

---

# ROAD SAFETY IN RURAL AND REMOTE AREAS

---

Prepared by: Michael Tziotis and Phil Roper, ARRB Group  
Colin Edmonston and Prof Mary Sheehan, CARRS-Q  
June 2008

---

## 1. A BRIEF STATEMENT OF THE ISSUE

Fatal road crashes in rural and remote areas of Australia and New Zealand are a major cause of road safety concern (Tziotis, Roper, Edmonston and Sheehan, 2006). About 60% of all fatal road crashes in Australia occur on rural roads, while for New Zealand the proportion is higher at 70%. In Australia between 1999 and 2003 there have been about 893 fatal crashes per year (i.e. 17 per week), while in New Zealand there are about 278 fatal crashes per year (i.e. five per week).

## 2. AN ASSESSMENT OF THE ROAD SAFETY ISSUE

### 2.1 Defining rural and remote areas and roads

While definitions of 'rural and remote areas' vary across Australasian jurisdictions, the definition adopted in this publication is based on the Rural, Remote and Metropolitan Areas (RRMA) classification system used by the Australian Government's Department of Health and Ageing (described in Tziotis, Roper, Edmonston and Sheehan, 2006). This system categorises population centres based on their size, access to goods and services and geographical location. Categories 1 and 2 refer to capital cities and other metropolitan areas, while Categories 3 to 7 range from large rural centres through to small remote areas.

'Rural and remote roads' are defined as roads that traverse a road environment with little or no abutting roadside development. As such these roads are either undivided with a speed limit of 80 km/h (which is indicative of sparse roadside development) or all other roads with sparse roadside development that have a speed limit greater than 80 km/h.

### 2.2 Crashes on rural and remote roads

Analysis of crash data from 1999 to 2003, using the above definition of rural and remote roads, revealed that:

- On average in Australia there have been 893 fatal crashes per year (17 fatal crashes per week), while in New Zealand there have been on average 278 fatal crashes (5 fatal crashes per week). These crashes resulted in an average of 1,025 fatalities per year (20 fatalities per week) for Australia and 336 fatalities (6 fatalities per week) for New Zealand.
- On Australian rural and remote roads there have been on average 17,319 non-fatal injury crashes per year (333 non-fatal-injury crashes per week), that resulted in 22,443 non-fatal injuries per year (432 non-fatal injuries per week).
- On New Zealand rural and remote roads there have been 3,110 non-fatal injury crashes (60 per week) that resulted in 5,277 non-fatal injuries (101 non-fatal injuries per week).

- Off-path and same direction (i.e. side-swipe, rear-end and lane change types of crashes) were the main types of crashes on rural and remote roads.

### **3. CURRENT PRACTICES IN AUSTRALASIAN JURISDICTIONS**

The Australian Transport Safety Bureau (ATSB), in coordination with key stakeholder groups, developed the National Road Safety Strategy 2001 – 2010 which contains a range of measures focusing on improving safety in rural and remote areas (Australian Transport Council, 2000). It should be noted that the measures subsequently adopted by each jurisdiction vary in detail to reflect local conditions and priorities.

The National Strategy is supported by a series of two-year Road Safety Action Plans. The most recent plan for 2009 and 2010 has as its centre-piece the application of a Safe System approach to road safety (Australian Transport Council, 2008). The framework that underpins the Safe System approach requires responsible road user behaviours and a transport system that allows for human error by preventing serious injury or death.

In New Zealand, rural and remote safety issues are addressed by regional plans and activity arising from data analyses carried out by Land Transport New Zealand, often in collaboration with local authorities. Annually Land Transport New Zealand produces reports for each local authority highlighting road safety issues that require attention, which include rural and remote safety issues.

There is not a specific focus on rural and remote road safety in New Zealand's Road Safety 2010 Strategy and supporting action plans. There is however, emphasis on issues such as fatigue and speeding which often are key safety problems in rural and remote areas.

## **4. A REVIEW OF THE RESEARCH**

### **4.1 Crash factors**

A review of literature has identified the following at-risk groups and factors that may have contributed to crash occurrence or crash severity in rural and remote areas (Tziotis et al, 2005).

#### ***At-risk groups***

Groups found to be most at-risk of being involved in a crash include:

- local residents
- young male drivers
- truck drivers
- Indigenous people.

#### ***Vehicle crash risk factors***

Vehicles that have relatively high relative crash risks include:

- motorcycles
- rigid and articulated trucks.

**Environmental crash risk factors**

Environmental crash risk factors include:

- road condition (e.g. shoulders, surface, alignment, etc.)
- road design (e.g. divided/undivided, number of lanes, sight distance, delineation, etc.)
- roadside environment (e.g. trees, culverts, embankments)
- speed limits (i.e. inconsistent or inappropriate).

**Behavioural crash risk factors**

Behavioural crash risk factors include:

- inattention
- driving under the influence of alcohol and other drugs
- speeding
- fatigue
- failure to wear seat belts
- failure to wear helmets.

**Post crash risk factors**

Key factors in the severity outcome of road crashes include:

- emergency response and retrieval times
- the level of rehabilitation services available.

**Crash types**

The majority of crashes are:

- single vehicle run-off-road crashes
- head-on collisions
- intersection collisions

## 4.2 Safety measures

The same literature review has also identified a range of safety measures that have the potential to deliver safety benefits in rural and remote areas (Tziotis et al, 2005).

**Measures for safer behaviours of road users**

- The fact 'that rural people die in rural crashes' should be highly publicised.
- Local education campaigns should target local road safety problems and 'at-risk' populations.
- Local communities should be actively engaged in public health decision-making and the subsequent development and distribution of resources/interventions.
- Increased resources need to be channelled into identifying unique road safety problems in Indigenous communities and harness their local knowledge to develop culturally appropriate interventions.

- Ongoing 'Fatal Four' (i.e. speeding, drink driving, fatigue and non-seatbelt wearing), education should complement rural enforcement campaigns.
- Road safety advertising should include explicit coping strategies (decision alternatives) to increase message acceptance and effectiveness.
- Rural enforcement programs, particularly speeding, need to use randomised scheduling or deployment methods to enable low levels of police presence to achieve more widespread coverage of vast road networks.
- A portion of the funds generated from traffic enforcement activities should be earmarked for rural road safety and associated research.
- Road safety training programs for practitioners should be developed and encouraged by Government to ensure the professionalism of the industry.

### ***Road environment safety measures***

- Treatment of crash blackspots.
- Road engineering improvements that include:
  - widening and sealing of road shoulders
  - proving protection around bridges and drains
  - improved delineation (i.e. guide posts, line markings and chevron alignment markers)
  - increased usage of tactile edge lining
  - treatment of roadside hazards (e.g. trees, drains, culverts, steep embankments, etc.). Refer to Part 9: Roadside Hazard Management of the Austroads Guide to Road Safety for more information.
  - provision of more overtaking lanes
  - improved road maintenance practices
  - improved road surfacing
  - improving signage (i.e. advisory and hazard warning signs)
  - improving sight distance at intersections.
- Expansion and improvement of road safety audit systems and the setting of minimum safety standards for rural roads.
- Improved risk assessment and risk management of hazards identified through the road safety audit process using the Road Safety Risk Manager (Road Safety Risk Manager is a relative risk prioritisation tool developed by ARRB for Austroads), will allow for the treatment of deficiencies that pose the greatest risk to road users to be given priority. Taking this approach ensures that the highest crash risk reduction may be achieved for a given budget.
- Consideration should be given to lowering speed limits on open roads.
- Authorities when investigating the safety performance of their road networks should consider reducing speed limits as a safety option. Refer to Austroads Guide to Road Safety: Part 3 - Speed Limits and Speed Management.

### ***Improving medical attention and trauma management***

- Increasing emergency medicine (paramedical) training should be given to rural nurses and GPs who are often the 'first to respond' at rural crash scenes.
- Improving medical and emergency services response times.
- Improving communication links and liaison between rural and regional medical staff and the Government should increase support for localised efforts to develop comprehensive trauma management systems (that include regular audits).
- Research into the effectiveness of rural and remote residents training in first-aid and resuscitation (as part of the driver licensing system) to increase the pool of helpers at rural crash scenes and counter slower response times and resource limitations should be undertaken.
- Future research directions include: an investigation of potential barriers to utilising health care services and rehabilitation in rural areas; and the feasibility of collecting standard data from emergency medical services professionals, to be forwarded to, and managed by, a central agency.

### ***ITS road safety applications***

Intelligent Transport System (ITS) technologies also hold considerable potential for reducing rural and remote area crash frequency and severity. Table 1 shows some of the technologies, either actual or impending, and the associated issues which they might assist in resolving (McCormack and Legg, 1999).

### ***Measures for safe vehicles***

- Electronic Stability Control (ESC) as a standard feature on passenger vehicles
- Further technological features to minimise driver error.

Table 1: ITS applications and their pertinence to rural and remote road safety

Contributing crash factors	Rural safety issue	Possible ITS solutions
Human	Unsafe speed or exceeding speed limit	<ul style="list-style-type: none"> <li>• Speed radar linked to warning sign</li> <li>• Variable speed limits</li> <li>• Photo enforcement system</li> </ul>
	Inattention or sleeping	<ul style="list-style-type: none"> <li>○ ≡ Driver monitoring system</li> <li>○ ≡ Roadway departure systems</li> </ul>
	Judgement errors	<ul style="list-style-type: none"> <li>• Computer designed roadway signs</li> <li>○ ≡ Crash avoidance countermeasures system for older drivers</li> </ul>
	Drug or alcohol	<ul style="list-style-type: none"> <li>• ≡ Ignition interlock with breath analyser</li> </ul>
Road	Weather	<ul style="list-style-type: none"> <li>• Area-wide weather warning systems</li> <li>• Fog, dust or smoke warning systems</li> <li>• Wind gust warning systems</li> <li>• Intelligent road markers with weather sensors</li> </ul>
	Wildlife collisions	<ul style="list-style-type: none"> <li>• ≡ Night vision systems</li> <li>○ ≡ Roadway obstruction detection</li> </ul>
	Work zone	<ul style="list-style-type: none"> <li>• Adaptable variable message signs</li> <li>• Portable work zone safety systems</li> <li>• Work zone intrusion warnings</li> </ul>
	Pedestrian or bicycle involvement	<ul style="list-style-type: none"> <li>• Self-activated warning signs for roads and tunnels</li> </ul>
	Railroad crossings	<ul style="list-style-type: none"> <li>• Train conflict sensors and warning signs</li> <li>○ Communication between vehicles</li> </ul>
	Rural intersections	<ul style="list-style-type: none"> <li>• Approaching vehicle warning sensors and signs</li> </ul>
Vehicle	Truck involvement	<ul style="list-style-type: none"> <li>• Truck classification detectors and warning signs at hazardous locations</li> <li>• Automated commercial vehicle inspection and enforcement programs</li> </ul>
Post-crash	Emergency notification	<ul style="list-style-type: none"> <li>• New technology call boxes</li> <li>○ ≡ In-vehicle mayday systems</li> </ul>
	Incomplete or inaccurate crash reports	<ul style="list-style-type: none"> <li>• Total stationing for crash reporting</li> <li>• Portable computers in police vehicles</li> <li>• Crash reporting systems utilizing GPS and GIS</li> </ul>

• = Application feasible currently or in the near future

○ = Potential future application

≡ = Application from vehicle manufacturers

Adapted from McCormack and Legg (1999)

## 5. POLITICAL, SOCIAL AND OTHER FACTORS

Improving road safety in rural and remote areas poses many challenges to government and the community. The vastness and challenging topographies across these areas increase the level of complexity and cost associated with delivering effective road safety. Substantial investment in infrastructure (i.e. roads, telecommunication networks, medical and emergency services facilities) will subsequently be required to bring about significant reductions in road trauma in rural and remote areas.

The application of ITS technologies provides further opportunities to improve road safety in the medium to long term. Subject to positive evaluations, systems such as the early warning 'mayday' calls which provide early notice to emergency and medical services in the event of a crash and which are currently in use overseas, should be 'fast tracked' in Australasia.

Other key factors common to many rural and remote areas relate to the cultural diversity of communities living in the areas (i.e. differing types of farming communities, Indigenous communities and business communities), all of which add to the difficulties in implementing effective countermeasures.

## **6. CONCLUSIONS**

Safe System principles continue to underpin Australia's approach to road safety improvement.

Improving road safety in rural and remote areas poses many challenges. A safe transport system makes allowance for human error and minimises the consequences: in particular, the risk of death or serious injury.

Roads, vehicles and travel speeds in rural and remote areas should be designed and managed to reduce the risk of crashes, and to prevent serious injury or death to people if a crash does happen. There are limits to the forces humans can withstand in a crash, and limits to the physical energy that can be absorbed by protective systems (such as vehicles and safe road infrastructure). Speed management is a critical factor in limiting the impact energy of crashes.

The steps to achieve these objectives lie across the range of safety measures briefly outlined above.

## REFERENCES

- Australian Transport Council (2000). *The National road safety strategy, 2001-2010*, Australian Transport Council, Canberra, ACT.
- Australian Transport Council (2008). *The National Road Safety Action Plan, 2009-2010*, Australian Transport Council, Canberra, ACT.
- Guide to Road Safety. Part 3: Speed Limits and Speed Management, Austroads, Sydney, Australia.
- McCormack ED and Legg, B 1999. *The contribution of ITS to rural safety: a look at crashes in Washington State*, report WA-RD 460.1, Washington State Department of Transportation, Washington.
- Tziotis M et al (2005). *Road Safety in Rural and Remote Areas*, for Austroads, Sydney, Australia.
- Tziotis M Roper P Edmonston C and Sheehan M (2006). *Guide to Road Safety. Part 5: Road Safety for Rural and Remote Areas*, Austroads, Sydney, Australia.