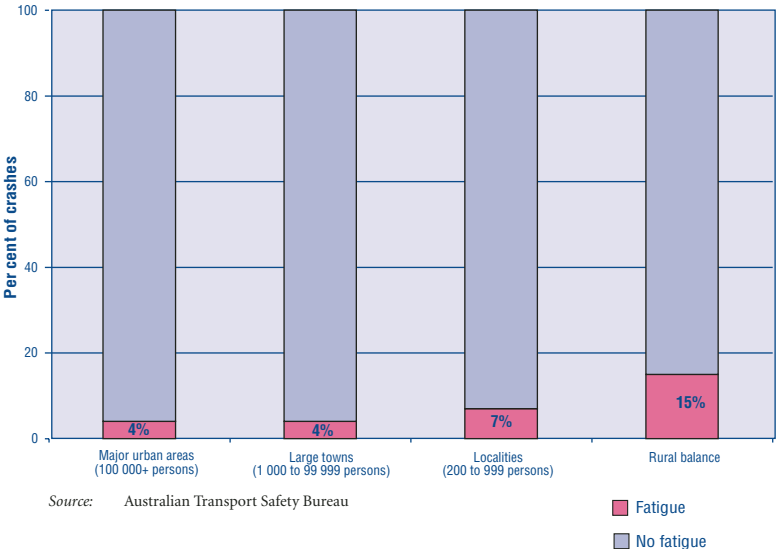


FIGURE 61:
Time for ambulance arrival at fatal road crashes, by region of crash, 1997–1999

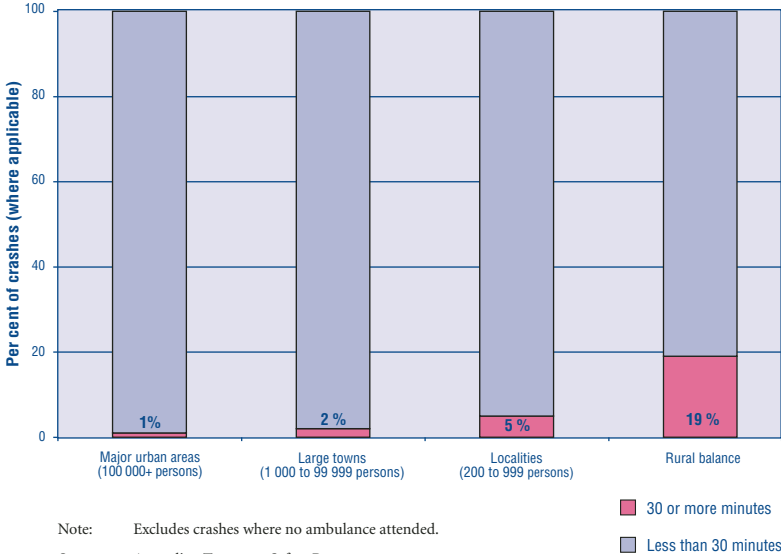
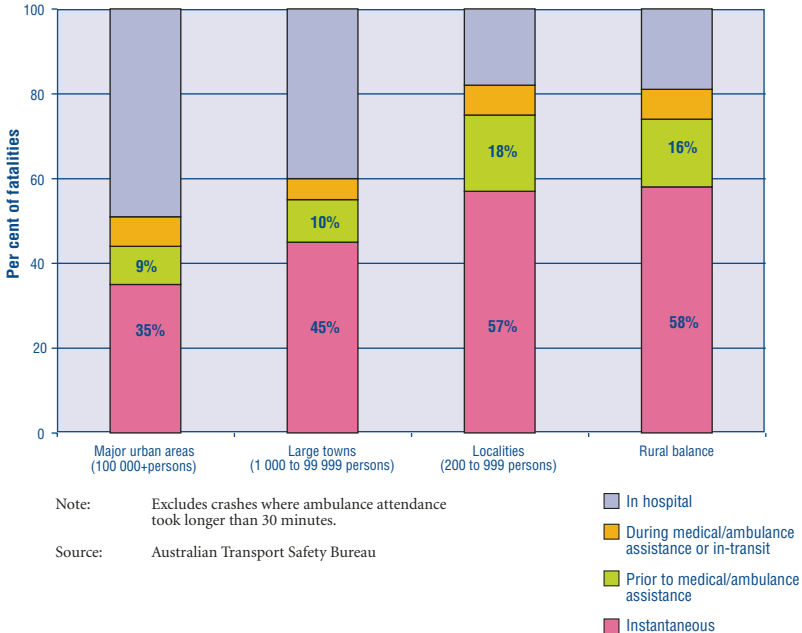


FIGURE 62:
Time of death in fatal crashes, by region of crash, 1997–1999





The generally higher rural travel speeds tend to increase the risk for unbelted occupants. It is also likely that many of those most in need of seat belts (those prone to taking greater risks) are also those who are most averse to wearing them. In Western Australia in 2000, 27 per cent of people who died in crashes were unbelted. Of these, 8 per cent died in metropolitan areas and 38 per cent in rural areas.

Figure 59 shows that seat belt wearing rates for vehicle occupants involved in fatal crashes was much higher in urban areas than in other areas of Australia.

Fatigue: The nature of rural work, longer trips which may make drivers prone to boredom, and the monotony of rural landscapes can tend to increase risk due to fatigue and/or inattention.

Fatigue is difficult to identify as a crash causal factor and is generally underestimated. However, on the basis of available data, figure 60 shows that fatigue-related fatal crashes were higher in rural areas than in urban areas and large towns. Risks due to fatigue are addressed through information and education (see chapter 16), ‘driver reviver’ programmes, particularly during holiday periods, and road-based measures such as audio-tactile edgelineing.

Risk exposure: There is more exposure to risk due to the greater need for vehicle use in rural and remote areas. There are fewer opportunities in rural and remote areas to use safer public transport. Travel distances also tend to be relatively longer than urban trips, thereby further increasing risk exposure.

Lifestyle and habits: The crash risk of people who live in rural areas can be influenced by lifestyle

factors. For example, it is likely that many young people in rural areas learn to drive on farms and rural properties.

Road quality: Road quality tends to be lower on roads with lower traffic volumes, including many of the roads linking smaller rural centres.

Vehicle types: The diversity of vehicle types in rural areas, with a higher proportion of larger vehicles (such as trucks and utility and four wheel drive vehicles) would tend to increase the severity of crashes.

Unfamiliar environment: Driving on unfamiliar rural and remote roads can be hazardous, particularly for people who live in urban areas. The majority of crashes involving international visitors occur in rural areas and this could be due, at least partly, to a lack of familiarity with the road environment (see chapter 29).





Stress: Financial problems, low wage levels, farm debt and similar issues could tend to distract some drivers in rural areas and lower their levels of attention and vigilance.

Enforcement: Effective enforcement (alcohol, speed and seatbelts) is more difficult in rural and remote areas because resources have to be spread over larger areas and also because police presence tends to be communicated fairly quickly in small, close knit communities.

Access to medical services: There are greater delays in accessing medical services in rural and remote areas than in urban areas. Research has shown that the risk of dying in a rural crash is very much greater than in an urban crash of similar severity.

US studies have shown that rural crash victims are seven times more likely to die if the emergency services response time is greater than 30 minutes. The critical first ten minutes has been called the 'golden ten minutes' and the first hour the 'golden hour'. Pre-hospital support care during this period, particularly the first ten minutes, are vital in preventing irremedial shock. An Australian study on road deaths before medical attention could be provided found that 86 per cent of crash victims in remote areas died before they received medical attention, compared with 73 per cent in rural areas and 56 per cent in urban areas.

The increasing use of automatic crash notification (ACN) systems in motor vehicles is likely to reduce emergency services response times and increase the effectiveness of services. These systems use airbag triggering sensors or emergency call buttons

to transmit crash data to call centres. Some systems can provide a voice connection through mobile phones that would enable emergency service teams to be better prepared when they reach the crash site.

Figure 61 shows the time for ambulance arrival at fatal road crashes. There is a marked increase in the proportion of fatal crashes involving response times over 30 minutes in rural areas compared with urban areas. Figure 62 shows the time of death of road crash victims by region of crash. There is a considerably higher proportion of crashes involving instantaneous death in rural areas, reflecting the generally higher severity of rural crashes. However, the proportion of deaths in rural areas prior to medical or ambulance assistance is about double that in urban areas and large towns.



What can be done?

In 1996, the Australian Transport Council endorsed Australia's *Rural Road Safety Action Plan: 'Focus for the Future'*. The Plan recognised that 'while there are many road safety issues equally relevant to urban and rural areas, there are vast differences between traffic conditions on interstate highways and rural roads on the one hand, and urban streets and arterial roads on the other.'

The actions proposed in the Plan related to road improvements; public education programmes; involvement of local communities; speed management; management of fatigue;

enforcement; trauma services; and addressing the unique problems of remote areas.

Research has shown that a key factor for successful interventions in the health area is community engagement and ownership of programmes. The people for whom the road safety strategies are intended need to be involved in the process to ensure that the strategies are consistent with local norms and culture. Most road safety strategies are designed for urban areas and merely extended to cover rural areas. However, due to cultural and local differences, these strategies may not have the same degree of success. It is therefore important to involve local communities and draw on local

resources in order to deal effectively with rural road safety issues.

Education campaigns should focus on raising awareness of the risk factors involved in rural crashes and highlight the fact that it is mainly rural people who die or are injured in such crashes.

Rural enforcement programmes need to be randomised to enable limited resources to be used more effectively in covering large areas. Intelligent Transport Systems (ITS) hold promise in improving vehicle safety and ensuring greater compliance with speed limits (see chapter 39).

3.2

improving road safety by treating hazardous areas

There is a general discussion of black spot programmes in chapter 11. This chapter presents more detailed information about hazardous sites and areas, including issues relating to the evaluation of programmes and results of the most recent evaluation of the Australian Government's Black Spot Programme.

*There can be no doubt that, in the
words of Sir Harold Scott, ...
'Road Safety can be bought',
but to determine what is a reasonable
price to pay is not easy.*

MICHAEL AUSTIN, 1966



What is a black spot?

The risk of a road crash is not constant throughout the road network. At certain locations the level of risk is higher than the general level of risk in surrounding areas. Crashes will tend to be concentrated at these high risk locations. Locations which have an abnormally high number of crashes are described as 'hazardous' or 'black spot' sites.

Although the term 'black spot' suggests a precise location, it is common to encounter 'black areas' or sections of road. Black spots are usually linked to particular characteristics of the road environment such as busy intersections and sharp bends.

Given the increasing emphasis on road safety as a public health issue, medical concepts may be used to describe black spot issues. The approach involves identifying the symptom (crashes at a site), the dysfunctions at the site, and prescribing curative or remedial measures.

Medical experience indicates that a single symptom is not always associated with the site of origin of the problem. The medical or clinical approach requires an overall examination of the patient to facilitate diagnosis. Similarly, a black spot should be regarded as a manifestation of a dysfunction at a point on a road, considered not in isolation, but as part of a traffic network. Prescribed treatment may therefore involve the site in question or other areas. The term 'mass action'

refers to treatments with proven effectiveness applied extensively to areas with a common problem. Similarly, 'route action' and 'area-wide schemes' refer to the application of various engineering treatments or countermeasures over specific routes or wider areas.

There is considerable potential for reducing crashes on the road network by applying relatively low-cost engineering treatments. Simple measures such as using road markings to channel traffic at complex intersections or adding a right turn phase to a set of traffic signals can result in substantial reductions in crashes.

The Australian Government's Black Spot Programme

The Australian Government commenced a road safety black spot programme in 1990. The programme operated with a budget of \$270 million from 1990–91 to 1992–93 and was directed at improving the physical condition or management of hazardous locations with a history of crashes involving death or serious injury. A total of 3 176 black spot projects with a mean cost of \$85 000 were approved under the programme.

The programme was evaluated by the then Bureau of Transport and Communications Economics (BTCE) – now the Bureau of Transport and Regional Economics. The BTCE found that the programme delivered net benefits to the Australian community of at least \$800 million, generating returns of about \$4 per dollar of expenditure.

The success of this programme led to the Government deciding to fund another programme commencing in 1996 (see chapter 11).

The first three years (1996–1999) of the second programme was evaluated by the Bureau of Transport Economics (BTE) in 2001. The results indicated that the programme was highly successful in reducing crashes involving death and serious injury and generated a benefit-cost ratio of 14. Urban areas derived significantly greater benefits than regional areas, most likely due to the greater flow of traffic through treated urban black spots. The urban benefit-cost ratio was over 18, whereas the regional benefit-cost ratio was under 11.

The most cost-effective black spot treatments based on existing technology have been introduced in Australia. The treatments that have been

implemented under federal and jurisdictional black spot programmes have resulted in a steady and continuing decline in the number of black spots. However, new black spots can and do appear as infrastructure changes and develops and traffic patterns and flows change over time. Moreover, the element of chance in road crashes means that it can take time for a high risk location to be identified in crash data, and treated.

It is likely that, overall, the number of highly hazardous spots and areas would decrease over time as black spot programmes continue to operate. Any savings in resources resulting from diminishing returns from engineering treatments over time could be reallocated to other aspects of road safety.

Evaluation studies have demonstrated that black spot programmes are highly effective in reducing road deaths and injuries.

Evaluating black spot programmes

A 'before and after' study is carried out to determine the effectiveness of treatments. This essentially involves comparing the number of crashes that actually occur after a site is treated with the estimated number of crashes that would have occurred in a similar period if the site had not been treated.

In attempting to determine the true effect of treatments, there are several potentially confounding effects to be considered. These effects include site-specific factors (such as weather conditions and changes in traffic flow patterns), crash trends over time (such as the long-term effects of various improvements in vehicles, the

road system and driving behaviour), changes in the way crashes are reported and recorded over time, the 'regression-to-mean' effect, and crash migration.

The regression-to-mean effect is a difficult issue in evaluation studies. It was first observed by Sir Francis Galton over a hundred years ago when he noticed that, on average, tall parents had shorter children and short parents had taller children. The childrens' heights tended to 'regress' or revert to the mean level of the population.

The regression-to-mean effect refers to the simple notion that when some condition is extreme or

abnormal, it is likely to be less extreme or closer to normal in a subsequent period. For example, a very hot day is more likely to be followed by a cooler day than an even warmer day.

Black spots are usually selected for treatment because they have experienced a large number of crashes in a recent period. Due to statistical variation associated with the regression-to-mean effect, a site with an abnormally high number of crashes in a given period is likely to have a lower number in the next period, even without any treatment. Some part of the observed benefits of any treatment can therefore be illusory.

Roundabouts are highly effective in reducing crashes.

Regression-to-mean effects are taken into account in evaluation studies by using control groups of non-treated sites or applying statistical techniques.

Crash migration refers to a possible increase in crashes in the vicinity of a black spot site after it has been treated: crashes may appear to 'migrate' from treated sites to nearby untreated sites. Crash migration has been investigated in studies, but it is still unclear whether it is a real effect or merely a statistical aberration.

Evaluations of black spot programmes provide information and knowledge to enable the effectiveness of treatments to be improved.

In their 2001 study, the BTE found that there were negative net present values (or disbenefits) for

certain treatments. The net present value is the difference between the current economic value of the stream of benefits over the life of the treatment and the current value of the stream of costs. Treatments with apparent disbenefits included improved lighting in urban areas.

Given the information available, the study could not provide an explanation, but recommended that such treatments be carefully monitored in jurisdictions. The counter-intuitive result for street lighting could have been due to several causes such as: increased glare, drivers compensating for better visibility by increasing speed, collisions with lighting columns or just poor data quality. Data may well have been the cause if the numbers of crashes recorded before and after treatment were not differentiated by day and night crashes.



What has recent evaluation told us?

As noted earlier, the then Bureau of Transport Economics (BTE) evaluated the first three years of the 1996–2002 programme. The analysis involved a sample of 608 projects (350 urban, 258 rural) undertaken between 1 July 1996 and 30 June 1999 and costing \$59.5 million.

The BTE found that there was very strong evidence (probability of chance occurrence less than one in one thousand) that the programme achieved its aim of improving safety at locations with a history of crashes involving death or serious injury. The evaluation results indicated that the programme generated a net present value of \$1.3 billion and a benefit-cost ratio of 14. It was

estimated that the programme prevented around 32 fatal crashes and 1 539 serious crashes between 1996–97 and 1998–99. The programme is therefore estimated to have saved at least 32 lives and prevented a large number of injuries over the three-year period. Benefits will continue to accrue over the life of the black spot treatments that were implemented.

Average casualty crash reduction was 31 per cent in urban areas, ranging from 20 per cent in Sydney to 70 per cent in Brisbane. In regional areas, the average crash reduction was 48 per cent and ranged from 27 per cent in South Australia to 75 per cent in Tasmania.

Detailed evaluation results for the 1996–97 to 2001–02 programme indicated that the programme was not uniformly effective in reducing the number of casualty crashes, in the sense that not all road engineering treatments had a statistically significant effect. The BTE report pointed to areas requiring further investigation.

Tables 20 and 21 set out urban and rural treatments that were clearly effective.

Table 20:
Effective urban treatments

<i>Treatment</i>	<i>Crash reduction (per cent)</i>
Roundabouts	70
New traffic lights—no turn arrow	47
Medians	46
New traffic lights—turn arrow	43
Non-skid surface	38
Traffic island on approach	36
Indented right turn and left turn	32
All other	28

Table 21:
Effective rural treatments

<i>Treatment</i>	<i>Crash reduction (per cent)</i>
New traffic lights—no turn arrow	76
Roundabouts	75
Improved lighting	63
Medians	57
Signs	54
New traffic lights—turn arrows	37
Edge lines	33
Shoulder sealing	29
All other	53

It will be seen from the tables that roundabouts were highly effective in both urban and rural areas and new traffic lights were highly effective in rural areas

Table 22:
Inconclusive urban and rural treatments

<i>Urban treatments</i>
Sealing road shoulders (crashes increased in Melbourne)
Marking edge lines
Improving pedestrian facilities
Street lighting (crashes increased)
<i>Rural treatments</i>
Traffic islands on approach
Indented right and left turn lanes
Non-skid surfaces (crashes increased)
Pedestrian facilities (crashes increased)

Source: Bureau of Transport Economics

In the BTE evaluation, the treatments in table 22 produced inconclusive results; that is, it was not possible to conclude that they produced any statistically significant benefits. In the case of some of these treatments, crashes increased after they were implemented.



Why did some treatments not work?

Why did the treatments in table 22 not work? Was the issue of an apparent lack of effectiveness more to do with the evaluation of the treatments than their actual efficacy? Treatments may have been ineffective, or less effective than expected, because of any or a combination of the following reasons.

- The treatments may have had no real effect. They may have been inappropriate for addressing the causes of crashes at the sites or may have been ineffective in changing the behaviour of drivers. Treatments may also have had unforeseen or unintended consequences. A particular treatment might have reduced one type of crash but increased another type of crash.
- There may have been a change in traffic flow or other site-related factors. As crashes depend on exposure factors and risk factors, an increase in traffic volume or a change in road conditions in the vicinity of the treated site could have nullified the beneficial effect of the treatment.
- The 'after' periods used in the evaluation may have been too short. Ideally, 'before' and 'after' periods should be between three and five years for robust statistical analysis.
- There is some arbitrariness in the way conventional statistical tests are carried out. Whether or not a treatment is deemed effective depends on the chosen level of statistical significance (the probability that a given result is not obtained merely by pure chance).

Varying the level of significance slightly can result in a treatment passing or failing the test for effectiveness. As the power of statistical tests decline as sample size decreases, a relatively large sample is required if tests for significance are conducted at the usual 5 per cent level (5 per cent probability that a given result could have been obtained by pure chance in the absence of any real effects) or at more stringent levels.

Such large samples are often not found for black spot treatment studies. Therefore, in some cases, the samples of data used may have been too small to identify results as statistically significant, even if there was a genuine reduction in crash risk.

- Compensatory behaviour by drivers (risk compensation) may have occurred. Risk compensation could be manifested by drivers in appropriating safety benefits resulting from black spot treatments as performance benefits. Such behaviour could include increased speed, lower levels of vigilance, and maintaining shorter distances between vehicles.
- The road network is a complex, dynamic system. Such systems comprise many interacting components in which cause and effect relationships can continually change. Complex systems can exhibit unpredictable behaviour and small changes in one part of a system can become amplified through the system, resulting in large impacts on other parts of the system. Various road user behaviours (including compensatory behaviour described above) and random events may have

combined to thwart the intended impact of a treatment during the period of time its effects were observed.

An incident in Sydney illustrates the systemic effects of seemingly small events. *The Daily Telegraph* of 28 August 2002 reported that on 27 August 2002 a snapped wire and a fallen cable conspired to cause the worst traffic gridlock Sydney has ever seen. A fallen cable had resulted in the closure of the northbound lane of the Harbour Tunnel. About an hour later, Victoria Road was closed when a snapped wire triggered a gas leak in Rozelle. The flow-on effects of these closures spread across the city, causing problems more than 10 kilometres away from the road closures.

Better data would enable more rigorous evaluations of black spot programmes in the future.

Advances in technology offer scope for better and possibly more cost-effective data collection. Innovations such as vehicle data recorders and automated incident recording systems can provide valuable information about crashes and pre-crash circumstances. The New South Wales Government has trialled an Automated Incident Recording System (AIRS) at some busy Sydney intersections. The new technology uses a continuous video recording loop linked to several microphones. When certain sounds like the screech of brakes or crunch of metal are detected, the system downloads and stores the four seconds of film recorded before the crash and the four seconds after the crash. The data are expected to provide insights into the causes of intersection crashes and will help road safety professionals to better analyse crash data and identify countermeasures.

Perceptual countermeasures: influencing speed through road markings

Perceptual countermeasures (PCMs) are a potentially simple, low-cost and practical type of road safety measure. They work by changing the appearance of the road to help drivers make safer decisions about speed, particularly in high-risk locations. Just using painted lines or other simple visual treatments can be effective in encouraging drivers to choose lower speeds.

Research commissioned by the ATSB and the New South Wales Roads and Traffic Authority used a driving simulator to develop and evaluate several treatments with potential to reduce traffic speeds. These included:

- transverse line treatments for use on the approach to intersections or hazards
- hatch-patterned median strips for use on continuous road lengths
- special roadside post arrangements for use on dangerous curves.

In the simulated environment, road markings were found to cut about 10 km/h from drivers' normal speeds in the approach to a rural intersection and about 2 km/h on long continuous road lengths. Even such small reductions could provide significant safety benefits because they give drivers more time to check that intersections are clear, and a better chance of stopping safely if they need to.

The study also found that different treatment designs are likely to be suitable for different applications. For example, transverse lines might be used to reduce speeds on the approaches to intersections or hazards, while hatch-patterned median strips might be particularly effective for continuous road lengths.

For dangerous curves, the research indicated that special roadside post arrangements can enhance the perceived curvature of the road and discourage unsafe entry speeds.

While the simulator results are encouraging, it remains to be seen if similar speed reductions, and associated crash savings, can be achieved in actual road conditions. Positive findings have been reported in a number of overseas studies, though these have been inconsistent. Closer to home, road-based trials using some of the treatments from the simulator research have also produced mixed results.

Researchers are confident that perceptual countermeasures will have an important role to play in Australian road safety. But at this stage, it appears that further work is required to fully realise their potential benefits.







Community Issues

33

how do australians feel about road safety?

The ATSB commissions annual community attitude surveys to determine the views and attitudes of Australians about a range of road safety issues. The ATSB also commissioned an extended survey on speeding and enforcement in 2003 (see chapter 13).

The 2003 Community Attitudes Survey

The main purpose of the ATSB's 2003 *Community Attitudes Survey* (CAS), the sixteenth in the long-running survey programme, is to monitor attitudes to a variety of road safety issues, evaluate specific road safety countermeasures, suggest new areas for intervention, and identify significant differences between jurisdictions.

The population for the survey was persons aged 15 years and over. Interviewing, using Computer Assisted Telephone Interviewing (CATI) technology, was conducted in March and April 2003. A total of 1 638 interviews were conducted with an average interview length of 16 minutes. The response rate was 68 per cent.

Speed is the factor most commonly nominated by the Australian community as the main cause of road crashes.

Factors perceived to contribute to road crashes

The Australian community continues to identify speed as the single most likely cause of road crashes. When asked to identify the main factor that leads to road crashes, 40 per cent say speed (37 per cent in 2002), 15 per cent say inattention/lack of concentration (significantly higher than the 2002 finding of 11 per cent), 11 per cent mention drink driving (unchanged from the 2002 result) and 9 per cent mention driver fatigue (down from 11 per cent in 2002).

When asked to nominate up to three factors that lead to road crashes, 62 per cent of the community nominate speed (the same as in 2002), 44 per cent drink driving, 30 per cent inattention/lack of concentration and 26 per cent driver fatigue.

For the first time since 1998, lack of concentration was a more commonly mentioned contributing factor (30 per cent) than driver fatigue (26 per cent).



Alcohol and drink driving

Random Breath Testing (RBT)

Community support for RBT is almost universal, with 98 per cent agreeing with RBT (84 per cent strongly agreeing and 14 per cent somewhat agreeing). Support for RBT has been in the 96–98 per cent band for the last 10 years.

Three-quarters of the sampled population have seen police conducting RBT in the last six months. This proportion is consistent with those reported in previous years and continues an upward trend in terms of the perceived visibility of RBT operations.

68 per cent of wine drinkers underestimate the number of standard drinks in a bottle of wine.

Attitudes to drink driving

In 2003, 44 per cent of ‘active drivers’ say that when driving they restrict what they drink, 40 per cent say that when driving they do not drink at all, 16 per cent do not drink at any time and 0.1 per cent (one in a thousand) say that if driving they do not restrict what they drink. This pattern of response has been consistent over the last ten years.

Awareness of standard drinks and alcohol consumption guidelines

Just over half (53 per cent) of beer drinkers accurately identify the number of standard drinks in a stubby/can of full strength beer (around one and a half), and 14 per cent underestimate,

meaning that they may be at risk of accidentally consuming more alcohol than they think is the case. The proportion of beer drinkers able to accurately identify the number of standard drinks in a full strength stubby/can has ranged from 39 per cent to 53 per cent over the last 10 years, with the 2003 figure (of 53 per cent) being the highest on record.

Only 23 per cent of wine drinkers correctly identify that a bottle of wine contains seven or eight standard drinks (28 per cent in 2002). Sixty-eight per cent of wine drinkers underestimate the volume of alcohol contained in a 750 ml bottle of wine (64 per cent in 2002).

The published guidelines stipulate two standard drinks for males and one standard drink for females in the first hour, with one standard drink per hour or less after that. A significantly higher proportion of males (47 per cent) had accurate knowledge of the guidelines compared with females (28 per cent).

More than half the community still believes that speeding fines are mainly to raise revenue.

Speed

Speed enforcement

Seventy two per cent of all respondents are of the view that the level of speed limit enforcement has increased in the last two years. The current result represents a significant increase compared with 2002 (65 per cent) and confirms an upward trend in recent years (from 58 per cent) in 2001.

Just under a quarter (23 per cent) of those that have held a licence and driven in the last two years had been booked for speeding at some stage during that period, with 35 per cent of this group (8 per cent of current drivers) reporting having been booked for speeding in the last six months.

Selected attitudes to speeding

The proportion of the community agreeing that a crash at 70 km/h will be more severe than one at 60 km/h has been fairly static in recent years, but increased from 80 per cent in 1995 to 91 per cent in 2003. The level of agreement with the statement that speed limits are generally set at reasonable levels has fluctuated somewhat over recent years from 88 per cent in 2001 down to 83 per cent in 2002 and back to 86 per cent in 2003. Awareness of the road safety message that you are more likely to be involved in a road crash if you increase your speed by 10 km/h has continued to increase steadily from 55 per cent in 1995 to 70 per cent in 2003.

There has been a slight tapering off in the extent to which the view is held that speeding fines are mainly intended to raise revenue (down from a peak of 58 per cent in 2001 to 54 per cent in 2003) and also a tapering off in the proportion of the community that believe it is acceptable to speed as long as you are driving safely (down from 32 per cent in 2002 to 29 per cent in 2003).

Perceived acceptable and actual speed tolerances

Just over a third (35 per cent) of the community believe that there should be no tolerance when it comes to booking people for speeding, that is, the maximum speed at which people should be allowed to travel in a 60 km/h zone in an urban area is 60 km/h. When looking at perceptions as to



what speed was actually permitted in 60 km/h zones in urban areas before a speeding fine would be issued, it emerges that 15 per cent of the community (12 per cent in 2002) think that zero tolerance is enforced, 47 per cent believe there to be a tolerance of up to 5 km/h (52 per cent in 2002) and 19 per cent feel that speeds greater than 65 km/h will be tolerated without a speeding fine being issued (28 per cent in 2002).

Just over a quarter (26 per cent) of the community felt that the maximum speed people should be able to travel in a 100 km/h rural area without being booked was 100 km/h. This finding, consistent with previous years, indicates a slightly more relaxed attitude toward speeding in 100 km/h rural areas compared with 60 km/h urban zones. Just over 1 in 10 respondents (11 per cent) thought

there was no permitted tolerance for speeding in a 100 km/h area, 12 per cent felt speeds between 101 km/h and 104 km/h would be tolerated, 19 per cent thought there was a 5 km/h tolerance, and almost a quarter (24 per cent) thought there was a 10 km/h threshold for speeding in a 100 km/h rural area before a speeding fine would be imposed.

Self-reported driving behaviour

The proportion of those who had driven in the last two years reporting either always or nearly always driving 10 km/h over the speed limit has more than halved over the last 10 years, from 15 per cent in 1993 to 7 per cent in 2003.

Driver fatigue

The incidence of having ever fallen asleep while driving remains unchanged, at 15 per cent, over the last three years, with the most commonly mentioned preventative measure being getting a good night's sleep before driving (26 per cent). Other preventative measures frequently mentioned include frequent/regular stops (13 per cent), pulling over to get something to eat/drink (12 per cent), pulling over for a walk/to get some fresh air (11 per cent), winding the window down (10 per cent), having food/coffee/a smoke (without mentioning pulling over) (10 per cent) and sharing the driving (also 10 per cent).

Along similar lines, strategies mentioned for dealing with tiredness/fatigue while driving

15 per cent of Australian drivers have fallen asleep while driving.

include the need to pull over and rest, have a nap/sleep, have a walk/get some fresh air and/or have something to eat or drink with these types of responses (i.e. involving stopping driving) much more frequently mentioned than those involving trying to stay awake while continuing driving.

Compulsory licence carriage

Consistent with the findings of previous surveys, the 2003 survey shows community approval for the compulsory carriage of a licence while driving remains high (86 per cent), with 67 per cent strongly approving and 20 per cent somewhat approving. The 2002 overall approval rating was 85 per cent.

Seat belt wearing and enforcement

The proportion of people who always wear a seat belt when travelling in the front seat of a car has remained largely unchanged (between 95 per cent and 97 per cent) since 1993. While the proportion of passengers who always wear a seat belt when travelling in the back seat has always been at slightly lower levels, 2003 results show the gap to be the narrowest yet observed (96 per cent front seat/91 per cent back seat).



3.4

improving road safety through community involvement

There has been a growth in interest in Community Road Safety (CRS) in Australia both by road safety authorities and communities around Australia. This is consistent with the notion that road safety is everyone's business – not just the responsibility of governments.

The primary purpose of CRS is to reduce road crashes and the resulting deaths and injuries. Other objectives include raising the level of awareness of communities about road safety matters, drawing on local resources and skills to improve road safety, promoting measures and programmes of proven effectiveness, adopting road safety programmes that are appropriate to

particular communities and are culturally sensitive, and providing opportunities to effectively coordinate and integrate various programmes.

Local government is responsible for most (about 80 per cent) of Australia's road network. The involvement of people in small communities or localised areas can closely target road safety issues specific to those areas. CRS programmes could also reach groups that cannot be effectively reached by conventional media.

One of the aims of CRS programmes is to create a positive road safety culture in which continuous improvement in road safety is considered a

desirable outcome, and road safety considerations become incorporated in decision-making processes.

Successful CRS programmes require a local body to be in charge of implementing strategy (usually a local council), personnel who can undertake the duties involved, and a commitment of local resources, including funds and in-kind contributions. Many CRS programmes use the services of volunteers. Ideally, government support of CRS at the state/territory level should involve long-term commitment, appropriate funding, management support, advice, and evaluation of programmes.

CRS programmes

Some examples of CRS programmes are described below.

Driver Reviver: The Driver Reviver programme provides coffee and refreshments to drivers, particularly during holiday periods. The programme depends on volunteers at individual sites.

Safe Routes to School: This community based programme, based mainly on influencing behaviour, is intended to improve the safety of children travelling to and from primary schools. The programme involves surveying travel patterns of children travelling to and from school, taking account of concerns of parents and carers and evaluating hazardous sites. Families participating in the programme are provided with information enabling them to make choices about safer routes to school.

Mobilising potential advocates of road safety in communities can achieve benefits not readily available by other means. Local government and schools are well placed to support local advocacy and other road safety initiatives within communities.

THE NATIONAL ROAD SAFETY ACTION PLAN 2001 AND 2002

A programme called the *Walking School Bus*, which has been implemented overseas, is being trialled in some Australian jurisdictions (see chapter 25).

Drink Drive Prevention Coordinators: Some jurisdictions have coordinators based in different areas who work with local communities in developing locally-appropriate interventions based on information, provision of alternative transport, and responsible alcohol serving practices.

School Crossing Supervisor Schemes: Supervisors at school crossings stop vehicles and ensure that children cross safely.

Various other community programmes relating to the road safety of children are described in chapter 25.



Road safety slogans

Road safety slogans are pithy statements, which convey road safety advice to the community, often in a witty manner. They are therefore usually memorable. The following is a selection of such slogans from around the world.

Click Clack – front 'n' back
Clunk, click, every trip
Children should be seen and not hurt
Stop–look–and–listen
None for the road
It's better to be a minute late than 'the late'
Stay alert, stay alive
Look every way everyday
Alert today, alive tomorrow
Danger lurks where caution shirks
It's better to be 10 minutes late in this world
than 10 minutes early in the next

Don't be rash and end in a crash
Take your time, not your life
Driving faster can cause a disaster
Be slower on earth than quicker to eternity
He passed them all, all saw him passing
If you drink like a fish – swim, don't drive
The speed that thrills is the speed that kills
Don't dash – you will cause a crash
Hug your kid at home, belt him in the car
It's better to be late than never
It's better to be late than dead on time

35 unfinished trips: remembering those who didn't arrive

Roadside memorials

Roadside memorials are widely regarded as a valuable part of the grieving process for bereaved families and friends of crash victims. They often appear as spontaneous acts of remembrance – typically in the form of a bunch of flowers, a small wooden cross, or photographs of the deceased person – and sometimes evolve into more elaborate (and more permanent) shrines or monuments.

The proliferation of these memorials in many parts of the world has been accompanied by the emergence of organisations and Internet sites devoted to honouring and aiding (or exploiting) the practice.

*Roadside memorials are folk art
created out of love and grief....
they say, we will not let you die unnoticed,
you are valuable, you deserve to be
remembered.*

C LEIMER, 1996



In Australia, this form of public mourning appears to be respected by the community at large. Judging by the level of media attention and other anecdotal evidence, it is also becoming more prevalent. A recent programme broadcast on ABC Radio National suggested that as many as one in five road crash deaths are now marked by roadside memorials.

As a measure of the growing interest in this issue, the First International Symposium on Roadside Memorials is being hosted in June 2004, by the University of New England, Armidale. The symposium aims to examine the phenomenon from a range of academic and social perspectives, including its role in road safety.

Government policies

The practice of placing commemorative objects at the roadside is not entirely uncontentious. It has been argued that they are emotionally intrusive or culturally offensive to some people in the community. More serious concerns have focused on the potential for memorials to adversely affect road safety, either by distracting road users or by constituting a physical obstruction.

Safety considerations, in particular, have led to various policy responses by governments, including the imposition of stringent controls on the nature and location of memorials. In some countries they have been banned altogether.

Australian and New Zealand authorities have generally taken a sympathetic approach to roadside memorials, as long as they are not overtly hazardous to road users. However, a number of jurisdictions have attempted to restrict or discourage the ad hoc erection of memorials by implementing official crash marker programmes. These programmes aim to 'standardise' the appearance of roadside markers, and typically include detailed installation and maintenance guidelines.

In South Australia and Tasmania, official markers are standard roadside guide posts painted black to indicate a fatal crash or red to indicate a serious injury crash, usually with a small reflective cross or vertical dash near the top.

Standardised markers may not work well for memorialising victims, and in fact it seems that is not their primary purpose. They are intended as a public service message.

C LEIMER, 1996

In Western Australia, people may choose to mark a death with one of the following approved memorials:

- a small timber cross, painted white
- a grey concrete paver displaying a white cross
- a black decal displaying a white cross, to be located at the base of a traffic signal pole or street light column
- a plant that complies with roadside vegetation guidelines.

In New Zealand, white timber crosses may be installed at fatal crash locations on state highways.

Why roadside crash marker programmes?

Official crash marker programmes in Australia and New Zealand have often been presented as public safety initiatives, for example:

- serving as a positive road safety reminder (Transit NZ)
- keeping the road environment safe for all road users (Main Roads WA)
- reflecting the government's ongoing commitment towards the involvement of local communities in road safety (Transport SA).

The road safety rationale appears to be well accepted by the public, at least in areas where they have been implemented. Market research undertaken after markers were installed in one South Australian district found that most local residents supported the scheme and believed it raised community awareness of road safety.

Despite these sentiments, there is a dearth of objective evidence on the actual road safety effects of crash marker programmes. The most reported evidence relates to the death and injury marker campaign run in the Millicent district of South Australia between 1994 and 1998. One evaluation study attributing significant crash reductions to this programme has often been cited as proof of

the effectiveness of crash markers. However, the conclusions of this research have since been rejected on technical grounds by a number of other researchers.

A more rigorous investigation by the Road Accident Research Unit (University of Adelaide) examined the effects on driver behaviour and community perceptions of crash markers installed in the Gumeracha (Adelaide Hills) area. The study included measurements of the speeds of vehicles in the vicinity of marker posts, before and after installation, and found no change in either the average or the 85th percentile speeds.

There is no direct evidence available that marker posts are an effective road safety measure and any justification of their continued use can only be based on a positive public perception and possible but unproven long term and indirect effects.

CN KLOEDEN, AJ McLEAN AND AJT COCKINGTON, 1999



36 Ls, Ps and beyond: can driver training work?

A high risk group

People aged between 17 and 20 are seriously over-represented among vehicle occupants killed and seriously injured on Australian roads. In 2002, this group represented 16.3 per cent of all vehicle occupant deaths, but only 7.3 per cent of the total population. Drivers in this age group are eleven times more likely to die per kilometre of road travel than drivers aged between 40 and 44. Chapter 27 provides a detailed survey of risk factors associated with young drivers.

Recent research shows that there are several promising options for improving the safety of young novice drivers.

Kermit: Fozzie, where did you learn to drive?

Fozzie: I took a correspondence course.

JERRY JUHL AND JACK BURNS, THE MUPPET MOVIE SCREENPLAY, 1979

Graduated licensing

A graduated licensing system allows new drivers to gain experience and competence in relatively low risk conditions, through a series of restrictions that are progressively relaxed as they move through the system. A basic model would consist of a learner period, at least one stage of solo driving with some restrictions and possibly testing at the end, and then full licensing on completion of the prior stages.

Graduated licensing can incorporate a variety of elements, such as an extended period of supervised practice, restrictions on carrying passengers or night time driving, and zero or low-alcohol restrictions. Specific types of training and/or testing can also be included at different stages.

Successful enforcement of any restrictions on novice drivers would require drivers, and possibly

their passengers, to carry identification. Most Australian jurisdictions do not have compulsory licence carriage rules. The *National Road Safety Action Plan 2003 and 2004* lists this as a priority. Interestingly, the ATSB's annual Community Attitudes Survey shows that most drivers believe that they are required to carry their licence, and an even higher percentage approve of such a law (chapter 33). Introducing restrictions also requires consideration of the potential social effects, and what exemptions will be allowed (e.g. driving at night if the person needs to get to work).

Extended practice

Research has highlighted the importance of providing extensive supervised on-road experience (with or without formal instruction) for young drivers during the learner period. The ATSB and other safety agencies in Australia recommend as much as 100–200 hours of practice during the

learner period, under a wide range of conditions including night and wet weather driving. There should also be a gradual progression from simplest and least risky to more complex conditions as the new driver gains confidence and competence.

Many jurisdictions have already increased the length of learner periods and are working to encourage young drivers to spend a longer time practising before driving solo.

Alcohol restrictions

Driving after drinking any quantity of alcohol increases crash risk to some extent, and alcohol is a significant factor in young driver crashes. A zero or low blood alcohol concentration (BAC) limit has been shown to reduce young driver crashes, and it has been suggested that it might also encourage the development of safer drinking and driving habits after the restriction period ends. All





Australian jurisdictions have implemented a zero or 0.02 BAC limit for young novice drivers (usually for the first three years for solo driving).

A requirement that all drivers and riders carry their licence and produce it when requested by police is important for effective enforcement of this limit.

Passenger restrictions

The risk of being involved in a fatal or serious injury crash is generally higher for young drivers when passengers are present in the vehicle compared with driving alone (although it may depend on who the passengers are, e.g. parents or peers). Inexperienced drivers, for whom the basic tasks of driving are not yet automated, would find distractions and interruptions particularly hard to deal with.

Some countries have passenger restrictions for novice drivers, although these are generally places with lower licensing ages than Australia (for example, New Zealand and some US states).

The idea of legal passenger restrictions was one of a number of options examined in an extensive review carried out by the Monash University Accident Research Centre (MUARC) a few years ago. The researchers identified some potential problems, including:

- potentially more young inexperienced drivers on the road at any one time, and
- the possibility of reduced opportunities for a 'designated driver' approach to avoid driving when affected by alcohol or fatigue.

Various reviews have noted that the evidence is limited, but does support the safety benefits of passenger restrictions.

Night-time driving restrictions

Crash risk is higher at night for all drivers, and especially so for young inexperienced drivers. Fatigue is a significant risk factor for young drivers. They are often juggling many lifestyle demands, and may not recognise the signs or dangers associated with driving while tired. Driving at night is also more challenging because of the difference in visibility.

Restricting night time driving reduces new drivers' exposure to risk until they have more experience and are likely to be better equipped to cope with the extra challenges of night driving. Research has shown that night driving restrictions reduce both night-time and overall crashes, due to reduced risk exposure.

*Drive carefully – 90 per cent of people
are caused by accidents.*

BUMPER STICKER



Reduced tolerance of driving infringements

It is possible to increase the consequences of traffic violations, for example by reducing the number of demerit points available. There is as yet no conclusive evidence that this approach reduces young driver crashes. On the plus side, it is relatively simple to introduce, and may help to address the motivational components of the young driver safety problem (whereas the restriction-type measures are more aimed at reducing exposure).

Several Australian states and territories have special point demerit limits for provisional licence holders.

Exit tests to progress to next stage

Movement between stages of a graduated licensing system, whether to a less restrictive provisional stage or to a full licence, can either be automatic after a fixed time period (which can be extended for driving offences) or an exit test can be used. The safety benefit of such tests in themselves is unknown, but they can provide an opportunity to assess higher order skills and check the development of any 'bad habits'. Perhaps most importantly, setting exit tests is an opportunity to influence the type of training or practice attained during the provisional stage – in effect keeping the pressure on for novices to continue improving their driving and focusing on particular skills.

Driver training and education

Although the terms 'training' and 'education' in the driving context are often used interchangeably, they do not have the same meaning. Training generally refers to the practical development of vehicle control skills and other competencies, usually over a short period of time. The concept of education (which may include training) is broader and targeted at the cognitive level, extending to a more complete knowledge and understanding of the complex driving task. It has been suggested that 'driver development' is a more meaningful description of a potentially effective approach than training or education.



Past evaluations of driver training programmes have produced disappointing results – particularly for programmes that focus on developing vehicle control skills. There are several possible reasons for this. As crash risk is generally low for individual drivers, training that focuses on vehicle control skills or relatively rare emergency situations is likely to result in learning decay. Improved knowledge and skill does not necessarily translate into changes in on-road behaviour. Training may be unable to overcome personal traits and values developed over many years. Overconfidence or optimism bias can induce drivers to take more risks. Novice driver training can also increase crash risk by factors such as an unwarranted increase in confidence, earlier licensing and greater risk exposure.

While there is evidence that developing successful novice driver programmes is not easy, that does not mean that nothing worthwhile can be done.

There is considerable interest among road safety and driver education experts in educational programmes to promote safer driving through raising awareness of risks and promoting a culture of safe driving.

In Europe and particularly Scandinavia (and later in several other countries including Australia), work has gone into developing new driver training and education models along these lines. Driver development programmes that seek to raise awareness about risk factors and how risk is often underestimated, to improve decision making and

judgement of risk, and to provide novice drivers with insight into their own skill limitations, are sometimes referred to as ‘insight’ training. The term ‘insight’ refers to the objective of increasing novice drivers’ understanding of their abilities and limitations through experiential learning.

Early evaluations of programmes based on these principles have provided some evidence that they may contribute to crash reductions for new drivers.

*Some people have learned to
drive by accident.*

ANON

Developments in Australian driver education

At the Australian Transport Council (ATC) meeting in May 2003, the Deputy Prime Minister and Minister for Transport and Regional Services, the Hon. John Anderson MP, proposed that Australia should establish a compulsory national programme of driver education for all new provisional licence holders.

This initiative had strong support from leaders of the Australian automotive industry who have offered to help implement and maintain a national

programme, and support from insurance and other industries.

Transport Ministers agreed that Austroads, the association of Australian and New Zealand road transport and traffic authorities, should review relevant national and international research, and consult with relevant stakeholders on proposals for a best-practice national programme of driver education.

Austroads, with the New South Wales Roads and Traffic Authority as lead organisation, has undertaken a review of relevant research, and existing programmes in Australia and overseas. This review proposes development and evaluation of a course based on the 'insight' programme developed in Finland, and suggests this could ultimately form the basis of a best-practice national programme.

Other driver education initiatives

The states and territories all provide road safety education in schools, although approaches vary. Tasmania, Victoria (*Keys Please*) and the ACT all have pre-driver education programmes.

The ACT's *Road Ready* is a holistic staged programme, intended to reduce the high road crash involvement of young drivers aged 17 to 25. A pre-learner stage encourages students to observe and talk about driving with their parents. The year 10 course (also available outside the school system) is a pre-requisite for a learner's permit and includes research activities, statistics, problem solving and decision making sessions, to help make pre-learners aware of issues relating to safer road use. There is a strong emphasis on encouraging parents or supervisors to provide learners with many hours of driving practice.

Reviews of school-based driver training programmes have consistently found little or no evidence of a crash reduction benefit; however, programmes such as *Road Ready* and *Keys Please* focus on encouraging a greater amount of driving practice, which has been linked with safety benefits.

In the Australian Capital Territory, the optional *Road Ready Plus* course can be taken after six months of driving solo. It includes pre-course activities and facilitated discussion sessions intended to encourage participants to share their driving experiences and learn from each other. Provisional drivers pay a fee to attend, and incentives include the awarding of four additional demerit points and permission to not display P plates.

In 2001, the ATSB, with the Australian Driver Trainers' Association, introduced the *Key Facts for New Drivers* package. The package consists of handouts for driver trainers to use with learner drivers and their parents, with information about risk factors such as speed and fatigue, as well as particular hazards for young drivers and strategies for dealing with them. The aim is to make young drivers more aware of important safety issues and to involve parents more in the learner period.



37 vehicle advertising: is there more scope for promoting safety?

Over many years, a sense of disquiet has been building among road safety experts about the emphasis on speed and aggressive driving behaviour in car advertising. During 2001 the issue was brought to the attention of the National Road Safety Strategy Panel, which includes representatives of federal, state and territory road safety agencies, police, health and medical authorities, insurers, motoring organisations and community groups (see chapter 38).

The majority of Panel members were concerned that motor vehicle advertising was placing an increasing emphasis on speed, power and aggressive driving behaviour. Such advertising is at odds with prevailing community standards and is likely to be a contributing factor to road deaths in Australia.

...some advertising displays a lack of understanding, or perhaps of concern, with the possibly damaging effects on road safety.

HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ROAD SAFETY, 1983



What is the problem with (some) vehicle advertising?

Many road safety agencies in Australia devote considerable resources to undertaking road safety research and publicising information to the community, including through road safety advertising campaigns. The consensus of these agencies and other National Road Safety Strategy Panel members is that vehicle advertising that emphasises speed and power undermines road safety messages and presents contradictory and confusing messages to viewers.

Vehicle advertisements sometimes depict activities that would be illegal on public roads, such as speeding and dangerous manoeuvres. It is

sometimes argued that many advertisements, particularly on television, represent a ‘fantasy’ situation. The words ‘filmed under controlled conditions’ are often included to somehow distance the images from reality. However, it is clear that the advertisement would be of little value if viewers did not identify with the drivers and the scene and therefore want to purchase the product. Adding such a disclaimer does little to convey to drivers that the behaviour depicted is inappropriate on our roads.

Research has shown that even minor levels of speeding increase crash risk significantly (see

chapter 13) and therefore even a subtle influence on driver behaviour could have a significant impact on road safety. Advertising that presents dangerous behaviours as acceptable, fun, and desirable contributes to misconceptions about the real risks involved in driving, especially speeding.

In the past, advertisers have questioned the appropriateness or relevance of expecting advertisements not to portray speeding and/or dangerous driving behaviour, when such material is commonly included in other television content. However, there are important distinctions between programme content and advertising.

Advertisements are generally carefully designed to shape perceptions and influence behaviour. Often, products are marketed by 'selling' desirable images. Sometimes advertising goes further, to define which aspects of a product are most desirable, through the advertiser's choice of features that are promoted.

Concerns about vehicle advertising are not new. In 1983, the House of Representatives Standing Committee on Road Safety undertook an inquiry into the impact of advertising standards on road safety. In its report the Committee reported that:

...Advertisements which contain unsafe driving can have an effect on viewers particularly those who are impressionable or who already have a predisposition to behave irresponsibly on the road. People may be conditioned into a sub-conscious assessment that unsafe driving is less dangerous and more normal than it is.

...Some advertising displays a lack of understanding, or perhaps of concern, with the possibly damaging effects on road safety.

...Advertisements which glamorise unsafe driving ought to be considered socially irresponsible regardless of where they may have been filmed, and ought not to be excused by narrow legalistic interpretations of the codes.

Young drivers are at greater risk

Of particular concern to transport and safety agencies is the influence that advertising featuring speed and other irresponsible driving behaviour may have on the behaviour and attitudes of young drivers. While drivers aged 17 to 25 represent only 17 per cent of people old enough to drive (17 years and above), they account for about 28 per cent of all drivers killed and seriously injured. Males in this age group are at considerably higher risk of death or serious injury than females.

Various national and international bodies, including the UN General Assembly, have expressed concern about the marketing of speed by vehicle manufacturers.

A study published in the journal *Accident Analysis and Prevention* in 2003 notes that ‘...an emphasis on speed and power, [in advertising] without pointing out their deleterious effects, can have the side effect of glamorizing and legitimising high-speed travel,’ and that the message to ‘a young and especially high-risk population, is that speed is fun and risk free.’

Research by the United Kingdom Automobile Association investigated young adults’ attitudes to cars, car use and advertising. The researchers note a distinct gender difference, with young males showing definite interest in advertisements depicting speed and power. They concluded that

car advertisements may influence the attitudes of young adults, in combination with other influences, including other sectors of the media (for example, car chases in films).

Many of the car advertisements featuring speed and aggressive driving appear to target younger drivers (aged about 17–39 years), and males in particular. Advertisements often show impressive vehicle handling skills, far beyond those required for safe driving, to appeal to these segments of the market.

All government road safety agencies in Australia are working towards reducing the over-

representation of young drivers in road trauma. Research has shown that learning to recognise risks and hazards is a most important element for novice drivers in learning to drive – more important (and more difficult to attain) than learning mechanical skills like manoeuvring and braking. Based on strong research evidence, most agencies have adopted a common approach of trying to reduce the emphasis on advanced vehicle control skills, and assisting novices in developing an understanding of risk factors such as speed, and hazard perception skills. Vehicle advertising that shows off complex and flashy manoeuvres, or that glorifies speed and power, is directly in conflict with these efforts to improve young driver safety.

The international situation

The potential conflict between particular styles of vehicle advertising and road safety aims has also been recognised internationally.

In 2003, a report by the UN Secretary-General to the UN General Assembly stated that ‘Peer pressure is a contributing factor to vehicles travelling at high speed, as is the marketing of speed as a desirable attribute by vehicle manufacturers.’ The World Health Organisation has urged vehicle manufacturers to ‘Advertise and market vehicles responsibly by emphasising safety’ (see chapter 2).

In November 1989, The European Conference of Ministers of Transport (ECMT) adopted a resolution on advertising that conflicts with road safety aims. The resolution urges ECMT member countries ‘to regard as inappropriate any advertising whose content extols performance or power and treats driving as a sport [or] shows

scenes evoking motor racing, lightning acceleration and top speeds.’

Denmark and Spain, among other countries, have introduced laws permitting banning of advertisements that encourage dangerous or irresponsible behaviour, or requiring special permission for such advertisements.

In 1999, the European Advertising Standards Alliance published the results of a survey conducted among its European Union members, which found that seven member states had self-regulatory systems that included specific codes or sections relating to motor vehicle advertising. In general, these included provisions referring to not showing unsafe or aggressive driving; avoiding messages based on speed, performance and acceleration; and not presenting technical advances and safety features in ways which might encourage a false sense of security and lead to dangerous and

irresponsible driving. In many cases, the advertising codes had been negotiated by the national car industry association and given to a self-regulatory organisation to administer.

The United Kingdom has separate advertising codes for television and radio, which were developed in conjunction with advertisers and the motor vehicle industry, and are enforced by a statutory corporation, the Office of Communications. A further code covering non-broadcast (print) advertising is administered by the Advertising Standards Authority, an independent self-regulatory body.

The UK television code precludes advertisements that ‘encourage or condone dangerous, inconsiderate or irresponsible driving or motorcycling’, encourage fast driving or refer to speeds over 70 mph, or ‘demonstrate power, acceleration, handling characteristics etc, except in

The majority of the Australian community believes there is too much emphasis on speed in motor vehicle advertising.

a clear context of safety’ and without implying excitement or competitiveness. Similarly, the code for radio advertising requires that ‘references to the power or acceleration of motor vehicles or automotive products must not imply that it is acceptable for speed limits to be exceeded, and there should be no accompanying suggestion of excitement or aggression’.

The non-broadcast (print) code requires that advertisements do not make speed or acceleration claims the predominant message, or portray speed in a way that might encourage motorists to drive irresponsibly or break the law, or portray or refer to practices that encourage anti-social behaviour.

In 1999, the UK Environment, Transport and Regional Affairs Committee’s report, *Young and Newly-Qualified Drivers: Standards and Training* recommended consultation with advertisers, as well as motor manufacturers, to ensure that irresponsible advertising of cars is ended, and that advertisers seek to promote safe driving.

In New Zealand, a self-regulatory industry body is responsible for the *Code for Road Safety in Advertising*, which requires consideration of ‘currently accepted road safety practices’. The code also includes a list of specific unacceptable elements including: actions which would constitute traffic offences, associating driving with

alcohol, glorifying excessive speed and unsafe driving practices, and showing cyclists or motorcyclists without helmets.

The Insurance Institute for Highway Safety has noted that in the US, judgements about the social responsibility of advertising are generally left to advertisers and broadcasters. Advertising industry groups are subject to voluntary standards, but there are no specific rules or guidelines for car advertisements. The Institute considers that there is a need to tighten voluntary standards in the US, making them more specific like those in New Zealand and the United Kingdom, to prevent inappropriate advertising.

Community views

In Australia, community sentiment about speed in car advertising is becoming increasingly strong. Governments at all levels regularly receive correspondence from individuals and community groups expressing concern, anger or amazement about advertisements focusing excessively on speed and power, or showing aggressive or illegal driving.

In 2002, the ATSB commissioned a survey of 2 543 people, and included questions about views on speed in car advertising. The results showed that a clear majority (56 per cent) of adult Australians agree that there is too much emphasis on speed in advertising. Community opinion on this issue is unusually strong: 41 per cent of people said they agree strongly that there is too much emphasis on speed (compared with 17 per cent who said they disagree strongly), and only 4 per cent of respondents did not have an opinion.

The results of a survey of 1 601 drivers reported in the October 2003 AAMI *Crash Index* indicated that

75 per cent agreed that car advertising builds an unrealistic expectation of being able to drive fast and freely on Australian roads. Further, 85 per cent of drivers said they would like to see a greater focus on safety rather than speed in car advertising. This figure rose to 95 per cent among women aged 55 and over.

A 2003 study in the US analysed the content of car and passenger van advertisements from 1983, 1988, 1993 and 1998 (they did not consider sports

utility vehicles). By far the two most predominant themes were sales incentives and performance (rapid acceleration, vehicle moving at speed, vehicle cornering at speed, claims about turning radius). Safety was rarely a primary theme in advertisements. The authors noted that research has shown that safety concerns play an important part in car purchasing decisions, but that this is not generally reflected in the messages advertisers use to sell cars.

Research in the US has shown that vehicle manufacturers are missing an opportunity to promote vehicle safety – a feature that consumers have indicated is very important to them.

*In the absence of traditional authority,
advertising has become a kind of social guide.
It depicts us in all the myriad situations
possible to a life of free choice. It provides ideas
about style, morality, behavior.*

RONALD BERMAN, 1981

Working towards appropriate Australian vehicle advertising standards

In 2001, the issue of inappropriate vehicle advertising came to the attention of the National Road Safety Strategy Panel. At that time, the existing *Advertiser Code of Ethics* provided little specific guidance for vehicle advertising, requiring simply that advertisements not depict material contrary to ‘prevailing community standards’.

On behalf of the Panel, the ATSB began discussions with the Australian Association of National Advertisers, who are responsible for the *Advertiser Code of Ethics*. Senator the Hon. Ron Boswell, then Parliamentary Secretary to the

Minister for Transport and Regional Services, met with representatives of the advertisers and the vehicle industry in April 2002. Although the vehicle industry representatives did not accept that their advertisements could be linked to road crashes, they recognised the importance of road safety. Consequently, the Federal Chamber of Automotive Industries (FCAI) agreed to introduce a new voluntary industry code for vehicle advertising.

In August 2002, the FCAI introduced the *Advertising for Motor Vehicles Voluntary Code of*

Practice. At the August 2002 meeting of the Australian Transport Council (ATC), all Transport Ministers welcomed the new code and said that they would watch with interest the change in advertisements expected under the new arrangements.

The vehicle advertising code operates within the existing self-regulatory framework, in which the Advertising Standards Board (ASB), a non-government organisation, is responsible for reviewing advertising complaints. The code applied to new advertisements from 8 August 2002

and to all advertisements from 1 December 2002. In the explanatory notes accompanying the code, the FCAI asks advertisers to be mindful of the importance of road safety and to ensure that advertising for motor vehicles does not contradict or undermine efforts to achieve improved road safety outcomes. The code requires that advertisements do not portray obviously unsafe driving, driving at speeds in excess of speed limits, or other practices which breach road laws.

The Panel established a monitoring group, chaired by VicRoads, to assess outcomes under the code. Road safety officials from all jurisdictions, the Australian Automobile Association and the ATSB are all concerned that although there has been some improvement in vehicle advertising overall, the first iteration of the code has not produced satisfactory outcomes. They consider that some of the specific provisions of the code need to be

strengthened, and also that the ASB's decisions on formal complaints about advertisements should be informed by a less permissive interpretation of the code, with advice from a road safety expert.

Some state transport ministers have pushed for mandatory regulation of advertising, and proposals for mandating vehicle advertising standards are to be presented to the ATC. However, the ATSB and state and territory transport agencies have indicated that they still see merit in continuing to negotiate with industry representatives to improve the voluntary system.

In November 2003, the FCAI announced a comprehensive review of both the vehicle advertising code and the way it is administered, in consultation with the Monitoring Group and other stakeholders. At present the FCAI and the monitoring group are working together on an

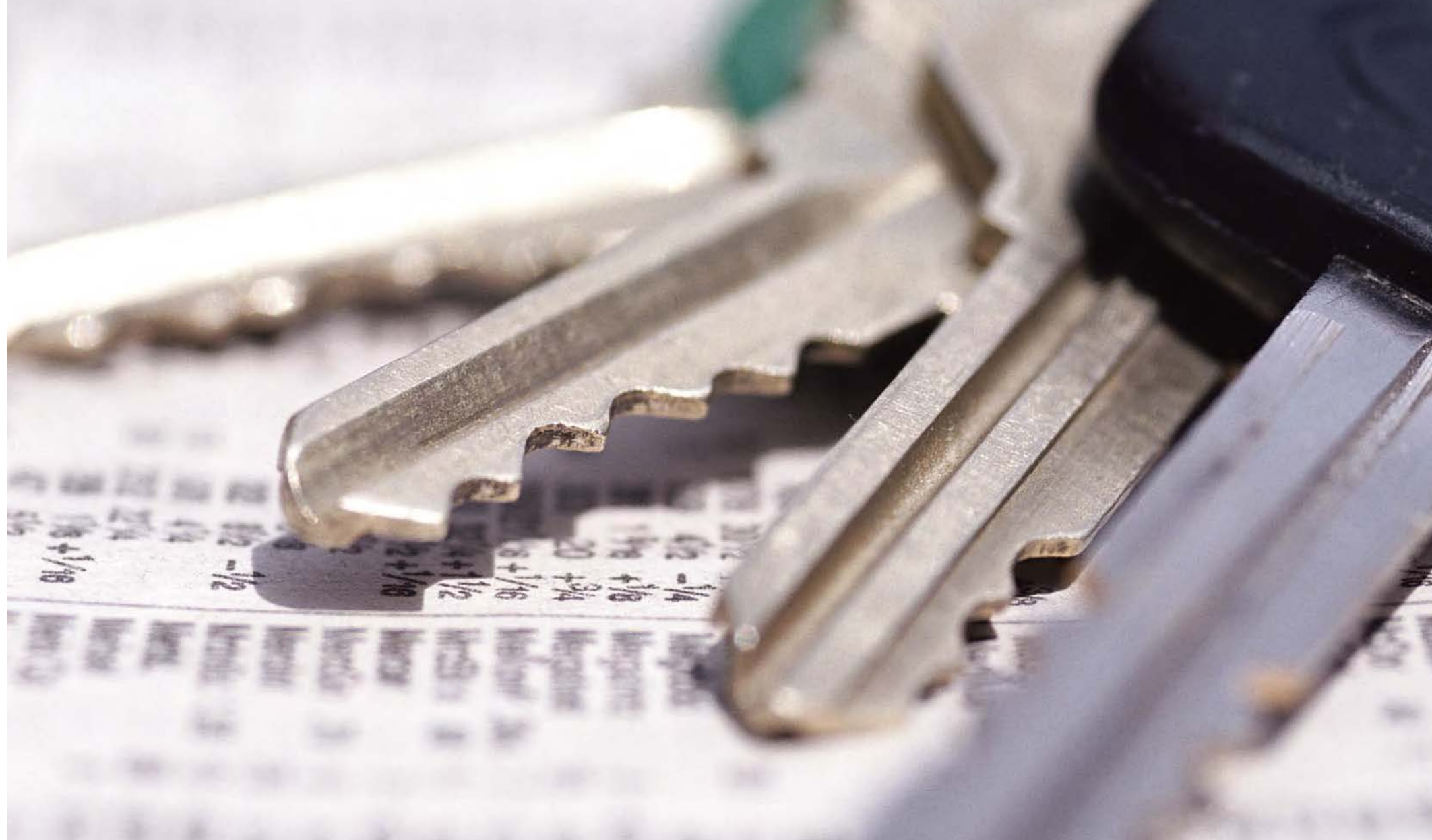
amended version of the code. This will be considered by Ministers at the next ATC meeting.

At any time, complaints about specific advertisements can be lodged with:

Advertising Standards Board
Level 2, Northbourne Ave,
Turner ACT 2612

Telephone: (02) 6262 9822
Fax: (02) 6262 9833

website: www.advertisingstandardsbureau.com.au



38 national coordination: the National Road Safety Strategy Panel

The first National Road Safety Strategy was developed in an attempt to build a uniform national approach in an area where the legislative, administrative and enforcement functions were based in the states and territories. The first National Road Safety Strategy was developed in consultation with a wide range of stakeholders and was endorsed by federal, state and territory Transport Ministers in April 1992.

Implementation of the strategy was achieved through a task force comprising representatives from federal, state and territory road safety authorities and key national stakeholders

representing education, police, health, local government, the heavy vehicle industry, motorists organisations and vehicle manufacturers. This group was known as the National Road Safety Implementation Task Force, and it was chaired and coordinated by the then Federal Office of Road Safety (now the ATSB).

The role of the task force was to provide representative leadership, and its responsibilities were to:

- encourage lead agencies to develop and implement their own road safety strategies

- facilitate the exchange of information
- develop road safety targets
- coordinate research priorities
- monitor and report on progress of the National Road Safety Strategy.

The National Road Safety Strategy Panel

Austroads, the association of road and traffic authorities in Australia and New Zealand, has responsibility for identifying and promoting best practice in a range of areas including road safety and traffic engineering. The Australian Transport Council (ATC) – which comprises Ministers with transport responsibilities from the Australian Government and the states and territories, and an observer from local government – took the decision in May 1997 to merge the Austroads Road Safety Advisory Panel and the National Road Safety Implementation Task Force into one body. This new body – the National Road Safety Strategy Panel – reports to ATC through the Austroads Council.

The Panel's role is to:

- monitor implementation of the National Road Safety Strategy and Action Plans
- develop and administer projects that enhance road safety and the transfer of best practice under the Austroads Road Safety Programme
- identify and recommend areas of research which will assist in reducing the impact of causes of road trauma, including input to Austroads' national strategic road research programme
- provide a forum for the exchange of information between stakeholders on road safety matters

- ensure that effective linkages are in place so that road safety strategies and action plans at the jurisdictional level are consistent with overall national objectives
- assist in the harmonisation of road safety policies and practices between jurisdictions
- promote the development and implementation of road safety countermeasures based on research and national best practice
- assist in identifying emerging national road safety priorities.

The National Road Safety Strategy Panel is chaired and coordinated by the ATSB. Its membership reflects the broad alliance of government, industry and community organisations that work together to reduce the burden of road deaths and serious injuries.

National Road Safety Strategy Panel – Membership (at 22 March 2004)

Mr Phill Allan	Department of Transport and Urban Planning (SA)	Professor Soames Job	Roads and Traffic Authority NSW
Mr Robin Anderson	Australian Local Government Association	Supt. Peter Keogh	Victorian Police
Mr Kym Bills	Department of Transport and Regional Services (ATSB)	Mr Murray Kidnie	Austroads
Mr Chris Brooks	Department of Transport and Regional Services (ATSB)	Supt. Bob Langford	Western Australia Police Service
Mr Iain Cameron	Department of Premier and Cabinet (WA)	Mr Gary Mahon	Queensland Department of Transport
Ms Fiona Campbell	Bicycle Federation of Australia	Mr Peter Makeham	National Road Transport Commission
Mr Garry Cislowski	Australian Council of State Schools Organisations	Mr Jeff McDougall	Australian Driver Trainers Association
Ms Jacqueline Clarke	Institute of Public Works Engineers Australia	Mr Lauchlan McIntosh	Australian Automobile Association
Mr John Collis	Department of Transport and Regional Services (ATSB)	Supt. Steve Mewburn	ACT Policing
Ms Angela Conway	Department of Infrastructure, Energy and Resources (Tas)	Mr Joe Motha	Department of Transport and Regional Services (ATSB)
Ms Leah Croke	Department of Infrastructure Planning and Environment (NT)	Dr Ken Ogden	RACV Ltd
Chief Supt. Kerry Dunn	Queensland Police Service	Mr Peter Robertson	Department of Transport and Regional Services (VSSB)
Mr Graham Fraine	Queensland Department of Transport	Mr David Rynne	Australian Trucking Association
Dr Raphael Grzebieta	Australian College of Road Safety	Mr Keith Seyer	Federal Chamber of Automotive Industries
Chief Supt. John Hartley	NSW Police Department	Ms Kerry Smith	Department of Health and Aged Care (Cwlth)
Dr Andrew Hearn	Land Transport Safety Authority of New Zealand	Mr Guy Stanford	Australian Motorcycle Council
Mr Jon Henchy	Department of Transport and Regional Services (ATSB)	Mr Ray Taylor	Australian College of Road Safety
Mr Eric Howard	VicRoads	Mr Gordon Trinca	Royal Australasian College of Surgeons
Supt. Peter Gordon	Northern Territory Police	Mr Geoff Vogt	Motor Accident Commission
Mr Stephen Jiggins	Department of Urban Services (ACT)	Supt. Roger Zeuner	South Australia Police







The Future

39 using technology to improve safety: the emerging role of intelligent transport systems

Technological advances in transport commonly described as Intelligent Transport Systems (ITS) have the potential to greatly improve the safety, security and efficiency of road travel.

ITS Australia has defined intelligent transport systems as ‘The application of modern computer and communication technologies to transport systems, to increase efficiency, reduce pollution and other environmental effects of transport and to increase the safety of the travelling public.’

Benefits of ITS in Australia have been estimated, in 1999 values, to total at least \$14.5 billion by 2012. Of this amount, \$3.8 billion is estimated to be

savings due safety improvements. However, some ITS applications can also have some disbenefits: for example, driver distraction caused by inappropriate design of in-vehicle information systems.

ITS commonly used in Australia include airbags, adaptive cruise control, car navigation, telematics,

taxi camera and dispatch systems, incident detection systems, variable message signs, ramp metering, speed and red light cameras, weigh-in-motion devices to address vehicle overloading, Safe-T-Cam which monitors the road safety performance of trucks, and traffic management systems used in Australian cities.

Technology – the knack of so arranging the world that we don't have to experience it.

MAX FRISCH, SWISS WRITER

ITS may radically modify transport systems, particularly in terms of the extent to which they may change the role and the behaviour of the driver. It is presently impossible to predict all the ways in which our lives will be changed and only our imagination puts limits on that.

EUROPEAN TRANSPORT SAFETY COUNCIL, 1999

In November 1999, the Australian Transport Council (ATC), endorsed *e-transport*, the national strategy for ITS. This was the first national strategy for ITS in Australia. e-transport was commissioned and funded by Austroads (the association of Australian and New Zealand road and traffic authorities) and was a cooperative effort by federal, state and territory Transport Ministers, in consultation with users and industry,

to harness the potential of advanced technologies to improve Australia's transport systems. It was implemented over a three-year period under the auspices of Austroads and managed by ITS Australia.

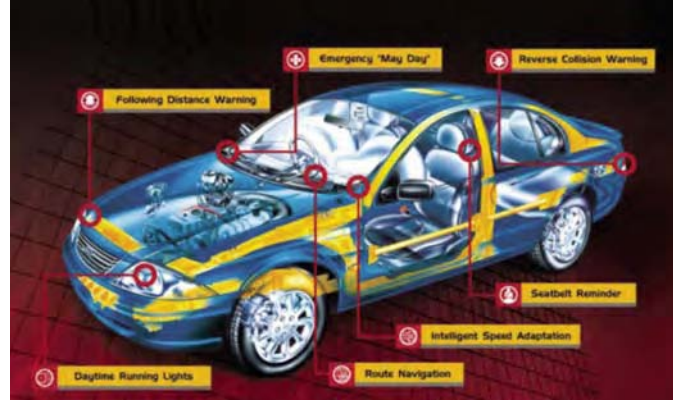
The Standing Committee on Transport (SCOT) – which comprises the heads of federal, state and territory transport agencies – has approved the

establishment of a special sub-committee to oversee the development of a new national ITS strategic plan. The sub-committee has recently conducted an extensive consultation process and is continuing to develop a new strategic framework and plan. The Department of Transport and Regional Services (DOTARS) has been actively involved in this process and continues to contribute to the development of the strategy.

ITS and road safety

The *National Road Safety Strategy 2001–2010* notes that ITS has considerable potential to improve road safety, particularly in the longer term. Although the long-term potential of such systems may be large, the strategy document made cautious assumptions about the fatality reductions that could be achieved by 2010 from such systems. Only 2 per cent of the targeted 40 per cent reduction in fatalities by 2010 was expected to be due to ITS. These benefits were expected to be provided by seat belt interlocks/warning devices (introduced in new vehicles from 2005) and alcohol interlocks (fitted to cars of convicted drink-drivers for two years).

ITS can improve road safety by reducing the possibilities for crashes to occur, by reducing the injuries associated with crashes, and by influencing the level of exposure of drivers to the road environment (such as alcohol detection and



interlock systems which prevent drivers from starting their vehicles if intoxicated). Systems with potential to improve safety include the following:

- intelligent cruise control (to maintain safe following distances)
- speed alerting and limiting systems
- alcohol detection advisory and interlock systems
- crash data (black box) recorders
- incident management systems (systems that detect incidents and provide warnings for avoiding secondary incidents)
- seat-belt reminder and interlock systems
- intelligent restraint systems (adjusts air bag deployment to suit occupants' physical characteristics)
- vision enhancement systems (improves visibility in the night and during adverse weather)
- emergency notification (Mayday) systems
- electronic driving licences (to reduce unlicensed driving and ensure that drivers adhere to their licence conditions)
- roadside speed control systems using variable speed limits
- urban traffic control systems
- electronic or global navigation satellite systems to monitor vehicles for speeding

It is critical for their success...that these [ITS] systems are tailored to the specific safety needs of road users and that human factors knowledge and principles are incorporated into the design, deployment and evaluation of these systems.

MA REGAN, JA OXLEY, ST GODLEY AND C TINGVALL, 2001

- on-road information alerting drivers to hazards ahead
- in-vehicle navigation systems
- in-vehicle collision avoidance systems
- in-vehicle sensors which detect driver fatigue
- lane tracking devices (which warn the driver when a vehicle drifts from its lane).

The Victorian Transport Accident Commission (TAC) *SafeCar* project involves the Monash University Accident Research Centre (MUARC)

and the Ford Motor Company. The project aims to identify and test ITS applications that have an impact on road safety and to incorporate them into a vehicle. The technologies included in the prototype car were chosen for their expected ability to reduce the chance of a crash occurring or the severity of outcomes if a crash occurs. The technologies being trialled are daytime running lights, following distance warning, emergency Mayday system, seatbelt reminder system, intelligent speed adaptation, route navigation, and reverse collision warning. The *SafeCar* serves to provide information to drivers and prevent unsafe driving, but does not assume control of the vehicle at any time.

An Austroads project – the Intelligent Access Project – is examining the feasibility of using vehicle tracking technologies to monitor the compliance of heavy vehicles in regard to access conditions set by jurisdictions, including speed, on Australian roads.

There is a need for more information on how drivers and road users adapt to ITS technologies and how these behavioural factors affect safety. Behavioural adaptation can occur in various ways, such as a driver taking more risks due to the perceived increase in safety provided by an ITS technology. The *SafeCar* project will examine behavioural adaptation effects over long periods.



*We look at the present through a rearview
mirror. We march backwards into the future.*

MARSHALL McLuhan, CANADIAN COMMUNICATIONS THEORIST AND EDUCATOR, 1911–1980



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