Risky Areas

30 level crossings

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

Deaths at level crossings

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

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

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

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

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

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

Source: Australian Transport Safety Bureau

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

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

Source: Australian Transport Safety Bureau

Deaths at level crossings average about 12 per year.

Circumstances surrounding level crossing crashes

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

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

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

31 rural areas

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

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

Statistics on rural road crashes are provided in chapter 4.

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

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

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

Why is rural crash risk higher?

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

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

ATSB-sponsored research on travelling speed and crash involvement on rural roads (with speed limits of over 80 km/h) has shown that the risk of a casualty crash increases more than exponentially with increasing free travelling speed above the mean traffic speed. There is a lower casualty crash risk at speeds below mean traffic speed. The crash risk is twice as great at 10 km/h above average speed and six times as great at 20 km/h above average speed. The study also showed that a 5 km/h reduction in speed would lead to a 31 per cent reduction in casualty crashes. Lowering the speed limit to 80 km/h on undivided roads would result in a 32 per cent decrease in casualty crashes.

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

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

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

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

A study of 149 drink-driving offenders in regional Queensland in 1997 found that they were more likely to change their driving habits (such as taking a taxi or travelling with a designated non-drinking driver) than their drinking habits.

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

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

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

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

Source: Australian Transport Safety Bureau

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

Source: Australian Transport Safety Bureau

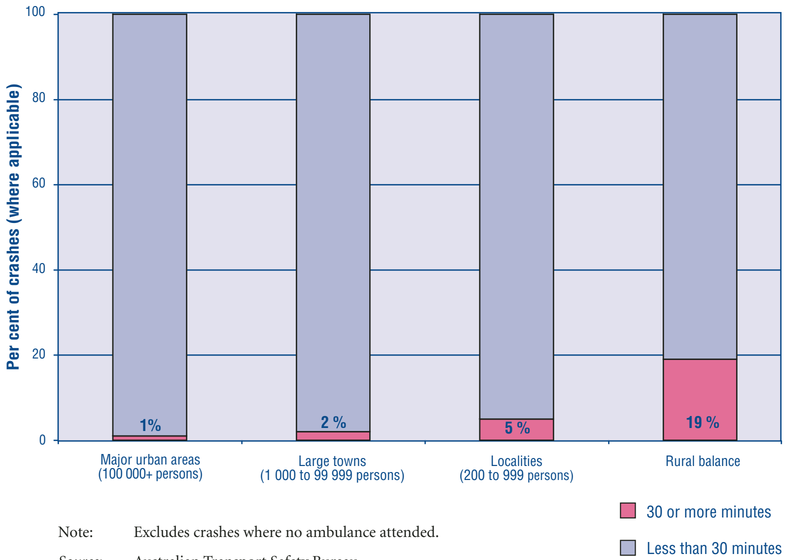
FIGURE 59:
Seat belt use among vehicle occupants involved in fatal crashes, by region of crash, 1997–1999

Source: Australian Transport Safety Bureau

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

Source: Australian Transport Safety Bureau

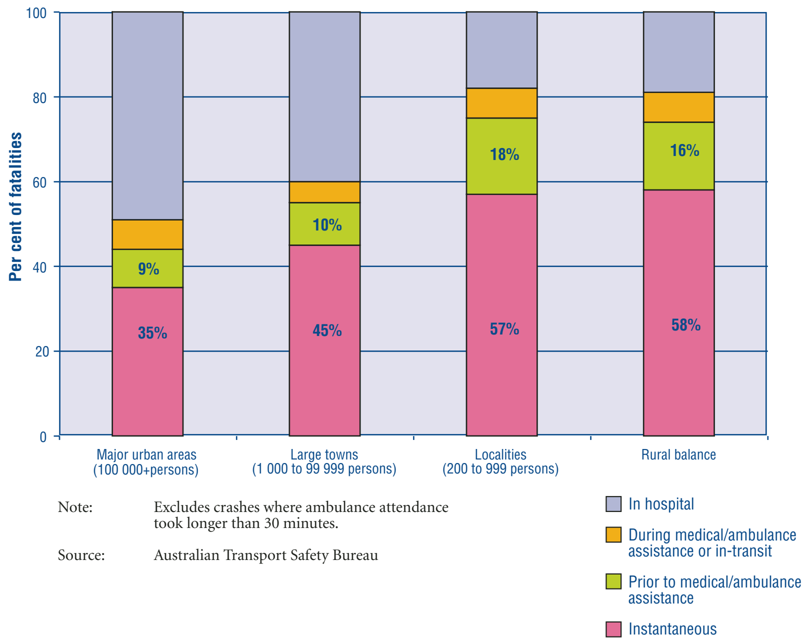
FIGURE 61:
Time for ambulance arrival at fatal road crashes, by region of crash, 1997–1999



Note: Excludes crashes where no ambulance attended.

Source: Australian Transport Safety Bureau

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



Note: Excludes crashes where ambulance attendance took longer than 30 minutes.

Source: Australian Transport Safety Bureau

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

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

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

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

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

Lifestyle and habits: The crash risk of people who live in rural areas can be influenced by lifestyle factors. For example, it is likely that many young people in rural areas learn to drive on farms and rural properties.

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

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

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

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

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

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

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

The increasing use of automatic crash notification (ACN) systems in motor vehicles is likely to reduce emergency services response times and increase the effectiveness of services. These systems use airbag triggering sensors or emergency call buttons to transmit crash data to call centres. Some systems can provide a voice connection through mobile phones that would enable emergency service teams to be better prepared when they reach the crash site.

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

What can be done?

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

The actions proposed in the Plan related to road improvements; public education programmes; involvement of local communities; speed management; management of fatigue; enforcement; trauma services; and addressing the unique problems of remote areas.

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

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

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

32 improving road safety by treating hazardous areas

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

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

Michael Austin, 1966

What is a black spot?

The risk of a road crash is not constant throughout the road network. At certain locations the level of risk is higher than the general level of risk in surrounding areas. Crashes will tend to be concentrated at these high risk locations. Locations which have an abnormally high number of crashes are described as ‘hazardous’ or ‘black spot’ sites.

Although the term ‘black spot’ suggests a precise location, it is common to encounter ‘black areas’ or sections of road. Black spots are usually linked to particular characteristics of the road environment such as busy intersections and sharp bends.

Given the increasing emphasis on road safety as a public health issue, medical concepts may be used to describe black spot issues. The approach involves identifying the symptom (crashes at a site), the dysfunctions at the site, and prescribing curative or remedial measures.

Medical experience indicates that a single symptom is not always associated with the site of origin of the problem. The medical or clinical approach requires an overall examination of the patient to facilitate diagnosis. Similarly, a black spot should be regarded as a manifestation of a dysfunction at a point on a road, considered not in isolation, but as part of a traffic network. Prescribed treatment may therefore involve the site in question or other areas. The term ‘mass action’ refers to treatments with proven effectiveness applied extensively to areas with a common problem. Similarly, ‘route action’ and ‘area-wide schemes’ refer to the application of various engineering treatments or countermeasures over specific routes or wider areas.

There is considerable potential for reducing crashes on the road network by applying relatively low-cost engineering treatments. Simple measures such as using road markings to channel traffic at complex intersections or adding a right turn phase to a set of traffic signals can result in substantial reductions in crashes.

The Australian Government's Black Spot Programme

The Australian Government commenced a road safety black spot programme in 1990. The programme operated with a budget of $270 million from 1990–91 to 1992–93 and was directed at improving the physical condition or management of hazardous locations with a history of crashes involving death or serious injury. A total of 3 176 black spot projects with a mean cost of $85 000 were approved under the programme.

The programme was evaluated by the then Bureau of Transport and Communications Economics (BTCE) – now the Bureau of Transport and Regional Economics. The BTCE found that the programme delivered net benefits to the Australian community of at least $800 million, generating returns of about $4 per dollar of expenditure.

The success of this programme led to the Government deciding to fund another programme commencing in 1996 (see chapter 11).

The first three years (1996–1999) of the second programme was evaluated by the Bureau of Transport Economics (BTE) in 2001. The results indicated that the programme was highly successful in reducing crashes involving death and serious injury and generated a benefit-cost ratio of 14. Urban areas derived significantly greater benefits than regional areas, most likely due to the greater flow of traffic through treated urban black spots. The urban benefit-cost ratio was over 18, whereas the regional benefit-cost ratio was under 11.

The most cost-effective black spot treatments based on existing technology have been introduced in Australia. The treatments that have been implemented under federal and jurisdictional black spot programmes have resulted in a steady and continuing decline in the number of black spots. However, new black spots can and do appear as infrastructure changes and develops and traffic patterns and flows change over time. Moreover, the element of chance in road crashes means that it can take time for a high risk location to be identified in crash data, and treated.

It is likely that, overall, the number of highly hazardous spots and areas would decrease over time as black spot programmes continue to operate. Any savings in resources resulting from diminishing returns from engineering treatments over time could be reallocated to other aspects of road safety.

Evaluation studies have demonstrated that black spot programmes are highly effective in reducing road deaths and injuries.

Evaluating black spot programmes

A 'before and after' study is carried out to determine the effectiveness of treatments. This essentially involves comparing the number of crashes that actually occur after a site is treated with the estimated number of crashes that would have occurred in a similar period if the site had not been treated.

In attempting to determine the true effect of treatments, there are several potentially confounding effects to be considered. These effects include site-specific factors (such as weather conditions and changes in traffic flow patterns), crash trends over time (such as the long-term effects of various improvements in vehicles, the road system and driving behaviour), changes in the way crashes are reported and recorded over time, the 'regression-to-mean' effect, and crash migration.

The regression-to-mean effect is a difficult issue in evaluation studies. It was first observed by Sir Francis Galton over a hundred years ago when he noticed that, on average, tall parents had shorter children and short parents had taller children. The childrens' heights tended to 'regress' or revert to the mean level of the population.

The regression-to-mean effect refers to the simple notion that when some condition is extreme or abnormal, it is likely to be less extreme or closer to normal in a subsequent period. For example, a very hot day is more likely to be followed by a cooler day than an even warmer day.

Black spots are usually selected for treatment because they have experienced a large number of crashes in a recent period. Due to statistical variation associated with the regression-to-mean effect, a site with an abnormally high number of crashes in a given period is likely to have a lower number in the next period, even without any treatment. Some part of the observed benefits of any treatment can therefore be illusory.

Roundabouts are highly effective in reducing crashes.

Regression-to-mean effects are taken into account in evaluation studies by using control groups of non-treated sites or applying statistical techniques.

Crash migration refers to a possible increase in crashes in the vicinity of a black spot site after it has been treated: crashes may appear to 'migrate' from treated sites to nearby untreated sites. Crash migration has been investigated in studies, but it is still unclear whether it is a real effect or merely a statistical aberration.

Evaluations of black spot programmes provide information and knowledge to enable the effectiveness of treatments to be improved.

In their 2001 study, the BTE found that there were negative net present values (or disbenefits) for certain treatments. The net present value is the difference between the current economic value of the stream of benefits over the life of the treatment and the current value of the stream of costs. Treatments with apparent disbenefits included improved lighting in urban areas.

Given the information available, the study could not provide an explanation, but recommended that such treatments be carefully monitored in jurisdictions. The counter-intuitive result for street lighting could have been due to several causes such as: increased glare, drivers compensating for better visibility by increasing speed, collisions with lighting columns or just poor data quality. Data may well have been the cause if the numbers of crashes recorded before and after treatment were not differentiated by day and night crashes.

What has recent evaluation told us?

As noted earlier, the then Bureau of Transport Economics (BTE) evaluated the first three years of the 1996–2002 programme. The analysis involved a sample of 608 projects (350 urban, 258 rural) undertaken between 1 July 1996 and 30 June 1999 and costing $59.5 million.

The BTE found that there was very strong evidence (probability of chance occurrence less than one in one thousand) that the programme achieved its aim of improving safety at locations with a history of crashes involving death or serious injury. The evaluation results indicated that the programme generated a net present value of $1.3 billion and a benefit-cost ratio of 14. It was estimated that the programme prevented around 32 fatal crashes and 1 539 serious crashes between 1996–97 and 1998–99. The programme is therefore estimated to have saved at least 32 lives and prevented a large number of injuries over the three-year period. Benefits will continue to accrue over the life of the black spot treatments that were implemented.

Average casualty crash reduction was 31 per cent in urban areas, ranging from 20 per cent in Sydney to 70 per cent in Brisbane. In regional areas, the average crash reduction was 48 per cent and ranged from 27 per cent in South Australia to 75 per cent in Tasmania.

Detailed evaluation results for the 1996–97 to 2001–02 programme indicated that the programme was not uniformly effective in reducing the number of casualty crashes, in the sense that not all road engineering treatments had a statistically significant effect. The BTE report pointed to areas requiring further investigation.

Tables 20 and 21 set out urban and rural treatments that were clearly effective.

Table 20:
Effective urban treatments

Treatment	*Crash reduction (per cent)*
Roundabouts	70
New traffic lights—no turn arrow	47
Medians	46
New traffic lights—turn arrow	43
Non-skid surface	38
Traffic island on approach	36
Indented right turn and left turn	32
All other	28

Table 21:
Effective rural treatments

Treatment	*Crash reduction (per cent)*
New traffic lights—no turn arrow	76
Roundabouts	75
Improved lighting	63
Medians	57
Signs	54
New traffic lights—turn arrows	37
Edge lines	33
Shoulder sealing	29
All other	53

It will be seen from the tables that roundabouts were highly effective in both urban and rural areas and new traffic lights were highly effective in rural areas

Table 22:
Inconclusive urban and rural treatments

Urban treatments
Sealing road shoulders (crashes increased in Melbourne)
Marking edge lines
Improving pedestrian facilities
Street lighting (crashes increased)

Rural treatments
Traffic islands on approach
Indented right and left turn lanes
Non-skid surfaces (crashes increased)
Pedestrian facilities (crashes increased)

Source: Bureau of Transport Economics

In the BTE evaluation, the treatments in table 22 produced inconclusive results; that is, it was not possible to conclude that they produced any statistically significant benefits. In the case of some of these treatments, crashes increased after they were implemented.

Why did some treatments not work?

Why did the treatments in table 22 not work? Was the issue of an apparent lack of effectiveness more to do with the evaluation of the treatments than their actual efficacy? Treatments may have been ineffective, or less effective than expected, because of any or a combination of the following reasons.

- The treatments may have had no real effect. They may have been inappropriate for addressing the causes of crashes at the sites or may have been ineffective in changing the behaviour of drivers. Treatments may also have had unforeseen or unintended consequences. A particular treatment might have reduced one type of crash but increased another type of crash.
- There may have been a change in traffic flow or other site-related factors. As crashes depend on exposure factors and risk factors, an increase in traffic volume or a change in road conditions in the vicinity of the treated site could have nullified the beneficial effect of the treatment.
- The 'after' periods used in the evaluation may have been too short. Ideally, 'before' and 'after' periods should be between three and five years for robust statistical analysis.
- There is some arbitrariness in the way conventional statistical tests are carried out. Whether or not a treatment is deemed effective depends on the chosen level of statistical significance (the probability that a given result is not obtained merely by pure chance).

Varying the level of significance slightly can result in a treatment passing or failing the test for effectiveness. As the power of statistical tests decline as sample size decreases, a relatively large sample is required if tests for significance are conducted at the usual 5 per cent level (5 per cent probability that a given result could have been obtained by pure chance in the absence of any real effects) or at more stringent levels.

Such large samples are often not found for black spot treatment studies. Therefore, in some cases, the samples of data used may have been too small to identify results as statistically significant, even if there was a genuine reduction in crash risk.

- Compensatory behaviour by drivers (risk compensation) may have occurred. Risk compensation could be manifested by drivers in appropriating safety benefits resulting from black spot treatments as performance benefits. Such behaviour could include increased speed, lower levels of vigilance, and maintaining shorter distances between vehicles.

- The road network is a complex, dynamic system. Such systems comprise many interacting components in which cause and effect relationships can continually change. Complex systems can exhibit unpredictable behaviour and small changes in one part of a system can become amplified through the system, resulting in large impacts on other parts of the system. Various road user behaviours (including compensatory behaviour described above) and random events may have combined to thwart the intended impact of a treatment during the period of time its effects were observed.

  An incident in Sydney illustrates the systemic effects of seemingly small events. *The Daily Telegraph* of 28 August 2002 reported that on 27 August 2002 a snapped wire and a fallen cable conspired to cause the worst traffic gridlock Sydney has ever seen. A fallen cable had resulted in the closure of the northbound lane of the Harbour Tunnel. About an hour later, Victoria Road was closed when a snapped wire triggered a gas leak in Rozelle. The flow-on effects of these closures spread across the city, causing problems more than 10 kilometres away from the road closures.

Better data would enable more rigorous evaluations of black spot programmes in the future.

Advances in technology offer scope for better and possibly more cost-effective data collection. Innovations such as vehicle data recorders and automated incident recording systems can provide valuable information about crashes and pre-crash circumstances. The New South Wales Government has trialled an Automated Incident Recording System (AIRS) at some busy Sydney intersections. The new technology uses a continuous video recording loop linked to several microphones. When certain sounds like the screech of brakes or crunch of metal are detected, the system downloads and stores the four seconds of film recorded before the crash and the four seconds after the crash. The data are expected to provide insights into the causes of intersection crashes and will help road safety professionals to better analyse crash data and identify countermeasures.

Perceptual countermeasures: influencing speed through road markings

Perceptual countermeasures (PCMs) are a potentially simple, low-cost and practical type of road safety measure. They work by changing the appearance of the road to help drivers make safer decisions about speed, particularly in high-risk locations. Just using painted lines or other simple visual treatments can be effective in encouraging drivers to choose lower speeds.

Research commissioned by the ATSB and the New South Wales Roads and Traffic Authority used a driving simulator to develop and evaluate several treatments with potential to reduce traffic speeds. These included:

- transverse line treatments for use on the approach to intersections or hazards
- hatch-patterned median strips for use on continuous road lengths
- special roadside post arrangements for use on dangerous curves.

In the simulated environment, road markings were found to cut about 10 km/h from drivers' normal speeds in the approach to a rural intersection and about 2 km/h on long continuous road lengths. Even such small reductions could provide significant safety benefits because they give drivers more time to check that intersections are clear, and a better chance of stopping safely if they need to.

The study also found that different treatment designs are likely to be suitable for different applications. For example, transverse lines might be used to reduce speeds on the approaches to intersections or hazards, while hatch-patterned median strips might be particularly effective for continuous road lengths.

For dangerous curves, the research indicated that special roadside post arrangements can enhance the perceived curvature of the road and discourage unsafe entry speeds.

While the simulator results are encouraging, it remains to be seen if similar speed reductions, and associated crash savings, can be achieved in actual road conditions. Positive findings have been reported in a number of overseas studies, though these have been inconsistent. Closer to home, road-based trials using some of the treatments from the simulator research have also produced mixed results.

Researchers are confident that perceptual countermeasures will have an important role to play in Australian road safety. But at this stage, it appears that further work is required to fully realise their potential benefits.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