Hazard
(Edition No. 36)
September 1998

Victorian Injury
Surveillance System
Monash University
Accident Research Centre

VicHealth

This edition of Hazard examines general trends in road traffic fatality and injury, providing a broad overview of a complex area. The improvement in road safety over the past decade and future countermeasures are discussed briefly. Resource contacts and MUARC research activities are listed.

Trends in Road Traffic Fatality and Injury in Victoria

by Lei Li [*], Virginia Routley

Summary

Motor vehicle crashes are a major cause of death and injury, with enormous health and financial impacts. In recent years they have been ranked the second most important cause of injury/death and hospitalisation, after suicide and falls respectively. Over the study period (1984 to 1996) the highest fatality and injury rates in Victoria were observed in 1989, with 776 motor vehicle occupants killed and 35,000 injured (rates of 18 and 801 per 100,000 population respectively). These fatality and injury rates declined rapidly between 1989 and 1992, to the level of about 9 and 479 per 100,000 population respectively. Since 1992 and 1993 fatality and injury rates appear to have levelled off.

Fractures were the most common cause of hospital admission for all road user groups, especially to the lower limbs. Intracranial, open wounds and internal injuries were frequent but less common. Injuries differed by road user type. Pedestrians and motorcyclists had relatively higher proportions of fractures; pedalcyclists and pedestrians, intracranial injuries (not skull fractures) and motor vehicle occupants injuries to the chest, abdomen and pelvis. Neck sprain/strains were common for emergency department presentations.

In 1996, passenger vehicle occupants represented 73% of road users involved in motor vehicle crashes, pedestrians 16%, motorcyclists 8% and bicyclists 3%. Decreasing rates were experienced by all road user groups, especially pedestrian fatalities after 1989. Fatality and injury rates have declined for all age groups and the decline has been greatest for those aged 15-24 years, the age group with the highest rates.

Similarly hospital admission rates and length of stay have declined and then levelled off for all road user and age groups. Length of stay and reductions in length of stay have been greatest for pedestrians and persons aged 65 years and over. The decline in both admission rates and hospital stays could result in savings of as much as $17 million hospital expenditure a year in Victoria.

* Lei Li is a Research Fellow with Monash University Accident Research Centre

Introduction

Motor vehicle crashes are a major cause of death and injury, with enormous health and financial impacts. More than half a million motor vehicle crashes occurred in Australia in 1993, of which over 1,700 resulted in death, 17,000 in hospitalisation and 47,000 in injury requiring medical treatment (Bureau of Transport and Communications, 1993).

Despite much progress through successful road safety programs, motor vehicle crashes still cause about 360 deaths per year in Victoria and are ranked the second most important cause of hospitalisation due to injury, after falls (VicRoads and TAC, 1997; Watt, 1995). The total annual cost of road casualty for Victoria is estimated to be well over $1 billion (including property damage) and the total lifetime medical and associated costs for motor vehicle traffic related injury, which occurred in 1993/94, totalled $570 million (VicRoads and TAC, 1997; Watson and Ozanne-Smith; 1997).

This issue of *Hazard* describes the trends in and nature of motor vehicle crash fatality and injury in Victoria using the latest available data. Fatality and injury rates resulting from motor vehicle crashes are calculated for the period 1984 to 1996, and admission rates to Victorian public hospitals are calculated for the period 1987/88 to 1995/96.

The data bases used for this analysis include the State Traffic Accident Record (STAR), ie the VicRoads enhanced database of police reported crashes and the Victorian Inpatient Minimum Dataset (VIMD) for hospital admissions data (see Box 1, page 9). The STAR database contains motor vehicle crashes resulting in personal injuries. The VIMD database includes admissions to public hospitals due to injury in Victoria, and admissions to private hospitals in later years. Only admissions to public hospitals are used in this analysis.

Fatality and Injury Rates

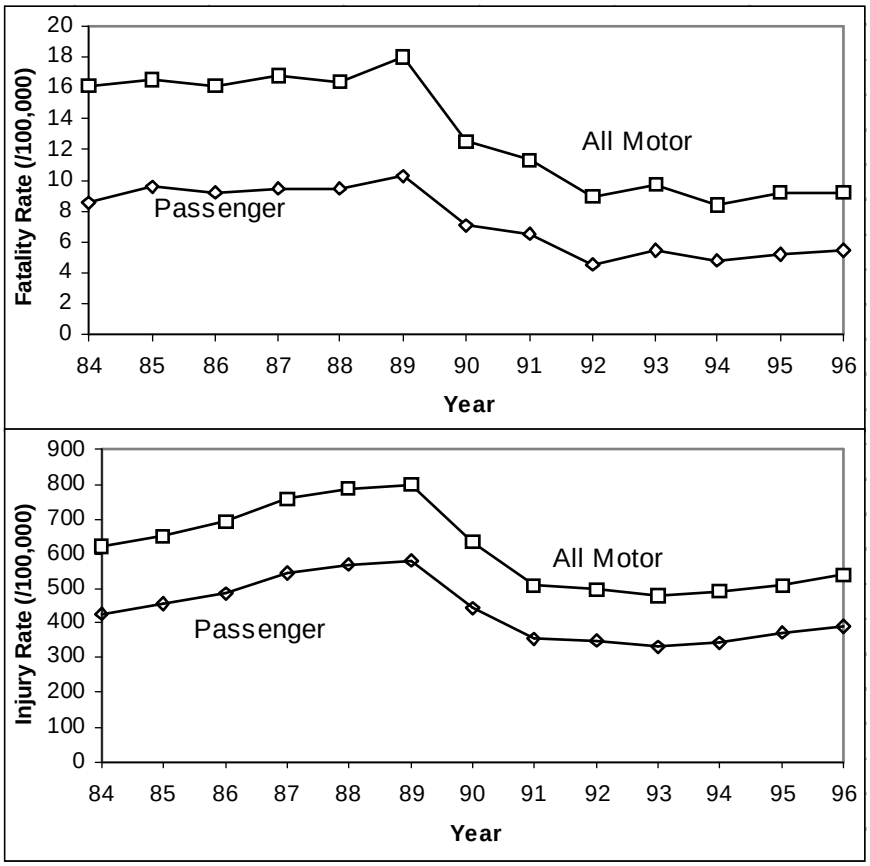
In the VicRoads STAR database, occupant injury severity is recorded on a four-level scale - *fatal*, *serious*, *other* and *non-injury*. In 1995, 1% of cases were fatal, 13% serious, 38% other injury and 48% non-injury. In this analysis fatality and injury rates are calculated using frequencies from VicRoads STAR data as the numerator and mid-year population estimates, by age group where appropriate, as the denominator. *Serious* and *other injury* have been combined.

Motor vehicle crashes

Trends in fatality and injury rates for all road users involved in motor vehicle crashes and those for passenger vehicle occupants only (car, station wagon, taxi, mini-bus) are shown in Figure 1.

The fatality rate due to motor vehicle crashes was 16.1 per 100,000 population in 1984. The highest fatality rate was observed in 1989, with 776 motor vehicle occupants killed (18 per 100,000 population). The fatality rate declined rapidly between 1989 and 1992 to the level

Motor Vehicle Crash Fatality and Injury Rates, 1984-96, Victoria **Figure 1**



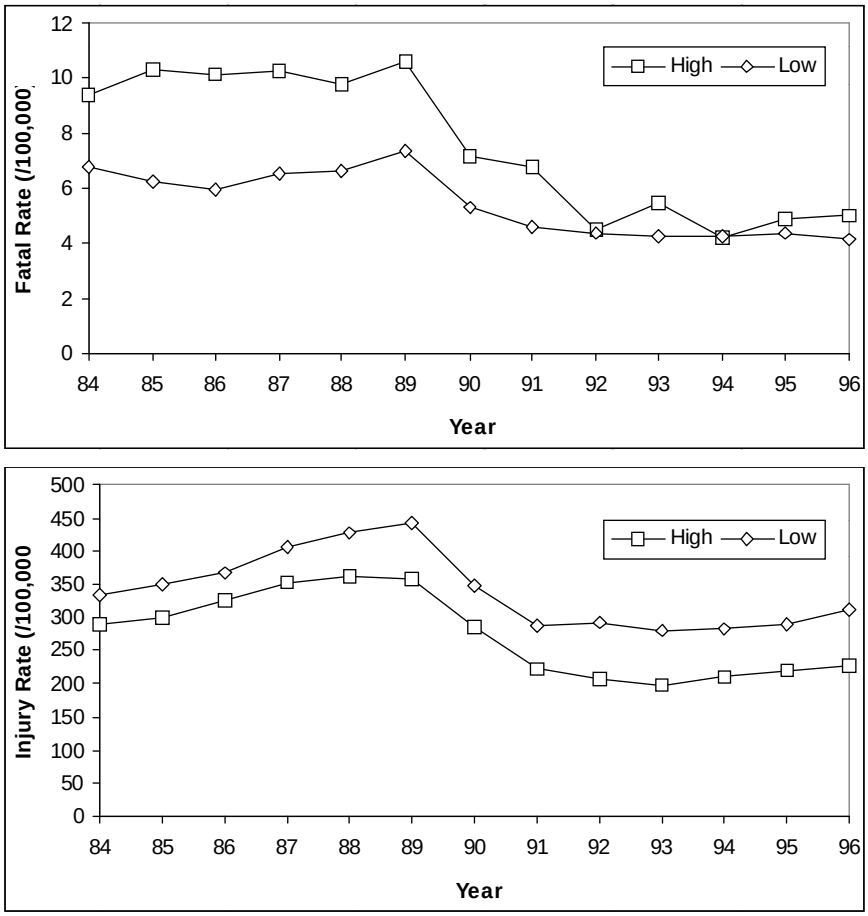
Source: State Traffic Accident Record database of police reported crashes.

of about 9 per 100,000 population, and appears to have levelled off since then. This recent level corresponds to about 400 motor vehicle occupants killed each year in Victoria.

More than 50% of all road users involved in motor vehicle crashes notified to Victorian police sustain an injury (22,000 to 35,000 per year). The injury rate increased annually between 1984 and 1989 from 623 to 801 per 100,000 population, and then declined rapidly to 479 per 100,000 in 1993. The injury rate appears to be increasing slightly from 1993.

Passenger vehicle occupants represent about 75% of road users involved in motor vehicle crashes in Victoria. The trends in their fatality and injury rates show similar patterns to those for all motor vehicle crashes (Figure 1). Upward trends were observed between 1984 and 1989, and the highest fatality and injury rates for passenger vehicle occupants were in 1989 (10.3 and 581 per 100,000 respectively), with 445 occupant deaths and 25,116 occupants injured. After sharp declines between 1989 and 1992, the fatality rate stabilised and the injury rate showed a moderate increase from 1993.

Fatality and Injury Rates during High and Low Alcohol Hours, 1984-96, Victoria **Figure 2**



Source: State Traffic Accident Record database of police reported crashes

Motor Vehicle Crashes during High Alcohol Hours

Figure 2 shows the fatality and injury rates in motor vehicle crashes during high and low alcohol hours, as previously defined (Harrison, 1990)[1]. High alcohol hours were defined by Harrison as those two hour blocks during which more than 15% of all drivers who were killed or seriously injured had a Blood Alcohol Concentration (BAC) over 0.05%. It can be seen that the fatality rates during the high alcohol hours were higher than those during the low alcohol hours between 1984 and 1989. After decreasing considerably between 1989 and 1992, the fatality rate during the high alcohol hours converged with that of the low alcohol hours. The decrease may be in part related to a decrease in alcohol related crashes.

The injury rate during the high alcohol hours was significantly lower than the injury rate during low alcohol hours but showed a similar trend to fatalities. Unlike fatalities however there was no convergence of the injury rates between high and low alcohol hours. The injury rates increased annually between 1984 and 1989 and then turned downward between 1989 and 1993.

Young and Older Persons

Figure 3 shows the trends in fatality and injury rates by age group. Young persons of years 15-24 had the highest fatality and injury rates. They also showed the greatest decrease in the fatality rate during the period from 1984 to 1996 (33.8 to 18.3 per 100,000). Although they demonstrated a pattern of injury rates similar to that of the 25-64 age group, their

[1] Low alcohol hours: Mon – Thurs 6.00- 17.59, Friday 6.00 - 15.59, Saturday 8.00 – 13.59, Sunday 10.00 – 15.59. High alcohol hours are those which are not low alcohol.

injury rate decrease was greater during 1989-1991. Prior to 1989 the injury rate of the 15-24 age group was about 2.5 times as high as that of the 25-64 group, but after 1991, this ratio decreased to about 2. A moderate upward trend of the injury rate can be seen between 1992 and 1996.

Older persons (65 years and over) also had a higher fatality rate than that of the 25 - 64 age group. After experiencing a large increase in the fatality rate up to 1988 they had shown a decreasing fatality rate, with the most rapid decrease occurring between 1988 and 1992. As a result, the ratio of their fatality rate to that of the 25 to 64 age group decreased from 1.7 in 1984 to 1.4 in 1996. However, their injury rate was much lower than that of the 25-64 age group. The injury rate of the 25-64 group was nearly twice as high as that of older population.

Although children aged 5-14 years had slightly higher injury rates before 1987 than older persons, their injury rate was lower after 1988.

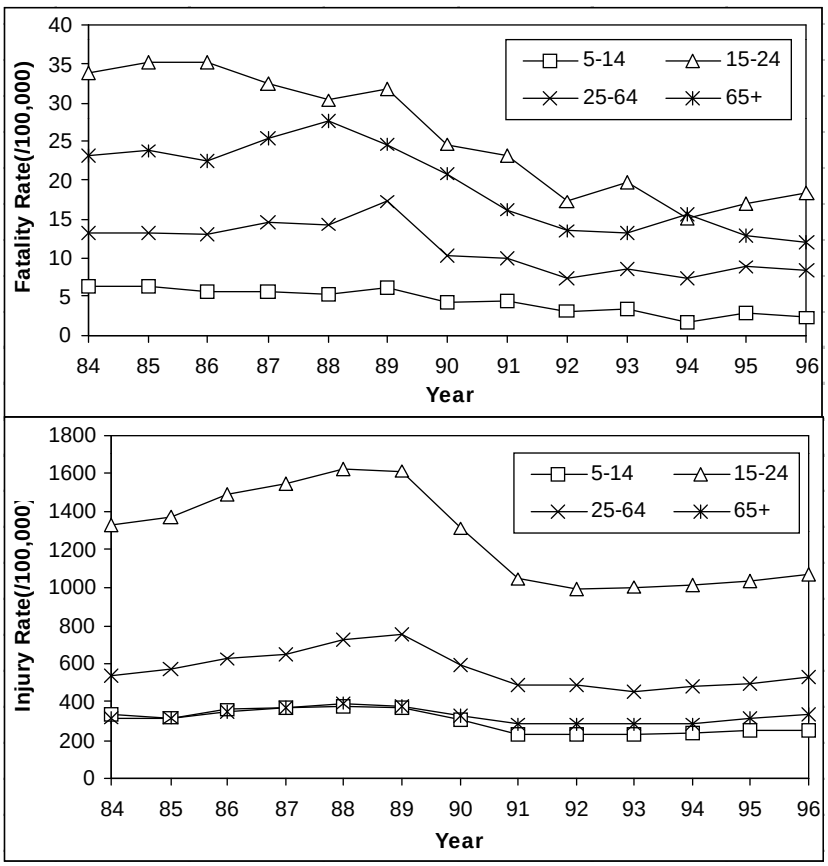
Pedestrians, Bicyclists and Motorcyclists

Similar to motor vehicle occupants, other major road users in Victoria, including pedestrians, bicyclists and motorcyclists (motorcycle/moped/motor scooter) experienced decreasing fatality and injury rates during the period from 1984 to 1996, to varying degrees. Figure 4 summarises the trends of their fatality and injury rates.

A sudden decline in the fatality rate of pedestrians was observed between 1989 and 1990. The fatality rate for pedestrians had been well above 3 per 100,000 population with about 150 pedestrian fatalities per year before 1990, but after 1990 the fatality rate fell to below 2 per 100,000 population, which represents about 80 pedestrian fatalities per year in Victoria. The injury rate of pedestrians also showed a substantial decrease between 1988 and 1993. The injury rate of pedestrians was above 50 per 100,000 population before 1990 and remained at the level of 40 per 100,000 population after 1990. This decrease translates into about 500 pedestrian injuries being avoided, i.e. a decline from about 2,300 to about 1,800 pedestrian injuries per year.

The fatality rates of bicyclists and motorcyclists fell more than 50% between 1984 and 1996, from 2 per 100,000 population and 0.7 per 100,000 population in 1984 to 0.9 per 100,000 population and 0.3 per 100,000 in 1996 respectively. There were 28 bicyclists and 80 motorcyclists killed in 1984, but only 13 bicyclists and 39 motorcyclists were killed in 1996. There were 1,429 bicyclists injured in 1988 and 1,318 in 1996. The injury rate of motorcyclists had been decreasing continuously since 1987. It was 56 per 100,000 population in 1987 and 36 per 100,000 population in 1996.

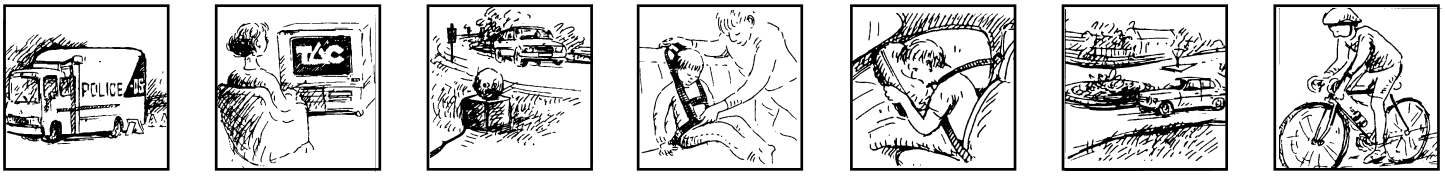
Motor Vehicle Crash Fatality and Injury Rates by Age Groups, 1984-96, Victoria **Figure 3**



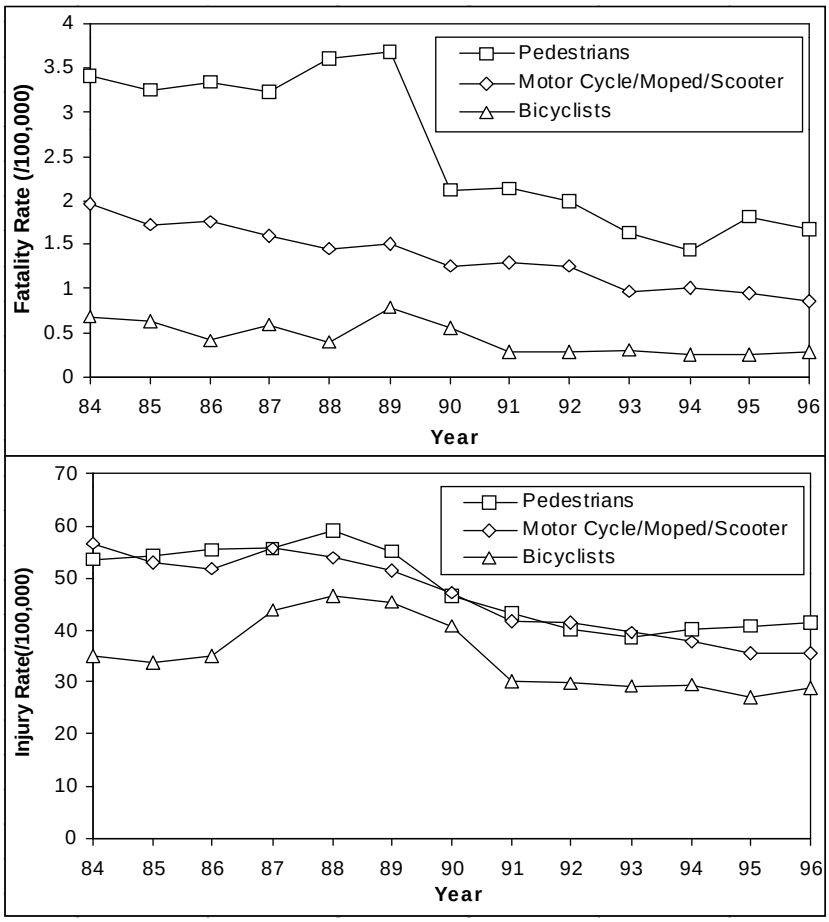
Source: State Traffic Accident Record database of police reported crashes.

Admissions to Public Hospitals

Public hospital admissions appear to have been strongly influenced by the



Pedestrian, Motorcyclist and Bicyclist Fatality and Injury Rates, 1984-96, Victoria — Figure 4



Source: State Traffic Accident Record database of police reported crashes.

hospitals of all road users and of passenger vehicle occupants.

It can be seen that the admission rates continued to decrease until the 1991/92 financial year and then stabilised. The hospitalisation rate of all road users was 131 per 100,000 population in 1987/1988 and 41 per 100,000 population in 1991/1992. In terms of the number of admissions, this decline (in the hospitalisation rate) corresponds to a reduction of 2,183 admissions (from 5,528 to 3,345) whose length of stay was more than one day. The hospitalisation rate for passenger vehicle occupants had a similar trend. However, the decrease in the early period seems less steep.

Figure 6 presents the trend in the hospitalisation rate by age group and road user type other than passenger vehicle occupants.

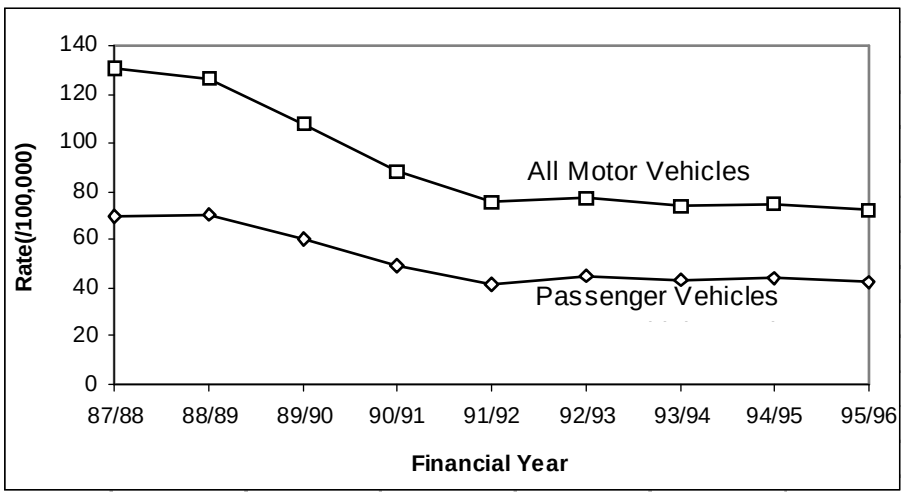
Similar to the differences in overall fatality and injury rates, the 15 to 24 age group had the highest hospitalisation rate, ie about twice that of those 25-64 years. The hospitalisation rate of 15-24 age group decreased nearly

casemix funding policy that took effect on 1st July, 1993 (Watt, 1996; Carr, 1995). Since the admission of cases whose length of stay in public hospitals was one day or less might be influenced by casemix funding policy, these cases were excluded from the analysis. There were 60,261 motor vehicle crash injury cases in the VIMD who were admitted into public hospitals during the nine year period from 1987/88 to 1995/96. Of these 38,546, ie 64%, stayed more than one day.

Hospitalisation Rate

Figure 5 shows the rates of admissions (more than one day) to public

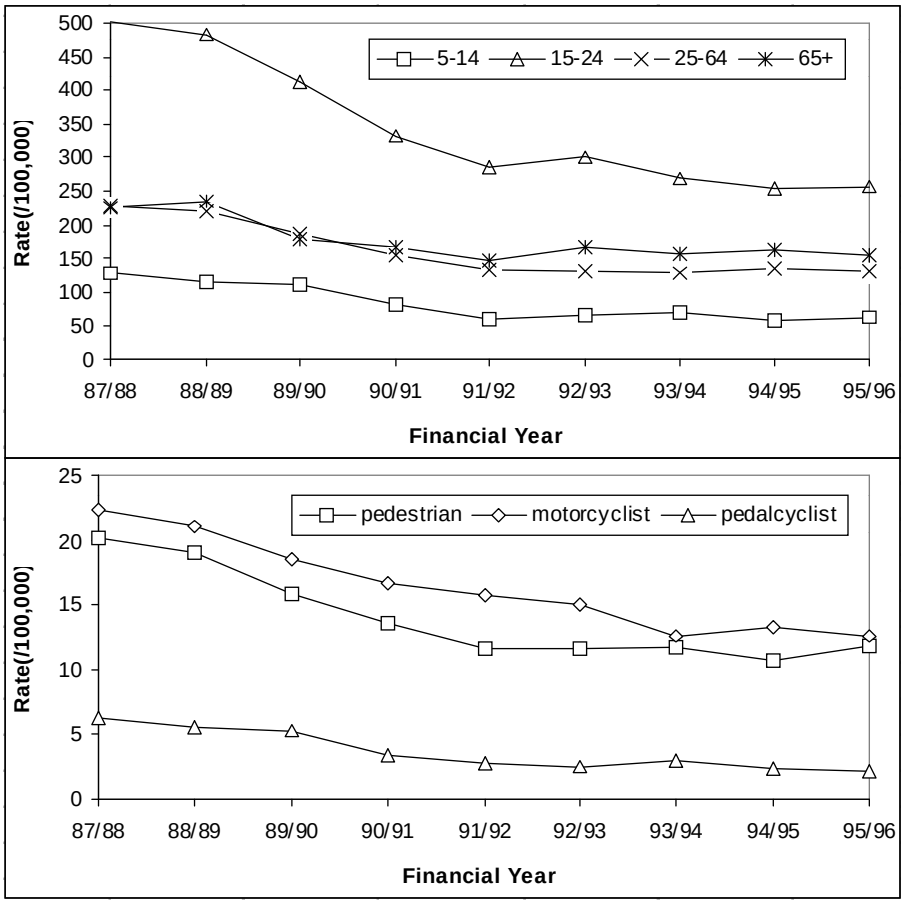
Admissions of Motor Vehicle Crash Injuries to Public Hospitals, July 1, 1987-June 30, 1996, Victoria — Figure 5



Source: Victorian Inpatient Minimum Dataset

Admissions to Public Hospitals by Age Groups and Road User Types, July 1, 1987-June 30, 1996, Victoria

Figure 6



Source: Victorian Inpatient Minimum Dataset

50% during the nine year period. Nonetheless, the gap in the 15-24 and the 25-64 hospitalisation rates reduced only moderately. Older persons and those 25-64 years also had substantial decreases in their hospitalisation rates. Older persons did not have a higher hospitalisation rate than the 25-64 group before 1992 but they appeared to have a slightly higher hospitalisation rate afterwards. Children of 5-14 years had a much lower hospitalisation rate than other age groups. Additionally they also experienced a 50% decrease in the hospitalisation rate during the period 1987/1988 to 1991/1992.

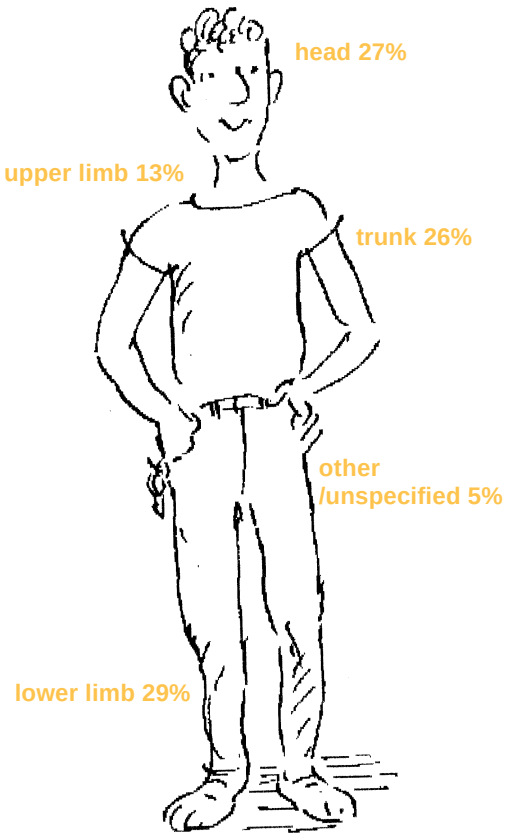
In the VIMD data, bicyclists and other cyclists are coded together as pedal cyclists. In Figure 6, it can be seen that the hospitalisation rates of these road users decreased notably during the study period. The hospitalisation rate of pedal cyclists decreased two thirds from 6.3 to 2.1 per 100,000 population between 1987/88 and 1995/1996. The greatest decrease in the hospitalisation rate of pedestrians occurred between 1988/89 and 1991/92, while the hospitalisation rate of motorcyclists decreased more consistently over the time period.

Nature and Body Region of Injury

Fractures were the most common type of principal injury caused in motor vehicle crashes admitted to hospital over the study period, accounting for 60% of hospitalised cases. Other common injuries included intracranial (not skull fracture) (9%), open wounds (6%) and internal (chest/abdomen/pelvis) (6%). Injury by body part for hospital admissions is shown in figure 7.

Injury by Body Region

Figure 7



Source: Victorian Inpatient Minimum Dataset

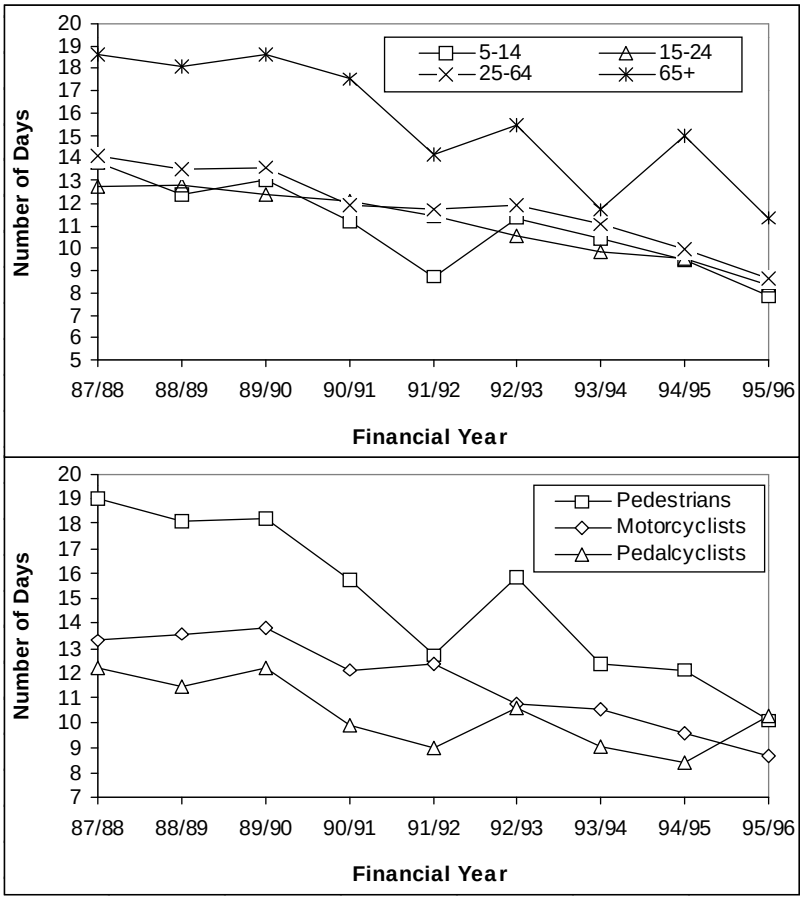
Trunk injuries included abdomen/pelvis (11%), chest (11%) and spine/back (4%). The head included face and eye (9%) and neck (3%). Among those with fractures, the body region of injury shows a slightly different

pattern to injuries overall. Lower limb injury was most common (40% of fracture cases), followed by upper limb (17%) and chest injury (15%).

Over the study period, pedestrians and motorcyclists incurred more fractures than other road user groups (68% and 67% respectively cf 62% for pedalcyclists, 57% for motor vehicles and 49% others). Pedalcyclists and pedestrians incurred higher proportions of both intracranial (not skull fractures) and head injury than other road users. Lower limb injuries were most common to motor cyclists (49% of injuries by body part), pedestrians (48%) and pedalcyclists (41%). Injuries to the chest, abdomen and pelvis were more common to motor vehicle occupants than other injury groups. Over the study period, apart from a decline in head injuries for pedalcyclists, the proportions of injury by road user group did not indicate any clear trend.

In order to compare emergency department presentations with admitted cases, the Victorian Emergency Minimum Dataset (VEMD) was examined. Over the period 1996 and 1997, approximately 20% of the 28,682 emergency department road traffic presentations to VEMD (VISS) hospitals (page 15) were admitted to hospital (one day admissions cannot be excluded). The most common injuries for presentations only (in order of frequency and excluding admissions of four hours or more) were neck sprains/strains, open wounds to the face (excluding eyes), no injury detected and multiple superficial injuries (excluding eyes). These injuries differed considerably from those of hospital admissions.

Length of Stay in Public Hospitals by Age Group and Road User Types, July 1, 1987-June 30, 1996, Victoria **Figure 8**



Source: Victorian Inpatient Minimum Dataset

Length of Hospitalisation

Along with the decrease in the hospitalisation rate, the length of stay in public hospitals also decreased consistent with the general trend towards shorter hospital stays. The mean length of stay in public hospitals was 14 days in 1987/1988 and 8.9 days in 1995/1996 (Table 4). Since the frequency distributions of the length of hospital stay are skewed very much towards short stays, the median length of hospital stay is also presented (7 days in 1987/1988, 6 days in 1995/1996). The median is less sensitive to changes in extremely long or short hospital stays which affect the mean greatly. The lower reduction in median hospital stays may be caused by the decrease in cases with extremely long hospital stays.

As shown in Figure 8, the mean length of hospital stay by age group also decreased. The mean length of hospital stay of older persons and over decreased by nearly 40%, or more than a week. Although young persons had the highest hospitalisation rate, they tended to be hospitalised for shorter periods than older persons. Older persons were hospitalised for the longest period. Length of stay for older persons is influenced by slower healing times, interaction with other conditions,

increasing frailty, and a higher incidence of complications.

Figure 8 also shows the trend of mean length of stay by road user types. Pedestrians were hospitalised longer than other road users. They sustained more head and lower extremity injuries, and more fractures. They had the greatest reduction in the mean length of hospital stay from 19 days in 1987/1988 to 10 days in 1994/ 1995. Motorcyclists and passenger vehicle occupants had almost the same mean length of hospital stay, and their mean length of hospital stay declined nearly five days over the study period. The mean length of hospital stay of motorcyclists was slightly shorter than those of passenger vehicle occupants and pedal-cyclists.

Discussion

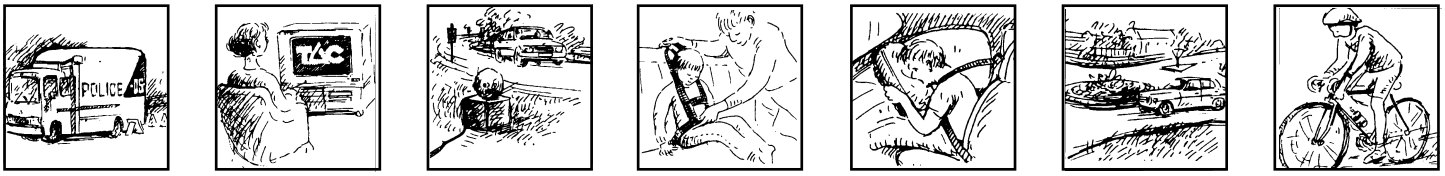
The improvement in road safety in Victoria has been very impressive over the past decade. One of the successes has been the sharp reverse in the upward trend of fatality and injury rates. The drop in the fatality rate of road users during this period implies that more than 350 lives may have been saved per year. Similarly, hospitalisation rates and length of stay in public hospitals, which can be indicators of injury severity and financial impact, also decreased substantially. Assuming that the average cost of one bed day in a Victorian public hospital was $450, the reduction in the hospitalisation rate from 131 per 100,000 population in 1987/88 to 41 per 100,000 population in 1991/92 and the reduction in the average length of stay from 13 days to10 days would result in savings of more than $17 million hospital expenditure a year in Victoria (Australian Institute of Health & Welfare, 1994). Additional savings generated from road users who had not stayed more than one day in hospital and were not included in this analysis should also be substantial as they made up about one third of hospital admissions.

Factors that may have contributed to these successes are numerous and complex, including behaviour changes of road users e.g. reduction in drink driving; improvements in road conditions eg roundabouts, shoulder sealing; and vehicle crash-worthiness. A series of road safety programs including publicity campaigns and enforcement programs against drink driving and speeding initiated by Transport Accident Commission (TAC), Victoria Police and VicRoads, from 1989 to 1992 may have been the most important factors (Vulcan in Ozanne-Smith, Williams, 1995; Cameron and Newstead, 1996; Cameron, Newstead and Vulcan, 1994). It was estimated that nearly one third of the reductions in serious road casualties between 1989 and 1992 in Victoria could be attributed to the intensive publicity campaigns against drink driving and speeding, and to the random breath testing programs.

As revealed in this analysis, however, motor vehicle fatality and injury rates, as well as admission rates to public hospitals, did not continue to decline after 1992, and some of these indicators have actually showed a moderate upward trend since. This feature may be related to increased road traffic induced by the economic recovery early this decade. Nevertheless, it also poses a challenging question: how to sustain further improvement in road safety in Victoria? The answer to this question is demanding increased sophistication in research design and counter-measure implementation. However a number of pertinent issues are outlined below.

Safety belt usage is almost universal, with a wearing rate of 97% (Diamantopoulou, Dyte and Cameron 1996). Involvement of alcohol and excessive speed in motor vehicle crashes has been greatly reduced. The extent of the benefits gained from the publicity campaigns aimed at the change of road user behaviours during 1988-1992 is unlikely to be replicated. In addition, some emerging issues in road safety, such as the rapid increase in the number of very old drivers, associated with an aging Victorian population, will make further improvement in road safety more difficult.

On the other hand, some opportunities exist to facilitate further improvement in road safety. Among them are national and state strategies which serve to focus the commitment of all relevant bodies and organisations. The Victorian government released its road safety strategy "Safety First" in 1995, under which related agencies, research organisations and local community groups have joined forces to promote road safety through research, better co-ordination, education and enforcement. The goal is to continue the long-term downward trend in road trauma in Victoria. Main focuses are drink driving, speeding, fatigue, restraint wearing, road quality, drivers in high risk age groups, motor cycle, bicycle and pedestrian safety, heavy vehicle crashes, drugs and driving and occupant protection. Nationally there is the National Road Safety Strategy (1992-2001) which aims to reduce the road toll to below 10 per 100,000 by 2001 ie a 30% reduction. Key priorities are similar to *Safety First*



i.e. alcohol and drug abuse, speeding, protection of vehicle occupants, driver fatigue, road hazards, heavy vehicles, novice drivers and riders and improved trauma management.

Another is technological advances in intelligent transport system (ITS) and vehicle occupant protection. After decades of conception and research, ITS is finally being realised in Australia and overseas. It holds great promise for smooth and safe transport. ITS has the potential to reduce motor vehicle crashes through the implementation of collision avoidance technology, while research on vehicle occupant protection technology has the potential to further reduce the severity of injury.

Although continued efforts aimed at behaviour change and enforcement will be necessary, these activities may need to be conducted in a more focused manner to be effective. Technological advances have the potential to make an important contribution to road safety. However, the full utilisation of this potential will depend on the accommodation of the new technology to human factors. In the future it will be necessary to conduct fundamental research to better understand behaviour and needs of specific road user groups and the mechanism of motor vehicle crashes. (Fildes, 1997). Since young and older persons had the highest fatality rates, current research focusing on these age groups will provide strategic input into prevention programs. In addition, the needs of bicyclists and pedestrians should continue to be considered.

This *Hazard* analysis has included only hospital admissions of patients who stayed in public hospitals more than one day. Clearly these hospitalised cases, who sustained the more severe injuries, would represent only a small proportion of motor vehicle crash victims. According to police reports, about 13% of road users involved in motor vehicle crashes were admitted to hospital and more than 99% of them sustained serious injuries. Currently it is very difficult to verify police reports on hospital admissions or to obtain information on length of hospitalisation from police reports.

The hospital admissions data contain reliable and detailed information on the nature of injury and the length of hospitalisation, which are essential outcome indicators used to gauge the impact of injury and to explore prevention methods. However VIMD data do not provide information on the causal process of injury, which is required for injury prevention research and included in the STAR database. Recent advances in statistical computation have made it possible to link data from different sources without using information on subject identity (NHTSA, 1996). Linkage of the VIMD, STAR and other databases would provide numerous new research opportunities for injury prevention. Furthermore, the benefits of data linkage extend beyond injury prevention research and include efficient data collection and improved data quality.

Acknowledgments

Stuart Newstead and Kathy Diamantopoulou (MUARC) for assistance with the STAR database and road safety advice respectively, Lesley Day, George Rechnitzer and Warren Harrison (MUARC) for editorial comment.

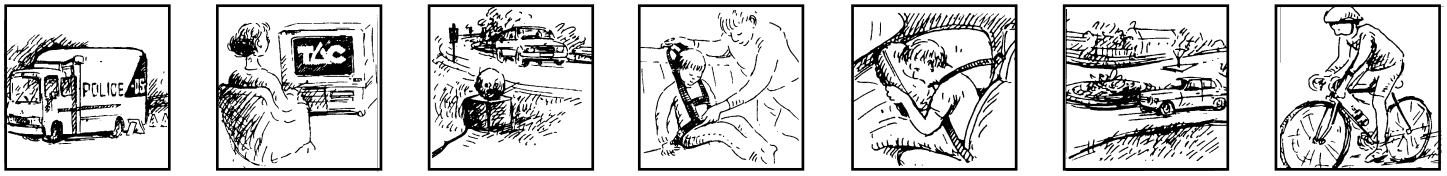
Data bases — Box 1

• State Traffic Accident Record (STAR)

STAR is the VicRoads enhanced database of police reported crashes. The data are based on police accident reports at the scene of motor vehicle crashes that resulted in personal injury. Information collected by police includes characteristics of crashes such as time and location, characteristics of vehicles such as type of vehicle, model, year of manufacture, personal details of those involved such as age, gender, licence and injury severity, and event information that depicts the process of crash occurrence. This data has the most complete coverage of motor vehicle crash fatalities and injuries, and would include a proportion of those admitted to hospital and thereby also captured in the VIMD.

• Victorian Inpatient Minimum Dataset (VIMD)

The VIMD contains information on admissions to Victorian hospitals. For the period covered the data was collected by Health Computing Services Victoria under the direction of Human Services Victoria. Detailed information on hospitalisation from admission to discharge is collected. The information on the nature of injury is based on the diagnosis by physicians. The Monash University Accident Research Centre has access to those records which involve injury. This analysis used only transport transport-related injury cases which were restricted to ICD-9 “external cause” codes ranging from E810.0 to E819.9.



MUARC road safety research projects

Evaluations

- Evaluation of the Country Random Breath Testing and Publicity Program in Victoria, 1993-94
- Evaluation of the Deployment of Laser Speed Detection Devices in Melbourne
- Evaluation of Moving Mode Radar for Speed Enforcement
- Evaluation of the Queensland Random Road Watch Program
- Evaluation of the multi-action pedestrian program

Road User Safety

- Learner Driver Experience and Safe Driving Skills
- The Driving Experiences of Learner Drivers
- Transport Accident Commission Simulator - Young Driver Research Program
- Young Drivers and Speed Enforcement
- Older Driver Behaviour
- Older Road Users
- Older Pedestrian Road Crossing Behaviour
- Walk-With-Care Update
- Profile of the Speeding Driver
- Research on the Speed Camera Program
- Promotion of Public Breath Testing
- Development of a Road Safety Public Education Plan for Western Australia
- The Relationship Between Demerit Points Accrual and Crash Involvement
- Multi-action Pedestrian Program in the City of Stonnington
- Personality and Drink Driving
- Development of the Theoretical Accounts of Deterrence
- Novice Driver Subtypes

Vehicle Safety

- Benefits of a Hybrid Side Impact Standard
- Airbag Effectiveness for GMH
- General Airbag Effectiveness Study
- Side Impact Research
- Consumer Advice on Vehicle Crash Performance
- Correlation between NCAP and Real Crashes
- Correlation between U.S. Crash Tests and Real Crash Data
- Development and Testing of Energy Absorbing Rear Underrun Barriers for Heavy Vehicles
- Safe Carriage of Personnel in General Service Vehicles Study (Australian Defence Forces)

Road and Traffic Engineering Safety

- Perceptual Countermeasures
- Evaluation of 1994/96 TAC Funded Accident Black Spot Program
- Injury Reduction Measures in Areas Hazardous to Pedestrians
- Highway Design for Older Drivers

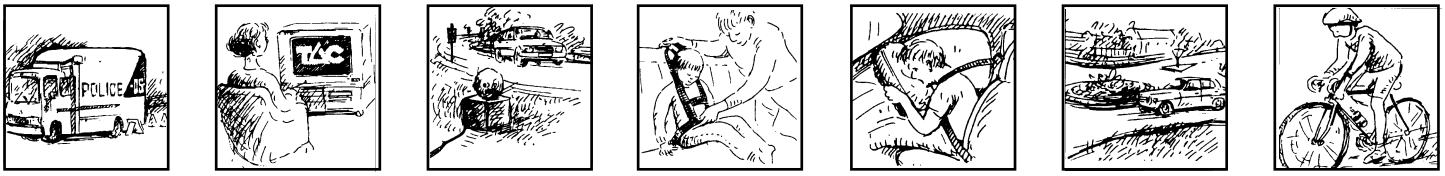
Road Safety Systems Analysis

- Case-Control Study of Single Vehicle Crashes
- Serious Injury Single Vehicle Crash Study
- Case-Control Study of Motorcycle Crashes
- Motorcycle Inspections Survey
- Index to Measure Police Traffic Enforcement Effectiveness
- Modelling of Factors Influencing Road Trauma Trends in Victoria
- Review of Reductions in the Victorian Road Toll during late-1996/mid-1997

(Source: Monash University Accident Research Centre Annual Report, 1997, updated)

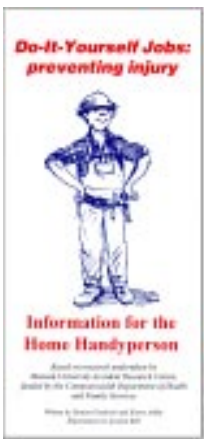
References

- Australian Institute of Health & Welfare. Health Services Series No. 5: Hospital utilisation and costs study 1991-1992, Vol. 1. 1994.
- Bureau of Transport and Communications Economics. Information Sheet 4: Costs of road crashes in Australia - 1993.
- Cameron, M. and Newstead S. (1996). Mass media publicity supporting police enforcement and its economic value. Public health association of Australia, 28th annual conference, symposium on mass media campaigns in road safety.
- Cameron M., Newstead S. and Vulcan P. (1994) Analysis of reductions in Victorian road casualties, 1989 to 1992. Proceedings 17th ARRB Conference, Part 5, 165-182.
- Carr,D, Skalova,M, Cameron,M.H. (1995). Evaluation of the Bicycle Helmet Wearing Law in Victoria During its First Four Years. Report No. 76. Melbourne: Monash University Accident Research Centre.
- Diamantopoulou K., Dyte D. and Cameron M. (1996). Seat belt wearing rates in Victoria: 1994. Monash University Accident Research Centre, Report No. 89.
- Diamantopoulou K., Skalova,M, Dyte D. and Cameron M. (1996). Crash risks of road user groups in Victoria, Monash University Accident Research Centre, Report No. 88.
- Fildes, B. Speeding: Crashes, Environment and Enforcement, a paper presented to the VicRoads Symposium, Accident Investigation and Prevention, 14-16 May, 1995.
- Fildes B. (1997). Road safety into 21st Century, paper presented at Monash University Accident Research Centre Symposium on Future Directions in Road Safety.
- Harrison,WA (1990) "Update of alcohol times as a surrogate measure of alcohol-related involvement in accidents". Research Note, Monash University Accident Research Centre
- Safety First – Victoria's Road Safety Strategy 1995-2000. http://www.vicnet.au/~safeone/
- U.S. Department of Transportation National Highway Traffic Safety Administration (NHTSA). The Crash Outcome Data Evaluation System (CODES). Technical Report DOT HS 808 338. 1996.
- VicRoads and Transport Accident Commission (TAC). Road safety in Victoria: trends and developments during 1997.
- Vulcan P, Road Trauma Prevention in Injury Research and Prevention: a Text, Ozanne-Smith,J, Williams,F (ed), Monash UniversityAccident Research Centre, 1995.
- Watt, G. M. (1995) Hospitalised injuries Victoria, July 1987 - June 1993. Monash University Accident Research Centre, Report No 67.
- Watt,G & Ozanne-Smith,J. (1996).Trends in public hospital injury admission rates, Victoria, July 1987 to June 1993, *Australia and New Zealand Journal of Public Health*, Vol. 20 No. 4.
- Watson, W.L. & Ozanne-Smith, J. (1997). The cost of injury to Victoria. Monash University Accident Research Centre, Report No 124.



Road Safety Resource Contacts

- **Monash University Accident Research Centre** (MUARC) http://www.general.monash.edu.au/muarc or phone 9905 4371 for research report publication list.
- **Royal Automobile Club of Victoria** (RACV) phone: 9790 2190 or 1800 134 126 (rural areas) – numerous road safety programs and services eg Years Ahead – Road Safety for Seniors, Traffic Safety Education delivered to pre-schoolers, primary and secondary schools, engineering investigation of road safety problem areas, restraint fitting stations. http://www.racv.com.au.
- **VicRoads** - Bookshop phone: 9854 2782; video lending library (no charge) ph: 9854 2861. http://www.vicroads.vic.gov.au for Safety First, road accident, teacher and student information, Community Road Safety Councils, Road Rules and Traffic Management.
- **Transport Accident Commission** (TAC) http://www.tac.vic.gov.au. Web site includes resources for secondary school curriculum. To borrow TAC TV advertisements (no charge) ph: 9664 6658
- **NRMA** – http://www.nrma.com.au/community for Victorian and NSW cyclist, driver, passenger and pedestrian road safety information.
- **Federal Office of Road Safety** Ph: 1800 026 349 for pamphlets eg drink driving, child restraints, bicycle safety. http://www.dot.gov.au/programs/fors/forshome.htm
- **Kidsafe** – The Kidsafe guide to road safety in cars. Ph: 9836 4070



Do-It-Yourself Jobs: preventing injury brochures

Esso Australia Ltd. has supported MUARC to develop three brochures to raise awareness about the patterns and causes of injury during Do-It-Yourself (DIY) activities and the preventative measures that can be taken to avoid such injuries.

Every year 15 Victorians are killed and at least 2,000 are seriously injured carrying out DIY work at home. The home, yard and garden are the sites of 30% of all emergency department presentations for injury to Victorian adults. Evidence suggests that home injuries result in more lost days from work than workplace injuries.

The most hazardous DIY activities for men are grinding, welding and car maintenance; gardening is the highest risk activity for women. Other high-risk DIY activities are lawn mowing and ladder use.

The three brochures are aimed at providing information to home handypersons, retail and hire outlets, and workplace managers.

Multiple copies of each brochure are available. For further information and to order brochures please contact Karen Ashby on (03) 9905 1805.

Fatality and Injury Rates by Age Group, 1984-96, Victoria (/100,000) Table 1

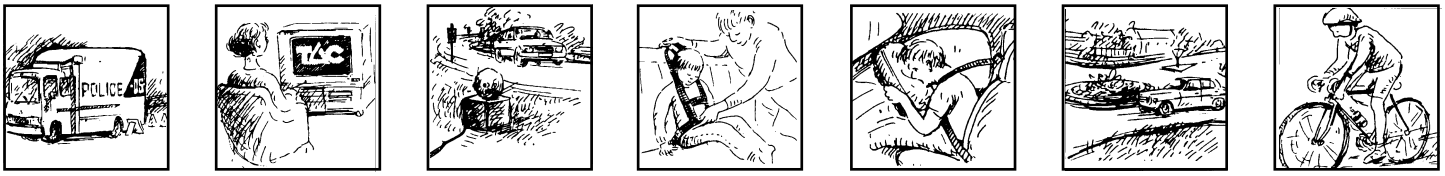
	Fatality Rate				Injury Rate			
Year	5-14	15-24	25-64	65+	5-14	15-24	25-64	65+
84	6.4	33.9	13.4	23.1	334.6	1324.9	538.5	313.4
85	6.3	35.2	13.3	23.9	317.2	1371.1	576.2	318.9
86	5.7	35.2	13.1	22.5	357.4	1490.0	626.8	347.5
87	5.7	32.5	14.6	25.6	371.6	1545.5	649.9	368.2
88	5.3	30.3	14.3	27.5	378.1	1624.2	731.9	391.6
89	6.1	31.8	17.2	24.7	369.8	1612.2	755.7	376.3
90	4.2	24.6	10.3	20.9	308.4	1311.9	588.2	322.2
91	4.3	23.1	9.8	16.1	232.2	1044.2	491.7	282.9
92	3.2	17.3	7.4	13.4	234.4	998.3	484.5	282.7
93	3.4	19.8	8.5	13.3	231.9	999.9	457.5	279.8
94	1.8	15.2	7.4	15.6	239.1	1008.1	478.2	284.4
95	2.9	17.1	8.8	12.7	250.2	1034.9	499.8	315.6
96	2.4	18.3	8.4	11.9	250.9	1075.5	535.5	332.1

Source: State Traffic Accident Record database of police reported crashes.

Fatality and Injury Rates of Pedestrians, Bicyclists and Motorcyclists, 1984-96, Victoria (/100,000) Table 2

	Fatality Rate			Injury Rate		
Year	Pedestrians	Bicyclists	Motorcyclists	Pedestrians	Bicyclists	Motorcyclists
84	3.4	0.7	2.0	53.6	35.1	56.6
85	3.3	0.6	1.7	54.3	33.7	52.9
86	3.3	0.4	1.8	55.4	34.8	51.7
87	3.2	0.6	1.6	55.7	43.8	55.7
88	3.6	0.4	1.5	59.0	46.5	53.8
89	3.7	0.8	1.5	55.2	45.4	51.4
90	2.1	0.5	1.3	46.6	40.8	47.3
91	2.1	0.3	1.3	43.3	30.0	41.8
92	2.0	0.3	1.3	40.3	29.7	41.3
93	1.6	0.3	1.0	38.6	29.2	39.7
94	1.4	0.2	1.0	40.1	29.4	37.8
95	1.8	0.2	1.0	40.8	26.9	35.5
96	1.7	0.3	0.9	41.4	28.9	35.5

Source: State Traffic Accident Record database of police reported crashes.



Admissions of Motor Vehicle Caused Injuries to Public Hospitals by Age Group and Road User type, July 1, 1987-June 30, 1996, Victoria (/100,000)

Table 3

Financial	Age Group				Road User Type		
Year	5-14	15-24	25-64	65+	Pedestrian	Pedalcyclist	Motorcyclist
87/88	129.6	501.8	227.2	225.2	20.2	6.3	22.4
88/89	116.8	482.2	220.8	236.2	19.1	5.6	21.0
89/90	111.9	412.7	187.9	180.4	15.9	5.3	18.6
90/91	82.6	332.3	156.1	168.3	13.6	3.5	16.7
91/92	61.3	285.9	134.5	147.8	11.7	2.7	15.8
92/93	65.7	301.9	131.3	167.6	11.7	2.5	15.1
93/94	70.9	269.6	128.2	158.4	11.8	3.0	12.6
94/95	57.3	255.9	136.8	163.5	10.7	2.4	13.3
95/96	63.7	256.7	129.9	155.5	11.8	2.1	12.6

Source: Victorian Inpatient Minimum Dataset

Length of Stay in Public Hospitals of Motor Vehicle Caused Injuries, July 1, 1987-June 30, 1996, Victoria (Days)

Table 4

	All Hospitalisations		Mean by Age Groups				
Financial Year	Mean	Median	0-4	5-14	15-24	25-64	65+
87/88	14.0	7	8.7	13.8	12.7	14.1	18.6
88/89	13.7	7	6.7	12.4	12.8	13.5	18.1
89/90	13.8	7	13.1	13.0	12.3	13.6	18.6
90/91	12.6	7	12.8	11.2	12.0	12.0	17.5
91/92	11.6	6	7.6	8.7	11.4	11.7	14.2
92/93	12.0	7	16.1	11.3	10.5	11.9	15.5
93/94	10.7	6	10.4	10.4	9.8	11.0	11.7
94/95	10.6	6	7.8	9.4	9.5	9.9	14.9
95/96	8.9	6	5.5	7.8	8.4	8.6	11.4

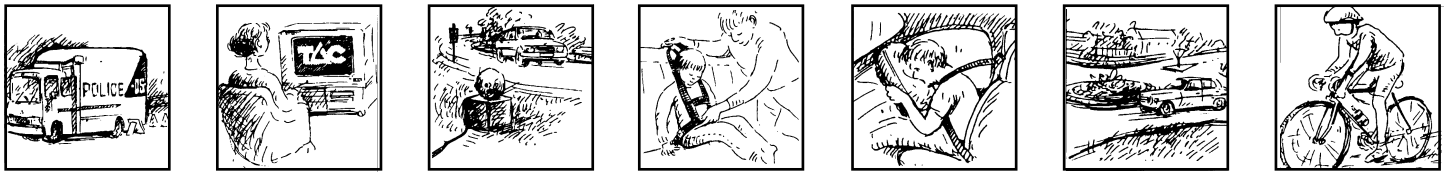
Source: Victorian Inpatient Minimum Dataset

Length of Stay in Public Hospitals by Road User type, July 1, 1987-June 30, 1996, Victoria (Days)

Table 5

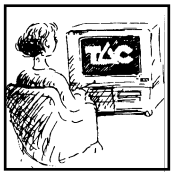
Financial Year	Passenger Vehicles	Pedestrians	Motorcyclists	Pedalcyclists
1987/88	13.2	19.0	13.3	12.2
1988/89	12.9	18.1	13.6	11.5
1989/90	13.1	18.2	13.8	12.2
1990/91	12.3	15.7	12.1	9.9
1991/92	11.6	12.7	12.4	9.0
1992/93	11.1	15.9	10.7	10.6
1993/94	10.3	12.4	10.5	9.0
1994/95	10.3	12.1	9.6	8.4
1995/96	8.3	10.1	8.6	10.3

Source: Victorian Inpatient Minimum Dataset



- INDEX -

* Special edition







Editorial Board

VISS Staff

General Acknowledgements

Participating Hospitals

Alfred Hospital
Angliss Hospital
Austin and Repatration Medical Centre
Ballarat Base Hospital
The Bendigo Hospital Campus
Box Hill Hospital
Dandenong Hospital
Echuca Base Hospital
Frankston Hospital
The Geelong Hospital
Goulburn Valley Base Hospital
Latrobe Regional Hospital
Maroondah Hospital
Mildura Base Hospital
Monash Medical Centre
The Northern Hospital
Royal Children's Hospital
Royal Melbourne Hospital
Royal Victorian Eye and Ear Hospital
St Vincent's Hospital
Wangaratta Base Hospital
Warrnambool and District Base Hospital
Western Hospital
The Williamstown Hospital
Wimmera Base Hospital

Coronial Services

Access to coronial data and links with the development of the Coronial Service's statistical database are valued by VISS.

National Injury Surveillance Unit

The advice and technical back-up provided by NISU is of fundamental importance to VISS.

Recent issues of *Hazard*, along with other information and publications of the Monash University Accident Research Centre, can be found on our internet home page:

http://www.general.monash.edu.au/muarc

How to Access VISS Data:

VISS collects and tabulates information on injury problems in order to lead to the development of prevention strategies and their implementation. VISS analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISS Co-ordinator or the Director by contacting them at the VISS office.

VISS is located at:

Building 70
Accident Research Centre
Monash University
Wellington Road
Clayton, Victoria, 3168

Phone:

Reception	(03) 9905 1808
Co-ordinator	(03) 9905 1805
Director	(03) 9905 1810
Fax	(03) 9905 1809

Email:
Karen.Ashby@general.monash.edu.au
Virginia.Routley@general.monash.edu.au

Project Funded by
Victorian Health Promotion Foundation

VISS is a project of the Monash University Accident Research Centre.

Hazard was produced by the Victorian Injury Surveillance System
with the layout assistance of Glenda Cairns, Monash University Accident Research Centre.
Illustrations by Jocelyn Bell, Education Resource Centre, Royal Children's Hospital.

ISSN-1320-0593

Printed by Sands and McDougall Printing Pty. Ltd., Brunswick