

ROAD DEATHS AND INJURIES AMONG CHILDREN AND YOUNG PEOPLE IN RURAL NEW SOUTH WALES

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for the

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EXECUTIVE SUMMARY

Background

In the 1999-2000 report of the Child Death Review Team, it was recommended as follows:

That the Motor Accidents Authority, in consultation with other relevant agencies, investigate deaths of children and young people involving motor vehicles. This investigation should focus on fatal incidents that occur in regional and remote locations and continue to develop a range of practical measures to reduce the number of deaths of children and young people involving motor vehicles across NSW.

This report has been prepared as the first step in a response to that recommendation.

Data

About six out of ten fatal crashes occur in "rural regions". If only non-pedestrian crashes are taken into account, the "rural" percentages are even higher.

Drivers resident in country NSW are, on average, 50% more likely than metropolitan resident drivers to be involved in a fatal crash. It is mostly country people who die on country roads.

In 2000 there were 3,773 casualties aged 17 years or less. Of these, 66 were fatally injured in 139 fatal crashes. Among children and young people killed in road crashes in NSW, over 60% (40 out of 66) die in country regions. Among the 40 (approximately two-thirds of all fatalities) who died in country regions in the year 2000, 20 (50%) have been passengers in motor vehicles. For rural area crashes involving passengers aged under 18 years, 64 of them were killed, as opposed to 36 in urban area crashes.

In both urban and rural areas, far more were killed in single-vehicle crashes than in multiple-vehicle collisions. More than half of all the country passenger casualties in the 11-17 year age group have been riding in motor vehicles driven by the youngest group of drivers, aged 20 or less. In terms of risk, passengers aged 11-17 are probably more likely to have been riding with their peer group, and younger children with their parents and carers.

Young drivers and their passengers

The drivers who are most likely to have been behind the wheel in crashes that result in such casualties are themselves young, and predominantly male. The "problem" of the young driver, and specifically the young male driver, is of course not one that is confined to country roads and country towns. Driver licensing administrations throughout the developed world recognise that the transition between novice status and maturity carries with it several hazards associated with attitudes, behaviour, experience and skills.

In this regard, probably the most important single initiative of recent years in New South Wales is the introduction and implementation of a formal graduated licence scheme, the underlying aim of which is to ensure that young drivers gain their experience in a relatively safe environment and under continual monitoring.

Inappropriate speed

Inappropriate and excessive speeds are important contributing factors in rural road crashes. Managing speeds and reducing the incidence of excessive speeding depends on a mix of countermeasure activities, including the following:

- technology (for example, speed cameras);
- a mixture of covert and overt enforcement;
- targeted intensity of enforcement;
- monitoring performance and outcomes for speeding countermeasures;
- adjustment of tolerance levels;
- a fine and demerit point system which reflects community expectations;
- public education based on good theoretical models.

The NSW Government has recently doubled the penalties for exceeding the speed limit by 30 km/h or more. It has introduced other initiatives that target speeding, such as double demerit points for speeding over holiday periods. Under the "Road Safety 2010" framework, educating the community about the risks and consequences of speeding will continue to form a major part of the NSW speed management program. These activities are coordinated with highly visible police enforcement.

In addition to its public education campaigns, the RTA is increasing the number of fixed digital speed cameras across rural NSW, and expanding the number of 50 km/h urban speed limits in country towns. Further, the speed limit zoning of rural roads is under review by the RTA and other authorities.

Young driver fatigue

The RTA estimates that driver fatigue is a factor in at least 20% of fatal crashes in NSW. There is no doubt that fatigue – probably more correctly defined as sleepiness or drowsiness – is a major contributor to road trauma in rural areas, and significantly affects young people. There are three priority areas for countermeasure activity:

- Educate young males (ages 16 to 24) about drowsy driving and how to reduce lifestyle-related risks.
- Promote shoulder rumble strips as an effective countermeasure for drowsy driving; in this context, raise public and policymaker awareness about drowsy-driving risks and how to reduce them.
- Educate shift workers about the risks of drowsy driving and how to reduce them.

Drink driving

Alcohol use remains a major problem for road safety, and is arguably a worse problem in the country. The bulk of the numbers of alcohol-related fatal crashes (with and without speed as an associated contributing factor) occur on roads in rural locations, with the incidence of alcohol involvement at around 25% to 28%. In crashes on roads in remote locations, the incidence of alcohol use is very high indeed.

The most cost-effective deployment of enforcement effort would appear to be on non-remote rural roads.

The influence of passengers on driver behaviour

There may be scope for enhancing road safety through the direct influence of the behaviour of young passengers on young drivers. If passengers can play a positive role in influencing the behaviour of the driver to enhance both driver and passenger safety, then identifying the ways in which this can be achieved through an understanding of the behavioural mechanisms would provide an additional strategy for future road safety campaigns and programs.

Seat belts and child restraints

In the country, vehicle occupants – especially in rear seats – are less likely to wear seat belts than in other parts of the State. Crash statistics can be summarised by the following points:

- The proportion of unrestrained crash casualties is rather constant over time. In remote areas, the proportion is much higher than in metropolitan or rural areas. A higher proportion of casualties not wearing seatbelts than casualties wearing seatbelts received serious injuries.
- Male crash casualties are less likely to be wearing a seat belt than females.
- The lowest seat belt wearing rate amongst crash casualties was found for the age groups 0-2 and 8-16 years. Casualties aged over 60 had the highest seat belt use rate.

A combination of education, enforcement and incentives can be effective in improving seat belt wearing rates. Enforcement may be effective in encouraging people to start wearing seat belts, and education on the safety benefits of seat belts may sustain their use. Educating people on the dangers that unrestrained passengers pose to other occupants of the vehicle can be an effective way of improving passenger restraint use rates.

The following countermeasures have the most promise:

- Signage, particularly on remote area highways, reminding road users to "buckle up".
- Community based campaigns aimed at parents (who often did not correctly use child restraints).
- Continuous reporting of road safety issues in the local media (local incidents and broader research findings).

- Increased enforcement, coupled with publicity to increase the perceived risk of being caught without a seat belt.

Several of the very youngest passengers, aged under five years, have been killed in NSW while not using any kind of restraint. It is essential the principles suggested above for adult belt wearing are applied to the correct use of child restraints.

Young pedestrians and pedal cyclists

The incidence of pedestrian deaths and injuries among children and young people is overwhelmingly an urban problem. Even in country areas, the great majority of pedestrian casualties occur on roads with a speed limit of 60 km/h or less. The general picture is very similar to that for child and young pedestrians, with only a very few being injured on roads where the speed limit exceeds 60 km/h.

Technological approaches to reducing pedestrian casualties are part of the NSW Government commitment to reducing pedestrian casualties, but resource priorities will probably mean that most of these approaches will have to be applied in urban rather than rural regions.

Injured young pedal cyclists are overwhelmingly male, with a steadily increasing trend in numbers up to the early teen years, with some decrease in numbers after that.

To reduce the incidence of child pedestrian and cyclist injuries, a great deal will necessarily depend on the active involvement of local communities, including local governments, in association with the move in country regions to the adoption of 50 km/h speed limits in built-up areas, 40 km/h school zones (or 60 km/h in the country where there is a higher standard speed limit), and the Sharing the Main Street program for improved safety in shopping precincts.

Roads and roadsides

The provision of low-cost safety improvements could result in major benefits. The features regarded as most important are signing, centre-lining and edge marking, shoulder sealing and maintenance, the provision of guide posts and reflectors, overtaking lanes and intersection improvements.

"Forgiving" roadside concepts and roadside improvements in general are stressed because they can significantly reduce the severity of crashes. There is very high potential for improving overall safety by treating or removing roadside obstacles. Obstacle-free zones of between four and 10 metres are desirable if the road geometry and right-of-way will allow it.

The importance of local communities

The involvement of local communities could be sought along the following lines, all of which have clear implication for youth road safety:

- Promote greater involvement of rural shires and councils and their local communities in defining local road safety issues and developing partnerships to address them.
- Assist local authorities in the detailed analysis of factors impacting on local road safety, and in the development of action plans to target problems.

- Establish information programs to disseminate information to councils and local communities about successful local initiatives and local programs, as well as those found not to have been effective.
- Provide training opportunities and guidance for local government on best practice in application of road safety countermeasures.
- Formulate special arrangements for Aboriginal communities, particularly in remote areas, ensuring representation in the planning, implementation and evaluation of programs to improve safety for them.

The NSW Local Government Road Safety Program is expanding, particularly in rural NSW, and the community-based program will continue to make a substantial contribution to the understanding of and response to road safety issues in communities across the State.

Trauma systems

While prevention will always be the ideal solution to the problem of road trauma, an effective trauma care system is essential to treat the injured. The physiological consequences of injuries sustained in road crashes need to be reduced through more rapid notification of crashes and provision of primary treatment, and through more effective medical and rehabilitation services. All health care providers should therefore be encouraged to further improve their casualty treatment operations and distribution of trauma treatment centres to reduce the disabling consequences of trauma and to conserve life.

1 INTRODUCTION AND BACKGROUND

In its 1999-2000 report, the NSW Child Death Review Team (CDRT) recommended that the Motor Accidents Authority (MAA) investigate and report on measures to reduce the death rate among children and young people using and riding in motor vehicles in rural and remote areas of New South Wales (Child Death Review Team, 2001).

The CDRT had reported that from July 1999 to June 2000, 809 children and young people aged 0 to 17 years died in New South Wales, which is 51.2 deaths per 100,000 children in the population. There were large variations in fatality rates according to the age of the child. The highest fatality rates were for infants (under 12 months of age) the majority of whom died from conditions originating in the perinatal period. After infancy, the fatality rates drop dramatically and remain relatively low and stable from 1 to 14 years of age.

For one to four year olds the leading cause of death was drowning (15 deaths which is 4.3 deaths/100,000 children). For 5 to 9 year olds, and 10 to 14 year olds, the leading cause of death was cancer (respectively 12 deaths, 2.7 deaths/100,000; and 11 deaths, 2.5 deaths/100,000). Of particular significance was that at 15 to 17 years of age there was a sharp increase in fatality rates in two groups: car passenger deaths (18 deaths, 6.8 deaths/100,000), and intentional self-harm and cancer (both 17 deaths, 6.5 deaths/100 000).

Through the group as a whole, a large number of children and young people died from motor vehicle crashes, which was the most common "external" cause of death. This included passenger deaths (37), pedestrian deaths (20), motorcycle deaths (6), car driver deaths (4), and cyclist deaths (2). Males accounted for 60% of traffic deaths, and a large proportion of transport incidents involved 15 to 17 year olds, the majority of whom were passengers in vehicles.

In four out of the fourteen passenger deaths of 15 to 17 year olds, documentation indicated that the driver had consumed alcohol, and rural roads were a feature of over half the passenger deaths.

Pedestrian deaths mostly involved younger children (between 2 to 9 years, there were 12 deaths), and included four more deaths in driveways in this reporting period. (Driveway deaths among children, which are not included in "road accident" statistics, are already under study and countermeasure development by the MAA, following an earlier recommendation of the Child Death Review Team.) In contrast to passenger deaths, pedestrian deaths largely occurred in residential streets in urban metropolitan environments, especially across South-West Sydney. All pedestrian deaths of 15 to 17 year olds involved risk factors such as alcohol, speed or circumstances implicating intentional self-harm.

The report's authors pointed to the need to constantly reinforce safe driving practices, and noted the possible influence of driver competence, road conditions, speed and alcohol. They stressed the importance of restraint use in all types of vehicles.

Accordingly, in order to expand on these findings, the 1999-2000 report of the Child Death Review Team went on to recommend as follows:

That the Motor Accidents Authority, in consultation with other relevant agencies, investigate deaths of children and young people involving motor vehicles. This investigation should focus on fatal incidents that occur in regional and remote locations and continue to develop a range of practical measures to reduce the number of deaths of children and young people involving motor vehicles across NSW.

The present report has been prepared for the Motor Accidents Authority as its first response to this recommendation.

1.1 The Motor Accidents Authority

The Motor Accidents Authority of New South Wales is a statutory corporation that monitors and supervises the NSW Motor Accidents Compulsory Third Party Insurance Scheme. It was established by the NSW Parliament under the *Motor Accidents Act 1988* on 10 March 1989. The Motor Accidents Scheme is the Compulsory Third Party (CTP) personal injury insurance scheme for motor vehicle registered in NSW. The MAA is funded by a levy on third party premiums. Among its several functions as laid down in the Act (as amended in 1999), the MAA provides funding for the reduction of trauma resulting from motor vehicle accidents.

1.2 The Child Death Review Team

The impetus for establishing the NSW Child Death Review Team (CDRT) came from the report, *Preventing Child Homicide* (NSW Child Protection Council, 1995). This report, undertaken by the NSW Child Protection Council, suggested that very little systematic information was available about the deaths of children in NSW. The report recommended that systematic child death reviews be undertaken by a team with a legislative base.

The Child Death Review Team was then established by the *Children (Care and Protection) Amendment Act 1995*. It has as its members nominees from government departments concerned with the safety and well-being of children. For the Team's first three and a half years, it was administratively supported by the NSW Child Protection Council. In June 1999 when the Commission for Children and Young People came into existence, the Commissioner became the Convenor of the team and the Commission became responsible for providing research and administrative support to the Team.

The purpose of the Team, as defined in the Act, is to prevent or reduce child deaths in New South Wales, including children and young people who are aged from birth to under 18 years of age (17 years 11 months). Its functions include the maintenance of a register of child deaths, and the undertaking of detailed case reviews of deaths due to abuse and neglect. They also include research and surveillance aimed at reducing or preventing child deaths in NSW. The Team is also required to identify areas requiring further research by the Team or other agencies.

The role of the Team is then to formulate recommendations for policies and practices to be implemented by government and private agencies and by the community for the prevention or reduction of child deaths. The Team is also required to comment upon the extent to which its previous recommendations have been accepted, and may comment on the extent to which those recommendations have been implemented in practice.

Each year, the Team's *Annual Report* has documented the deaths of children in the reporting year. Each report also includes case reviews of certain categories of deaths. Although there are specialised groups and bodies such as the office of the Coroner that are undertaking research on specific types of deaths of children in NSW, the work of the Team remains unique in NSW: namely, to comment on trends and patterns in all child deaths with a view to making recommendations for prevention. Individual case file reviews are conducted which consider the circumstances surrounding each child's death. These reviews are conducted in order to identify systemic failures or deficiencies in the protection of children in New South Wales, and to identify areas requiring further research. The Team focuses on prevention rather than the culpability of alleged offenders.

2 THE IMPORTANCE OF RURAL ROAD SAFETY: SOME RECENT HISTORY IN AUSTRALIA

From its unique perspective, the Child Death Review Team has identified the great importance of road safety in rural regions in addressing road safety in general, and severe crashes in particular. Crashes on rural roads do not generally possess the features that catch the attention of the general public or the media. In this regard, there is widespread belief that preventing rural road crashes is extremely complex by nature because rural road crashes are incidental, far-away events that are caused by unsafe individual behaviour that cannot be influenced by proper road design or effective police enforcement. In other words, the scattered nature of rural road crashes leads many to believe that the country driver is all to blame. This is an over-simplistic view, and this report will identify several potentially successful countermeasure activities that have great promise for reducing the number and severity of rural road crashes and casualties among children and young people.

2.1 Rural road safety and public health

Road safety is, of course, not only a transport problem but also a health problem, and data from the health and transport sectors differ subtly in emphasis and approach. A review by Moller (1994) for the National Injury Surveillance Unit (NISU) placed rural road crash data in a public health context. The NISU study showed that the rate of death from all kinds of unintentional injury is higher for residents in rural than urban areas, with males having a highly elevated risk of injury-related death. For all categories of unintentional death, there was a tendency for rates to be higher in the more remote areas. However, he showed that it was transport that carried the highest death rates and had the strongest relationship between death rates and remoteness.

Moller showed that motor vehicle deaths accounted for nearly all the transport related deaths, and most were traffic deaths on public roads. By age group, young male drivers had comparatively high death rates per 100,000 in both rural and urban areas, but the death rate for 20-24 year-old male drivers living in the country was nearly three times that for the same age group in capital cities. Further, for remote areas, the differentially high rate for young men was extended into older age groups, so that the highest rate for male drivers was in the 30-34 year age group, and the death rate some nine times that for the same group living in capital cities. Females were rarely killed as drivers in the country, but as passengers they showed the same tendency as for males: female death rates are higher in rural areas than urban, and higher again in remote areas.

A similar pattern had already been shown in the United States, where motor vehicle deaths had been termed "a rural epidemic" (Muelleman, 1993).

2.2 National approaches to rural road safety

Rural road safety was thus emerging by the early nineties as a very important issue in Australia. Under the 1994 National Road Safety Strategy, states and territories with special problems in rural and remote areas were called upon to cooperate in the development and implementation of strategic actions that focused on reducing rural crashes. As a major development towards the development of an action plan, the National Road Trauma Advisory Council (which later evolved into the Australian Advisory Committee on Road Trauma) sponsored a seminar on April 20-21, 1995, at Wodonga, Victoria: *Rural Road Safety: Focus for the Future*. This provided an opportunity for experts and practitioners to discuss critical issues and themes affecting road safety in rural Australia. Participating in the seminar and its several workshops were representatives and individuals from all over the country and from all relevant disciplines. No such group had previously been brought together, and thus the conclusions of the workshops

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were expected to have a unique influence on the formulation of rural road safety strategy and the development of an action plan.

The defined purpose of the seminar was to:

- better understand when, where and why crashes happen on country roads;
- assess a range of options which might improve safety on rural roads; and
- formulate some major recommendations that governments and responsible organisations might consider.

The seminar focused on three areas of influence in rural road crashes:

- the road user behaviour issues that contribute to rural crashes and how these can be addressed through education and enforcement;
- the role of local government and the community in addressing area-specific issues in rural road safety; and
- the treatment and management of trauma.

Formal papers presented to the seminar covered fundamental data on rural road trauma, enforcement and behaviour, health services and trauma systems, local government, the road environment, and Aboriginal and remote-area issues. The seminar culminated in a series of workshops, each of which reported to a plenary session. This ensured a fully comprehensive coverage of all issues related to rural road safety.

Following the rural road safety seminar of 1994 and its many recommendations, in 1996 the Australian Transport Council (comprised of the transport ministers from all States and Territories and the Federal Government) agreed to support the implementation of a *Rural Road Safety Action Plan*, with responsibility for its implementation shared between government, commercial and community organisations. In the present report, some selected sections of the Action Plan will be highlighted in the context of specific countermeasure activities. In Queensland, the Parliamentary Travelsafe Committee has gone so far as to establish an inquiry into rural road safety in Queensland, using the Rural Road Safety Action Plan as a framework for examining what has been done and to what effect. Its interim findings have recently been published (Travelsafe Committee, 2001).

In addition, there were two monographs published at the time of the seminar by the Federal Office of Road Safety (now part of the Australian Transport Safety Bureau), reviewing rural road safety in general. The first of these studied general trends in fatal crashes on rural roads over the years, using the national file of fatality data (Federal Office of Road Safety, 1995).

	Rural	Urban
1988	1186	1372
1990	880	1153
1992	828	884
% decrease from 1988 to 1992	30.2%	35.6%

Table 1 - Fatal crashes in rural and urban areas, 1988-1992
(Source: Federal Office of Road Safety, 1995)

This showed that in the early nineties, fatal crashes on open rural roads were declining at a slower rate than in urban areas and the difference in the rate of decline was statistically significant (see Table 1).

The type of crash occurring on open roads had remained stable over the period 1988-1992, although the typical rural crash differed from the typical urban crash. The majority of crashes in rural areas involved a single vehicle (55%) while urban crashes were more likely to involve multiple vehicles (40%). Pedestrian fatalities were far more frequent in urban areas (35% of crashes) than in rural areas (5% of crashes).

The second of these FORS monographs (Federal Office of Road Safety, 1996) considered the risks faced by city drivers travelling in the country and country drivers in the city, as seen in the fatality file data for 1992. Male drivers were found to be more involved in fatal crashes than female drivers, and country drivers more than city drivers. Male country drivers are involved in 23.4 fatal crashes per 100,000 population of driver age compared to a male city driver rate of 16.2 crashes per 100,000. Similarly, female country drivers are involved in 9.2 fatal crashes per 100,000 of driver age population, compared with 6.3 crashes for female city drivers. The rate of involvement for country drivers was found to be approximately 45 per cent higher than that for city drivers.

Nearly one third of fatal crashes in the country involve city drivers. However, it is true for all of Australia that it is *mostly country people who die on country roads*. Ryan et al (1992) showed that most rural crashes involved people who lived and worked in the region they crashed, and who were familiar with the roads concerned. The Rural Road Safety Action Plan called for local publicity on the fact that those most likely to be involved in serious crashes in rural areas are rural residents.

Elements of the Rural Road Safety Action Plan became incorporated in the *2001-2010 National Road Safety Strategy* (Australian Transport Council, 2001). This document pointed to the fact that those people living in rural and remote areas did not enjoy an equivalent level of road safety to those in more favoured areas, with the risk of dying in a road crash (per head of population) increasing with increasing distance from capital cities.

2.3 Recent approaches to rural road safety in New South Wales

The Roads and Traffic Authority of New South Wales clearly recognises the importance of rural road safety, and has a Country Programs Manager overseeing its activities in that field. Drivers resident in country NSW are, on average, 50% more likely than metropolitan resident drivers to be involved in a fatal crash. Since 1996, while the number of people killed on roads in metropolitan areas has continued to fall (although at a slower rate than through the 1980s), the number of people killed on country roads has started to rise again. This is shown in Figure 1 (taken from a review paper by Wall, 2000).

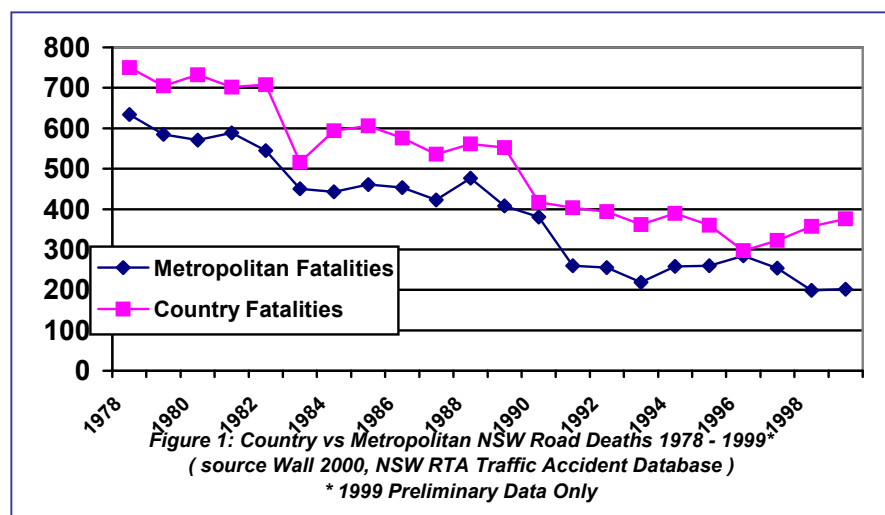
The NSW Country Road Safety Program is based on an integrated approach to the development of road safety interventions. The program employs engineering, education, encouragement and enforcement strategies in its approach to reducing the country road crash rate.

In November 1999 the NSW Minister for Roads launched Road Safety 2010 framework document. This document provides a basis for discussions on the development of the NSW Road Safety Strategic Plan with road safety stakeholders across the state. In relation to rural issues, also in 1999, RTA data was reviewed and led to the conclusion that there was resistance among rural drivers to road safety measures, arising in part from a range of competing beliefs about the causes and outcomes of crashes. These beliefs included the following:

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- it is not local people dying on rural roads;
- it's safe to speed (up to 20km/h over the limit) and drink drive (depending if they 'feel' drunk);
- seat belts do not necessarily protect drivers in case of accidents; and
- rural drivers are better at driving long distances without a break.

In the present report data will be presented that addresses such beliefs, and a range of countermeasures reviewed that are intended to address them. It naturally follows that measures that increase the general level of road safety in rural areas in New South Wales will also increase the level of safety for children and young people in the same areas.



3 NEW STATISTICAL DATA ON CRASHES INVOLVING CHILDREN AND YOUNG PEOPLE IN RURAL AND REMOTE LOCATIONS

3.1 Data sources

As noted above, the Child Death Review Team has summarised the basic statistics for the deaths among children and young people in NSW associated with motor vehicle use in its annual report. For the present report, these data have been expanded by the use of two existing databases: the Fatal Crash Database (the "Fatal File") maintained by the Australian Transport Safety Bureau (ATSB), and the database maintained by the Roads and Traffic Authority (RTA) of New South Wales.

The value of each is as follows. The ATSB Fatal File contains much detailed information about the circumstances surrounding each death, including factors associated with the road, the vehicle and the persons involved. It was used to generate the two FORS monographs briefly reviewed above. It is a national file, although of course data are available for each State individually. Information generated nationally is likely to be of value for each State, and of course the numbers (and therefore the reliability) of data generated nationally are greater than those generated for deaths only in a single State administration. Included in the present paper, therefore, are data from the 1998 Fatality File, kindly provided by the Australian Transport Safety Bureau.

The RTA data are entirely based on police reports for crashes in New South Wales. They also include information on crash circumstances, although not in the same detail as in the Fatal File. However, because the RTA database includes crashes complying with wider criteria than death only, the numbers are much bigger again. Fatal crashes comprise only about 1% of all crashes resulting in injury. For the present study, the Information Branch of the RTA kindly provided for analysis case data for 3,773 crashes. The criterion for inclusion in this data set was that a person aged up to and including 17 years of age was killed or injured.

3.2 Problems of definition: what is "rural"?

The crash location descriptors for the ATSB Fatal File have changed over time. For the 1992 and 1994 files, categories for geographic location were divided into 12 descriptors, ranging from "capital city" to "rural remote". For later editions of the file, the Australian Bureau of Statistics classification, "Section of State" has been used. This is as follows:

- Major urban (>100,000 population)
- Other urban (1,000-100,000)
- Locality (200-1,000)
- Rural balance

This is the grouping used for the relevant Fatal File tabulations in the present report. For "serious injury" crashes, ATSB data can be categorised by "major urban" and "other", with speed limits being a possible surrogate for the degree of urbanisation.

The RTA classifies the location of crashes by Local Government Area (LGA) in New South Wales. These areas can be grouped into regions, and in turn, these regions can be grouped again into the generally "metropolitan" zone of Sydney, Newcastle and Wollongong, and the generally "country" areas comprising the remainder. It is also possible to identify roads and highways in country areas by speed limit, and the definition used is that a road with a speed limit

of 80 km/h or below is "country urban", and with a speed limit of above 80 km/h or higher is "country non-urban". These are the groupings used for the analysis of NSW data in the present report.

3.3 Geographic distribution of rural and urban crashes

The ATSB Fatal File has been employed previously for the analysis of crashes in rural and remote areas, apart from the FORS monographs summarised above. In particular, a paper was prepared as background source material for the 1995 rural road safety seminar, *An Overview of Crash Data and Countermeasure Implications* (Henderson, 1995). The crash data used for this earlier report were drawn from the 1992 FORS (now ATSB) Fatality File. The paper was intended to provide a general overview, and was not specifically directed towards children and young people. Many of the data were nevertheless directly relevant to the recommendation of the Child Death Review Team on young people and road safety in rural areas. For the purpose of the present report, it was considered desirable to review these earlier data and bring them up to date, and incorporate the directions indicated by the Child Death Review Team.

Table 2 shows the general geographic of fatal *crashes* (as opposed to fatally injured *people*) in Australia by region. In 1998, the most recent year for which full Fatal File data are now available, very nearly half (48%) of all fatal crashes occurred on rural roads, as defined above. The earlier more detailed analysis conducted for the rural road safety seminar established that a further 14% of fatal crashes occurred in towns with fewer than 50,000 people. Thus, about six out of ten fatal crashes occur in what we might call "rural regions". If only non-pedestrian crashes are taken into account, the "rural" percentages are even higher. In the remainder of this paper, the focus is on crashes on *rural roads*, outside built-up areas. However, it should be borne in mind that crashes in *rural towns* comprise a significant minority of all fatal crashes, and there is reference to appropriate countermeasures later in the present report.

		State/Territory									
			NSW	Vic	Qld	SA	WA	Tas	NT	ACT	AUST.
Section of State of crash site	Major urban (100,000+)	N	164	152	69	48	57	5		12	507
		%	37.2	43.2	27.4	33.1	29.1	10.6		60.0	33.5
	Other urban (1,000-99,999)	N	39	31	32	12	26	6	17		163
		%	8.8	8.8	12.7	8.3	13.3	12.8	28.8		10.8
	Locality (200-999)	N	5	2	4	4	2	4	2		23
		%	1.1	0.6	1.6	2.8	1.0	8.5	3.4		1.5
	Rural balance	N	213	164	143	80	109	32	40	8	789
		%	48.3	46.6	56.7	55.2	55.6	68.1	67.8	40.0	52.2
	Unknown	N	20	3	4	1	2				30
		%	4.5	0.9	1.6	0.7	1.0				2.0
Total	N	441	352	252	145	196	47	59	20	1,512	
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Table 2 - Fatal crashes, by section of state, States & Territories of Australia, 1998
(Source: Australian Transport Safety Bureau, 2001)

Road deaths and injuries among children and young people in rural NSW

		State/Territory									
			NSW	Vic	Qld	SA	WA	Tas	NT	ACT	AUST.
Urbanisation of crash site	Major urban (100,000+)	N	2,840	3,885	1,575	695	1,406	93	173	143	10,810
		%	58.11	76.28	45.69	56.83	62.05	26.20	53.40	88.27	60.9
	Remainder, limit below 110 km/h	N	1,895	1,167	1,850	321	496	244	59		6,032
		%	38.78	22.91	53.67	26.25	21.89	68.73	18.21		34.0
	Remainder, limit 110 km/h +	N	91	31	22	205	330	18	92		789
		%	1.86	0.61	0.64	16.76	14.56	5.07	28.40		4.4
	Remainder, unknown speed limit	N	61	10		2	34			19	126
		%	1.25	0.20		0.16	1.50			11.73	0.7
	Total	N	4,887	5,093	3,447	1,223	2,266	355	324	162	17,757
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Table 3 - Serious injury crashes, by urbanisation of crash site, States & Territories of Australia, 1998. (Crash counts for NSW are for 1996)
(Source: Australian Transport Safety Bureau, 2001)

The distribution throughout the states, of course, is not homogeneous. While numerically the bulk of rural crashes are in the larger states, Table 2 shows that there is a much greater proportion of rural crashes in the smaller states and in the Northern Territory: over 70% of fatal crashes in the Northern Territory occur on rural roads, for example.

"Serious injury" crashes can be categorised by the ATSB by speed limit for the stretch of road where the crash occurred, which gives an indication of "urbanisation". There is a slightly different distribution of serious injury crashes, in comparison with fatal crashes. Table 3 shows that 58% of serious injury crashes (in 1996) occurred in "major urban" areas in New South Wales, a much higher proportion than for the fatal crashes shown in Table 2. Nearly all of the remainder occurred on roads with a speed limit of less than 110 km/h.

Data from the Roads and Traffic Authority in New South Wales show that in the year 2000, there were 3,773 casualties aged 17 years or less, the group of interest to the Child Death Review Team. Of these, 66 were fatally injured in 139 fatal crashes. Table 4 shows the distribution of these fatal crashes and child fatalities by urbanisation. The figures confirm that among children and young people killed in road crashes in NSW, over 60% (40 out of 66) die in country regions. Among these fatalities, 36.4% die in "country urban" areas, with a speed limit of 80 km/h or less, and 24.2% in other country areas.

For non-fatally injured children and young people, Table 5 shows that there is a much higher proportion of children and young people non-fatally injured in urban areas than non-urban, a reversal of the pattern seen for fatalities.

Road deaths and injuries among children and young people in rural NSW

		Fatal crashes involving children aged 0-17		Fatalities aged 0-17	
		N	%	N	%
Urbanisation	Sydney metropolitan	36	25.9	22	33.3
	Newcastle metropolitan	4	2.9	2	3.0
	Wollongong metropolitan	8	5.8	2	3.0
	Country urban (speed limit 70-80 km/h)	43	30.9	24	36.4
	Country non-urban (speed limit > 80 km/h)	48	34.5	16	24.2
	Totals	139	100.0	66	100.0

Table 4 – Fatalities and fatal crashes, road users aged 0-17, NSW 2000
(Source, RTA 2001)

		Road user injuries aged 0-17 years	
		N	%
Urbanisation	Sydney metropolitan	1767	47.7
	Newcastle metropolitan	195	5.3
	Wollongong metropolitan	149	4.0
	Country urban (speed limit 70-80 km/h)	1032	27.8
	Country non-urban (speed limit > 80 km/h)	558	15.0
	Country unknown	6	0.2
	Totals	3707	100.0

Table 5 – Non-fatally injured, road users aged 0-17, NSW 2000
(Source, RTA 2001)

The ATSB and RTA data are consistent in establishing that there is a higher proportion of fatalities in country than urban areas, with the difference being reversed for non-fatal crashes and injuries. This is true, both for all crashes and for crashes involving children and young people.

Within rural regions, numerically rather few fatal crashes occur in remote locations. It is self-evident that most crashes happen where there are most people and most travel, and from a resource allocation point of view, to bring about the greatest good for the greatest number may mean applying countermeasures to these areas as a priority. But in more sparsely-populated and lightly-travelled areas, individual factors causing crashes may be especially influential. For

example, alcohol may only be a moderately influential factor in rural crashes generally, but to reduce that moderate influence may have substantial benefits for the wider community because of the large numbers affected. On the other hand, alcohol may be an especially potent factor in some remote areas, but total numbers are small. Thus, even if all alcohol-related crashes in remote areas were to be prevented, the overall effect on the whole community would also be limited. What this means is that there are difficult decisions on priority and equity to be made, and that countermeasures for a given factor may be very different from one area to another.

3.4 The distribution of road injury by road user category

Noted above is the CDRT finding that between July 1999 and June 2000, deaths among children and young people from causes associated with motor vehicle use were predominant among passengers and pedestrians, with differing urban/rural distributions by casualty.

For the purpose of the present report, RTA data for the calendar year 2000 were analysed to provide more detail on these distributions, including both fatal and non-fatal injuries. Analysis of casualties was confined to those aged 17 years and under. For simplicity, "urban" casualties are grouped to include Sydney, Newcastle and Wollongong metropolitan areas, and "country" casualties are grouped to include country urban and country non-urban areas, as defined above.

	Urban		Country		Totals	
	N	%	N	%	N	%
M/V driver	3	4.5	7	10.6	10	15.1
M/V passenger	12	18.2	20	30.3	32	48.5
M/C rider	0	0	4	6.1	4	6.1
Pedestrian	11	16.7	9	13.6	20	30.3
Totals	26	39.4	40	60.6	66	100.0

Table 6 – Fatalities among children and young people, aged 0-17 years, by road user category and urbanisation, NSW 2000

(Source: RTA 2001)

Table 6, for fatal injuries, shows that among the 40 (approximately two-thirds of all fatalities) who died in country regions in the year 2000, 20 (50%) have been passengers in motor vehicles. The absence of any reported fatalities among pedal cycle riders of the subject age group is worth noting.

	Urban		Country		Totals	
	N	%	N	%	N	%
M/V driver	315	8.5	306	8.2	621	16.7
M/V passenger	1046	28.2	877	23.7	1923	51.9
M/C rider	36	1.0	46	1.2	82	2.2
M/C passenger	9	0.2	18	0.5	27	0.7
Pedal cyclist	197	5.2	165	4.4	362	9.8
Pedestrian	508	13.7	184	5.0	692	18.7
Totals	2111	56.9	1596	43.1	3707	100.0

Table 7 – Non-fatal injuries among children and young people, aged 0-17 years, by road user category and urbanisation, NSW 2000

(Source: RTA 2001)

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Table 7, for non-fatal injuries in NSW, also shows the high number of passenger injuries, but there are proportionally more in urban areas than non-urban. Far more young pedestrians are injured in urban areas than the country, and the number of pedal cycle injuries is also higher in urban areas.

Simply taking deaths and injuries in the subject group in order of their relative proportions, motor vehicle passengers are easily the most predominant, followed by pedestrians and motor vehicle drivers.

For fatally-injured passengers, Australian Transport Safety Bureau figures for the whole of Australia are shown in Table 8, which gives the numbers of passengers killed in urban and rural areas for the year 1998.

		Passenger age group					
		0-4	5-10	11-17	18+	Un-known	Total
Urban crashes	Single vehicle crashes		1	20	53		74
	Multiple vehicle crashes	4	4	7	67		82
	Total	4	5	27	120		156
Rural crashes	Single vehicle crashes	10	6	29	134		179
	Multiple vehicle crashes	6	4	9	100	2	121
	Total	16	10	38	234	2	300

Table 8 - Passengers^(a) killed in urban^(b) and rural^(c) road crashes, by passenger age and crash type, Australia, 1998

^(a) Includes passengers in motor vehicles and on motor cycles. Excludes passengers on pedal cycles.

^(b) Urban crashes are those defined as occurring in urban areas of population 1,000 persons or greater.

^(c) Rural crashes are those defined as occurring in rural localities (ie having population of 200 to 999 persons) and other (ie less densely settled) rural areas.

Note: Not included in this table are those deceased passengers for whom urban/rural crash location is unknown.

(Source: Australian Transport Safety Bureau)

This shows that for rural area crashes involving passengers aged under 18 years, 64 of them were killed, as opposed to 36 in urban area crashes. Further, in both urban and rural areas, far more were killed in single-vehicle crashes than in multiple-vehicle collisions. Single-vehicle crashes are prevalent in fatal rural road crashes because all three elements of the family of hazardous factors - driver behaviour, the vehicle, and the road (infrastructure) - contribute to these crashes and increase their severity. These are all factors that will be further discussed later in the present report.

In summary, both the latest RTA data and the national ATSB data support the Child Death Review Team's conclusion that a priority group for attention is composed of young people riding as passengers in motor vehicles. For fatal injuries, this is a particular problem in the country. Again in the country, young drivers are another priority group, with pedestrians and pedal cyclists also worthy of attention.

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The present report now turns to more detail for these priority groups, focusing on country areas, identifying risk factors and discussing possibilities for intervention and countermeasure development.

4 RISK FACTORS FOR COUNTRY CHILDREN

4.1 Passenger deaths and injuries

Figure 2 shows deaths and injuries among young passengers in all country areas in NSW, by single year of age and by sex. The total number for the year 2000 was 896 (20 deaths and 876 non-fatally injured). There 434 males injured, and 462 females. It can be seen that for the first ten years or so of life, casualties are fairly evenly distributed between the sexes. In the early teens, females are more likely to be injured as passengers than males, with the figures becoming generally level again at the ages of 16 and 17.

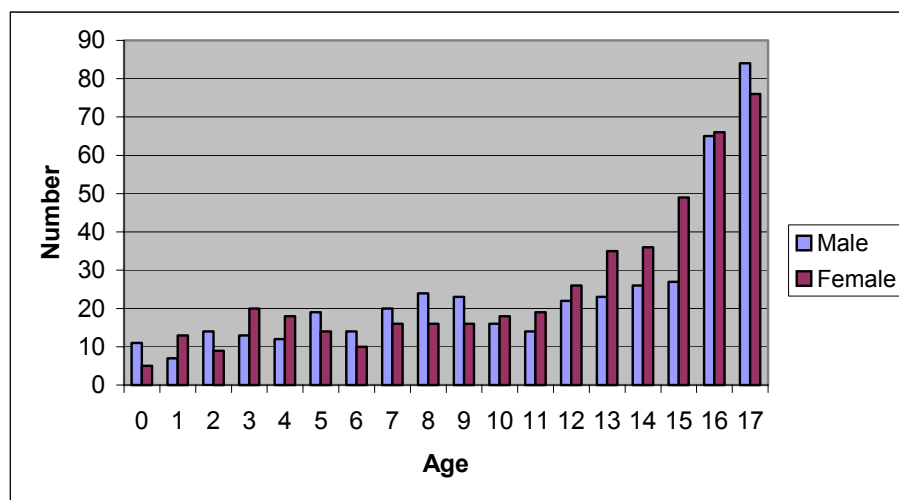


Figure 2 - Deaths and injuries among young passengers in all country areas in NSW, by single year of age and by sex
(Source: RTA, 2001)

The age and sex of the driver is likely to be associated with this pattern, and this likelihood is supported by Table 9.

Driver age group	Passenger age group			Total
	0-4	5-10	11-17	
0-20	5	15	292	312
21-25	9	6	35	50
26+	108	185	241	534
Total	122	206	568	896

Table 9 – Driver age group by passenger age group, NSW country, young passenger deaths and injuries
(Source: RTA 2001)

This shows the age group of the driver of the motor vehicle by the age group of the passenger (grouped into toddlers aged 0-4 who would desirably be riding in child restraints, pre-adolescent children aged 5-10, and adolescents/teenagers aged 11-17).

More than half of all the country passenger casualties in the 11-17 year age group have been riding in motor vehicles driven by the youngest group of drivers, aged 20 or less. In contrast, injured

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passengers in the younger age groups are far more likely to have been riding in motor vehicles driven by more mature drivers. Thus, in terms of risk, passengers aged 11-17 are probably more likely to have been riding with their peer group, and younger children with their parents and carers.

National fatality figures are shown in Table 10. This confirms the general trend seen in injuries in NSW, although the numbers are comparatively small.

		Passenger age group					
Urban areas		0-4	5-10	11-17	18+	Un-known	Total
Driver age	<17			7	2		9
	18-20	1		15	16		32
	21+	3	4	4	88		99
	Unknown		1	1	14		16
	Total	4	5	27	120		156
Rural areas		0-4	5-10	11-17	18+	Un-known	Total
Driver age	<17			11	7		18
	18-20	4		5	22		31
	21+	9	8	21	153	2	193
	Unknown	3	2	1	52		58
	Total	16	10	38	234	2	300

Table 10 - Passengers^(a) killed in urban^(b) and rural^(c) road crashes, by passenger age and driver age, Australia, 1998

^(a) Includes passengers in motor vehicles and on motor cycles. Excludes passengers on pedal cycles.

^(b) Urban crashes are those defined as occurring in urban areas of population 1,000 persons or greater.

^(c) Rural crashes are those defined as occurring in rural localities (ie having population of 200 to 999 persons) and other (ie less densely settled) rural areas.

Note: Not included in this table are those deceased passengers for whom urban/rural crash location is unknown.

(Source: Australian Transport Safety Bureau)

Table 11 shows that the drivers in the younger age groups are much more likely to have been male, whereas the more mature drivers are likely to have been female.

Driver age group	Driver sex				Total	
	Male		Female		N	%
	N	%	N	%		
0-20	208	23.2	102	11.4	310	34.6
21-25	33	3.7	17	1.9	50	5.6
26+	240	26.8	292	32.6	534	59.6
Totals	481	53.7	411	45.9	894	100.0

Table 11 – Driver age group by driver sex (excluding two undetermined), NSW country, young passenger deaths and injuries

(Source: RTA 2001)

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The types of vehicles in which the injured young passengers were riding are shown in Table 12.

Vehicle type	Passenger age group			Total
	0-4	5-10	11-17	
Cars/car derivatives	111	185	527	823
Light trucks	8	16	30	16
Heavy rigid trucks	0	1	0	1
Articulated trucks	2	2	3	2
Buses	0	1	6	1
Other motor vehicles	1	1	2	1
Totals	122	206	568	896

Table 12 – Vehicle type by passenger age group, NSW country, young passenger deaths and injuries
(Source: RTA 2001)

ATSB Fatal File figures for Australia as a whole are shown in Table 13. Both sets of figures show that easily the commonest kind of vehicle in which young passengers have been injured is the passenger car and car derivatives. A few have been riding in light trucks, which could have affected their access to seat belts.

Passengers may be killed or injured in single-vehicle crashes or in multiple-vehicle collisions. National figures for fatalities to passengers, by type of crash, are shown in Table 14. Among young passengers, it is clear, single-vehicle crashes account for more than double the number of deaths in multiple-vehicle crashes. There is a difference of the same kind for older passengers, but to a far lesser extent.

Vehicle type	Passenger age group					Total
	0-4	5-10	11-17	18+	Un-known	
Motor cycle				7		7
Passenger car	13	6	26	157	1	203
Van, ute or 4WD	2	3	6	43	1	55
Bus			1	5		6
Light rigid truck ^(c)		1	5	8		14
Heavy rigid truck				1		1
Articulated truck	1			3		4
Other vehicle				1		1
Unknown				9		9
Total	16	10	38	234	2	300

Table 13 - Passengers ^(a) killed in rural ^(b) road crashes, by passenger age and vehicle type, Australia, 1998

^(a) Includes passengers in motor vehicles and on motor cycles. Excludes passengers on pedal cycles.

^(b) Rural crashes are those defined as occurring in rural localities (ie having population of 200 to 999 persons) and other (ie less densely settled) rural areas.

^(c) Light rigid trucks are defined as forward control vans, light goods trucks, single or twin cab utilities not based on car design, and other light trucks, all under 4.5 tonnes gvm.

Note: Not included are those deceased passengers for whom urban/rural crash location is unknown.

(Source: Australian Transport Safety Bureau)

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		Passenger age					Total
		0-4	5-10	11-17	18+	Un-known	
Single-vehicle crashes	Off straight	8	5	15	80		108
	Off curve, hit object	1	1	10	31		43
	Off curve, overturn			2	16		18
	Other crash	1		2	7		10
	Total	10	6	29	134		179
Multiple-vehicle crashes	Intersection crash			1	14		15
	Head-on crash	5	3	6	58	1	73
	Other opposing direction	1			7		8
	Overtaking crash			1	4	1	6
	Other crash		1	1	17		19
		Total	6	4	9	100	2

Table 14 - Passengers killed in rural single-vehicle and multiple-vehicle road crashes, by passenger age and crash type, Australia, 1998

Note: Not included are those deceased passengers for whom urban/rural crash location is unknown.
(Source: Australian Transport Safety Bureau)

The types of crashes in which the young passengers have been killed or injured in New South Wales is shown in Table 15, which gives crash types by driver age groups.

		Driver age group			Total
		0-20	21-25	26+	
Multiple-vehicle crashes	Intersection	21	4	60	85
	Opposing direction	39	9	101	149
	Same direction	20	4	114	138
	Manoeuvring	6		11	17
	Overtaking	5	2	4	11
	Struck object on road	8		16	24
Single-vehicle crashes	Off road, on straight	97	12	95	204
	Off road, on curve	109	19	123	251
	Miscellaneous	7		10	17
	Total	312	50	534	896

Table 15 – Road user movement by driver age group, NSW country passenger casualties aged 0-17 (Source: RTA 2001)

Table 15 shows that in about half the country crashes in which children and young people were killed or injured as passengers, the car had run off the road, either from the same side or the opposite side. There is, however, a substantial difference in the patterns between younger and older drivers. Drivers aged up to and including 25 years are much more likely to have injured their young passengers in run-off-road crashes, as shown in Figure 3. This difference is highly significant ($p < 0.01$). Older drivers are relatively more likely to be involved in crashes involving vehicles moving in the same direction and in opposite directions.

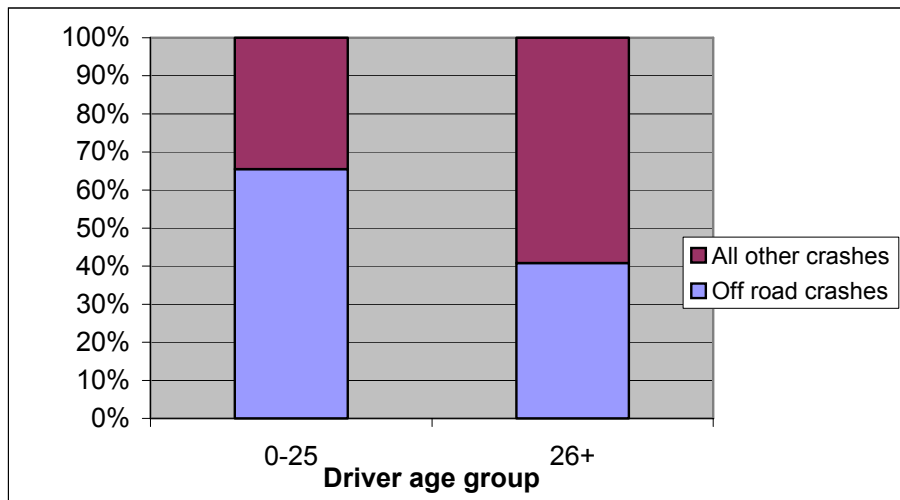


Figure 3 – Run-off-road crashes versus all others, percentage of all crashes, young drivers (aged <25) and older drivers (aged 26+), NSW country passenger casualties aged 0-17

Run-off-road crashes often involve contact with a roadside obstacle. Table 16 shows that in about 40% of country crashes that injured young passengers, a roadside object was contacted. Trees and bushes, and natural surrounds such as embankments and cutting, were the most commonly encountered obstacles, followed by man-made obstacles.

First object impacted	N	%
No object hit	549	61.3
Trees or bushes	135	15.0
Embankments etc	48	5.4
Guardrail or fence	40	4.5
Utility pole	39	4.3
Other objects	85	9.5
Total	896	100.0

Table 16 – Type of first object impacted, all country crashes with injured passenger aged 0-17
(Source: RTA 2001)

Road types and speed limits for passengers killed in country crashes in Australia as a whole are shown in Table 17, which is taken from the ATSB Fatal File. Numerically, most have been killed on

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sealed roads with an unsealed shoulder. None were killed on a two-lane undivided road with a speed limit of 110 km/h or more, but four died on divided roads.

		Passenger age group					Total
		0-4	5-10	11-17	18+	Un-known	
Road type	Intersection	1	2	3	22		28
	Unsealed road	2	1	5	15		23
	Sealed road, unsealed shoulder	9	5	20	126	1	161
	Two-road, all sealed, <110		2	4	18	1	25
	Two-road, all sealed, <110, unknown shoulder	2		3	32		37
	Two-road, all sealed, >=110				1		1
	Two-road, all sealed, >=110, unknown shoulder	2			6		8
	4-lane or divided road, all sealed			3	14		17
	Total	16	10	38	234	2	300

Table 17: Passengers^(a) killed in rural^(b) road crashes, by passenger age and road type, Australia, 1998

^(a) Includes passengers in motor vehicles and on motor cycles. Excludes passengers on pedal cycles.

^(b) Rural crashes are those defined as occurring in rural localities (ie having population of 200 to 999 persons) and other (ie less densely settled) rural areas.

Note: Not included in this table are those deceased passengers for whom urban/rural crash location is unknown.

(Source: Australian Transport Safety Bureau)

Factors that may have contributed to the causation of the crash are sometimes recorded by NSW police, but opinions on these factors are not customarily the subject of detailed crash investigation. However, some causal factors, derived on this basis, are available for analysis in the NSW database.

"Distraction" as a factor includes fatigue and sleepiness. In 143 crashes (about 15% of all) in which young passengers were injured, some kind of distraction was recorded as a factor. For these crashes, in 48 of them (about 5% of all crashes), drowsiness or fatigue was regarded as a factor. Other kinds of distraction, inside and outside the car, were less numerous. In five cases the driver was being pursued by police, which was also regarded as being a distraction.

Driver "error" is another factor recorded in the statistics. However, no "error factor" is given in most cases, and alcohol as a factor (the most likely) was not available for analysis (for reasons of privacy). Among the 335 error factors that were recorded, over 60% were given as "loss of control", with only small numbers being attributed to other factors.

"Excessive speed" was given as a factor in 18 cases, or 5.4% of those for which a factor was recorded. In about two-thirds of all crashes, police record the "stated speed". In 11 cases the stated speed was over 110 km/h, and in another nine it was described as "excessive". Out of the 664 crashes in which children and young people were injured as passengers, these 20 cases thus represent 3.0%. What is not known, of course, is how many of the cases in which the stated speed was recorded the police also considered the speed to be "excessive".

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Data for all crashes in NSW that may have involved alcohol, speeding or fatigue are reviewed in the countermeasure discussion later in the present report.

The ATSB Fatal File also attributes causal factors where possible, following close examination of the available documentation. Table 18 shows data for passengers aged 17 or below killed in 1998 road crashes in Australia, by crash location and major causal factors in the crash.

		Location of crash			Total
		Urban ^(b)	Rural ^(c)	Un-known	
Major causal factors in the crash	Alcohol ^(d) and speed	10	8		18
	Alcohol ^(d) , not speed	6	6		12
	Speed, not alcohol ^(d)	11	17		28
	Neither alcohol ^(d) nor speed	9	33	1	43
	Total	36	64	1	101

Table 18 - Passengers^(a) aged 17 or below killed in road crashes, by crash location and major causal factors in the crash, Australia, 1998

^(a) Includes passengers in motor vehicles and on motor cycles. Excl. passengers on pedal cycles.

^(b) Urban crashes are those defined as occurring in urban areas of population 1,000 persons or greater.

^(c) Rural crashes are those defined as occurring in rural localities (ie having population of 200 to 999 persons) and other (ie less densely settled) rural areas.

^(d) Includes drugs other than alcohol.

(Source: Australian Transport Safety Bureau)

Table 18 shows the typical interaction of causal factors, with the combination of alcohol and speed at least partially responsible for the deaths of eight out of 64 passengers (12.5%) in country regions. Alcohol alone was a causal factor in six out of the 64 (9.4%), and speed alone for 17 (26.6%).

Survival of passengers (indeed, all occupants) of a motor vehicle in a crash depends fundamentally on the proper use of restraint systems. There is observational evidence that in the country, vehicle occupants – especially in rear seats – are less likely to wear seat belts than in other parts of the State. However, this is not supported by the police data, which, however, is not very reliable in terms of seat-belt use (being much more likely to record that the seat belt is worn when there is any doubt, or in some instances when the contrary is known). Table 19 shows that among all young casualties in the country, fewer than 3% were recorded as *not* having worn an adult belt when one was available.

Casualty age	Adult belt worn		Adult belt not worn		No restraint		Child restraint		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
0-4	38	4.2	14	1.6	1	0.1	39	4.35	30	3.3	122	13.6
5-10	176	19.6	9	1	2	0.2	2	0.2	17	1.9	206	22.9
11-17	486	54.2	25	2.8	10	1.1	0	0.0	47	5.3	568	63.4
Total	700	78.1	48	5.4	13	1.4	41	4.6	94	10.5	896	100.0

Table 19 – Restraint status, by age group, young passengers in the country
(Source: RTA 2001)

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Of more concern is the observation that in the 0-4 year age group, all of whom should desirably have been restrained in a dedicated child restraint, 38 (over 30% of this group) were recorded as wearing an *adult* belt.

Also of concern is that among the 20 *fatally* injured young country passengers, three out of 13 (23%) in the 5-17 year age groups were not wearing available adult belts, which – even given the small numbers - confirms other work that indicates that fatally-injured occupants are less likely to have been wearing seat belts than non-fatally-injured occupants.

Section of State at crash site			Passenger age				Un-known	Total
			0-4	5-10	11-17	18+		
Major urban (100,000+)	Not worn	N	1	1	7	24		33
		%	33.3	50.0	38.9	36.9		37.5
	Worn	N	2	1	11	41		55
		%	66.7	50.0	61.1	63.1		62.5
Other urban (1,000-99,999)	Not worn	N	1	2	1	6		10
		%	100.0	100.0	25.0	37.5		43.5
	Worn	N			3	10		13
		%			75.0	62.5		56.5
Locality (200-999)	Not worn	N		1	1	3		5
		%		100.0	100.0	100.0		100.0
	Worn	N						0
		%						
Rural balance (rural remainder)	Not worn	N	4	1	14	69		88
		%	26.7	20.0	53.8	44.2		43.3
	Worn	N	11	4	12	87	1	115
		%	73.3	80.0	46.2	55.8	100.0	56.7
Unknown	Not worn							0
	Worn	N				2		2

Table 9 - Restraint use amongst passengers^(a) killed in road crashes, by passenger age and section of state of crash, Australia, 1998

^(a) Includes passengers in motor vehicles; excludes passengers on motor cycles and pedal cycles
 Note: Table excludes deceased passengers for whom restraint use was unknown

(Source: Australian Transport Safety Bureau)

Road deaths and injuries among children and young people in rural NSW

The ATSB Fatal File has more accurate information on restraint use by fatally-injured passengers, as shown in Table 20. The cell sizes are small, but show that in urban areas 13 out of 30 passengers in the 0-17 age group (43%) were not wearing a seat belt, and in rural areas 21 out of 48 (44%) were unrestrained. (The figures are of the same order of magnitude for older passengers.)

It will be seen that several of the very youngest passengers, aged under five years, have been killed while not wearing any kind of restraint.

4.2 Pedestrian deaths and injuries

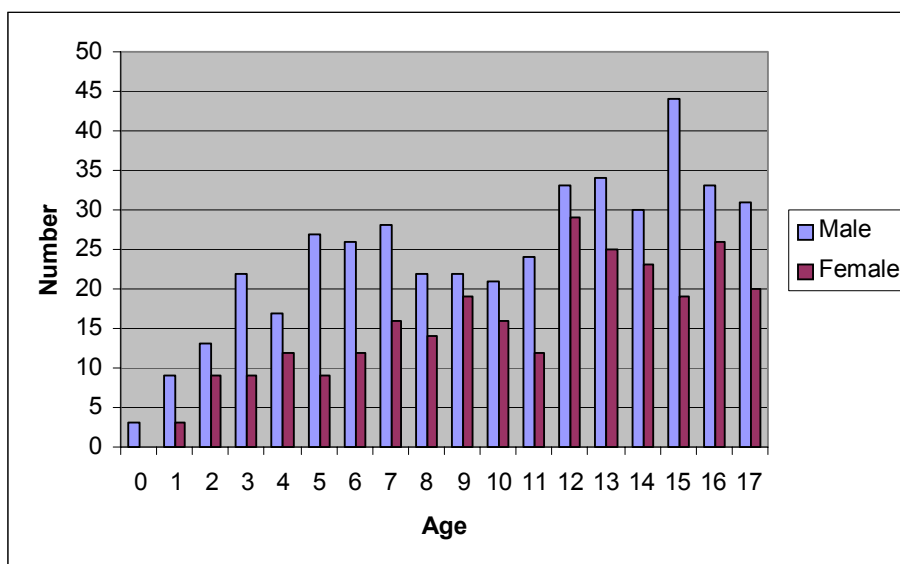


Figure 4 - Age and sex distribution, pedestrian casualties, aged 0-17, NSW 2000

Speed limit (km/h)	Urban		Country		Totals	
	N	%	N	%	N	%
40	28	3.9	10	1.4	38	5.3
50	141	19.8	48	6.7	189	26.6
60	317	44.6	124	17.4	441	61.9
70	26	3.7	2	0.3	28	3.9
80	3	0.4	3	0.4	6	0.8
90	1	0.1	1	0.1	2	0.3
100	0	0.0	5	0.7	5	0.7
Unknown	3	0.4	0	0.0	3	0.4
Totals	494	72.9	193	27.0	712	100.0

Table 21 - Deaths and injuries, pedestrians aged 0-17, by urban and country areas and speed limit of location (Source: RTA 2001)

Road deaths and injuries among children and young people in rural NSW

Figure 4 shows the age distribution of pedestrian casualties (killed and injured) aged 0-17 years. It shows two peaks, around the 5-7 year age group and at around 15 years. Out of the 712 casualties in the year 2000 there were 439 males (62%), and in all age groups males can be seen to predominate.

As previously noted in this report, the incidence of pedestrian deaths and injuries among children and young people is overwhelmingly an urban problem. Even in country areas, the great majority of pedestrian casualties occur on roads with a speed limit of 60 km/h or less (see Table 21).

	Pedestrian casualties	
	N	%
Cross intersection	122	17.1
T junction	153	21.5
Roundabout	6	0.8
L junction	1	0.1
One-way street	4	0.6
Two-way undivided street	358	50.3
Divided road (not freeway)	67	9.4
Other	1	0.1
Total	712	100.0

Table 22 - NSW pedestrian casualties, aged 0-17, by type of location
(Source: RTA 2001)

Table 22 shows the location of the young pedestrian casualties, with about half of them occurring on a two-way undivided street – probably the so-called "mid-block" accident.

A substantial minority of these accidents occurred at junctions of one kind or another.

4.3 Cyclist injuries

Speed limit (km/h)	Urban		Country		Totals	
	N	%	N	%	N	%
40	6	1.7	3	0.8	9	2.5
50	64	17.9	40	11.2	104	29.0
60	110	30.7	103	28.8	213	59.5
70	9	2.5	2	0.6	11	3.1
80	2	0.6	6	1.7	8	2.2
100	1	0.3	6	1.7	7	2.0
Unknown	2	0.6	4	1.1	6	1.7
Totals	194	54.2	164	45.8	358	100.0

Table 23 - NSW pedal cyclist casualties, aged 0-17, by urbanisation (Source: RTA 2001)

Road deaths and injuries among children and young people in rural NSW

No cyclists in the 0-17 year age group were killed in NSW during calendar year 2000. The number of non-fatal injuries among young cyclists is shown in Table 23, tabulated by speed limit in urban and country areas. (Four cyclists who were recorded as "pillion riders" have been excluded.)

The general picture is very similar to that seen for young pedestrians, with only a very few being injured on roads where the speed limit exceeds 60 km/h. The age and sex distribution of these young cyclists is shown in Figure 4. It can be seen that they are overwhelmingly male, with a steadily increasing trend in numbers up to the early teen years, with some decrease in numbers after that.

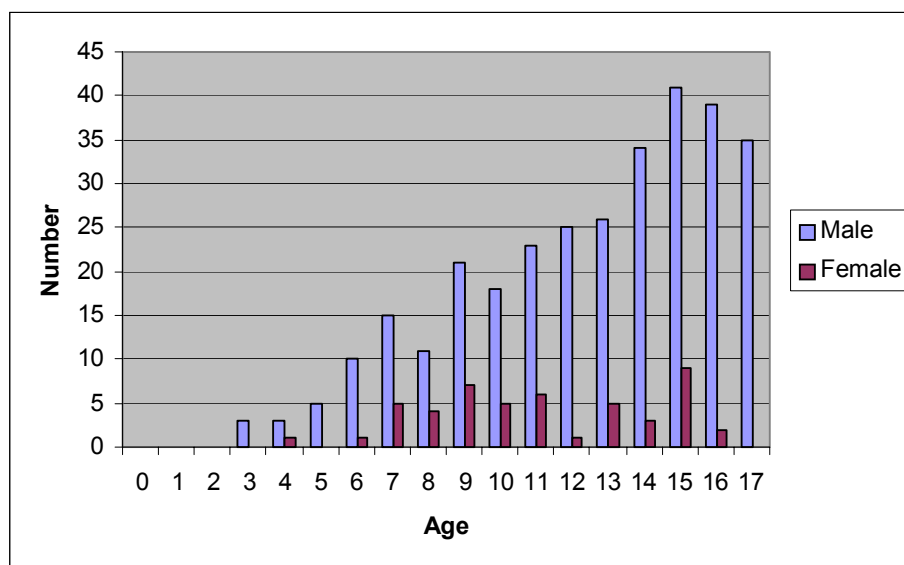


Figure 4 - Age distribution, NSW pedal cyclist casualties, aged 0-17

	Cycle rider casualties	
	N	%
Cross intersection	53	14.8
Y junction	4	1.1
T junction	99	27.6
Roundabout	13	3.6
Two-way undivided street	171	47.8
Divided road (not freeway)	18	5.0
Total	358	100.0

Table 24 - NSW pedal cyclist casualties, aged 0-17, by type of location
(Source: RTA 2001)

The location of the cyclist casualties is shown in Table 24. Again, the picture is similar to that for young pedestrians, with about half all injuries occurring on undivided roads.

5 TOWARDS COUNTERMEASURE DEVELOPMENT

5.1 Behavioural factors – the young driver "problem"

It is axiomatic that for there to be casualties among children and other young people riding as passengers, then someone has to be driving. It is clear from the data reviewed above in this report that the drivers who are most likely to have been behind the wheel in crashes that result in such casualties are themselves young, and predominantly male. This section of the report, therefore, discusses the issue of the young (male) driver "problem", which is central to reducing deaths and injuries among children and young people in rural and remote areas.

The "problem" of the young driver, and specifically the young male driver, is of course not one that is confined to country roads and country towns. The NSW policy framework document, *Road Safety 2010* (Roads and Traffic Authority, 2000), points out that while 17 to 25 year old drivers hold 16% of licences, they account for 26% of all drivers involved in crashes resulting in injury or death. Driver licensing administrations throughout the developed world recognise that the transition between novice status and maturity carries with it several hazards associated with attitudes, behaviour, experience and skills.

These factors have been the subject of a vast amount of research, much of it being performed in Australia (including the Roads and Traffic Authority) and with several related projects having been sponsored by the Motor Accidents Authority of NSW in recent years.

In 1998 the RTA established the Youth Programs Unit to focus on the development, management and implementation of Statewide initiatives aimed at promoting safe road use by young road users. The emphasis is on consultation, liaison and qualitative research, and is intended to complement and enhance the road safety initiatives that already address young people. Of particular note in the context of this report is the focus of the Unit on young people in rural areas.

Probably the most important single initiative of recent years in New South Wales is the introduction and implementation of a formal graduated licence scheme, the underlying aim of which is to ensure that young drivers gain their experience in a relatively safe environment and under continual monitoring. The outcomes of this new program will not be known for some time, but research is being implemented. What can be said is that overseas work along similar lines has brought encouraging results.

The interest of all driver licensing administrations in Australia in this subject has resulted in the publication by Austroads of a review paper, *Youth Road Safety* (Austroads, 2000). Austroads is the association of Australian (and New Zealand) State and Territory road transport and traffic authorities, including the RTA. Many of the strategies recommended in this plan were based on outcomes from a Youth Road Safety Workshop held in Melbourne in April 1999. In summary, the following objectives were identified as priorities:

- To involve and collaborate with youth to better communicate with young drivers.
- To ensure young drivers have support within the community, from family and from the driver training industry.
- To change attitudes to young drivers and driver education by publicising the benefits of developing skills prior to obtaining a provisional/probationary licence.

- To develop programs that benefit new drivers and reduce their risk of crash involvement.
- To ensure young drivers are aware of the risks and legal consequences of their driving behaviour.
- To achieve consistency in legislation across jurisdictions.
- To improve the evaluation of young driver programs and develop a better understanding of what can be done to reduce the over-representation of young drivers in crashes.
- To ensure that all agencies and jurisdictions share information and program evaluations to maximise benefits for all Australian and New Zealand youth.

In addition, it was considered desirable to enhance public education on alternative transport options (and encourage their provision), including providing information on location of bus stops or train stations, taxi ranks and details about timetables.

A wide variety of actions aimed at those objectives were identified. The Austroads recommendations comprise an excellent checklist, not only for what is now being done for youth road safety in Australia, but also what ought to be done. It is as appropriate for the safety of young people in rural areas as it is for other regions of the State and the country.

5.2 Specific risk-taking behaviours

5.2.1 Excessive speed

Inappropriate and excessive speeds are important contributing factors in rural road crashes because rural roads generally have inconsistent design characteristics over their total length as well as problems in individual design elements. These inconsistencies occur on roads whose alignment and use evolved over time rather than roads specifically designed for their current use. Because of these inconsistencies, drivers must constantly adapt their speed to account for regularly changing situations and circumstances that increase the opportunities for human error and lead to higher crash risks. Speed variation caused by the presence of buses, heavy trucks and agricultural vehicles also generates higher crash risks on rural roads than on other types of roads.

While the NSW Government (through the RTA) considers that speed is the major behavioural road safety problem in NSW, there are clearly other non-behavioural factors in play, and they will be further discussed in this report. In this context, the keys to improved road safety are driving at an appropriate speed, on roads designed for that speed and lined by roadsides that are forgiving of errors made at that speed.

As determined by the RTA and defined in the "*Road Safety 2010*" framework document, while 42% of all road fatalities (in 1998) involved speeding, this increased to more than 47% of the deaths on country roads. In 1998, of the 357 deaths on country roads, 167 were speeding related, with most of these fatalities being country people.

The definition of "excessive speed" (for the conditions) is a matter of debate. The general travelling speed of motor vehicles on rural roads is bound to be higher, on average, than it is in urban areas, and the energy released in any crash increases exponentially with the speed of impact. The RTA uses the following criteria for determining whether excessive speed for the prevailing conditions was a contributing factor for a crash:

A motor vehicle is assessed as having been speeding if it satisfies the conditions described below under (a) or (b) or both:

(a) The vehicle's controller (driver or rider) was charged with a speeding offence; or the vehicle was described by police as travelling at excessive speed; or the stated speed of the vehicle was in excess of the speed limit.

(b) The vehicle was performing a manoeuvre characteristic of excessive speed, that is:

- while on a curve the vehicle jack-knifed, skidded, slid or the controller lost control; or*
- the vehicle ran off the road while negotiating a bend or turning a corner and the controller was not distracted by something or disadvantaged by drowsiness or sudden illness and was not swerving to avoid another vehicle, animal or object and the vehicle did not suffer equipment failure.*

On this basis, for the year 2000, the RTA concluded that 38% of fatal crashes involved "speeding", and 15% of injury crashes (Roads and Traffic Authority, 2001). This is apparently lower than in 1998, but still a rather larger proportion than established on the basis of (national) ATSB data. It is however of the same order of magnitude if fatal crashes (nationally) that are associated with the combination of alcohol and speed are combined with those attributable to speed alone.

Clearly, the attribution of "speeding" to the crashes categorised as above is somewhat subjective and does not take full account of the interaction of factors that is inevitable in any crash. For example, a driver might have been made sleepy by the use of alcohol, run off the road at a curve, and hit a roadside pole. The resulting injury is a consequence of many factors, which are unlikely (quite understandably) to be identified and evaluated in the typical police report that is used for the collation of mass data.

A more systematic approach to the establishment of speed to the risk of being *involved* in a crash has been taken in two studies conducted by the NHMRC Road Accident Research Unit in Adelaide, under the sponsorship of the Australian Transport Safety Bureau. The first study addressed risks associated with excessive speeds in urban conditions. The second of these studies addressed the issue of travelling speed and the risk of crash involvement on *rural* roads (Kloeden et al, 2001).

Specifically, the main aim of the project was to quantify the relationship between free travelling speed and the relative risk of involvement in a casualty crash, for sober drivers of passenger vehicles in rural, out of town, 80 km/h-and-above speed limit zones in South Australia. A second aim of the project was to examine the effect of various hypothetical speed reductions on rural casualty crash frequency.

The speeds of passenger vehicles involved in casualty crashes were compared with the speeds of a control group of passenger vehicles not involved in crashes but travelling in the same direction, at the same location, time of day, day of week, and time of year. The conditions imposed on the selection of case vehicles were designed to ensure that the study would yield valid estimates of the relative risk of a passenger vehicle travelling at a free speed on a rural road becoming involved in a casualty crash, compared to the risk for a passenger vehicle travelling at the average speed of the control vehicles. The pre-crash travelling speeds of the case (crashed) vehicles were determined using computer-aided accident reconstruction techniques.

The researchers found that the risk of a free travelling speed passenger vehicle being involved in a casualty crash on a rural road, relative to the risk for a passenger vehicle travelling at an average speed, increased with speed at greater than an exponential rate. The risk of involvement in a casualty crash was found to be more than twice as great when travelling 10 km/h above the average speed of non-crash involved vehicles, and nearly six times as great when travelling 20 km/h above that average speed. Higher speeds are associated with longer stopping distances, increased crash energy and more likely loss of control.

It was determined that a large proportion of the casualty crashes would have been avoided if the free travelling speed vehicles had been travelling at a slower speed. It was shown that even small reductions in travelling speeds have the potential to greatly reduce crash and injury frequency. For example, it was estimated that a 5 km/h reduction in the speed of all the rural free travelling speed vehicles in this study would have led to a 31% reduction in casualty crashes. It was also estimated that 24% of all the casualty crashes investigated would have been avoided if none of the vehicles had been travelling above the speed limit and that lowering the maximum speed limit on undivided roads to 80 km/h could be expected to lower casualty crash frequency by 32%.

The authors of the study made several recommendations, as follows:

1. The level of enforcement of speed limits in rural areas be increased.
2. The tolerance allowed in the enforcement of rural speed limits be reduced or eliminated.
3. All currently zoned 110 km/h undivided roads be rezoned to no more than 100 km/h.
4. Speed limits be reduced where current limits are considerably greater than average travelling speeds and where there are frequently occurring advisory speed signs.
5. After a period with stricter enforcement of rural area speed limits, consideration be given to changing the maximum speed limit to 80 km/h on all two lane rural roads.
6. The level of public awareness of the risk of involvement in a casualty crash associated with speeding be increased.

Of course, changing the level and effectiveness of enforcement programs directed at excessive speed by young drivers in rural areas is much easier said than done, especially as in the present Australian context few drivers (of any age) regard exceeding the speed limit by a few kilometres per hour, especially on rural roads, as either excessive speeding or morally reprehensible.

In an interesting and challenging paper, Prabhakar et al (1996) focused on social disapproval and approval for speeding, and the conditions under which people speed. They reviewed earlier work by the same group that looked for attitudinal factors involved with speeding. This established the utility value in taking risks, especially for young drivers. They showed that one of the basic reasons for speeding, especially for young drivers, is that *it is fun*. The survey also identified that part of the fun for many young drivers was impressing or even frightening their passengers, which has echoes in the theories and observations of Amotz Zahavi.¹

¹ Zahavi postulates that while risky behaviour is conventionally seen as a "handicap", and contrary to Darwinian principles of survival, it is important in evolution as establishing status and success (Zahavi, Amotz and Zahavi, Avishag, 1997: *The handicap principle: A missing piece of Darwin's puzzle*, Oxford University Press).

In a follow-up study (Job et al, 2001), the same group reported that drivers – especially males – were generally quite tolerant, in terms of law-breaking, of driving at speeds well over the speed limit. A significant minority of respondents (4.5%) considered that a driver would have to be travelling at 100 km/h or more above a 100 or 110 km/h speed limit to be considered "criminal". Given these findings, the recommendation of Kloeden et al (2001) for increasing public awareness of the risk of speeding is unlikely to change attitudes that embrace risk-taking as a virtue. Indeed, Kloeden et al implicitly acknowledge this possibility in recognising that some of the increase in crash risk with speed, as shown in their study, is a result of risk-taking behaviour rather than the higher travelling speed itself. Driving at excessive speed is a risk-taking behaviour that is often found in association with other risk-taking behaviours such as not wearing a seat belt (considered later in this report).

Other Australian research has already established that young males are relatively likely to drive at excessive speed. Fildes et al (1991) unobtrusively measured the speeds of vehicles on urban and rural road segments in Victoria, then stopped a sample of the vehicles to interview the drivers. The researchers found that younger drivers, drivers without passengers, drivers of newer cars, drivers traveling for business purposes, and high mileage drivers were more likely to drive faster than average and exceed the speed limit. Arguably, all these groups see value in driving relatively fast, although the perceived values will be markedly different from group to group.

Kloeden et al also recommend alterations to speed limits. However, free travelling speeds have only a loose relationship to posted speed limits, especially when the latter are out of line with driver expectations. If there is a consensus to be drawn from major international reviews (see for example Fildes and Lee, 1993; Stuster and Coffman, 1998), it is that driving speeds change at some fraction – about one quarter – of the change in speed limit, there are inconsistent findings on the effect of lowered speed limits on crashes, and that when driving speeds increase then crashes increase also.

The aim of enforcement of speed limits is, of course, to minimise the incidence of deviant speeding behaviour. At least on well-travelled routes, by international standards Australian enforcement (when combined with education) has been very effective in this regard. However, there are significant differences in approaches to speed management and enforcement throughout Australia, as detailed in a recent Austroads report on the subject (Austroads, 2001).

Austroads was reporting on a project aimed at providing Australasian road safety and enforcement agencies with guidance on appropriate strategies and practices. An original aim of the project was to obtain detailed information from each jurisdiction about speed enforcement operations and related media activities, and then to produce an overlay of the available outcome data (on-road speeds and crashes) from which best practice guidelines could be developed. Unfortunately, it proved to be impracticable to identify best practice in speed enforcement from the data that was able to be gathered. Differences in operations, definitions and data collected within the different jurisdictions did not allow the necessary comparisons to be completed in any statistically valid manner.

In view of this, and in order to extract the maximum value from the assembled data, a synthesis of current practice was compiled, based on reasoned assessment of the data that were gathered for the study. The major topic headings used, and the main findings, were as follows:

Technology:

Speed cameras have provided a means to broaden the exposure of motorists to speed enforcement activities, and therefore awareness of speeding as an issue. Digital cameras provide an ability to reduce the time taken to process infringements, and the associated cost of infringement issue.

Methods of enforcement:

A mixture of covert and overt enforcement is required as well as varying degrees of mobility, and a strategy which ensures a coverage of a wide range of sites, whether these are targeted or not. At present there exists neither established theory nor sound empirical evidence to guide enforcement administrations as to how much visible and how much covert enforcement there ought to be in differing circumstances. The existence of covert enforcement, and the recognition of its existence by the great majority of drivers through publicity, arguably forms the main basis of the general deterrence effect of speed enforcement. A variable stationary covert speed camera will serve to provide both specific and general deterrence when in operation. However, a sign visible past the point of detection, stating the presence of the camera, will much enhance its general deterrence effects.

Intensity of enforcement:

The present state of knowledge does not permit clear prescriptions regarding the optimum intensity of enforcement. At the local level, anecdotal evidence suggests that a period of two to three weeks of initial concentrated enforcement at a given site will provide changes in behaviour that can be maintained over a longer period with lower levels of enforcement. At the systematic level, there is some evidence to suggest that major changes in speed enforcement can have a marked impact on speed behaviour.

Performance and outcome measures:

Measures of enforcement performance and outcomes are important tools for understanding the relationship between enforcement activity, speed and crash information. It may be appropriate to set target values for different enforcement modes, but outputs will depend on traffic flow, enforcement history, and site factors. Changes in crashes and covertly measured speed distributions are the two primary outcome measures for speed enforcement.

Intelligence-driven operations:

There appear to be no formal studies showing that intelligence-based programs are more effective. However, local level comparisons are increasingly used to monitor effectiveness. A complete reliance on a targeted approach to a small number of selected sites is not desirable, with predictability and lack of general deterrence a likely outcome. A balance is required between crash based intelligence driven targeted operations, and managed targeting to wider areas in a random nature. Details on the speed distributions across a network are limited, and therefore do not feature in the development of enforcement programs.

Tolerances:

The smallest feasible tolerance should be adopted through minimisation of equipment inaccuracies, although it is necessary to bear in mind the formal acceptance of practice from a legal aspect, and the potential backlash from drivers if tolerances are perceived to be impracticably small to allow for brief inadvertent excesses in speed. With a history of tolerance levels above the speed limit (in addition to equipment error tolerances) any major change in practice would be likely to have political implications. A possibility exists to simultaneously lower the tolerance level, while introducing a lower range penalty that considers a loss of demerit points only (thereby avoiding claims of revenue raising). Tolerance levels ultimately need to be reduced if the belief is to be changed that the speed limit is a maximum speed and not a minimum or recommended speed.

Penalties:

A fine and demerit point system which reflects community expectations is required. The effect of automatic licence loss for very high speed offences can be justified on theoretical grounds and (probably) in terms of community support. No monetary penalty (demerit points only) should exist for lowest level offences, thereby reducing court challenges and non-payment administration costs, as well as lessening the possible grounds for accusations of 'revenue-raising'.

Public education:

Coordination and cooperation between speed enforcement and public education initiatives is critical. Public education can serve two main purposes: to heighten public awareness of enforcement (where it is important that on-road enforcement levels reflect education campaigns), and progressive education where behavioural attitudes to speeding and safety in general are targeted with a long-term focus. Campaigns have to be carefully thought out in terms of current community perceptions, the target audience, attitudes and beliefs, the previous history of the issue, and the available time and resources. Successful campaigns have the following characteristics:

- they are based on theoretical models and prior research;
- they are persuasive rather than educational;
- they are more emotional than rational;
- they focus on a specific behaviour;
- they do not rely on celebrities;
- they are supported by enforcement.

Implementation of speed management programs and enforcement activities along the lines recommended by Austroads would stand the greatest chance of successfully reducing the incidence of deviant speeding in rural areas by - especially - young male drivers. In turn, given the Adelaide data, this would have a most favourable effect in the incidence of fatalities among young drivers and their passengers on country roads and in country towns.

The principles have been embraced in New South Wales. In relation to enforcement, the Government has recently doubled the penalties for exceeding the speed limit by 30 km/h or more. It has introduced other initiatives that target speeding, such as double demerit points for speeding over holiday periods.

Under the "Road Safety 2010" framework, educating the community about the risks and consequences of speeding will continue to form a major part of the NSW speed management program. These activities are coordinated with highly visible police enforcement. Under the RTA Rural Road Safety Public Education Campaign, the 'Testimonials' education program was designed as an umbrella advertising campaign to break down some of the resistance of rural communities to road safety messages, including those relating to speed. In the commercial, people living across country NSW - not actors - were chosen to speak about the loss of a relative, friend or mate in a country road crash. Post-campaign research indicated a significant shift in the attitude of country drivers towards the relevance of road safety advertising to country drivers as well as a greater awareness of the prevalence of country drivers involved in fatal crashes on rural roads. It was anticipated that road safety public education campaigns aired in country NSW in later years would have a more receptive audience than in the past (Wall, 2000).

A "Country Speeding Campaign" was then launched in 2000 as a follow up to "Testimonials". This "Mates" radio and television campaign focused on speeding, especially around curves in 100 km/h speed zones. It was developed featuring the message that 8 out of 10 fatal speeding crashes on country roads occur on bends. Post campaign research indicated that people were thinking and acting more conservatively about the speeds they were driving on clear roads and on bends.

At the national level, a national television and radio campaign has focused on the embarrassment, inconvenience and economic consequences of losing a driving licence, and the direct target was young males speeding in rural Australia. On first principles, given data on the acceptance of physical risk among young males, this would appear to be more likely to strike a receptive chord among the target group than trying to convince them that fast driving can be dangerous (which they already know).

In addition to its public education campaigns, the RTA is increasing the number of fixed digital speed cameras across rural NSW, and expanding the number of 50 km/h urban speed limits in country towns. Further, the speed limit zoning of rural roads is under review by the RTA and other authorities, and this will be briefly described later in the present report.

5.2.2 Fatigue and sleepiness

The RTA estimates that driver fatigue is a factor in at least 20% of fatal crashes in NSW. This is a high estimate compared to that of the Australian Transport Safety Bureau (an average of 13% of all crashes on the Route 39 inland highways), but nevertheless there is no doubt that fatigue – probably more correctly defined as sleepiness or drowsiness – is a major contributor to road trauma in rural areas, and significantly affects young people. The Australian Transport Safety Bureau has found that the proportion of crashes related to fatigue varies by region, and is higher in more remote areas where roads are primarily of two lanes, with low traffic density and where drivers tend to be making long trips.

Probably the best recent scientific review of the subject has been that of an Expert Panel on Driver Fatigue and Sleepiness, sponsored by the National Center on Sleep Disorders Research (NCSDR) of the National Institutes of Health, and the US National Highway Traffic Safety Administration (NHTSA). The report presents the results of a literature review and opinions on key issues involved in the problem (NCSDR/NHTSA, 2001). What follows is a brief summary of the review of this expert panel.

Sleep has predictable patterns of sleepiness and wakefulness. Sleepiness results from the sleep component of the circadian cycle of sleep and wakefulness, restriction of sleep, and/or interruption or fragmentation of sleep. The loss of one night's sleep can lead to extreme short-term sleepiness, while habitually restricting sleep by one or two hours a night can lead to chronic sleepiness. Sleeping is the most effective way to reduce sleepiness.

Sleepiness causes motor vehicle crashes because it impairs performance and can ultimately lead to the inability to resist falling asleep at the wheel. Critical aspects of driving impairment associated with sleepiness are reaction time, vigilance, attention, and information processing.

Research methods are available to approximate or detect sleepiness. However, unlike the situation with alcohol-related crashes, no blood, breath, or other measurable test is currently available to quantify levels of sleepiness at the crash site. Although current understanding largely comes from inferential evidence, a typical crash related to sleepiness has the following characteristics:

- The problem occurs during late night/early morning or mid-afternoon.
- The crash is likely to be serious.
- A single vehicle leaves the roadway.
- The crash occurs on a high-speed road.
- The driver does not attempt to avoid a crash.
- The driver is alone in the vehicle.

It will be clearly apparent that many of these characteristics are typical of fatal and other serious crashes on country roads.

Factors recognised as probably increasing the risk of drowsy driving and related crashes include the following:

- Sleep loss.
- Driving patterns, including driving between midnight and 6 a.m.; driving a substantial number of miles each year and/or a substantial number of hours each day; driving in the mid-afternoon hours (especially for older persons); and driving for longer times without taking a break.
- The use of sedating medications, especially prescribed anxiolytic hypnotics, tricyclic antidepressants, and some antihistamines.
- Untreated or unrecognized sleep disorders, especially sleep apnea syndrome (SAS) and narcolepsy.
- Consumption of alcohol, which interacts with and adds to drowsiness.

These factors have cumulative effects: a combination of them substantially increases crash risk.

Although no driver is immune, the evidence is that the following three population groups are at highest risk, based on evidence from crash reports and self-reports of sleep behavior and driving performance:

- Young people (ages 16 to 29), especially males.
- Shift workers whose sleep is disrupted by working at night or working long or irregular hours.
- People with untreated sleep apnea syndrome (SAS) and narcolepsy.

In relation to the incidence of sleep-related crashes among young people, virtually all studies that have analysed data by gender and age group have found that young people, and males in particular, are the most likely to be involved in fall-asleep crashes. A combination of having more of the risk factors and frequently being on the roads during nighttime hours may explain the greater incidence of drowsiness-related crashes in youth. During adolescence, young people are learning to drive, experimenting and taking risks, and testing limits. At the same time, this age group is at risk for excessive sleepiness because of the following:

- Maturation changes that increase the need for sleep.
- Changes in sleep patterns that reduce nighttime sleep or lead to circadian disruptions.
- Cultural and lifestyle factors leading to insufficient sleep, especially a combination of schoolwork demands and part-time jobs, extracurricular activities, and late-night socialising.

The US expert panel felt that vulnerability may be further increased when young people use alcohol or other drugs because sleepy young drivers are likely to be unaware of the interaction of sleepiness and alcohol and may not recognize related impairments they experience. NHTSA data show that males are five times more likely than females to be involved in drowsy-driving crashes. The reasons why young males have more crashes than do young females are not clear, because both young men and young women are likely to be chronically sleep-deprived.

To prevent drowsy driving and its consequences, road users need information on approaches that may reduce their risks, including the benefits of specific behaviors that help avoid becoming drowsy while driving. Helpful behaviors include the following:

- planning to get sufficient sleep;
- not drinking even small amounts of alcohol when sleepy; and
- limiting driving between midnight and 6 am.

As soon as a driver becomes sleepy, the key behavioral step is to stop driving - for example, letting a passenger drive or stopping to sleep before continuing a trip. Two remedial actions can make a short-term difference in driving alertness: taking a short nap (about 15 to 20 minutes) and consuming caffeine equivalent to two cups of coffee. The effectiveness of any other steps to improve alertness when sleepy, such as opening a window or listening to the radio, has not been demonstrated.

So-called "rumble strips" alarm or awaken sleepy drivers whose vehicles are going off the road. These rumble strips, when placed on high-speed, controlled-access, rural roads reduce drive-off-the-road crashes by 30-50%. However, rumble strips are not a solution for sleepy drivers, who must view any wake-up alert as an indication of impairment - a signal to stop driving and get adequate sleep before driving again.

Employers, unions, and shift work employees need to be informed about effective measures they can take to reduce sleepiness resulting from shift work schedules. Countermeasures include following effective strategies for scheduling shift changes and, when shift work precludes normal nighttime sleep, planning a time and an environment to obtain sufficient restorative sleep.

The following three priority areas were identified by the expert panel:

- Educate young males (ages 16 to 24) about drowsy driving and how to reduce lifestyle-related risks.
- Promote shoulder rumble strips as an effective countermeasure for drowsy driving; in this context, raise public and policymaker awareness about drowsy-driving risks and how to reduce them.
- Educate shift workers about the risks of drowsy driving and how to reduce them.

Under the Rural Road Safety Action Plan for Australia, it was proposed as follows:

- Develop guidelines and programs for installation or upgrading of rest areas at appropriate locations with facilities that will make their use attractive to long-distance travellers.
- Encourage community organisations to provide rest stops and coffee on holiday traffic routes.
- Facilitate coordination of their operations into a publicised network of rest opportunities.
- Encourage Governments to initiate programs at state and regional level of profile line marking or other fatigue management treatments.

In New South Wales, all the above principles have in general been accepted. Public education and advertising campaigns will continue to be used to ensure that drivers are aware of the dangers of driver fatigue over long and short distances, and what is needed to prevent it.

The Government will continue to work with the community and sponsors to improve the provision and operation of Driver Reviver sites throughout NSW, to encourage motorists to stop and take a break.

To help reduce long distance driver fatigue for both heavy and light vehicles, the Government will extend its program of building and upgrading rest areas across NSW, and investing in public education and information such as travel maps showing rest areas. Rest areas will be strategically located along key travel routes to provide drivers with opportunities and encouragement to break their journey at least every two hours. The Government will work with the trucking industry, drivers and the Transport Workers' Union to ensure that drivers have safe working conditions and are not required to drive for excessive hours.

5.2.3 Alcohol and drink-driving

The all-pervading, adverse influence of alcohol use on road safety is beyond debate, and has been already established in the present report as an important contributor to deaths among passengers on rural roads. NSW data for all reported road accidents shows that among those accidents for which alcohol involvement was known, it was a contributing factor in 44% of fatal accidents on Thursday, Friday and Saturday night, 21% of all fatal accidents, 9% of injury accidents and 7% of all accidents.

In work done for the 1995 rural road safety conference, it was established that the bulk of the numbers of alcohol-related fatal crashes (with and without speed as an associated contributing factor) occur on roads in non-remote and semi-remote rural locations, with the incidence of alcohol involvement at around 25% to 28%. The *absolute number* of alcohol-related fatal crashes on remote roads is low by comparison, but the *incidence* of alcohol use is very high, at around 54%. Thus, in crashes on roads in remote locations, the incidence of alcohol use is very high indeed, at rates of the kind that were seen long before alcohol countermeasures came to be accepted by the general Australian population.

It was found that 85% of alcohol-related fatal crashes in rural areas occur on roads with a 100 km/h or higher speed limit. However, the incidence of alcohol in individual crashes differs with the speed limit on rural roads, with alcohol being associated with nearly 40% of rural fatal crashes on roads with a speed limit of up to 60 km/h. On roads with higher speed limits, alcohol is found as a causal factor in a lower range, 20% to 27%.

Alcohol is associated with nearly three times as many single-vehicle crashes as multiple-vehicle crashes: it is a factor in 36% of single-vehicle crashes and 13% of multiple-vehicle crashes.

Although absolute numbers are small, it appears to be necessary to target alcohol use among drivers in remote communities. There is no other single activity that would have such an effect on fatal crashes on remote roads.

Ryan et al (1992) found that 30% of the crash-involved drivers in their sample of rural crashes had a BAC of 0.15 or greater, indicating that countermeasures must be developed to address the very heaviest and regular drinkers. However, they did not find that young drivers were either more or less likely to be involved in alcohol-related crashes than average.

In terms of the wider use of alcohol countermeasures, the most cost-effective deployment of enforcement bodies would appear to be on non-remote rural roads. The absolute numbers of alcohol-related crashes are greater on roads in semi-remote locations, but deployment so far from centres of population may dilute the enforcement effort in some areas and may fail adequately to raise the perceived risk of apprehension. The actual extent of this dilution, of course, depends on the characteristics of the specific location; about half of the semi-remote crashes occur on national or state highways, and especially on the more heavily travelled roads would normally be included within existing enforcement areas of activity.

Although most alcohol-related rural crashes occur in 100 km/h+ speed zones, alcohol is associated with a very high proportion of fatal rural crashes in 60 km/h zones and both educational and enforcement activities are likely to bear dividends close to population centres. Indeed, as a general rule, countermeasures that depend on traffic law enforcement will tend to become less effective and more expensive the further the distance from centres of population.

In its "Road Safety 2010" framework document, the NSW Government established its commitment to continue its efforts in this important field, and as an example has increased penalties for drink driving. Police may confiscate the vehicle keys of drink drivers. Trials of ignition interlock devices are being undertaken. Random breath testing is an integral part of enforcement activities. The clear difficulty is extending these efforts to rural and remote communities, and targeting young drivers for whom alcohol use and driving are recreational activities that are intimately woven together.

5.2.4 The effect of passengers on crash risk and driver behaviour

Systematic application of principles and plans such as those set out above can be expected to lower the risk to young passengers who are riding – as is common – with young drivers. There may also be some scope for enhancing road safety through the direct influence of passenger behaviour, and if passengers can play a positive role in influencing the behaviour of the driver to enhance both driver and passenger safety, then identifying the ways in which this can be achieved through an understanding of the behavioural mechanisms would provide an additional strategy for future road safety campaigns and programs.

This issue has been the subject of recent research (in the context of the ACT, but relevant to any rural areas) by the Monash University Accident Research Centre (MUARC) (Regan and Mitsopoulos, 2001). The centre reviewed the relevant literature, studied statistics on casualty crashes in the ACT, undertook a telephone survey of ACT residents, and set up focus groups to follow up the results of the telephone survey. For complete information on the study the report should be reviewed in full. What follows here is a summary of the centre's findings.

In the literature, there are reports of epidemiological studies which confirm that the risk of drivers being involved in a casualty crash is affected by the presence of passengers. However, it appears that the effect of passengers on driver behaviour depends at least on the age of the driver and the sex of the driver relative to the sex of the passenger. For young drivers at least, the age of the passenger is another factor that has been found to influence what sort of an effect the presence of passengers will have on them. These findings are consistent with the data for New South Wales reported earlier in the present report.

It has been found that the crash risk of young drivers is elevated further when carrying their peers as passengers, but is reduced when carrying an adult or a child as a passenger. The crash risk of older drivers was generally reduced in the presence of passengers. Young male drivers were reported to have a higher crash risk in the presence of passengers than young female drivers, and male passengers were found to place young drivers, male and female, at an even greater risk of a crash.

The *number* of passengers has also been found to influence the direction and magnitude of the passenger effect for young drivers. The fatal crash risk of young drivers was reported to increase with two or more passengers provided the passengers are peers of the young driver. The crash risk of young drivers, male and female, also was shown to increase with each additional male passenger. A beneficial effect of carrying two or more female passengers was observed for young drivers but for female drivers only.

The relationship between the driver and the passenger also affects driver behaviour and therefore, driver and passenger safety. It has been reported that friends or peers as passengers have a generally negative influence on the behaviour of the young driver, particularly the young male driver. The young driver may be more likely to take risks in response to peer pressure. Driver inattention through distraction caused by social interaction among peers may also play a role. In contrast, passengers who are the young driver's parents, children, spouse or partner were found to promote safer driving practices through the young driver's increased sense of responsibility and respect for the life of others. The beneficial effect of passengers on the safety of elderly drivers may result from the passenger warning the driver of hazards.

Regan and Mitsopoulos (2001) report that there are two road safety initiatives currently in place that concern passengers. Both are specifically aimed at dealing with the negative effect of teenage passengers on young novice drivers.

First, New Zealand and 15 US states have a passenger restriction as part of their graduated licensing programs. All jurisdictions with passenger restrictions permit young drivers to carry passengers if the young driver is being supervised by a fully licensed driver who is over the age of 20 or 21. An evaluation of the New Zealand passenger restriction revealed fewer crashes involving passengers among young drivers with a restricted licence, compared with young drivers licensed before the introduction of graduated licensing. The Californian passenger restriction has also been evaluated. Preliminary results have shown a reduction in the proportion of deaths and injuries among teenage passengers.

Passenger restrictions have been criticised on the grounds that rates of compliance might be low, and that compliance will force young (potential) passengers to drive themselves, which could thus increase the total exposure of young people to the risk of a crash. It has been argued, however, that even if all teenage passengers were to comply by driving themselves a large proportion of lives would still be saved each year. Careful modelling of predicted costs and benefits would be required if such a program were to be considered for New South Wales, in view of its (probable) unpopularity among the target groups.

The second initiative, the Norwegian "Speak Out" campaign, was designed to encourage teenage passengers to speak out to their teenage drivers about excessive speeding and other unsafe driving practices. An evaluation showed a reduction in the proportion of fatalities and serious injuries among *passengers* aged 16 to 19 years but not among *drivers* aged 16 to 19 years. It is possible that the effect of the campaign was to discourage passengers from driving with drivers who did not act on their advice to drive more safely.

A third initiative, the Transport Accident Commission of Victoria's "*If you don't trust the driver, don't get in*" campaign was aimed at young passengers and was an advertisement televised in Victoria for a period in the late 1990s. It was designed to make young passengers realise that they have a choice, and that they do not have to travel with drivers whose responsibility or judgment they question.

As a result of their research, MUARC made several recommendations for the development of further countermeasures. To assist in this process, the report's authors convened a discussion among a small group of experienced and respected Melbourne-based road safety researchers and practitioners. An integrated package of recommended countermeasures for the ACT were derived from the meeting and were categorised as follows:

Promotion: aimed at raising community understanding of the influences that passengers have on driver behaviour, and at empowering passengers to speak up if they feel that the driver is compromising their safety.

Education: educational materials and programs to reiterate the key messages of any promotional campaign.

Training: enhancing communication and teamwork between drivers and passengers.

Licensing: possible incorporation of information on the influence of passengers on driver behaviour and safety into the licensing system; consideration of a passenger restriction for newly licensed drivers.

Enforcement: possibly doubling demerit points for offences by young drivers when carrying passengers.

Research: necessary before the recommended countermeasures can be fully developed and implemented, and to quantify the costs and benefits of the proposed countermeasures.

Both the mass data reviewed earlier in this report, and the detailed research carried out by MUARC, have established that the relationship between the driver and the passenger(s) is an important factor in determining the incidence of fatalities among young people on rural roads, and this is a field in which there may be scope for innovation.

5.2.5 The use of seat belts

In the data section of the present report, it was established that an identifiable minority of young passengers in rural areas were not wearing a seat belt when the vehicle crashed, with the proportion being around 20% in the case of fatally injured young passengers. Attempting to ensure that all occupants of all vehicles in the country are properly restrained is a vitally important countermeasure activity.

This is well recognised by State and Territory authorities, and Austroads has recently published the results of a contracted investigation into seat belt and restraint use on remote area roads (Austroads, 2001a). The following tasks were undertaken:

1. A review of published literature examining seat belt use and related issues.
2. An analysis of crash statistics from Western Australia, New South Wales and the Northern Territory.
3. A series of focus group discussions and in-depth interviews in remote areas, targeting those who regularly drive without wearing a seat belt.

The work confirmed that non-users of seat belts are over-represented in crashes, that is they are more often involved in crashes than would be expected from surveys of restraint use in the population. Non-users are also over-represented in fatal or serious injury crashes compared with all crashes. The risks associated with non-use of restraints (increased injury) are compounded by the findings that suggest that drivers and passengers who travel unrestrained are also more likely to be engaged in other high risk behaviours, such as speeding or driving with a high level of alcohol in the blood. Therefore, it may be concluded that those who choose not to use seat belts are the individuals who might most benefit from their protection.

From the available literature, the study concluded that a combination of education, enforcement and incentives can be effective in improving seat belt wearing rates. Research conducted in the Western Region of New South Wales (which contains both rural and remote areas) has suggested that enforcement may be effective in encouraging people to start wearing seat belts, and that education on the safety benefits of seat belts may sustain their use. British research suggests that educating people on the dangers that unrestrained passengers pose to other occupants of the vehicle can be an effective way of improving passenger restraint use rates.

It was reported that crash statistics from New South Wales, the Northern Territory and Western Australia could be summarised by the following points:

- Overall, the proportion of unrestrained crash casualties was constant over time. In remote areas, the proportion was much higher than in metropolitan or rural areas. A higher proportion of casualties not wearing seatbelts than casualties wearing seatbelts received serious injuries.
- Male crash casualties were less likely to be wearing a seat belt than females.
- The lowest seat belt wearing rate amongst crash casualties was found for the age groups 0-2 and 8-16 years. Casualties aged over 60 had the highest seat belt use rate.

In qualitative research undertaken by the Austroads team, they conducted focus groups and in-depth interviews with residents of remote Western Australia and the Northern Territory. Results of the qualitative research suggested that some programs that might be successful in encouraging seat belt use were as follows:

- Signage, particularly on remote area highways, reminding road users to "buckle up".
- Community based campaigns aimed at parents (who often did not correctly use child restraints).
- Continuous reporting of road safety issues in the local media (local incidents and broader research findings).

- Increased enforcement, coupled with publicity to increase the perceived risk of being caught without a seat belt.

Restraint use could be modelled into six categories based on attitude towards seat belts (positive or negative) and seat belt use (always wear, sometimes wear or never wear). Different interventions were recommended for individuals in each of the six groups. Those who have a positive attitude and always wear their seat belts should receive "reinforcement" to encourage their continued use. People who have a positive attitude but sometimes or never wear seat belts should be "motivated" to improve their behaviour. For those people who always or sometimes wear seat belts but have a negative attitude, a "rationalisation" approach was seen to be appropriate (education on safety benefits) coupled with enforcement. Road users with a negative attitude who never wear seat belts require a "confrontation" approach, to attempt to alter key beliefs about seat belts.

The group recommended that the primary target audience for advertising and education interventions should be those people with a positive or negative attitude and who use restraints "sometimes". The focus should be on converting negative attitudes to positive and then reinforcing the desired behaviour.

Some specific points for advertising and education campaigns would be as follows:

- Highlight the need for seat belts, even at low speeds (for example, through demonstration with crash test dummies).
- Reinforce the fact that that crashes can happen at any time.
- Remind country people that crashes often happen close to home.

In addition, involvement of the local media, greater provision and access to information and school-based projects would assist in providing the additional support to the overall campaign.

5.2.6 The use of child restraints

Younger children who are killed as passengers in the country are most likely to have been riding with their parents and carers. The youngest passengers are relatively likely to have been in a car driven by a mature female. What is alarming is that several of the very youngest passengers, aged under five years, have been killed in NSW while not using any kind of restraint.

It is essential that parents and carers in the country accept and universally employ the most appropriate restraints for children of various ages. The MAA, with the RTA and the NRMA, have been very active in promoting the use of child restraints in the State, including sponsoring in-depth research into crashes involving children and supporting the development of safer restraints through the Child Restraint Evaluation Program and consumer education. It may be that some of these efforts have not struck a responsive chord in rural and remote areas, and that there is a need which requires filling in that regard.

Many of the approaches recommended in the Austroads review for seat belts generally (see above) would also be relevant in the case of child restraints.

5.3 Pedestrian deaths and injuries

Pedestrian deaths are not as much of a problem in rural regions as they are in urban areas, for obvious reasons of exposure. As already established, the great majority of pedestrian casualties

in the country occur within 60 km/h limits, with about half of young pedestrian casualties occurring on a two-way undivided street.

Technological approaches to reducing pedestrian casualties are part of the NSW Government commitment to reducing pedestrian casualties, but resource priorities will probably mean that most of these approaches will have to be applied in urban rather than rural regions.

A great deal will necessarily depend on the active involvement of local communities, including local governments, in association with the move in country regions to the adoption of 50 km/h speed limits in built-up areas, 40 km/h school zones (or 60 km/h in the country where there is a higher standard speed limit), and the *Sharing the Main Street* program for improved safety in shopping precincts.

5.4 Cyclist deaths and injuries

Young male cyclists remain an important target group for countermeasures in the country, with the most important single measure still being the use of safety helmets. Teenage and adolescent boys are arguably less likely to be wearing safety helmets in lightly-enforced rural regions than in major urban centres, where it is known that helmets are often not worn, and when they are, they are often not correctly fastened.

The MAA and other authorities have already and are still very closely involved with promoting bicycle helmet use, especially among young people, and it is important that these endeavours continue (see for example Henderson, 1995). Again, it will be local, concentrated tightly focused programs and activities that are most likely to raise the general level of helmet wearing among the young.

Not only does the general wearing of safety helmets require constant reinforcement, but also the *correct* wearing of helmets requires promotion. Incorrect wearing in New South Wales is well documented, and may be more prevalent in rural than urban areas through local difficulties in enforcement.

5.5 Vehicle safety

It is an unfortunate reality that the type of vehicle being driven and used by young people in rural and remote regions is likely to be less safe than the typical vehicle used in urban areas. Apart from a tendency for vehicles to be older, there is a very wide use of light utility vehicles and four-wheel-drives that do not behave to protect their occupants in crashes as well as newer, conventional passenger cars. Older vehicles are over-represented in injury crashes, with the risk of injury in a pre-1970 car being on average about double that in a modern car.

Nevertheless, with time, both mandated and other safety features now becoming commonplace in new cars will filter into the kind of fleet that is driven by the young, including young males. Consumers and now more aware of the importance of safety in passenger cars, with knowledge and awareness being promoted by programs such as the Australian New Car Assessment Program (ANCAP).

Where parents and carers are purchasing cars for young people, or helping them to make the choice, they should be helped to understand that the newer the car and the larger the car, the better.

5.6 Road design and traffic management

5.6.1 Speed management

The 1995 Rural Road Safety Action Plan called for rationalisation of speed limits on rural roads to provide greater consistency for similar conditions and raise the likelihood of compliance. The RTA is presently undertaking a review of speed zoning, speed limits and signage practices in NSW. The objective of the project is to provide a revised set of guidelines incorporating all aspects of speed zoning, speed limits and signage, which reflect the changed road environment, driver needs and behaviour and are consistent with international best practice. An extensive consultative process with internal and external stakeholders, in addition to the general community, has been undertaken. This review is being undertaken in consultation with a *Speed Limit Zoning Advisory Group* comprising representatives from the NRMA, the NSW Police Service, the Institute of Public Works and Engineering Australia (IPWEA) and Local Government and Shires Association (LGSA). The RTA has also formed two internal Working Groups to identify ongoing issues within metropolitan and rural areas, and to oversee the implementation of review recommendations.

Results from this extensive consultative process, combined with the outcomes of a local and international literature review and the expert input of both ARRB Transport Research and the *Speed Limit Zoning Advisory Group*, will form the basis for a new set of Speed Zoning Guidelines "owned" by all stakeholders and the general community.

5.6.2 Design, construction and maintenance of rural roads

The issue of the standard of construction and maintenance of rural roads, especially local roads constructed in the 1950s and 1960s, is receiving government attention at both national and state level. Many rural roads are reaching the end of their economic lives at a time when tonnage being carried is increasing, yet funding through local councils is contracting through declining populations. Most rural councils spend between 20% and 40% of their revenues on roads. Crash risk is directly related to road standard. However, there is currently little known about the condition and use of the local road network in any systematic way (Austroads 1997).

The provision of low-cost safety improvements could result in major benefits. The features regarded as most important are those associated with safe driving: signing, centrelining and edge marking, shoulder sealing and maintenance, the provision of guide posts and reflectors, overtaking lanes and intersection improvements.

The most numerous fatal crashes on rural roads are, in the case of single-vehicle crashes, driving off the road and then overturning or hitting a roadside object. Countermeasures must continue to be directed at the roadsides in order to maintain proper tracking and attention, including delineation lines and posts, and audible warning strips. Much previous work has identified the cost-effective nature of attending to the removal of unyielding roadside obstacles.

In multiple-vehicle crashes the crashes are predominantly head on, and are rarely associated with overtaking. Many such crashes are "unexplained", and are arguably related also to alcohol use, fatigue-associated loss of concentration and attention, and in many cases to loss of control on the nearside shoulder before crossing back into the road in the path of oncoming traffic. Few occur at intersections except close to towns and cities. Although these "accidents" have a strong behavioural causal background, therefore, it is still possible for road builders (including local councils) to prevent crashes and minimise the consequences of fallible human behaviour, subject to available resources.

It is axiomatic that the "safer" the roads, the lower the crash rate. However, to lower the crash rates on roads that are lightly travelled costs as much as for other, busier roads, and doing so makes no appreciable difference to the total road toll. The task, therefore, is to apply the available resources with greatest efficiency, but it is beyond the scope of this paper to canvass the complex issues that are involved in doing so.

Similar attention has been paid in recent years to rural towns, with environmental adaptation leading to a safer and more attractive environment for those who live in the country. Zones near population centres are open to countermeasures that benefit very many people in rural areas, and measures which have been identified as effective in these town and city approaches include the provision of acceleration and turning lanes, better delineation of curves, improvements in the sealing of shoulders, and better placement or protection of utility poles.

"Forgiving" roadside concepts and roadside improvements in general are stressed because they can significantly reduce the severity of crashes. There is very high potential for improving overall safety by treating or removing roadside obstacles. Obstacle-free zones of between four and 10 metres are desirable if the road geometry and right-of-way will allow it.

Because physically separating opposing traffic is a rather drastic and often impractical approach, the concept of conflict-free overtaking opportunities is one advantageous alternative. In addition, the combination of increasing lane width and shoulder width is the most effective approach for preventing a variety of crash types.

So-called "intelligent" transport systems (ITS) will no doubt have a role to play in reducing deaths among young people on rural roads in the future. Indeed, without being specific to rural areas, the potential benefits from ITS for young drivers is already the subject of research in Australia by motor vehicle manufacturers, universities and other groups, many working under the auspices of ITS Australia.

Although intelligent transportation systems are promising, the full safety potential of ITS can be realized only through research that addresses the costs of these systems, specific technical issues, the human-machine interface, and institutional and political constraints. Nevertheless, a host of low-cost ITS measures that will be ready for deployment within the next few years could help to reduce the principal crash types on rural roads. Because excessive speed is a major contributor to rural road crashes, the paramount ITS solutions are speed control technologies such as speed advisory systems and adaptive cruise control. Other near-term, low-cost measures include guiding lights and systems to monitor the driver and to warn of an upcoming intersection. Applications such as smart seat belts, smart air bags, and vehicle data recorders will be broadly available and can lessen the rural road safety problem. Decisions to apply higher cost measures must be made on a case-by-case basis.

Identifying the location of a crash is one of the key problems in responding to rural road crashes. There are several technological options to improve the situation. These options include improving road and milestone identification schemes, expanding the use of the global positioning system, and exploring possibilities for automated crash detection. A driver, passenger, or observer with a mobile telephone can help police and ambulance centres by providing information about the crash and by directing mobile units more rapidly to the crash location.

5.7 The importance of rural communities

In several parts of this report, attention has been drawn to the importance of local efforts and local communities. Most drivers involved in fatal crashes on rural roads are rural residents. Because the drivers in these crashes are generally familiar with the roads on which they are

driving, this drives home the important fact that the rural road safety problem is very much a local problem that deserves close attention from local authorities and residents.

This is well recognised by authorities in New South Wales, as manifest in the RTA Country Road Safety Program. Reference has already been made to the "Testimonials" campaign, which was designed to address and counter some ill-founded but strongly-held opinions on road safety among country residents. In country areas, without the support of country communities and their ownership of both road safety problems as well as their solutions, little progress will be made towards reducing the upward trend seen recently in the rural road crash rate (Wall, 2000).

The 1995 Rural Road Safety Action Plan stressed this. It called for localisation of the content of generic mass media education programs and make them available to relevant local communities. Special attention should be given to fatigue, alcohol use and failure to wear seat belts, which is consistent with the approaches relevant to young people that are highlighted in the present report.

It is suggested that the involvement of local communities could be sought along the following lines, all of which have clear implication for youth road safety:

- Promote greater involvement of rural shires and councils and their local communities in defining local road safety issues and developing partnerships to address them.
- Assist local authorities in the detailed analysis of factors impacting on local road safety, and in the development of action plans to target problems.
- Establish information programs to disseminate information to councils and local communities about successful local initiatives and local programs, as well as those found not to have been effective.
- Provide training opportunities and guidance for local government on best practice in application of road safety countermeasures.
- Formulate special arrangements for Aboriginal communities, particularly in remote areas, ensuring representation in the planning, implementation and evaluation of programs to improve safety for them.

The NSW Local Government Road Safety Program is expanding, particularly in rural NSW, and it is anticipated that the community-based program will continue to make a substantial contribution to the understanding of and response to road safety issues in communities across the State.

In the most remote areas, unique problems are faced by Aboriginal communities. Relevant programs should be developed in consultation with the communities, and extend to the design, implementation, and evaluation of local road safety programs. The Rural Road Safety Action Plan suggested the appointment of Aboriginal and Torres Strait Islander road safety officers to appropriate areas, with appropriate training that will enable them to become leaders in the promotion of road safety for their communities.

5.8 Trauma, medical and retrieval services

Trauma care in rural areas is especially difficult because of the following factors:

- rural crashes involve higher speed and are therefore more severe;
- the time taken for emergency services to be notified and to reach the site is greater;
- the standard of initial care at the site is lower as rural ambulances are less well equipped to deal with severe trauma;
- rural hospitals are less well equipped to provide appropriate care to severe trauma cases.

Coordination among all services, medical and non-medical, is essential to ensure that there is effective linkage between acute medical care, family support and ongoing rehabilitation and return to community life.

In the 2001 National Road Safety Strategy, it is stressed that while prevention will always be the ideal solution to the problem of road trauma, an effective trauma care system is essential to treat the injured. The physiological consequences injuries sustained in road crashes need to be reduced through more rapid notification of crashes and provision of primary treatment, and through more effective medical and rehabilitation services. All health care providers should therefore be encouraged to further improve their casualty treatment operations and distribution of trauma treatment centres to reduce the disabling consequences of trauma and to conserve life.

6 AN INTERNATIONAL VIEWPOINT: THE OECD AND RURAL ROAD SAFETY

The OECD regards rural road safety as a global challenge, and is urging member nations to set down national policies and targeted programs – which, of course, Australia has already done. In 1968, the OECD created the Road Transport Research (RTR) Program to provide regular interaction and exchange among national road researchers from OECD member countries. The RTR Steering Committee created an expert group, composed of representatives from 14 countries, to examine the rural road safety problems in the OECD countries and to propose strategies to reduce deaths and injuries resulting from traffic crashes on these roads (OECD, 1999).

One of the first tasks of the expert group was to quantify the rural road safety problem. The group was able to determine that more than 75,000 people are killed each year on rural roads in OECD countries. Rural road crashes result in more than 60% of all road fatalities in OECD countries, which is consistent with the Australian figures described in the present report. In the United States, the fatality rate per 100 million vehicle-miles travelled in rural areas is more than twice the rate in urban areas. This fact corresponds to OECD findings that the risk of being killed on rural roads is generally higher per kilometre driven than on urban roads, and four to six times higher than on freeways, and that rural road crashes are generally more severe than crashes on urban roads. A main conclusion from the OECD analysis is that the rural road system itself has inherent characteristics that significantly contribute to the high number of crashes and the high risks associated with rural road travel.

The expert group recommended that each country should establish a specific rural road safety strategy that includes short-term, medium-term, and long-term actions. Such a strategy should ensure that safety is considered at every stage of road development — from planning through design and construction to operations and maintenance. To ensure that the strategy is comprehensive in its vision and approach, the development and implementation of the strategy should involve all organizations and individuals who address road hazard factors, including the road, the driver, and the vehicle. The expert group also identified and recommended nearly 50 individual safety measures in four areas - infrastructure, enforcement, trauma management, and ITS - that can make a difference in improving rural road safety. These safety measures should be included in action plans developed in the OECD countries. Most, if not all, of the measures are covered by Australian programs, and many of the more important to NSW and the rest of this country have been reviewed in the present report.

7 SUMMARY

7.1 Background

In the 1999-2000 report of the Child Death Review Team, it was recommended as follows:

That the Motor Accidents Authority, in consultation with other relevant agencies, investigate deaths of children and young people involving motor vehicles. This investigation should focus on fatal incidents that occur in regional and remote locations and continue to develop a range of practical measures to reduce the number of deaths of children and young people involving motor vehicles across NSW.

This report has been prepared as the first step in a response to that recommendation.

7.2 Data

More than 75,000 people are killed each year on rural roads in OECD countries. *Rural* road crashes result in more than 60% of all road fatalities in OECD countries, which is consistent with Australian figures reviewed for this report.

Road crash statistics for Australia have shown that since the early nineties, fatal crashes on open rural roads have been declining at a slower rate than in urban areas. This trend is confirmed for New South Wales. Since 1996, while the number of people killed on roads in metropolitan areas has continued to fall (although at a slower rate than through the 1980s), the number of people killed on country roads has started to rise again.

Very nearly half of all fatal crashes occur on rural roads. A further 14% of fatal crashes occur in country towns. Thus, about six out of ten fatal crashes occur in what we might call "rural regions". If only non-pedestrian crashes are taken into account, the "rural" percentages are even higher.

Drivers resident in country NSW are, on average, 50% more likely than metropolitan resident drivers to be involved in a fatal crash. It is mostly country people who die on country roads. Most rural crashes involve people who live and work in the region they crash, and who are familiar with the roads concerned.

In regard to deaths and injuries among children and young people, in New South Wales in the year 2000 there were 3,773 casualties aged 17 years or less. Of these, 66 were fatally injured in 139 fatal crashes. Among children and young people killed in road crashes in NSW, over 60% (40 out of 66) die in country regions. Among these fatalities, 36.4% die in "country urban" areas, with a speed limit of 80 km/h or less, and 24.2% in other country areas.

Among the 40 (approximately two-thirds of all fatalities) who died in country regions in the year 2000, 20 (50%) have been passengers in motor vehicles. The absence of any reported fatalities among pedal cycle riders of the subject age group is worth noting.

For rural area crashes involving passengers aged under 18 years, 64 of them were killed, as opposed to 36 in urban area crashes. Further, in both urban and rural areas, far more were killed in single-vehicle crashes than in multiple-vehicle collisions. Single-vehicle crashes are prevalent in fatal rural road crashes because all three elements of the family of hazardous factors - driver behaviour, the vehicle, and the road (infrastructure) - contribute to these crashes and increase their severity.

More than half of all the country passenger casualties in the 11-17 year age group have been riding in motor vehicles driven by the youngest group of drivers, aged 20 or less. In contrast, injured passengers in the younger age groups are far more likely to have been riding in motor vehicles driven by more mature drivers. Thus, in terms of risk, passengers aged 11-17 are probably more likely to have been riding with their peer group, and younger children with their parents and carers.

In about half the country crashes in which children and young people were killed or injured as passengers, the car had run off the road, either from the same side or the opposite side. There is, however, a substantial difference in the patterns between younger and older drivers. Drivers aged up to and including 25 years are much more likely to have injured their young passengers in run-off-road crashes. Older drivers are relatively more likely to be involved in crashes involving vehicles moving in the same direction and in opposite directions.

7.3 Young drivers and their passengers

It is axiomatic that for there to be casualties among children and other young people riding as passengers, then someone has to be driving. It is clear from the data reviewed in this report that the drivers who are most likely to have been behind the wheel in crashes that result in such casualties are themselves young, and predominantly male. The issue of the young (male) driver "problem" is central to reducing deaths and injuries among children and young people in rural and remote areas.

The "problem" of the young driver, and specifically the young male driver, is of course not one that is confined to country roads and country towns. The NSW policy framework document, Road Safety 2010, points out that while 17 to 25 year old drivers hold 16% of licences, they account for 26% of all drivers involved in crashes resulting in injury or death. Driver licensing administrations throughout the developed world recognise that the transition between novice status and maturity carries with it several hazards associated with attitudes, behaviour, experience and skills.

Probably the most important single initiative of recent years in New South Wales is the introduction and implementation of a formal graduated licence scheme, the underlying aim of which is to ensure that young drivers gain their experience in a relatively safe environment and under continual monitoring.

7.4 Inappropriate speed

Inappropriate and excessive speeds are important contributing factors in rural road crashes because rural roads generally have inconsistent design characteristics over their total length as well as problems in individual design elements. These inconsistencies occur on roads whose alignment and use evolved over time rather than roads specifically designed for their current use. Because of these inconsistencies, drivers must constantly adapt their speed to account for regularly changing situations and circumstances that increase the opportunities for human error and lead to higher crash risks.

Managing speeds and reducing the incidence of excessive speeding depends on a mix of countermeasure activities, including the following:

- technology (for example, speed cameras);
- a mixture of covert and overt enforcement;
- targeted intensity of enforcement;

- monitoring performance and outcomes for speeding countermeasures;
- adjustment of tolerance levels;
- a fine and demerit point system which reflects community expectations;
- public education based on good theoretical models.

All the above principles should be tightly focused on rural problems and rural drivers. In relation to enforcement, the NSW Government has recently doubled the penalties for exceeding the speed limit by 30 km/h or more. It has introduced other initiatives that target speeding, such as double demerit points for speeding over holiday periods. Under the "Road Safety 2010" framework, educating the community about the risks and consequences of speeding will continue to form a major part of the NSW speed management program. These activities are coordinated with highly visible police enforcement.

Under the RTA Rural Road Safety Public Education Campaign, the 'Testimonials' education program was designed as an umbrella advertising campaign to break down some of the resistance of rural communities to road safety messages, including those relating to speed. In the commercial, people living across country NSW - not actors - were chosen to speak about the loss of a relative, friend or mate in a country road crash. Post-campaign research indicated a significant shift in the attitude of country drivers towards the relevance of road safety advertising to country drivers as well as a greater awareness of the prevalence of country drivers involved in fatal crashes on rural roads. A "Country Speeding Campaign" was then launched in 2000 as a follow up to 'Testimonials'. This "Mates" radio and television campaign focused on speeding, especially around curves in 100 km/h speed zones.

In addition to its public education campaigns, the RTA is increasing the number of fixed digital speed cameras across rural NSW, and expanding the number of 50 km/h urban speed limits in country towns. Further, the speed limit zoning of rural roads is under review by the RTA and other authorities, and this process, combined with the outcomes of a local and international literature review and the expert input of both ARRB Transport Research and the Speed Limit Zoning Advisory Group, will form the basis for a new set of Speed Zoning Guidelines "owned" by all stakeholders and the general community.

7.5 Young driver fatigue

The RTA estimates that driver fatigue is a factor in at least 20% of fatal crashes in NSW. There is no doubt that fatigue – probably more correctly defined as sleepiness or drowsiness – is a major contributor to road trauma in rural areas, and significantly affects young people. There are three priority areas for countermeasure activity:

- Educate young males (ages 16 to 24) about drowsy driving and how to reduce lifestyle-related risks.
- Promote shoulder rumble strips as an effective countermeasure for drowsy driving; in this context, raise public and policymaker awareness about drowsy-driving risks and how to reduce them.
- Educate shift workers about the risks of drowsy driving and how to reduce them.

7.6 Drink driving

Alcohol use remains a major problem for road safety, and is arguably a worse problem in the country. The bulk of the numbers of alcohol-related fatal crashes (with and without speed as an associated contributing factor) occur on roads in rural locations, with the incidence of alcohol involvement at around 25% to 28%. The absolute number of alcohol-related fatal crashes on remote roads is low by comparison, but the incidence of alcohol use is very high, at around 54%. Thus, in crashes on roads in remote locations, the incidence of alcohol use is very high indeed, at rates of the kind that were seen long before alcohol countermeasures came to be accepted by the general Australian population.

In terms of the wider use of alcohol countermeasures, the most cost-effective deployment of enforcement effort would appear to be on non-remote rural roads. The absolute numbers of alcohol-related crashes are greater on roads in more remote locations, but deployment so far from centres of population may dilute the enforcement effort in some areas and may fail adequately to raise the perceived risk of apprehension. The actual extent of this dilution, of course, depends on the characteristics of the specific location; about half of the semi-remote crashes occur on national or state highways, and especially on the more heavily travelled roads would normally be included within existing enforcement areas of activity.

7.7 The influence of passengers on driver behaviour

There may be scope for enhancing road safety through the direct influence of the behaviour of young passengers on young drivers. If passengers can play a positive role in influencing the behaviour of the driver to enhance both driver and passenger safety, then identifying the ways in which this can be achieved through an understanding of the behavioural mechanisms would provide an additional strategy for future road safety campaigns and programs.

7.8 Seat belts and child restraints

Survival of passengers (indeed, all occupants) of a motor vehicle in a crash depends fundamentally on the proper use of restraint systems. There is observational evidence that in the country, vehicle occupants – especially in rear seats – are less likely to wear seat belts than in other parts of the State. Among the 20 fatally injured young country passengers, three out of 13 (23%) in the 5-17 year age groups were not wearing available adult belts, which – even given the small numbers - confirms other work that indicates that fatally-injured occupants are less likely to have been wearing seat belts than non-fatally-injured occupants.

The ATSB Fatal File for 1998 showed that in urban areas, 13 out of 30 passengers in the 0-17 age group (43%) were not wearing a seat belt, and in rural areas 21 out of 48 (44%) were unrestrained. (The figures are of the same order of magnitude for older passengers.) Several of the very youngest passengers, aged under five years, were killed while not wearing any kind of restraint.

Crash statistics from New South Wales, the Northern Territory and Western Australia can be summarised by the following points:

- The proportion of unrestrained crash casualties is rather constant over time. In remote areas, the proportion is much higher than in metropolitan or rural areas. A higher proportion of casualties not wearing seatbelts than casualties wearing seatbelts received serious injuries.

- Male crash casualties are less likely to be wearing a seat belt than females.
- The lowest seat belt wearing rate amongst crash casualties was found for the age groups 0-2 and 8-16 years. Casualties aged over 60 had the highest seat belt use rate.

A combination of education, enforcement and incentives can be effective in improving seat belt wearing rates. Research in New South Wales (in both rural and remote areas) has suggested that enforcement may be effective in encouraging people to start wearing seat belts, and that education on the safety benefits of seat belts may sustain their use. British research suggests that educating people on the dangers that unrestrained passengers pose to other occupants of the vehicle can be an effective way of improving passenger restraint use rates.

The following countermeasures have the most promise:

- Signage, particularly on remote area highways, reminding road users to "buckle up".
- Community based campaigns aimed at parents (who often did not correctly use child restraints).
- Continuous reporting of road safety issues in the local media (local incidents and broader research findings).
- Increased enforcement, coupled with publicity to increase the perceived risk of being caught without a seat belt.

Younger children who are killed as passengers in the country are most likely to have been riding with their parents and carers. The youngest passengers are relatively likely to have been in a car driven by a mature female. What is alarming is that several of the very youngest passengers, aged under five years, have been killed in NSW while not using any kind of restraint. It is essential the principles suggested above for adult belt wearing are applied to the correct use of child restraints.

7.9 Young pedestrians and pedal cyclists

The incidence of pedestrian deaths and injuries among children and young people is overwhelmingly an urban problem. Even in country areas, the great majority of pedestrian casualties occur on roads with a speed limit of 60 km/h or less. The general picture is very similar to that for child and young pedestrians, with only a very few being injured on roads where the speed limit exceeds 60 km/h.

Pedestrian deaths are not as much of a problem in rural regions as they are in urban areas, for obvious reasons of exposure. As already established, the great majority of pedestrian casualties in the country occur within 60 km/h limits, with about half of young pedestrian casualties occurring on a two-way undivided street.

Technological approaches to reducing pedestrian casualties are part of the NSW Government commitment to reducing pedestrian casualties, but resource priorities will probably mean that most of these approaches will have to be applied in urban rather than rural regions.

Injured young pedal cyclists are overwhelmingly male, with a steadily increasing trend in numbers up to the early teen years, with some decrease in numbers after that.

A great deal will necessarily depend on the active involvement of local communities, including local governments, in association with the move in country regions to the adoption of 50 km/h speed limits in built-up areas, 40 km/h school zones (or 60 km/h in the country where there is a higher standard speed limit), and the Sharing the Main Street program for improved safety in shopping precincts.

7.10 Roads and roadsides

The provision of low-cost safety improvements could result in major benefits. The features regarded as most important are those associated with safe driving: signing, centre-lining and edge marking, shoulder sealing and maintenance, the provision of guide posts and reflectors, overtaking lanes and intersection improvements.

"Forgiving" roadside concepts and roadside improvements in general are stressed because they can significantly reduce the severity of crashes. There is very high potential for improving overall safety by treating or removing roadside obstacles. Obstacle-free zones of between four and 10 metres are desirable if the road geometry and right-of-way will allow it.

7.11 The importance of local communities

It is suggested that the involvement of local communities could be sought along the following lines, all of which have clear implication for youth road safety:

- Promote greater involvement of rural shires and councils and their local communities in defining local road safety issues and developing partnerships to address them.
- Assist local authorities in the detailed analysis of factors impacting on local road safety, and in the development of action plans to target problems.
- Establish information programs to disseminate information to councils and local communities about successful local initiatives and local programs, as well as those found not to have been effective.
- Provide training opportunities and guidance for local government on best practice in application of road safety countermeasures.
- Formulate special arrangements for Aboriginal communities, particularly in remote areas, ensuring representation in the planning, implementation and evaluation of programs to improve safety for them.

The NSW Local Government Road Safety Program is expanding, particularly in rural NSW, and it is anticipated that the community-based program will continue to make a substantial contribution to the understanding of and response to road safety issues in communities across the State.

7.12 Trauma systems

In the 2001 National Road Safety Strategy, it is stressed that while prevention will always be the ideal solution to the problem of road trauma, an effective trauma care system is essential to treat the injured. The physiological consequences of injuries sustained in road crashes need to be reduced through more rapid notification of crashes and provision of primary treatment, and through more effective medical and rehabilitation services. All health care providers should therefore be encouraged to further improve their casualty treatment operations and distribution of trauma treatment centres to reduce the disabling consequences of trauma and to conserve life.

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