INJURY IN AUSTRALIA

An epidemiological review

DEPARTMENT OF HUMAN SERVICES AND HEALTH

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Injury in Australia

An epidemiological review

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Preface

This report was prepared for the Commonwealth Department of Human Services and Health to advise on the implementation of national health goals and targets for injury.

The report is intended to provide an introduction to the impact of injury on the Australian community, drawing on a wide range of sources of information. Emphasis has been given to Australian literature and data sources, and new analyses of mortality and morbidity data collections have been undertaken for this project. It will be evident to readers that Australian information was more readily available for some topics than for others. In some instances (notably, the chapter on interpersonal violence), more use has been made of international sources than is typical of the report. For some other chapters, in depth analyses had only been completed for data for a single State, e.g. Victorian data for consumer product-related injury (Chapter 5).

Much of the report has been organised into chapters and sections corresponding to the main settings in which injury occurs. This has become conventional in documents oriented towards injury prevention, as much of the potential for injury control lies in making changes within these settings. Other chapters address the role of human intent in the occurrence of injury, and the occurrence of injury in a particular sector of the population.

Much of the information reported here could not have been provided a few years ago. This reflects the rapid improvements in information sources, and the heightened interest in injury as a subject for public health research and programs since the mid-1980s. And there are good reasons to expect continued improvement. Initiatives now in progress, and anticipated in the near future, will improve information on injury costs, on the social and geographic distribution of injury, on exposure to risk factors for injury, and on the consequences of injury. In addition, studies using techniques of analytical epidemiology will provide more specific information on certain important questions of causality, particularly concerning the effects of preventive interventions.

The report was produced by the National Injury Surveillance Unit (NISU) of the Australian Institute of Health and Welfare in collaboration with the Monash University Accident Research Centre. NISU managed the project, edited the report, and formatted the manuscript. Chapters were written by staff of NISU (1, 2, 7, 9 and 10) and of the Monash University Accident Research Centre (3, 4, 5, 6 and 8). Substantial individual contributions were as follows:

1. Overview: James Harrison
2. Transport-related injury: Peter O'Connor
3. Injury in residential settings: Lesley Day, Jennie Oxley
4. Injury in non-urban settings: Lesley Day
5. Consumer product-related injury: Joan Ozanne-Smith
6. Sports-related injury: Joan Ozanne-Smith, Caroline Finch, Virginia Routley
7. Suicide and other self–injury: James Harrison
8. Interpersonal violence: Irene Brumen, Joan Ozanne-Smith
9. Injury in the Aboriginal and Torres Strait Islander populations: James Harrison.
10. Work-related injury: James Harrison

Jerry Moller's ideas and advice have contributed to many parts of the project. Many other people provided comments on sections of the report, and to all of them thanks are extended.

Contents

List of tables

List of figures

List of abbreviations

ABS
Australian Bureau of Statistics

AIS
Abbreviated injury scale

AMS
Aboriginal medical service

ASMF
Australian Sports Medicine Foundation

BAC
Blood alcohol concentration

Comcare
Commission for the Safety, Rehabilitation and Compensation of Commonwealth Employees

FORS
Federal Office of Road Safety

ICD9
International Classification of Diseases, 9th revision

ICD9-CM
Clinical modification of ICD9

ISIS
Injury Surveillance Information System

ISS
Injury severity scores

Kidsafe
Child Accident Prevention Foundation of Australia

M:F
Male:female ration

MV
Motor vehicle

MVTA
Motor vehicle traffic accident

NEISS
National Electronic Injury Surveillance System (United States Consumer Product Safety Commission)

NHS
National Health Survey

NISU
National Injury Surveillance Unit

NOHSC
National Occupational Health and Safety Commission

RIIP
Road Injury Information Program (NISU)

ROPS
Roll-over protective structures

RVEEH
Royal Victorian Eye and Ear Hospital

SES
Socioeconomic status

SRR
Standardised rate ratio

VHPF
Victorian Health Promotion Foundation

VISS
Victorian Injury Surveillance System

Worksafe
Worksafe Australia

Chapter 1 Overview

1.1 Introduction

This report is intended to provide a compendium of information on injury occurrence in Australia, complementing and drawing on other sources of information. In particular, the report by Mathers and Greenhill[1] to the National Better Health Program Management Committee remains relevant, and most of the material in it is sufficiently current to be useful. Emphasis has been given here to reporting sources of information that have become available since that report was written and to additional analyses of mortality and morbidity data.

This chapter provides an overview of injury in Australia, considering it in relation to other causes of mortality and morbidity. The variation of injury is examined by gender, age, with time, and by social, demographic and geographic factors. Consumption of health sector resources for the treatment of injury, and available information on the costs of injury, is surveyed and the rather limited information on risk factors for injury in Australia is outlined.

Later chapters in the report review injury in several of its major settings of occurrence (transport, working life, the home, non-urban environments, the use of consumer products and sport). Two facets of the involvement of human intent in the occurrence of injury (self-harm and interpersonal violence) are considered, as well as the occurrence of injury in the Aboriginal and Torres Strait Islander populations. While sufficient information is now available in Australia to provide a good overview of the occurrence and distribution of injury, it will be evident to readers that the quality of the data available varies greatly among the topics considered.

1.1.1 Notes on data

Where no other source is specified, mortality information is based on analysis by the National Injury Surveillance Unit (NISU) of routine national data compiled by the Australian Bureau of Statistics (ABS). Hospital inpatient information is based on analysis by NISU of State and Territory routine hospital separations data. Emergency department attendance information is derived from the Injury Surveillance Information System collection that is maintained by NISU. ABS population estimates were used for calculating rates.

In general, the data cited include the most recent available to the authors at the time of writing (mid-1993). The major sources covered deaths registered by the end of 1991, and hospital separations in 1989–90 (also 1991–92 for New South Wales and Victoria). The Appendix contains a set of reference tables, which provide annual average injury mortality case numbers and incidence rates for two three-year periods (1979–81, and 1989–91). The Appendix also contains similar sets of tables for injury hospital separations in New South Wales for the financial year 1991–92. Some rates have been standardised to enable comparisons to be made after allowing for the effect of differences in the age structures of populations. Unless indicated otherwise, standardisation is by the direct method, using the Australian population in 1988 as the standard.

The injury burden of the Australian population in 1991 included 7703 fatal cases, about 40 times this number of hospital admissions, and several times as many again of injuries that led

to medical attention but did not result in hospital admission. In a general survey of injury, it is desirable to consider all three of these levels of the 'injury pyramid'. However, differences in the data available for each of the three levels limit the potential to provide directly comparable information. The strengths and weaknesses of the main sources of information are reviewed elsewhere. Three points need to be made here.

First, routine mortality data in Australia lack information on the nature of injury sustained. This limits understanding of the cases and prevents severity scoring. In Victoria, a special collection that includes this information has been made since 1990 for most injury deaths. Also, the Federal Office of Road Safety compiles detailed information on road deaths every other year (see Chapter 2 ref. 21 and Chapter 3 ref. 3).

Second, hospital inpatient injury data remain cumbersome to use and difficult to interpret at a national level. These difficulties are diminishing, particularly with increasing compliance with the *National Health Data Dictionary.*[2] However, the difficulties posed by the remaining differences are sufficient to have made it impracticable to analyse injury inpatient data in detail at a national level for this report. Consideration at the level of unit records has been limited to the most recently available year of data for the State with the largest population, New South Wales.

Third, data on non-hospitalised injury are of two main types: population-survey based data, which are quantitative but provide little detail; and data from Emergency departments that are relatively detailed but generally are difficult to interpret in terms of injury incidence in well-defined populations.

1.1.2 Definitions

In this report the term '*injury*' is used as shorthand to refer to injuries and poisonings and to all consequences of the '*external causes*' described in the supplementary chapter of the World Health Organization's *International Classification of Diseases*, 9th revision (ICD9). The definition includes interpersonal and self-inflicted violence. It also includes the unintended consequences of medical and surgical care, although these are not a major focus of attention in this report.

The term '*separations*' is commonly used as a unit for inpatient episodes. It includes episodes ending in discharge, transfer or death. Hospital separations are usually classified by 'primary reason for admission' according to the clinical modification of ICD9 (ICD9-CM).[5]

1.2 Injury in relation to other health problems

This section contrasts injury with other causes of mortality and morbidity, considering both the most recent data and trends over time.

In 1991, 7703 deaths registered in Australia were attributed to 'accidents, poisoning and violence' (external causes)[2] — the category usually regarded as 'injury' deaths. Injury accounted for 6.5 per cent of all deaths in 1991 and occurred at a crude rate of 44.5/100 000 mean population. Table 1.1 summarises the relationship between injury mortality and mortality from other major causes.

Table 1.1: Causes of death, Australia 1991

	Deaths	Per cent	Crude rate (per 1000 population)
Injury	7 703	6.5	0.45
Circulatory system disease	53 010	44.5	3.07
Neoplasms	31 609	26.5	1.83
Respiratory system disease	8 906	7.5	0.52
Infectious disease	830	0.7	0.05
Other conditions	17 088	14.3	0.99
All causes	**119 146**	**100.0**	**6.89**

Source: ABS 1992[3]

Injury accounts for about one in ten inpatient episodes (Table 1.2) — a little less if measured in terms of hospital separations for which injury or poisoning was identified as the primary reason for admission, and slightly more when measured in terms of admissions attributed to 'external causes'. The mean length of stay of injury cases is longer than the average for all admissions. Hence, injury accounts for a larger proportion of bed–days than the average for all admissions.

Table 1.2: Causes of hospitalisation, Australia 1989–90

	Separations		Bed days		
	per 1000 population	Per cent	per 1000 population	Per cent	Mean stay (days)
Injury	19.1	8.7	119.7	10.1	6.3
(external causes)*	(22.1)	(10.1)	(156.3)	(13.2)	(7.2)
Circulatory system disease	18.1	8.2	166.4	14.0	9.2
Neoplasms	14.5	6.6	102.6	8.7	7.1
Respiratory system disease	16.7	7.6	87.0	7.3	5.2
Infectious disease	3.9	1.8	17.2	1.5	4.4
Other conditions†	147.3	67.1	692.8	58.4	4.7
All causes	**219.6**	**100**	**1185.7**	**100**	**5.4**

* Primary diagnosis of 'external cause', whether coded to 'injury and poisoning' or not

† Includes obstetric and gynaecological reasons for admission (34.2 separations/1000 population); non-disease reasons for admission (23.8 separations/1000 population); and conditions of the musculoskeletal system and connective tissue. The latter category, in particular, includes conditions which are sometimes regarded as injuries, such as painful disorders of the lower back and tendons.

Note: The data shown are from the most recent and comprehensive source of national data on hospital utilisation. However, the data are not complete – notably, data were not available for private hospitals in Victoria. Differences may also exist in the way cases are reported, and in the way 'external causes' cases are identified. Further details are available in the source document for the table, see below.

Source: derived from data in Gillett et al. 1993[4]

Classification of separations by 'primary reason for admission' according to ICD9-CM,[5] understates the utilisation of health services for injury conditions for two reasons. First, certain effects of external causes of 'injury and poisoning' are coded to categories other than

'injury and poisoning'. The bracketed figures in Table 1.2 include all cases where the primary diagnosis was an 'external cause', whether the diagnosis was coded to 'injury and poisoning' or not. Second, injury may be part of the reason for admission, yet may not be coded as the 'primary' reason.

Data on injury as a cause of non-admitted morbidity are very limited. They are summarised in Table 1.3.

Table 1.3: Selected indicators of injury morbidity, Australia

Index of injury morbidity	Estimated rate per 1000 population	Per cent attributed to injury	Source and reference year
Persons consulting a doctor in past 2 weeks due to injury	14.6	7	National Health Survey 1989–90[6]
Injury as a cause of ill-health during past 2 weeks	74.6	10	National Health Survey 1989–90
Injury as a cause of long-term ill-health	13.8	2	National Health Survey 1989–90
Injury as underlying cause of handicapping condition	31.4	25	Survey of disability and handicap 1988[7]

The data in Tables 1.1 to 1.3 can be used to construct an approximate 'injury pyramid' for Australia. For each injury death, there are about 40 hospital admissions, 760 doctor consultations, and 3800 'recent injuries' — mostly of minor severity. However, the prominence of injury differs when different indices are used. Table 1.4 shows the ranking of injury and other major types of conditions for several indices.

Table 1.4: Ranking of injury and other major causes of mortality and morbidity, Australia, 1990–91 (or closest available year)

Rank*	Mortality	Years of potential life lost before age 65	Inpatient episodes†	Hospital bed-days†	Doctor visits‡	Recent illness‡
1	CIRC	OTHER	OTHER	OTHER	OTHER	OTHER
2	NEO	INJURY	INJURY	CIRC	RESP	RESP
3	OTHER	NEO	CIRC	INJURY	CIRC	CIRC
4	RESP	CIRC	RESP	NEO	INJURY	INJURY
5	INJURY		NEO	RESP	INF	INF
6	INF		INF	INF	NEO	NEO

* 1 = highest, 6 = lowest

† Gillet et al. 1993

‡ National Health Survey 1989–90

Key: INJURY=injury and poisoning; CIRC=circulatory diseases; NEO=neoplasms; RESP=respiratory diseases; INF=infectious diseases; OTHER=all other conditions

1.2.1 Trends in mortality from injury and other causes

Substantial changes have occurred in the pattern of mortality in Australia during the past several decades. Figures 1.1 and 1.2 show age and sex standardised mortality rates of males and females for major causes of death for the period since 1921. Early in the period, infections were the dominant major cause of mortality (the categories labelled 'other' and 'respiratory' include many infectious diseases). For much of the period, cardiovascular conditions ('circulatory') were the main cause of death, but have declined sharply since about 1970. Mortality rates from neoplasms have changed little for females and have risen steadily for males. Injury, which has remained a substantial minority cause of death throughout the period, is described further below.

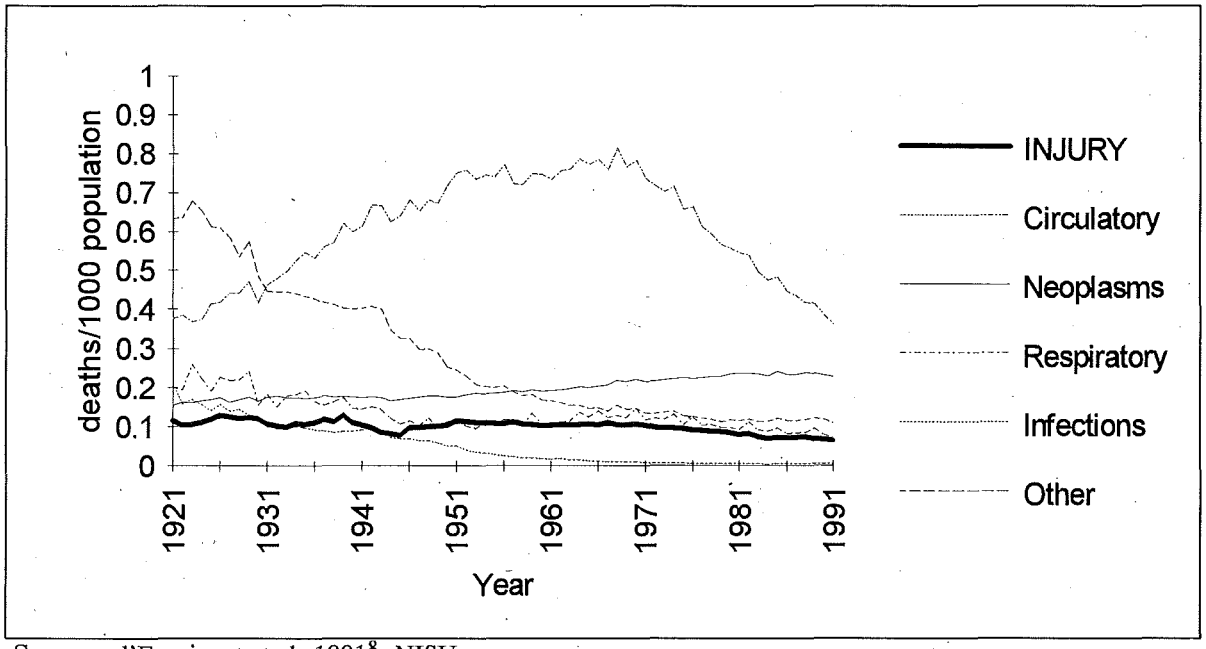
The proportions of all deaths that have been attributed to injury for the period since 1921 are shown in Figure 1.3. For males, injury has accounted for 6 to 8 per cent of deaths for most of the century (the dip during the 1940s is an artefact: most war deaths occurred overseas, and the 'usually resident' population has not been adjusted to account for the absence of many young males). The late 1980s saw the highest proportion yet recorded, reflecting the great decline in mortality from circulatory diseases. For females, a long, gradual increase in the proportion ceased about 1970. More recently the proportion has declined a little, as female injury mortality has declined slightly more rapidly than female mortality from other causes.

National data are not available for long-term trends in injury hospitalisation. Data are available for some States, for various periods. For example, Mathers and Greenhill[1] (in their figure 3.7) showed that acute hospital separation rates for injury in two States (NSW and Qld) showed little change in the period 1978–86, while rates declined somewhat in Western Australia during the same period.

1.3 Injury mortality and morbidity

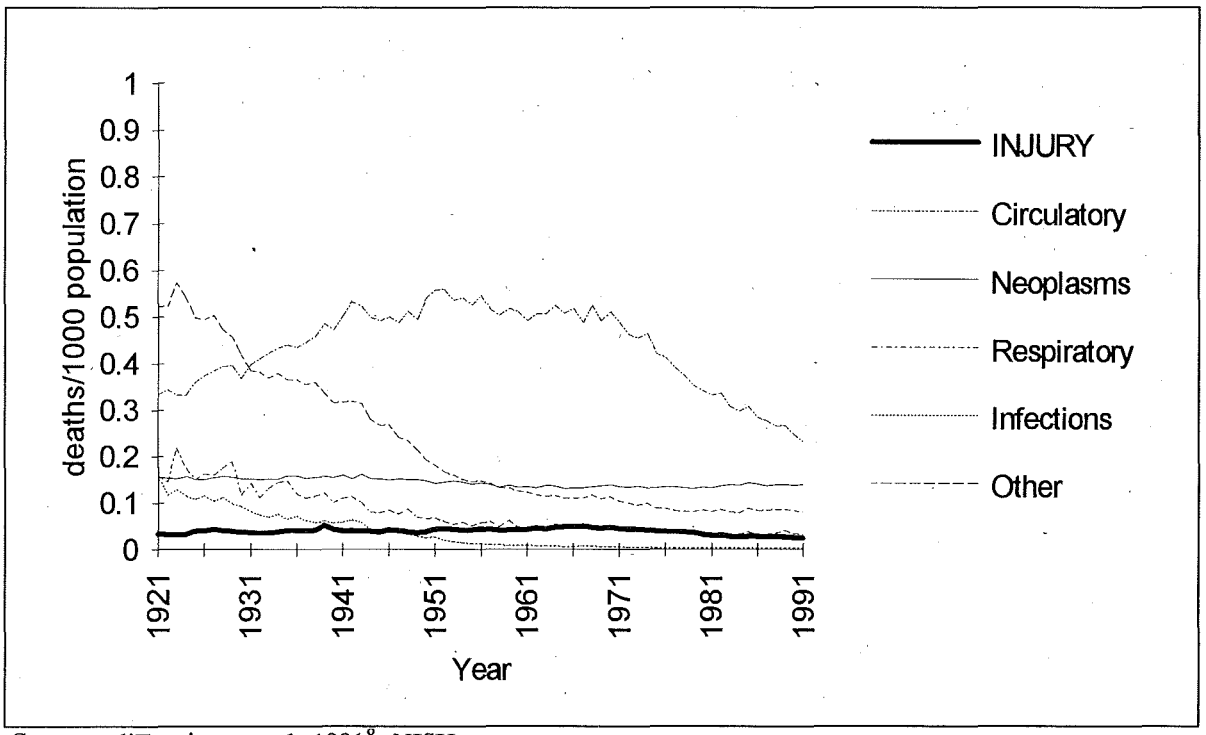
While injury is diverse in terms of circumstances of occurrence, aetiology and outcome, a number of generally consistent patterns are evident. These patterns are the subject of this section. Further detail on most of these characteristics of injury can be found in following chapters.

Figure 1.1: Male mortality rates from selected causes, Australia 1921–91



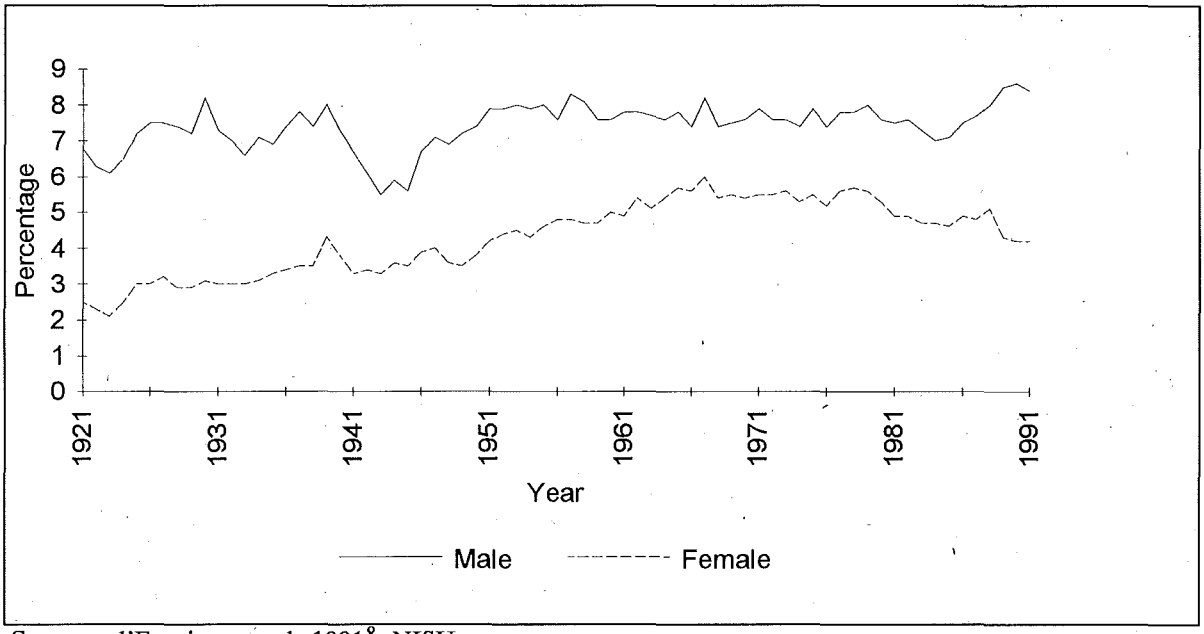
Source: d'Espaignet et al. 1991[8]; NISU

Figure 1.2: Female mortality rates from selected causes, Australia 1921–91



Source: d'Espaignet et al. 1991[8]; NISU

Figure 1.3: Proportions of all deaths due to injury, by sex, Australia 1921–91



Source: d'Espaignet et al. 1991[8]; NISU

1.3.1 Sex

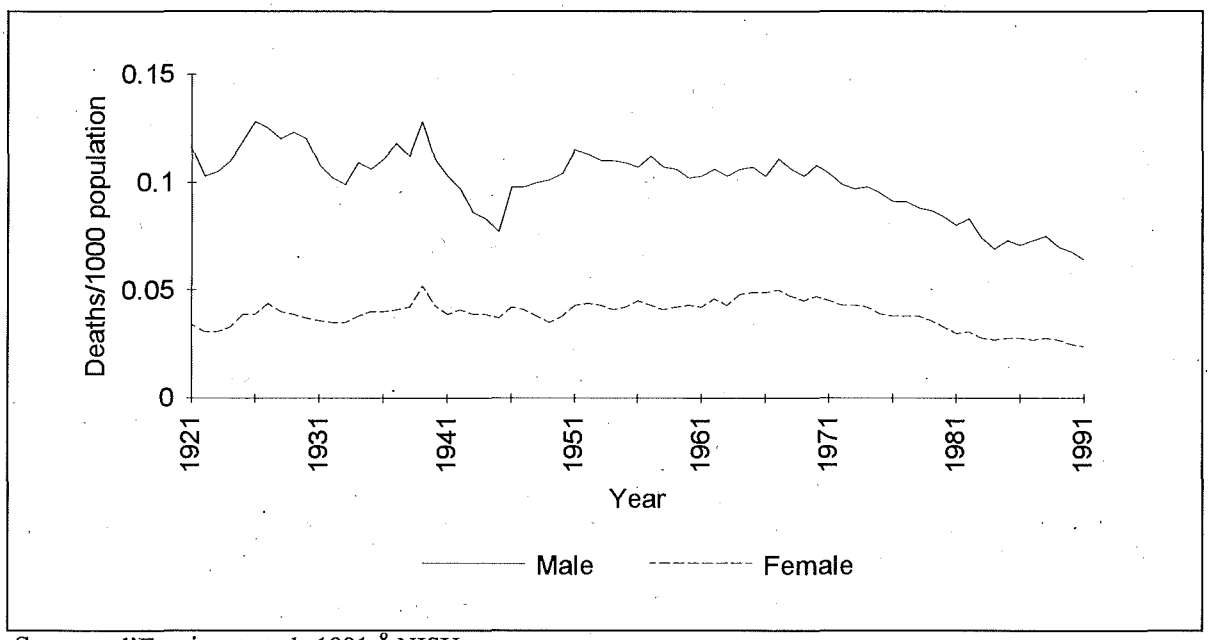
Injury is predominantly a male condition, whether measured in terms of case numbers, population incidence rates, mortality or morbidity. Table 1.5 shows male:female (M:F) ratios for a number of injury indices in Australia.

Despite reductions in absolute injury mortality rates for both males and females (Figure 1.4), M:F ratios in injury mortality (Figure 1.5) are enduring. The M:F injury mortality ratio tended to fall after the First World War and again after the second (the trough during the Second World War is an artefact related to the absence of many young males from Australia). Since the mid-1960s, the ratio has tended to rise, reflecting a more rapid decline in female injury mortality than male injury mortality.

Table 1.5: Male:female ratios for selected injury indices, Australia

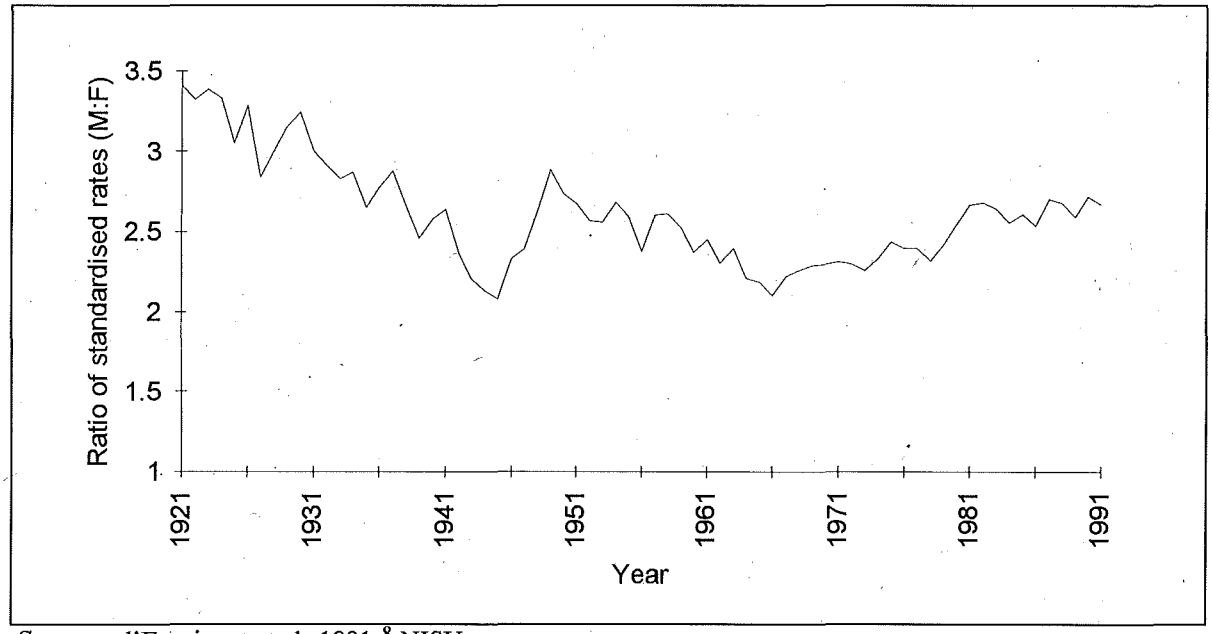
Index	Ratio male:female
Mortality 1990 – crude rates	2.4
Mortality 1990 – age standardised rates	2.7
Hospital admission 1989–90[4]	1.5
Recent injury (NHS 1989–90)[6]	1.2
Long-term injury (NHS 1989–90)[6]	1.5
Recent consultation with a doctor[6]	1.6
GP encounters due to new injury[9]	1.6
Emergency department visits (ISIS 1990)[10]	1.8
Work-place fatalities (1982–84)[11]	17.0

Figure 1.4: Injury mortality incidence rates (age standardised), by sex, Australia 1921–91



Source: d'Espaignet et al. 1991;[8] NISU

Figure 1.5: Injury mortality, M:F ratio of age standardised incidence, Australia 1921–91



Source: d'Espaignet et al. 1991;[8] NISU

There are very few exceptions to the pattern of higher injury levels for males. Even in the first year of life, a male excess is evident for many indices. The major exception to the pattern is conditions related to falls in the elderly, for which hospitalisation rates and numbers, and numbers of deaths have a strong female excess.

Much of the sex-related difference in the experience of injury can be explained in terms of differences in exposure to risk factors. For example, most of the higher incidence of male excess in occupational fatalities for males is due to occupational gender-bias. Mining, which

encompasses several high-risk occupations, demonstrates this. Few (if any) women work in these occupations, reducing the overall incidence rate of work-related fatality in females relative to males. Differences in exposure are important in other settings, such as road transport.

Two other types of factors, referred to here as *predisposition* and *susceptibility*, may contribute to the observed gender differentials. Predisposition refers to differences in likelihood of an injury event if exposure is identical. It includes some aspects of risk-taking which are characteristic of males. Susceptibility refers to the likelihood of a particular outcome following from a given injury event — for example, osteoporotic bones are more likely to fracture in a fall than normal bones.

Other major causes of mortality and morbidity do not show a significant male excess (Table 1.6).

Table 1.6: Male:female rate ratios for selected conditions, Australia

Type of condition	Mortality 1990		Hospital morbidity 1989–90
	Crude	Age standardised	
Injury	2.4	2.7	1.5
Circulatory disease	1.0	0.9	1.3
Neoplasms	1.3	1.7	1.0
Respiratory disease	1.6	2.3	1.2
Infectious disease	1.1	1.6	1.1

1.3.2 Age

Injury varies greatly with age and many specific types of injury have characteristic age distributions. These are discussed in Section 1.4 below. The overall age distribution of injuries is considered in this section.

The pattern of age-specific rates for mortality is similar to that for injury hospitalisation for ages 15 years and above (Figure 1.6). Younger people have a lower injury mortality relative to hospitalisation.

Figure 1.7 shows age-specific rates of injury mortality in Australia in 1991 for males and females (note that the vertical scale is logarithmic). For all age groups but the youngest, male rates are higher than female. For each gender, rates are lowest in childhood, higher in adolescence and early adulthood, lower in middle adulthood, and highest in old age. For many years, Australian injury mortality data have shown peaks at three ages: early childhood, early adulthood and old age. With the rapid decline in child injury mortality in recent years, the first of these peaks has all but vanished. As can be seen in Figure 1.10, the trend in injury mortality rates since 1968 has been downward at all ages, though most sharply in early childhood and least sharply in early adulthood.

Figure 1.6: Age-specific rates of injury mortality, Australia 1991; hospital separations, NSW 1991–92

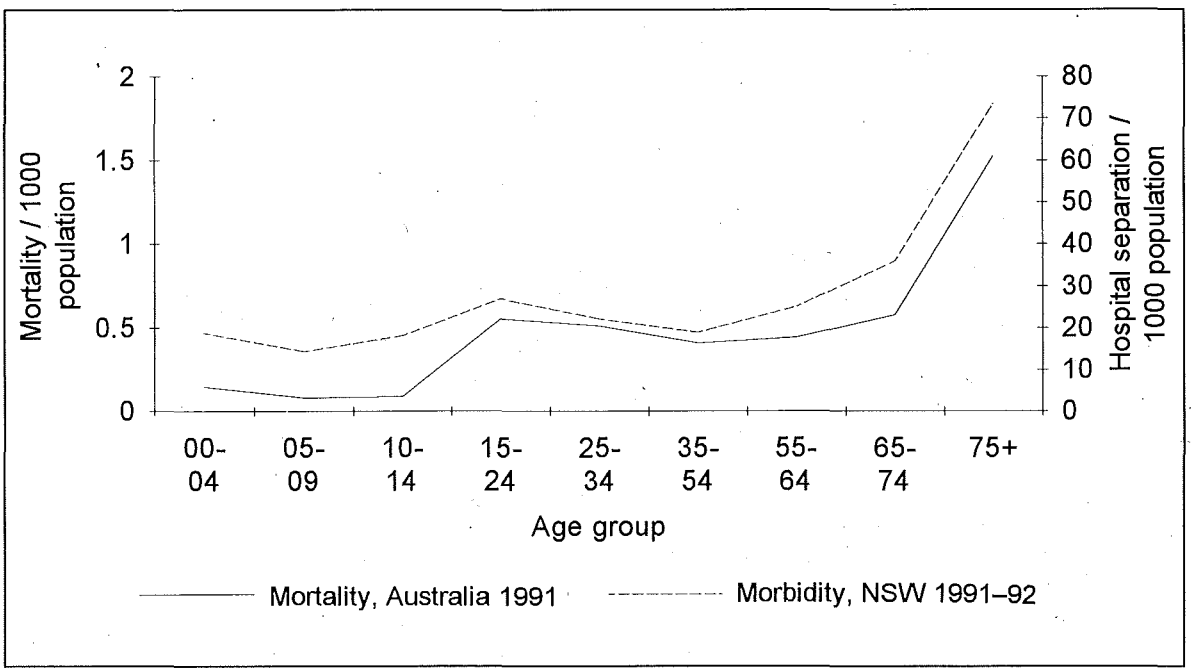
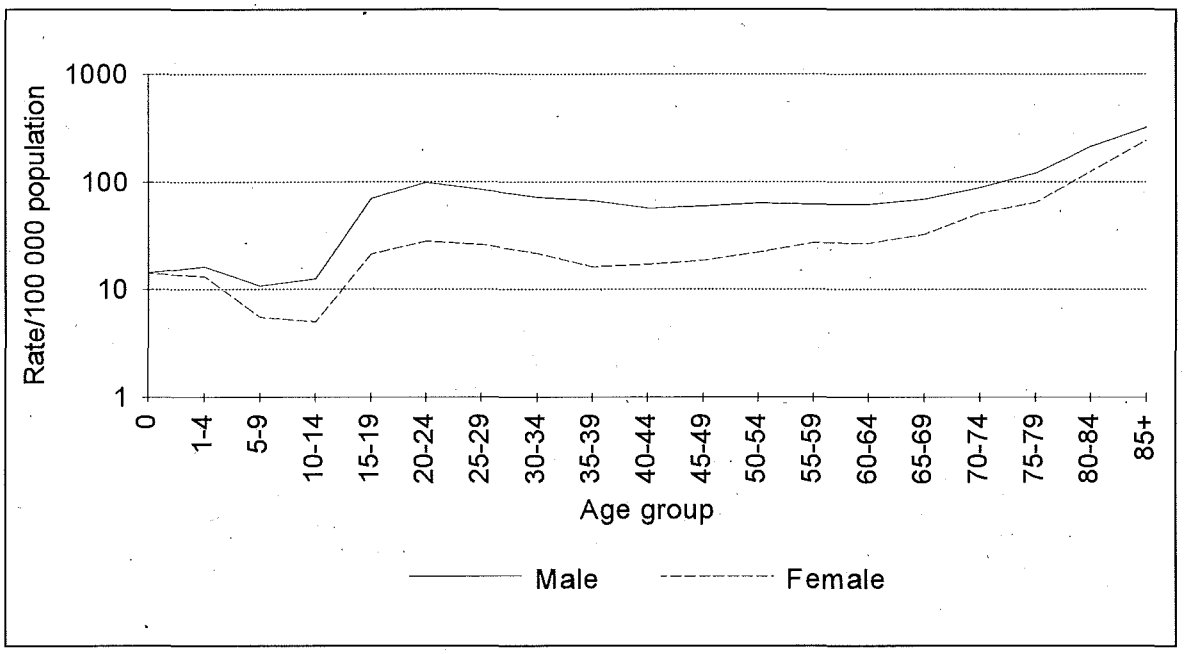


Figure 1.7: External causes death rates by age and sex, Australia 1991



Injury death case numbers show a relationship with age very different from than seen for rates (Figure 1.8). The largest number of cases occurs at ages where injury accounts for the largest proportion of all deaths (Figure 1.9) and where the rate of decline of rates (as shown in Figure 1.10) has been slowest. Indeed, because the age-specific population has grown more quickly than injury rates have declined (Figure 1.10), the average annual number of injury deaths has increased at young adult ages.

Figure 1.8: Injury mortality, age-specific case counts and rates, Australia 1991

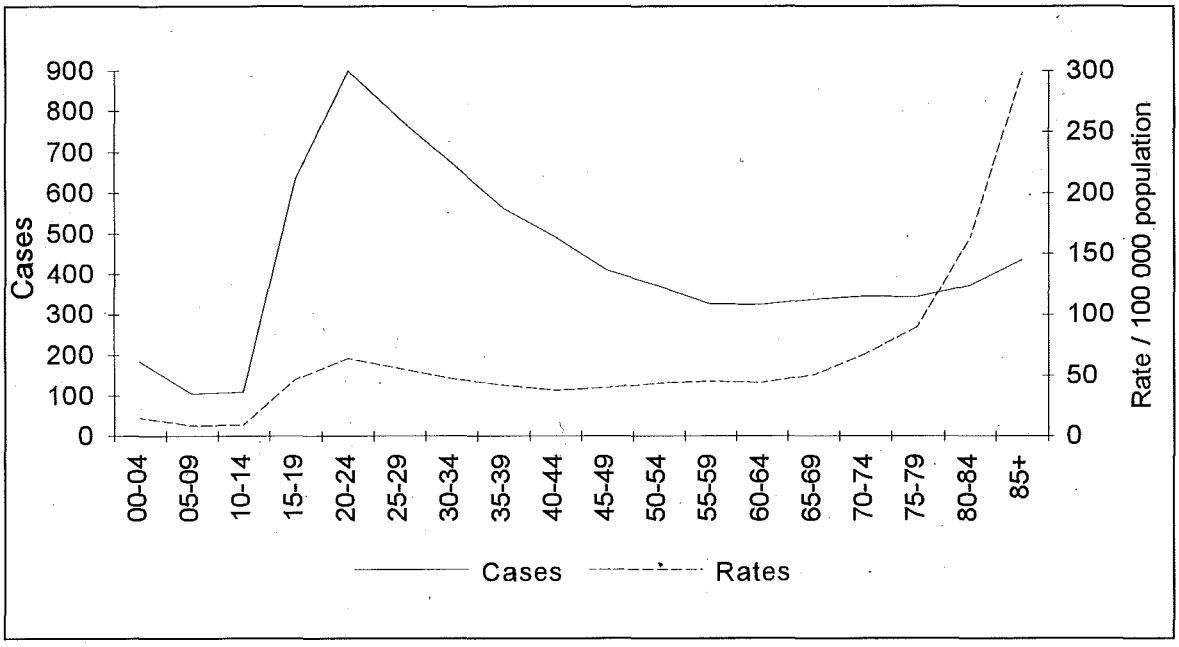
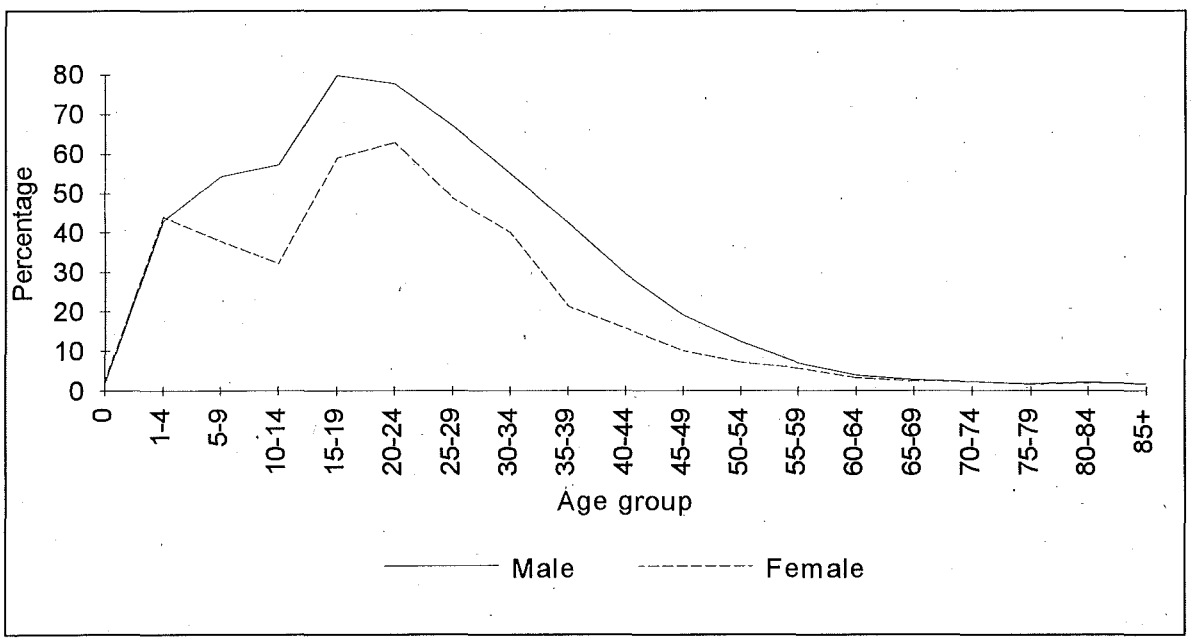


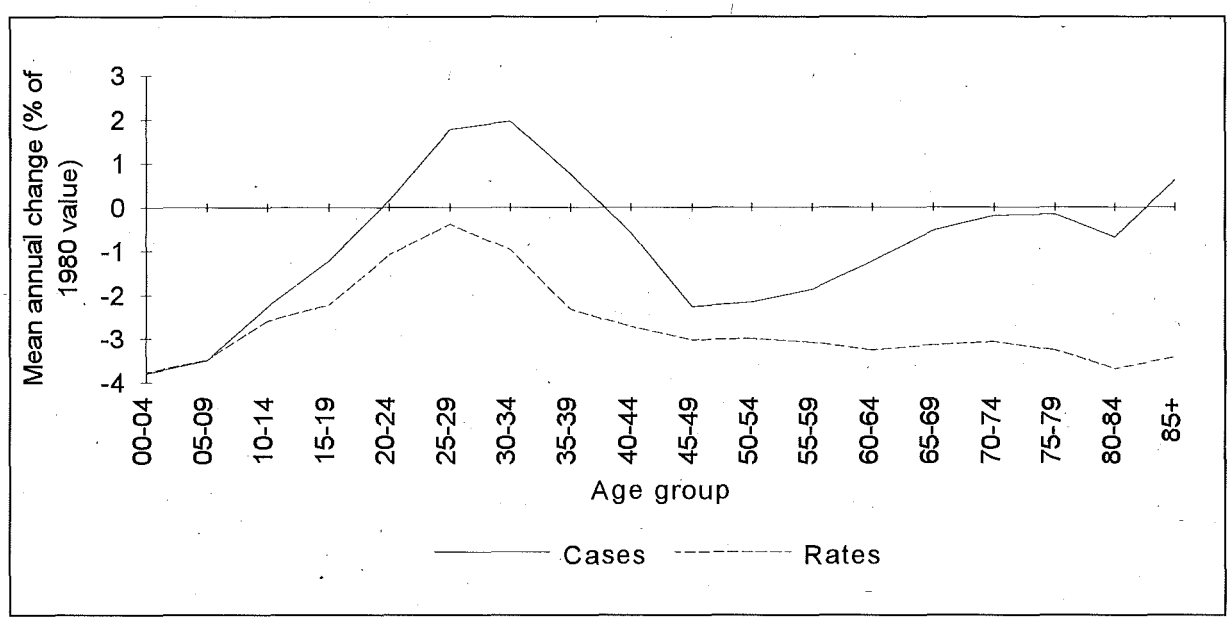
Figure 1.9: External causes deaths as a proportion of all deaths by age and sex, Australia 1991



1.3.3 Nature and severity of trauma

As mentioned at the start of the chapter, information is not available on the nature and severity of trauma for injury deaths generally. The routine mortality data collection does not record this information, though it exists for most injury deaths, often in the form of forensic pathology reports based on post-mortem examination. Several special collections covering some injury deaths have used the pathology reports to code injuries according to ICD-9CM injury and poisoning codes, and abbreviated injury scores.[12,13,14] Some of this work is considered in later chapters (particularly Chapter 2).

Figure 1.10: Mean annual change in injury mortality, Australia 1968–91



Note: The method used to calculate the mean annual change is described in Section 1.4 (B)

Table 1.7 provides an overview of the distribution by principal diagnosis of injury cases hospitalised in Australia during 1989–90. Average length of stay provides a rough indication of case severity. Care should be taken when interpreting this table. The source document should be consulted concerning the scope of the survey on which it is based.[4] In addition, it should be noted that the rate of injury separations (which this table estimates) is not equivalent to the incidence rate of injury leading to hospitalisation—the former measure includes cases involving more than one admission.

The male rate for injury separations is higher than the female rate, while the opposite ratio is seen for all separations. Fractures account for a large proportion of separations (male (M): 32%; female (F): 37%). The only category for which female rates exceed male is 'poisoning' (M7%; F12%). This category includes cases of intentional self-poisoning.

Average length of stay for female injury cases is longer than that for all cases, while that for males is about the same as the 'all diagnoses' mean. Separations involving females with fractures have a mean stay more than twice as long as the 'all diagnoses' average and this accounts for most of the difference.

More detailed summary information of the nature of injury resulting in hospital admission can be found in Tables 27–40 in the Appendix. Reference is made to this information in later chapters.

1.3.4 Causal factors for injury

Presumed and known causal factors for injury can be classified in many ways. The most widely used classification is the *Supplementary Classification of External Causes of Injury and Poisoning*, which is part of the ICD-9CM, and commonly known as the 'E-codes'[5]. It should be noted that they do not enable identification of some important categories of cases, contain conceptual inconsistencies and provide rather limited information.

Table 1.8 provides a summary of rates and proportions of injury deaths and separations by major E-code group. (Note that mortality rates have been expressed as rates per 100 000 population, while separation rates are per 1000 population.)

Table 1.7: Injury separations, acute hospitals, Australia 1989–90

Principal diagnosis	Separations from acute hospitals (1000 population)			Average length of stay in acute hospitals (days)		
	Male	Female	Persons	Male	Female	Persons
Fracture	7.4	5.6	6.5	7.6	11.6	9.3
Dislocation, sprain, strain	2.0	0.9	1.4	3.2	4.2	3.5
Intracranial, internal	2.7	1.2	2.0	4.3	3.8	4.1
Open/blood vessel injury	3.7	1.5	2.6	3.3	4.8	3.7
Late effects	0.1	0.1	0.1	7.0	6.8	6.9
Superficial/other injury	2.4	1.6	2.0	3.0	4.7	3.9
Foreign body	0.4	0.3	0.3	2.0	1.7	1.8
Burn	0.6	0.3	0.4	8.1	9.9	8.6
Poisoning	1.6	1.8	1.7	2.8	3.1	2.9
Complications	2.1	2.0	2.1	9.3	9.8	9.5
All injury/poisoning	**23.0**	**15.3**	**19.1**	**5.4**	**7.6**	**6.3**
All principal diagnoses	**193.6**	**245.5**	**219.6**	**5.5**	**5.5**	**5.5**
Per cent due to injury	**11.9**	**6.2**	**8.7**	-	-	-

Source: derived from data in Gillett et al 1993[4]

Table 1.8: Rates and proportions, injury mortality (1990) and morbidity (1989–90), Australia

'External cause' category	Rates		Proportions	
	Mortality (per 100 000 pop) 1990	Morbidity (per 1000 pop) 1989–90	Mortality (per cent) 1990	Morbidity (per cent) 1989–90
Transportation	16.7	3.2	35.9	14.5
Accidental poisoning	1.3	0.9	2.8	4.1
Medical misadventure	0.4	3.4	0.8	15.4
Falls	6.0	5.5	13.0	24.9
Fire, flames, fumes etc	0.6	0.2	1.2	0.9
Other accidents	5.3	6.4	11.4	29.0
Adverse effects	0.2	0.7	0.5	3.2
Intentional: self harm	12.7	0.6	27.2	2.7
Intentional: by other	2.3	0.9	4.9	4.1
Other violence	1.1	0.1	2.3	0.5
All 'external causes'	**46.5**	**2.1**	**100**	**99.3**

Sources: morbidity: Gillet et al;[4] mortality: NISU

1.4 Cause-specific summaries of injury mortality

Injury mortality data, grouped by ICD E-code (or earlier equivalents), have been available for most of the century. The classification has changed several times and comparability is limited between versions. The present revision (9th) has been used for Australian mortality data since 1979. Consistency is quite good with the 8th revision, used from 1968 to 1978. The following figures (Figures 1.11–1.23) cover selected major categories of injury mortality in Australia. For each category, three figures (A–C) are presented.

A. Injury mortality rates for the period 1968–91. The rates shown have been directly age-standardised to the Australian population in 1988.

B. Trends in rates during the period for each age group and gender. Values in the figures were calculated as follows. A least-squares trend line was fitted to each age- and sex-specific set of rates. The annual percentage change of rate estimated by this line was then calculated, using the 1980 estimate (the mid-year in the period studied) as the denominator, and the slope of the line as the numerator. Generally, values greater than zero indicate rising rates during the period, while values less than zero indicate falling rates. Note that these figures are subject to wide (and largely meaningless) variation when case numbers are very small and values based on average incidence of less than one case per year have not been presented.

C. Age- and sex-specific injury mortality rates and case numbers in 1991. Case counts of three or less (and corresponding rates) are not shown.

Many of the categories of injury shown here are dealt with in greater detail in other parts of the report.

1.4.1 Railway transport accidents

'Railway transport accidents' (E-codes 800–807) accounted for 48 deaths in 1991, (M37; F11). Most of the cases were pedestrians struck by trains (this group probably overlaps with suicide — though suicide by this means is not distinguished in the E-codes). The Granville disaster accounted for the peak in 1977 (Figures 1.11A,B). Numbers were very small for females. From 1968–91 male rates declined at most ages, but not at 15–29 years (the group accounting for the largest proportion of cases).

Figure 1.11A: Railway accident deaths, age standardised rates, Australia 1968–91

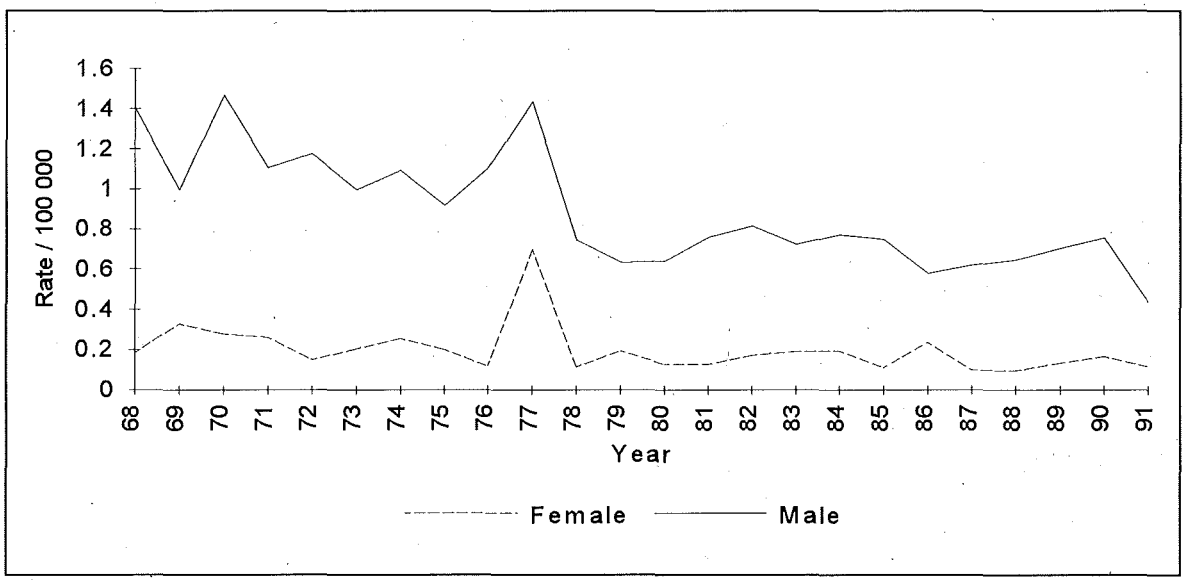
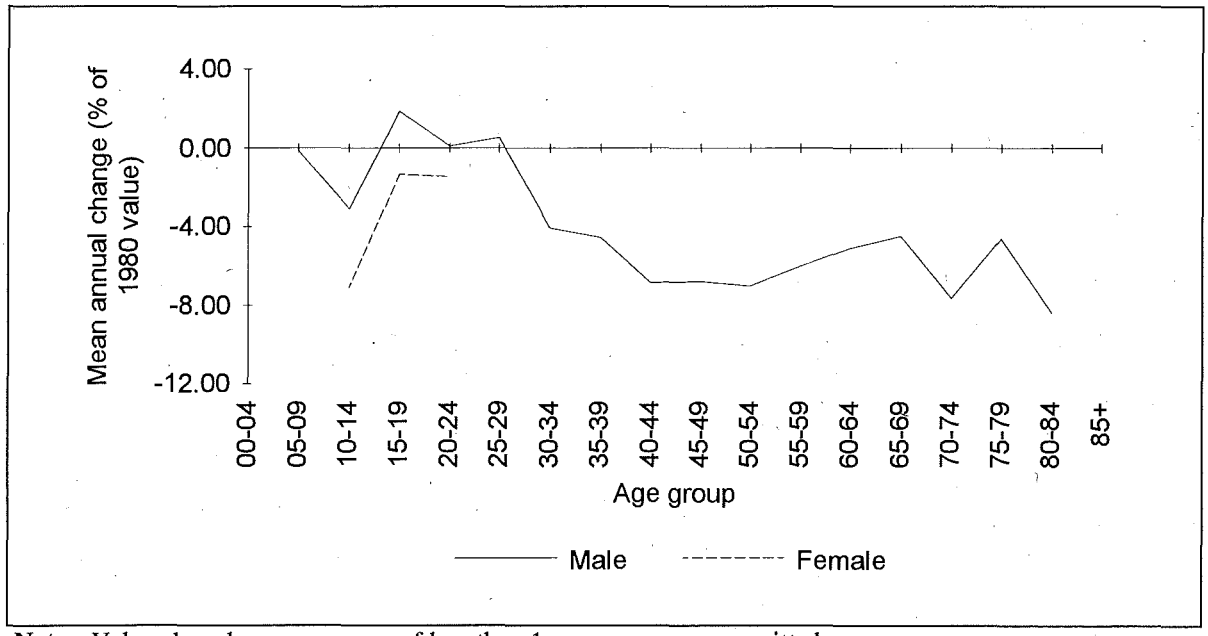


Figure 1.11B: Mean annual change in injury mortality rates, railway accidents, Australia 1968–91



Note: Values based on an average of less than 1 case per year are omitted

Fgure 1.11C: omitted due to small case numbers. There were three or fewer cases in each age-sex group except males aged 15–19 years (in which n=11), and males aged 20–24 years (n=6).

1.4.2 Motor vehicle traffic accidents

'Motor vehicle traffic accidents' (E810–819) accounted for 2221 deaths in 1991 (M1570; F651), 29 per cent of all injury deaths. Despite continuing decline in rates and case numbers, this category, along with suicide, accounts for the bulk of injury mortality (Figures 1.12A–C). From 1968–91 rates tended to rise for females aged 20–39, probably reflecting increasing exposure (rising proportion of women drivers). In 1991 case numbers were highest for young adults, while rates were highest for the elderly.

Figure 1.12A: Motor vehicle traffic accident deaths, age standardised rates, Australia 1968–91

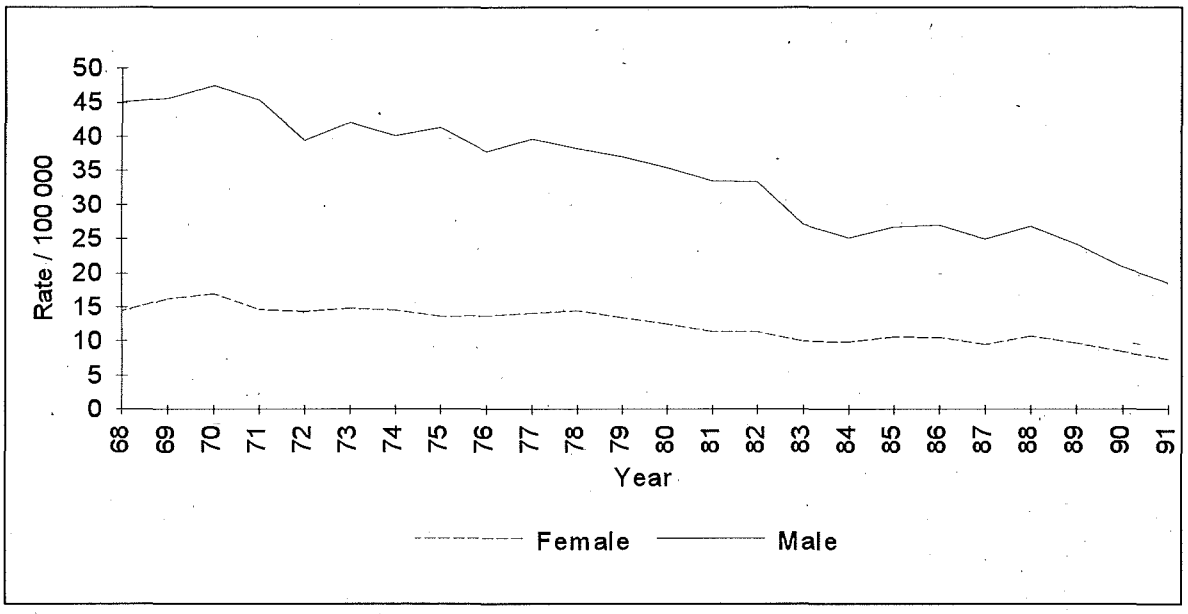


Figure 1.12B: Mean annual change in injury mortality rates, motor vehicle traffic accidents, Australia 1968–91

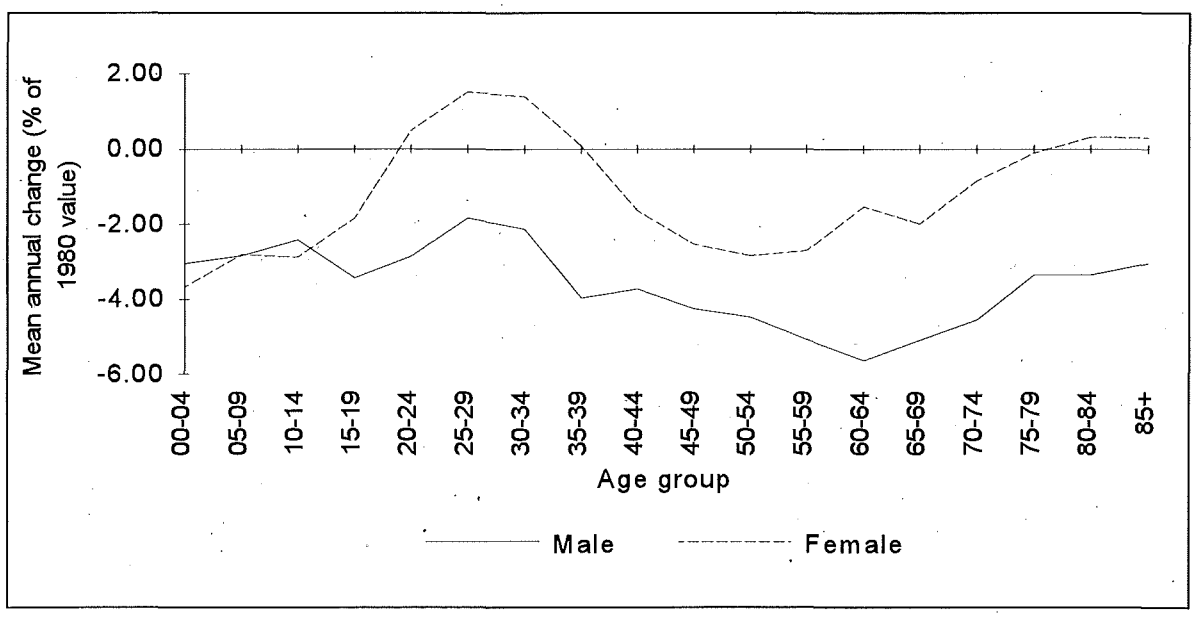
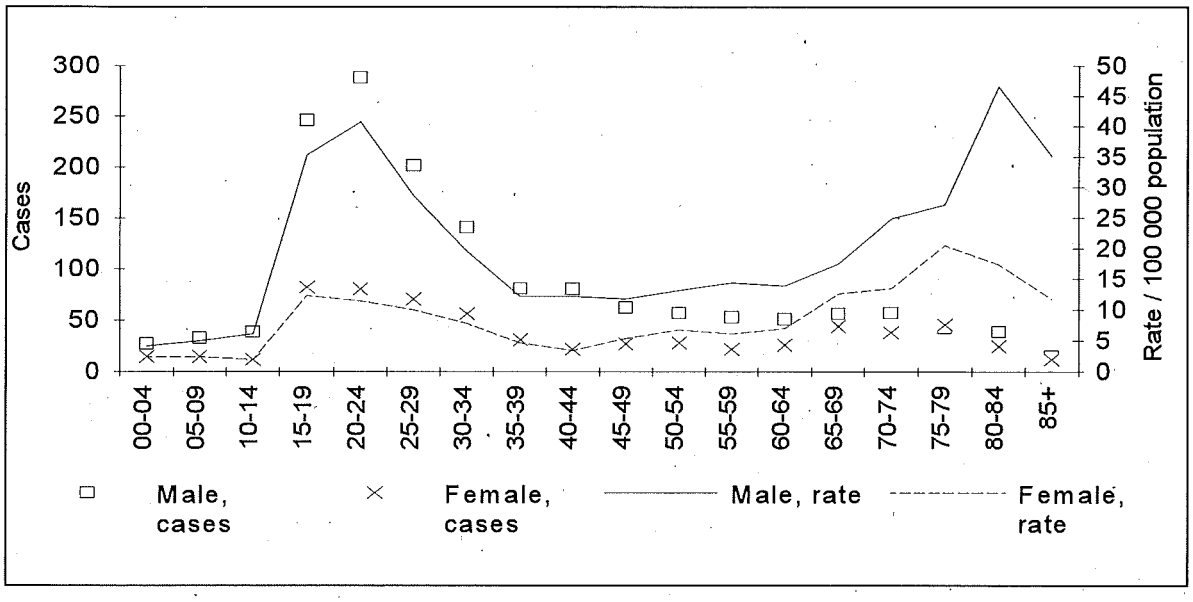


Figure 1.12C: Injury mortality incidence rates and counts, motor vehicle traffic accidents, Australia 1991



1.4.3 Water and air transport accidents

Like rail, accidental deaths involving watercraft (E830–838; 1991: M82; F7), and aircraft (E840–845; 1991: M53; F12) account for a much smaller proportions of injury deaths than does road transport (Figures 1.13A–C and Figures 1.14A–C, respectively). From 1968–91 rates have fluctuated, reflecting small numbers and some multifatality events. Male:female ratios are high for these categories. Male rates of water transport death have tended to decline for all ages, but the data suggest (on relatively small case numbers) a rise in air transport deaths occurred for males older then 40 from 1968–91.

Figure 1.13A: Water transport deaths, age standardised rates, Australia 1968–91

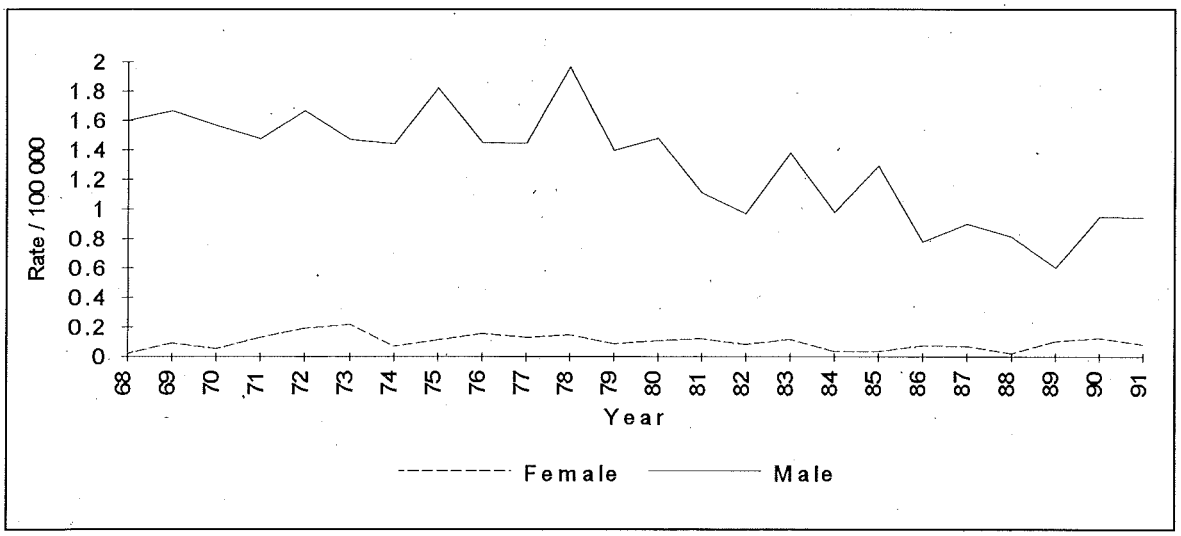
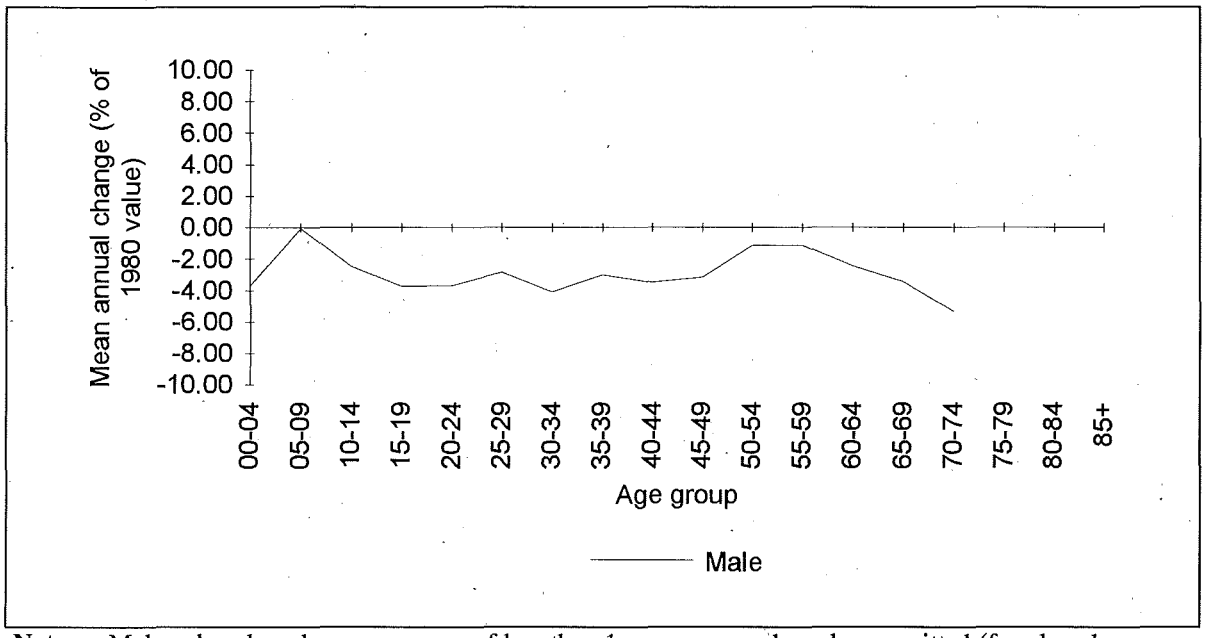
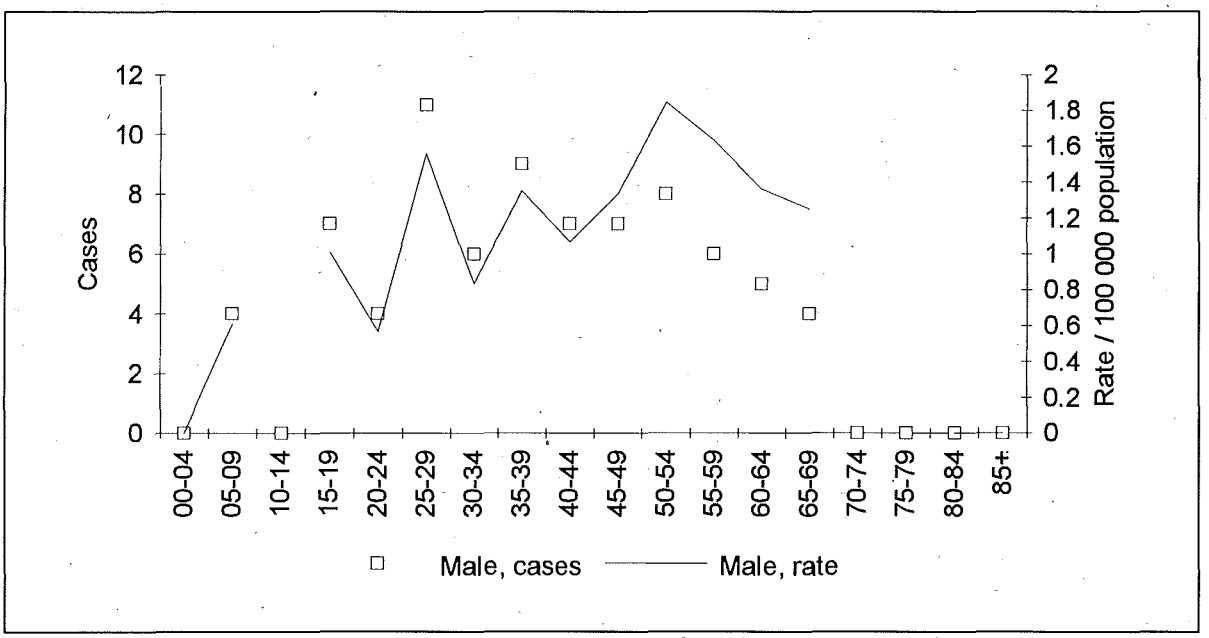


Figure 1.13B: Mean annual change in injury mortality rates, water transport, Australia 1968–91



Note: Male values based on an average of less than 1 case per year have been omitted (female values omitted due to small case numbers)

Figure 1.13C: Injury mortality incidence rates and counts, water transport, Australia 1991



Note: Male values based on 3 cases or fewer have been omitted (female values omitted - no more than 2 female cases in any age group)

Figure 1.14A: Air transport injury deaths, age standardised rates, Australia 1968–91

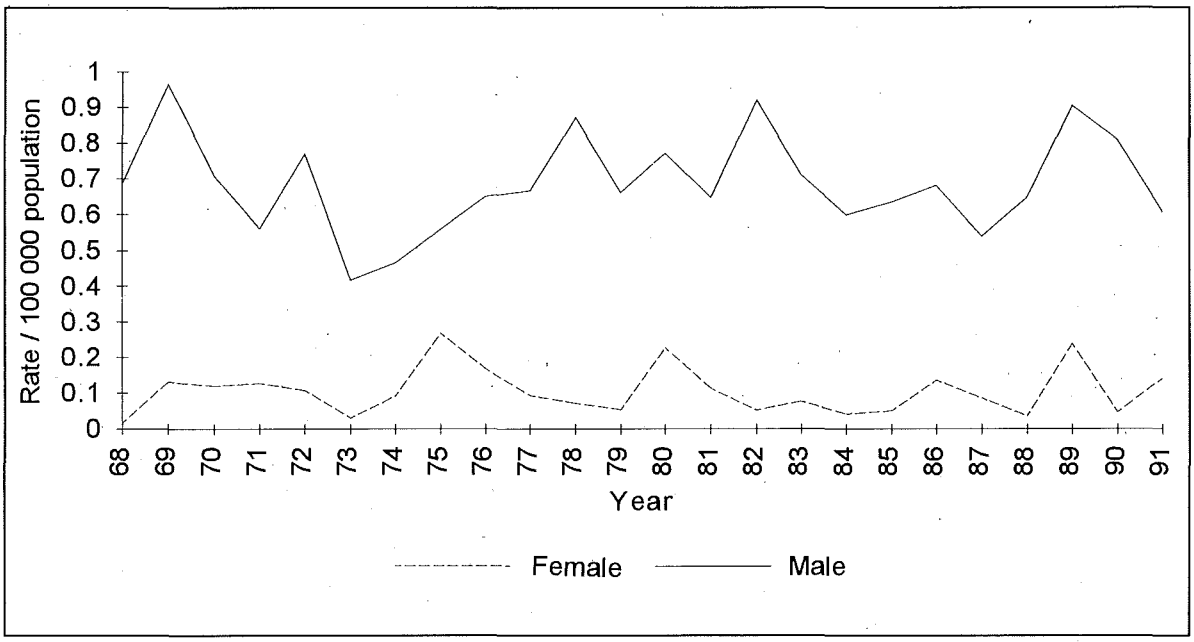
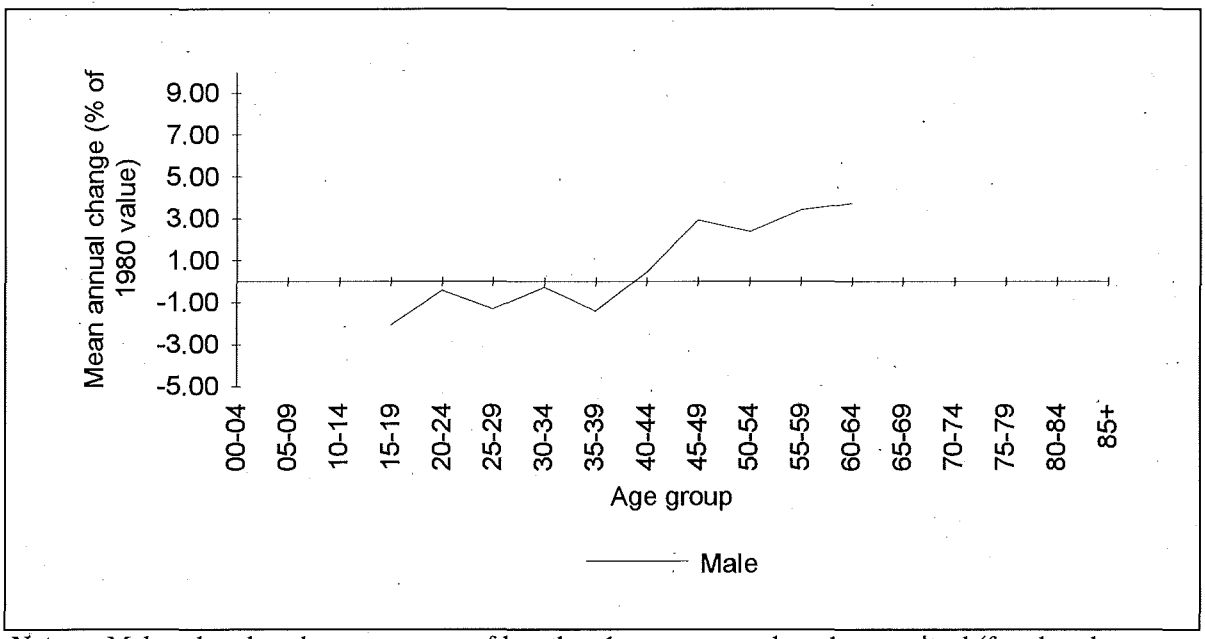
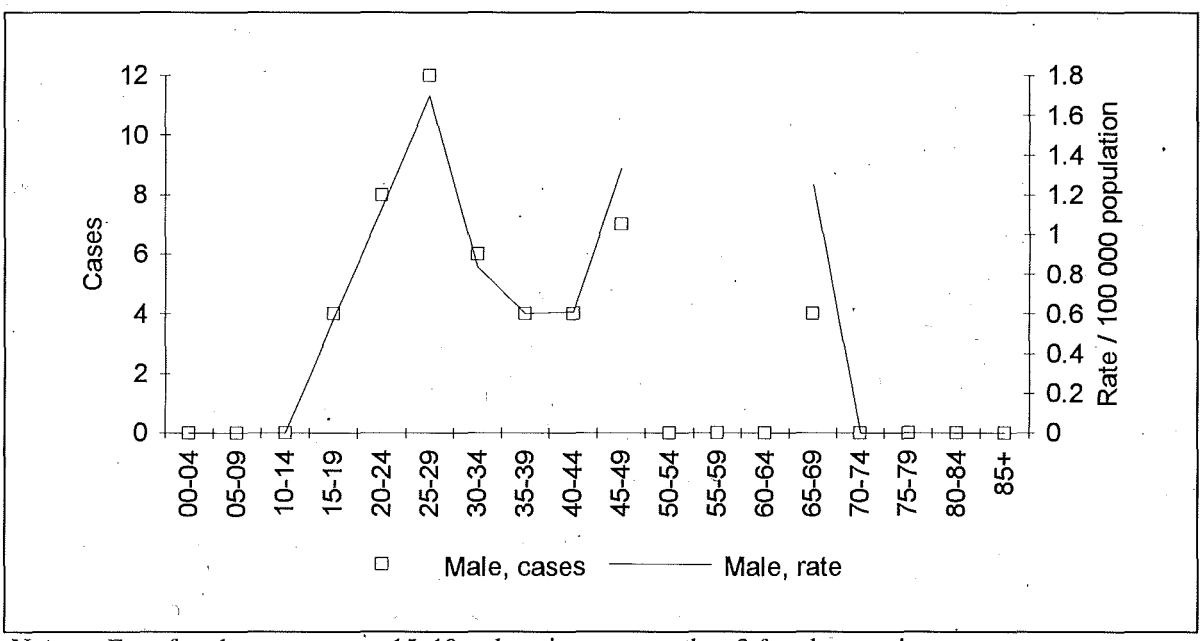


Figure 1.14B: Mean annual change in injury mortality rates, air transport accidents, Australia 1968–91



Note: Male values based on an average of less than 1 case per year have been omitted (female values omitted due to small case numbers)

Figure 1.14C: Injury mortality incidence rates and counts, air transport, Australia 1991



Note: Four female cases at ages 15–19; otherwise no more than 3 female cases in any age group. Values based on 3 cases or fewer have been omitted

1.4.4 Accidental poisoning by drugs, medicinal substances

The rate of 'accidental poisoning' involving drugs, medicinal substances etc. (E850–858; 1991: M101; F44) has risen for adolescents and young adults (especially males) largely due to increasing numbers of cases attributed to opiates. The fairly constant rate for females from 1968–91 disguised marked declines in cases due to barbiturates and chloral hydrate. (The counterbalancing rise did not seem to be accounted for by a particular substance). In 1991, only one case occurred at ages less than 10 years (Figures 1.15A–C).

Figure 1.15A: Poisoning (drugs, medicinal substances) injury deaths, age standardised rates, Australia 1968–91

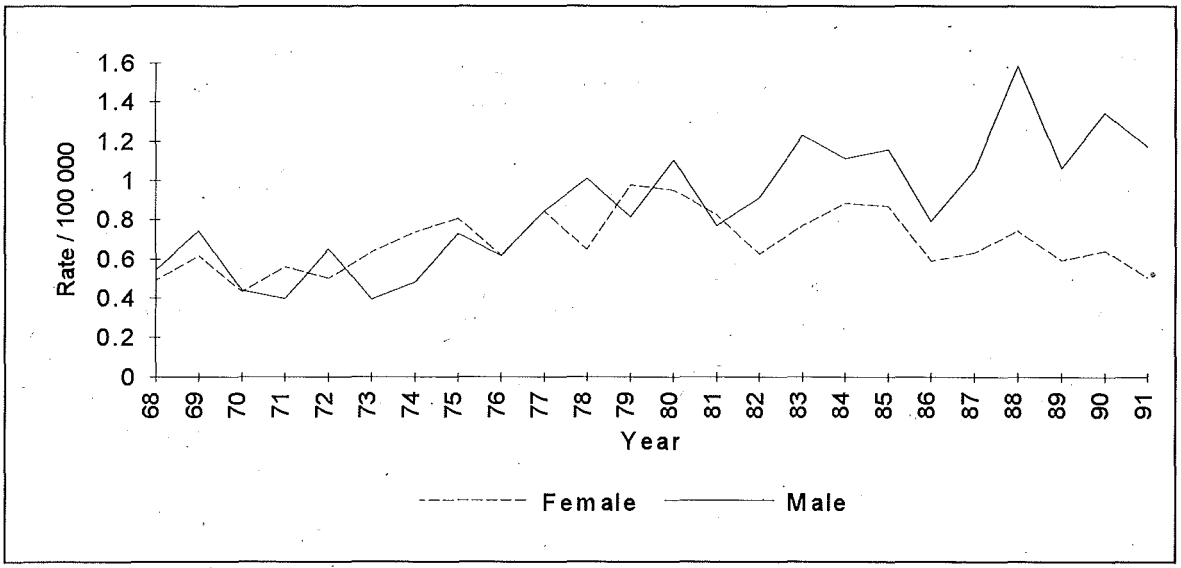
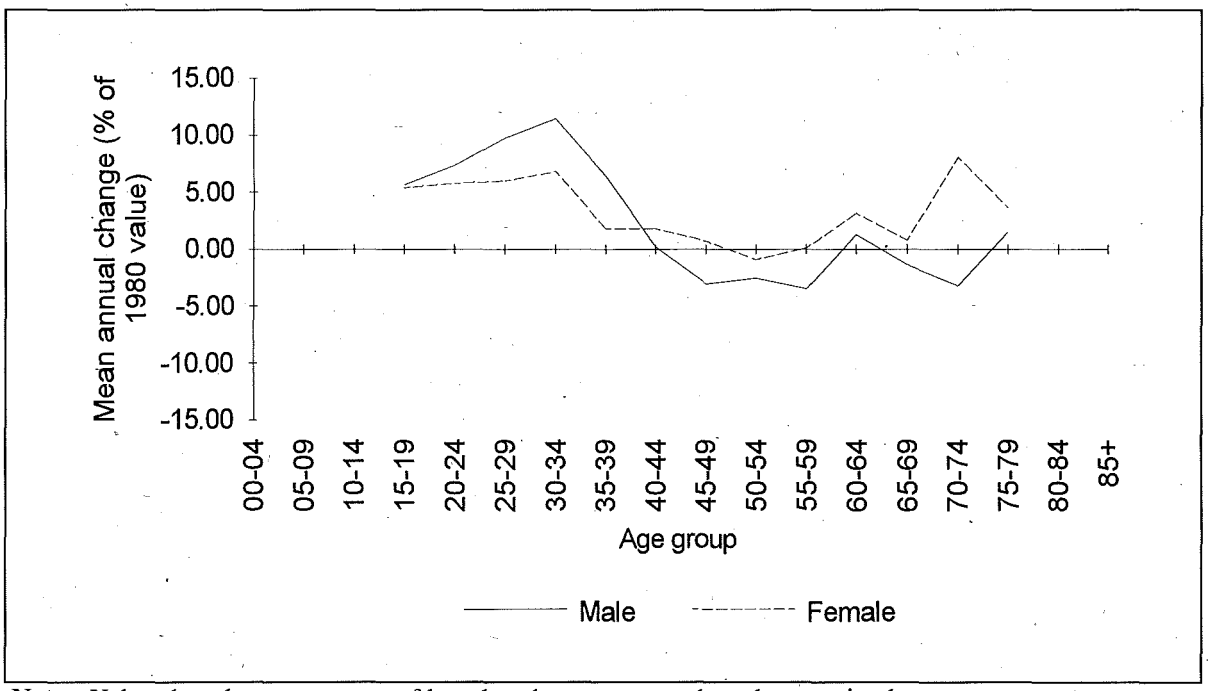
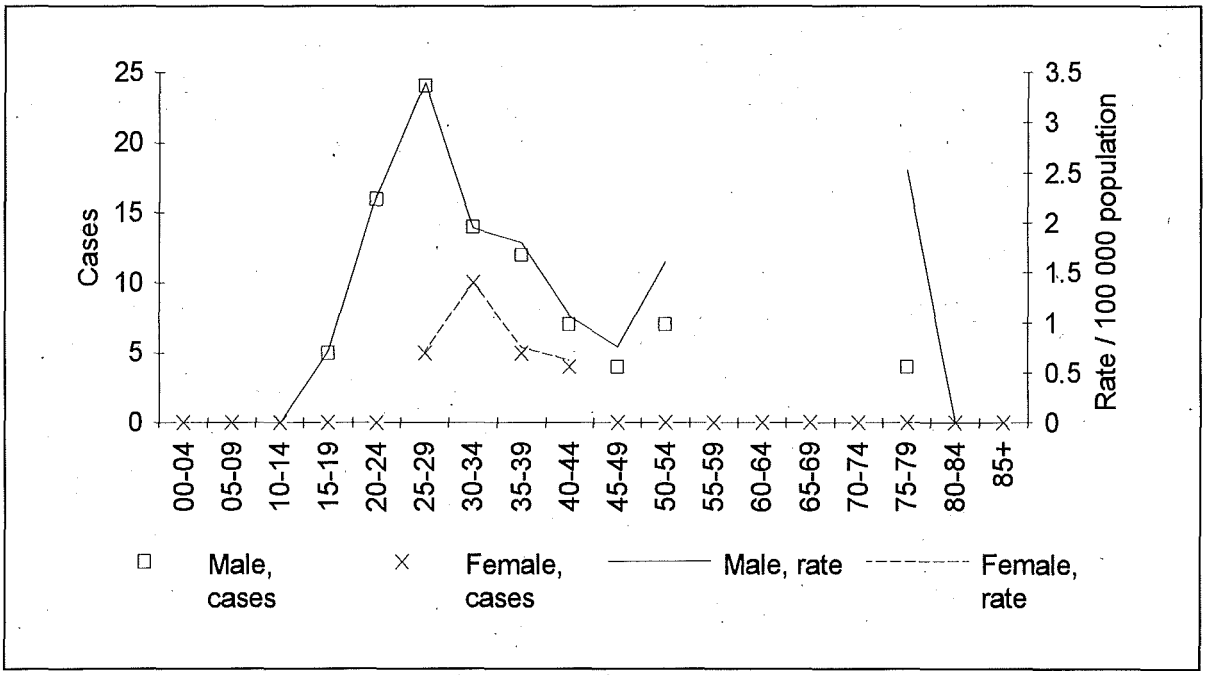


Figure 1.15B: Mean annual change in injury mortality rates, accidental poisoning (drugs, medicinal substances etc.), Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.15C: Injury mortality incidence rates and counts, poisoning (drugs, medicinal substances etc.), Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.5 Accidental poisoning by other substances

'Accidental poisoning' by other substances (E860–869), like the previous category, probably overlaps with the suicide category. In 1991, the category accounted for 63 cases (M49; F14) most commonly at ages 15–29 years. Only one case occurred at ages 0–9 years in 1991. This case was attributed to 'petroleum fuel and lubricants', as were six at ages 15–19 years—the most common age group in this category (Figures 1.16A–C).

Figure 1.16A: Poisoning (not drugs) deaths, age standardised rates, Australia 1968–91

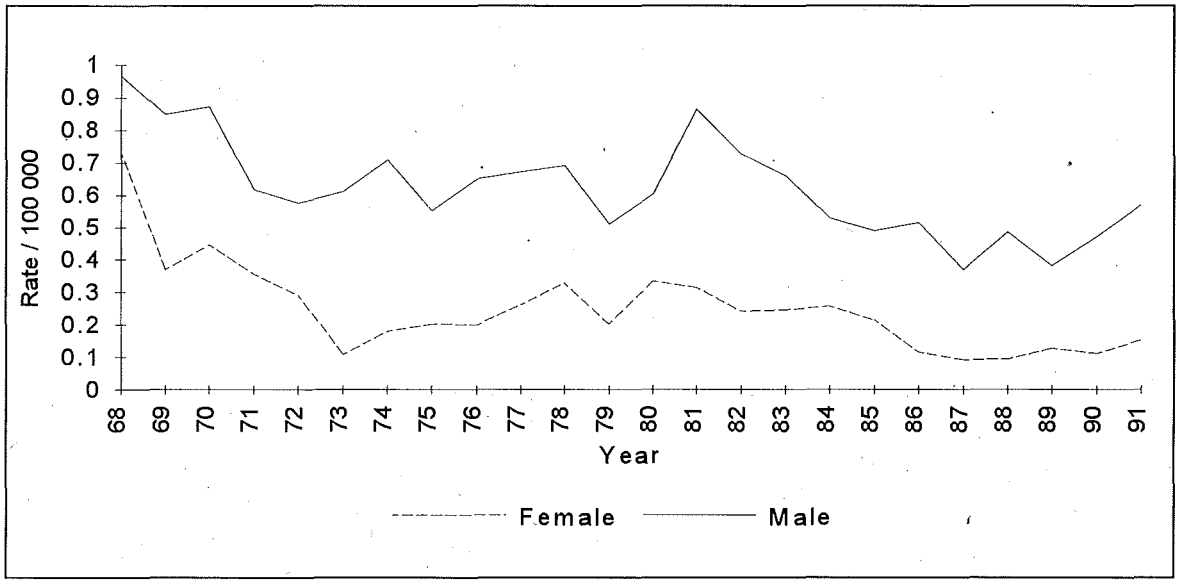
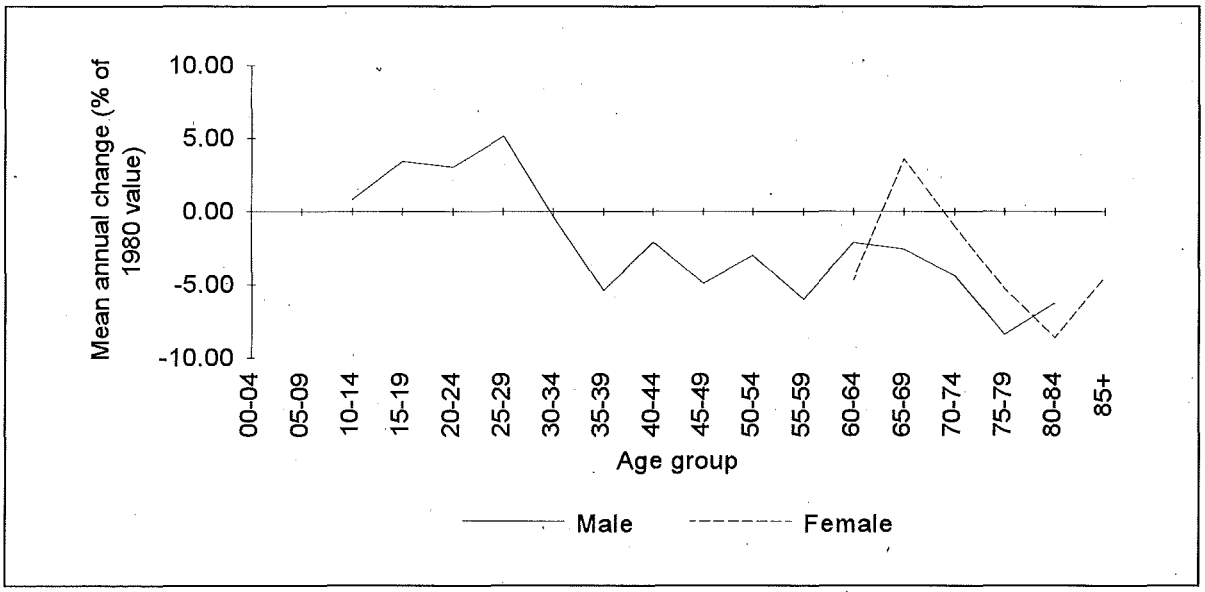


Figure 1.16B: Mean annual change in injury mortality rates, accidental poisoning (not drugs), Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.16C: omitted due to small case numbers. Three or fewer cases in each age-sex group except: male 15–19 (n=7), male 20–24 (n=13), male 25–29 (n=7), male 35–39 (n=5), and male50–54 (n=4),

1.4.6 Accidental falls

'Accidental falls' (E-codes E880–E888) is the most numerous category after motor vehicle crash cases and suicides (1991; M435; F495). Notably, female cases are more numerous than male, though male incidence rates are higher. Most of the cases involve persons of advanced age in relatively minor falls (on one level, from a bed or chair etc.). A smaller number of falls, often from a height, involve younger persons. A decline in rates during the 1970s flattened out in the 1980s. It remains to be seen whether the downward trend has resumed (Figures 1.17A–C). From 1968–91 the rates for males declined at all ages, and the relatively low rates for young women appeared to increase. Of greater significance, rates for the oldest group of females, the highest for any age, showed no downward trend.

Figure 1.17A: Falls deaths, age standardised rates, Australia 1968–91

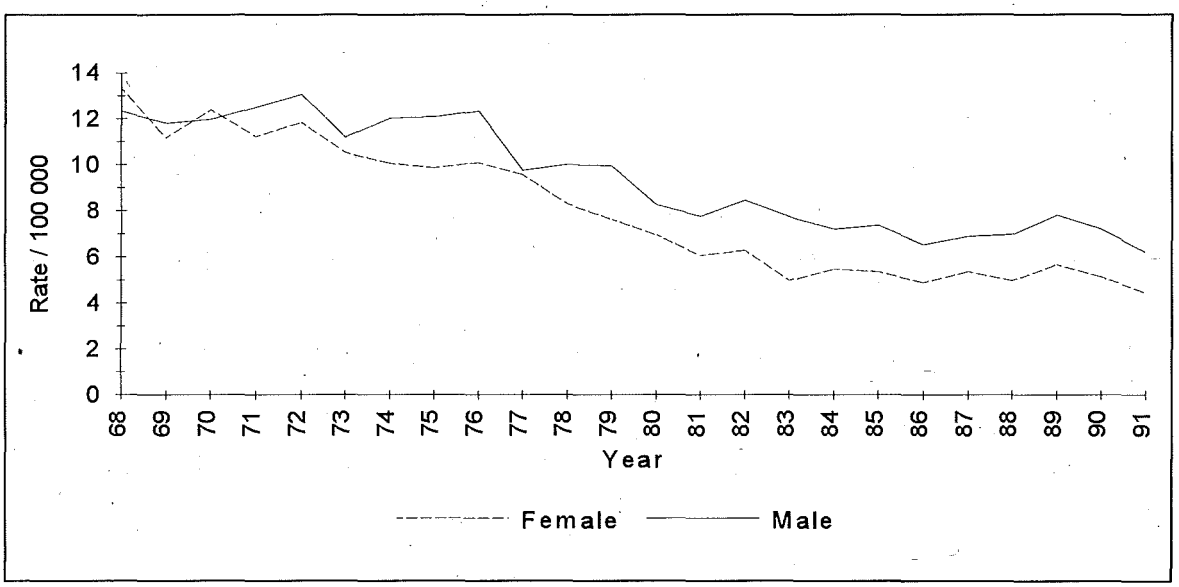
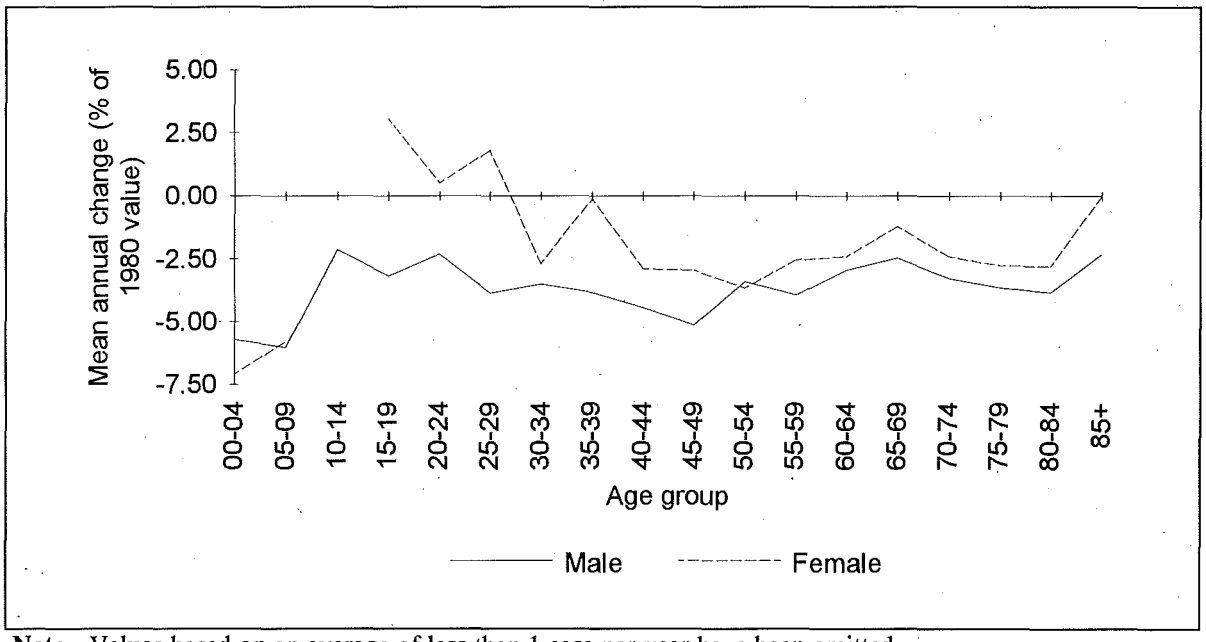
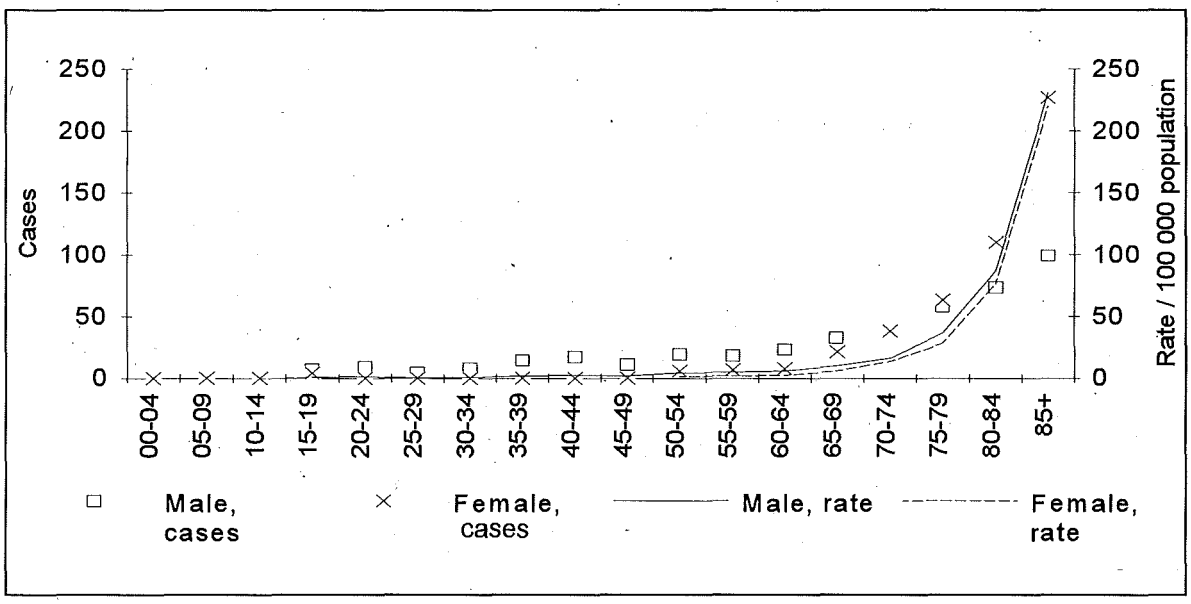


Figure 1.17B: Mean annual change in injury mortality rates, accidental falls, Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.17C: Injury mortality incidence rates and counts, falls, Australia 1991



1.4.7 Fire, flames, fumes etc.

The category comprising cases resulting from 'fire, flames, fumes etc.' (E890–899; 1991; M90; F54) shows a declining background rate (mainly house fires) with occasional peaks (bad bushfires—note the peak due to the severe bushfires of the 1982–83 summer, including 'Ash Wednesday') (Figures 1.18A–C). In 1991 case numbers were highest at age extremes and also for young adult males. Downward trends have been most marked at middle ages and for elderly men.

Figure 1.18A: Fire, flames etc. deaths, age standardised rates, Australia 1968–91

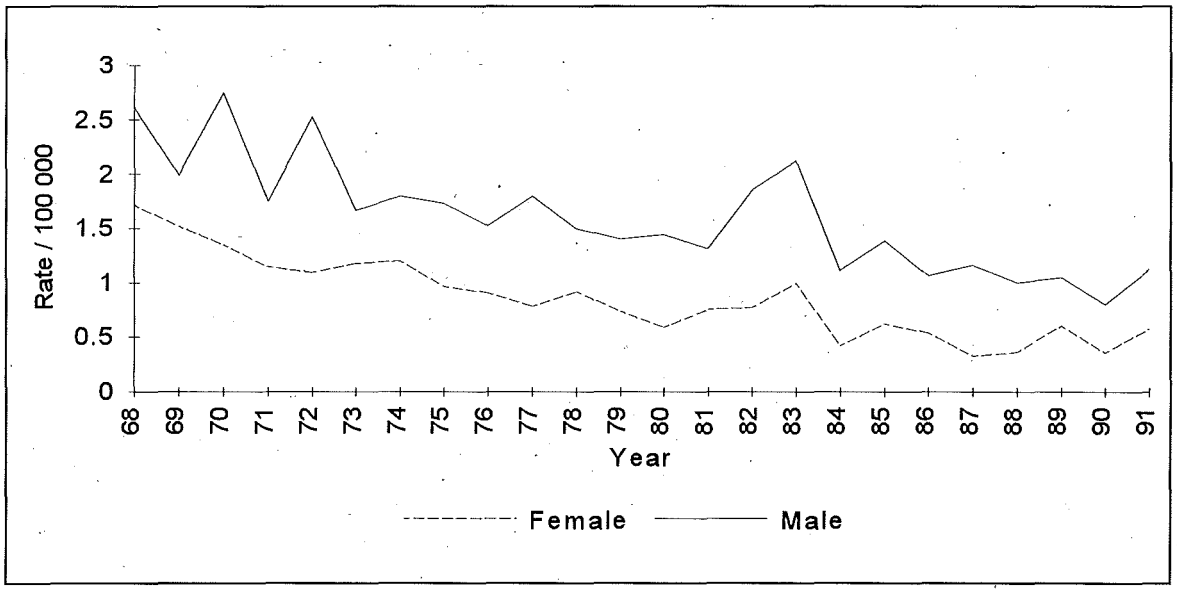
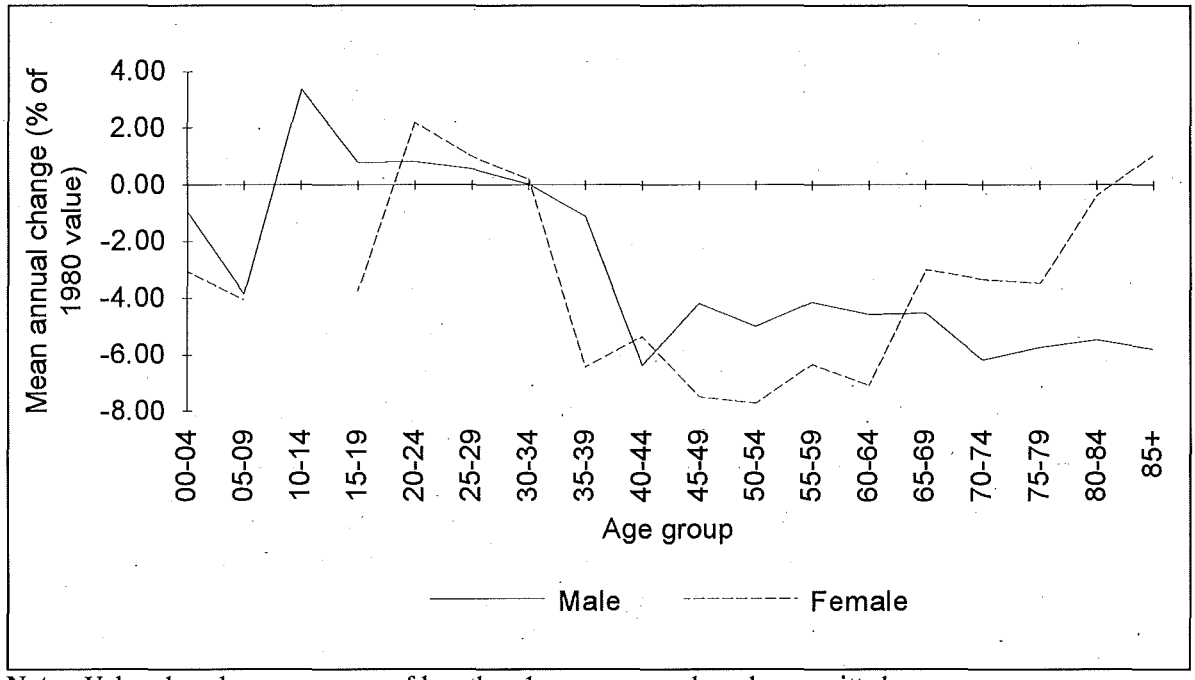
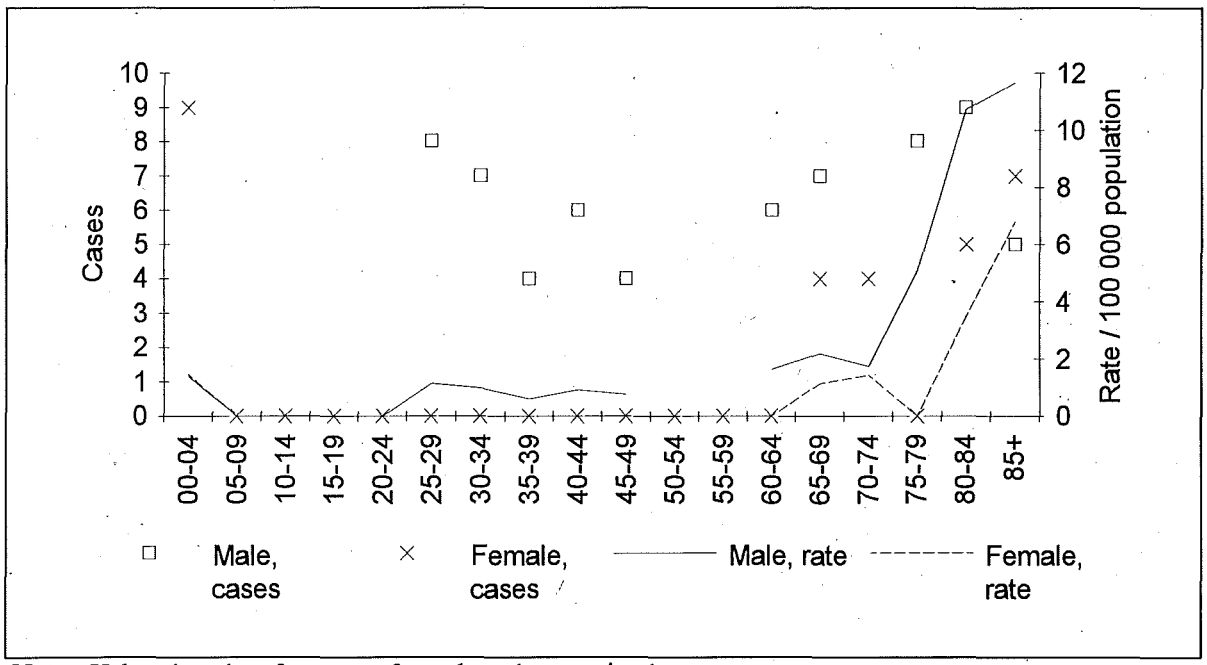


Figure 1.18B: Mean annual change in injury mortality rates, fire, flame etc., Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.18C: Injury mortality incidence rates and counts, fire, flames etc., Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.8 Submersion, suffocation, and foreign bodies

'Submersion, suffocation, and foreign bodies' (E910–E915; 1991: M319; F127) contains two important subgroups. 'Accidental drowning and submersion' (E910; M209; F60) is the largest (though it does not contain all drowning deaths — see Table 1.9, below). Respiratory obstruction due to food or other objects accounted for 120 deaths in 1991 (M68; F52) (Figures 1.19A–C). The greatest rates of decline are seen in infants and young children, though their rates remain high.

The 269 deaths coded to E910 comprise only about two-thirds of all drowning deaths, many of which are classified to other categories, such as watercraft accidents, and suicides. (This is a good example of a limitation of coding injury cases to only one 'cause' when several factors often are relevant). Table 1.9 shows the distribution of drowning cases (as defined by a drowning 'flag' data item in the routine mortality collection) between major external cause categories.

For several States, the drowning 'flag' item contains further information about the circumstances and location of drowning. One classification is used for New South Wales, Victoria and South Australia; another is used for Queensland. Table 1.10 summarises the 1991 data for the three States which used a common classification.

Table 1.9: Drowning, Australia 1991

'External cause' category	Number of drownings	Per cent
Road vehicle accidents	9	2
Water vehicle accident	59	14
Falls	1	0
Environmental factors	8	2
Drowning and submersion	269	66
Late effects of injury	1	0
Intentional: self harm (suicide)	41	10
Intentional (homicide/assault)	7	2
Undetermined intent	14	3
Total	**409**	**99**

Table 1.10: Classification of drownings in New South Wales, Victoria and South Australia 1991

Category		Number of cases
Fell or wandered into:	private swimming pool	13
	public swimming pool	0
	other body of water	21
	object containing water	4
Swimming in:	private pool	19
	public pool	5
	other place	43
Surfing		3
Swept from rocks etc.		13
Skin-diving		7
Attempting rescue		5
Drowned in bathtub		13
Watercraft submersion:	motorised craft	25
	non-motorised craft	4
Other and unspecified circumstances		50
Total (all drownings)		**225**

Figure 1.19A: Submersion, suffocation and foreign body deaths, age standardised rates, Australia 1968–91

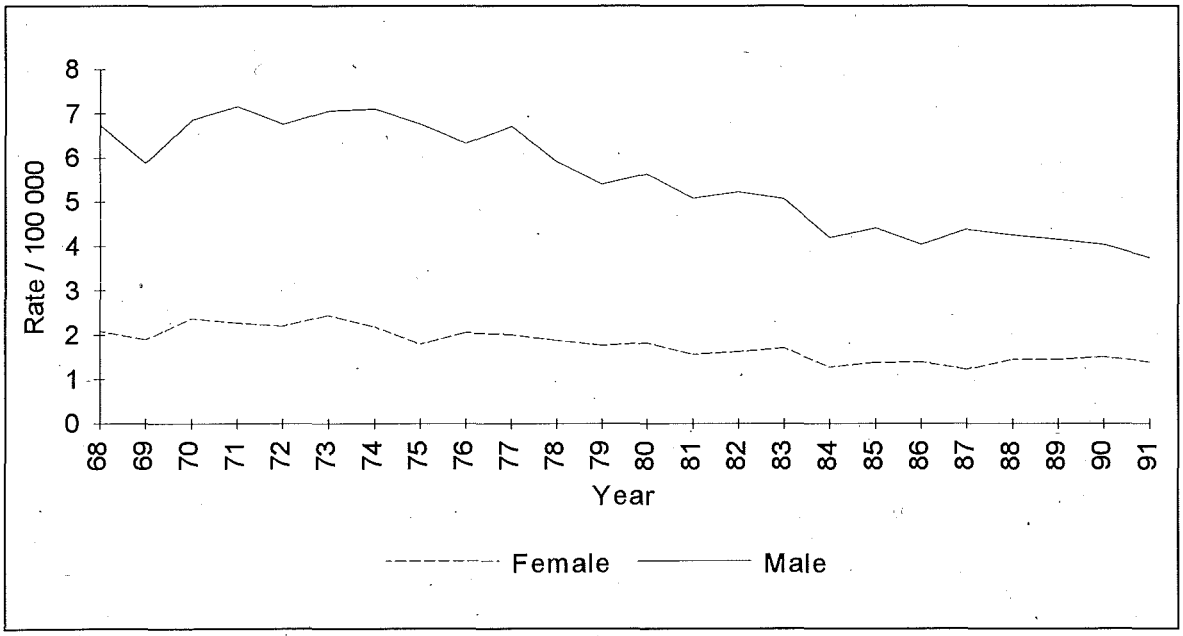


Figure 1.19B: Mean annual change in injury mortality rates, submersion, suffocation and foreign bodies, Australia 1968–91

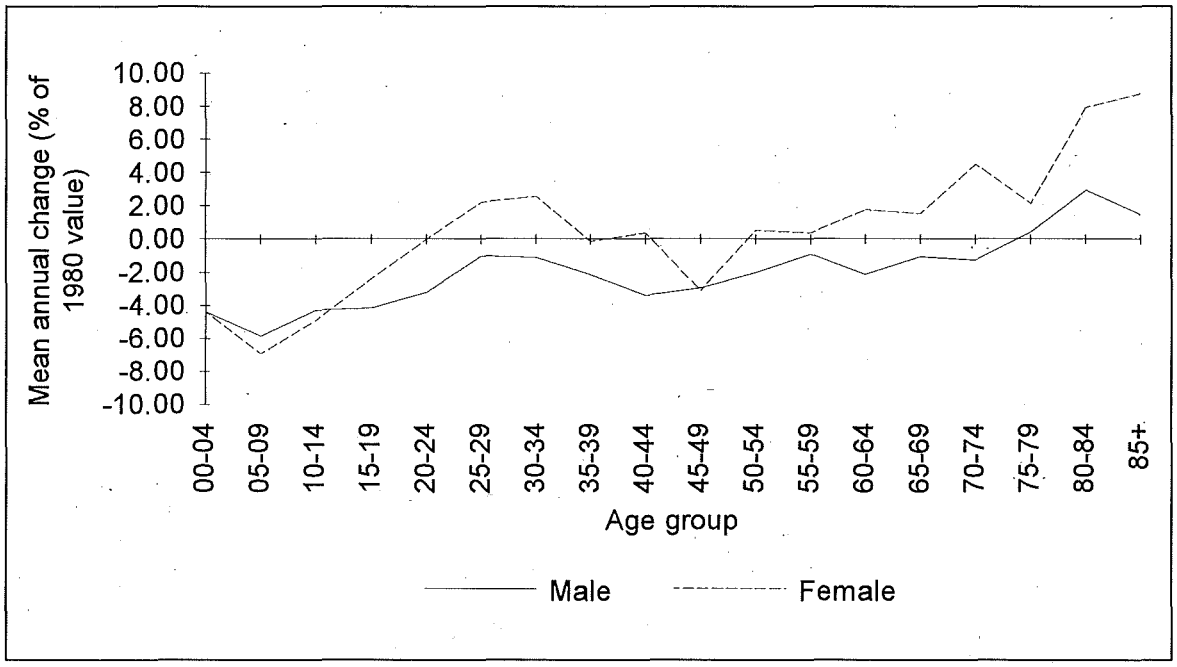
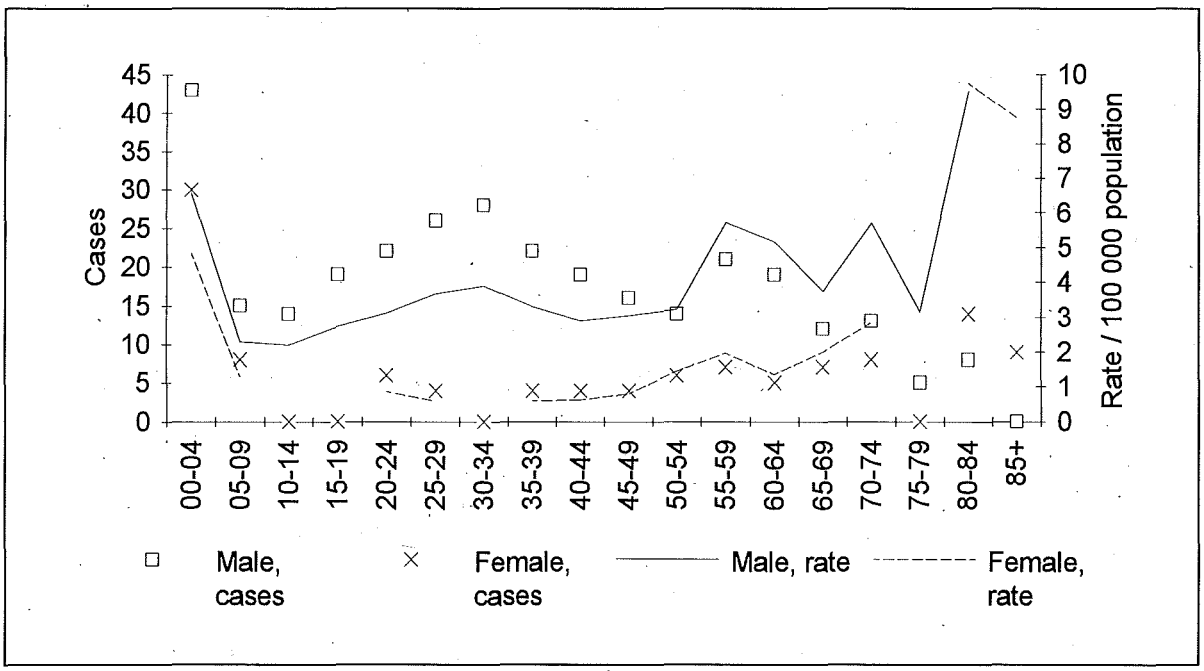


Figure 1.19C: Injury mortality incidence rates and counts, submersion, suffocation and foreign bodies, Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.9 Other accidental deaths

The diverse group titled 'other accidental deaths' (E916–E928; 1991: M257; F37) includes deaths associated with machinery (M84; F9), firearm accidents (M28; F1), and electricity (M36; F3). This category includes many work-related deaths (though the E-code classification does not enable these to be distinguished) (Figures 1.20A–C). From 1968–91 rates declined for males at ages up to 74 years. In 1991 case counts and rates for males were highest at working ages, reflecting the large number of work-related cases in this category (see also Section 10.2.3).

Figure 1.20A: Other accidental deaths, age standardised rates, Australia 1968–91

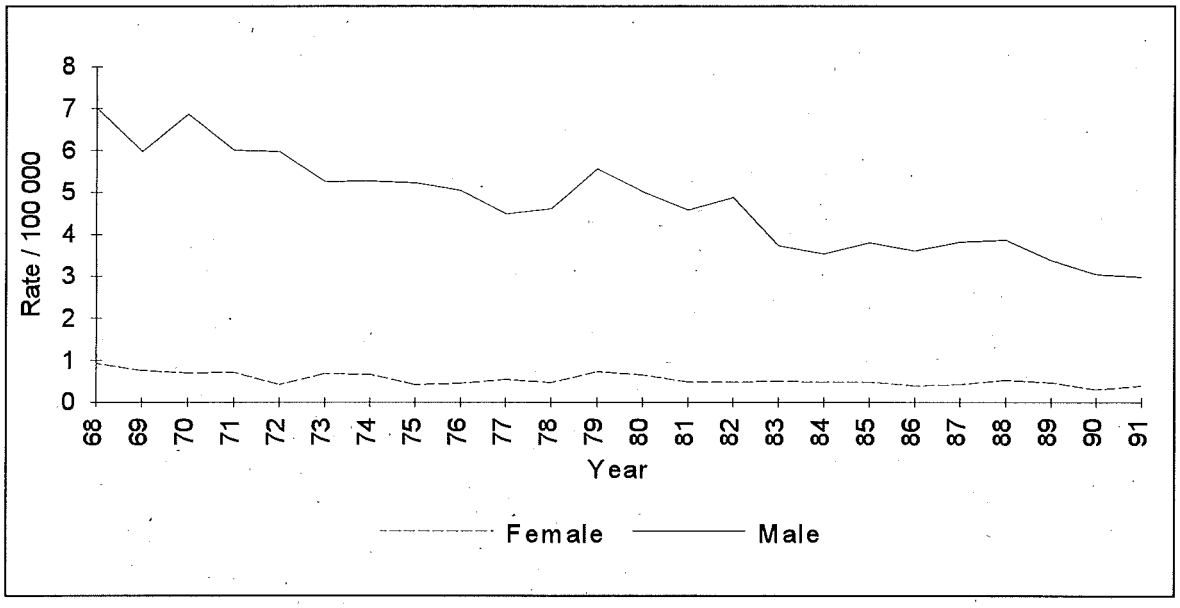


Figure 1.20B: Mean annual change in injury mortality rates, other accidents, Australia 1968–91

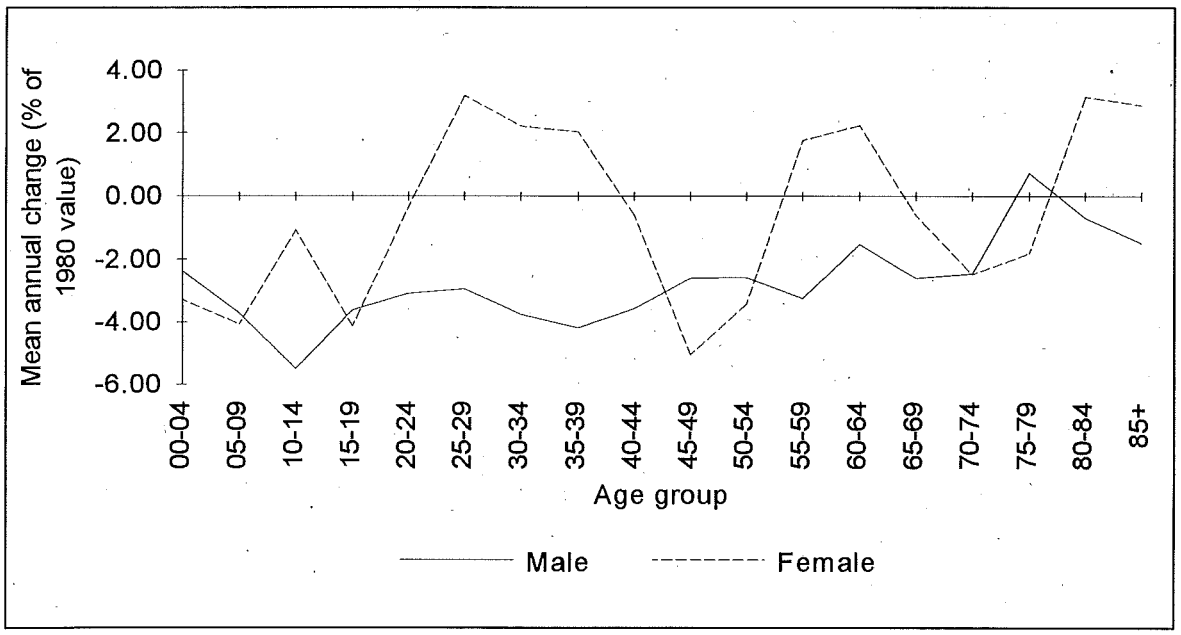
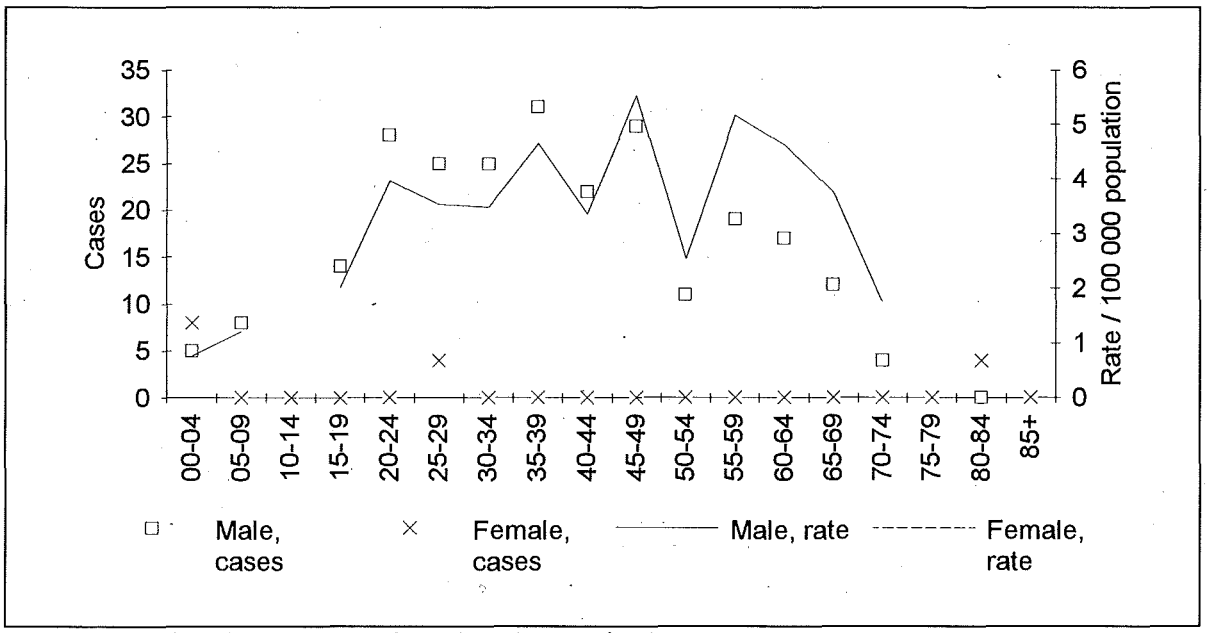


Figure 1.20C: Injury mortality incidence rates and counts, other accidents, Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.10 Suicide

Suicide (E-codes E950–E959; treated in more detail in Chapter 7) accounted for 2360 deaths in 1991 (M1847; F513)—more than motor vehicle traffic accidents. Male and, to a lesser extent, female rates are rising in adolescence and early adulthood and declining in middle life (Figures 1.21A–C). For males, case numbers are highest in early adulthood, while in 1991 rates were highest at ages 80–84.

Figure 1.21A: Suicide: age standardised rates, Australia 1968–91

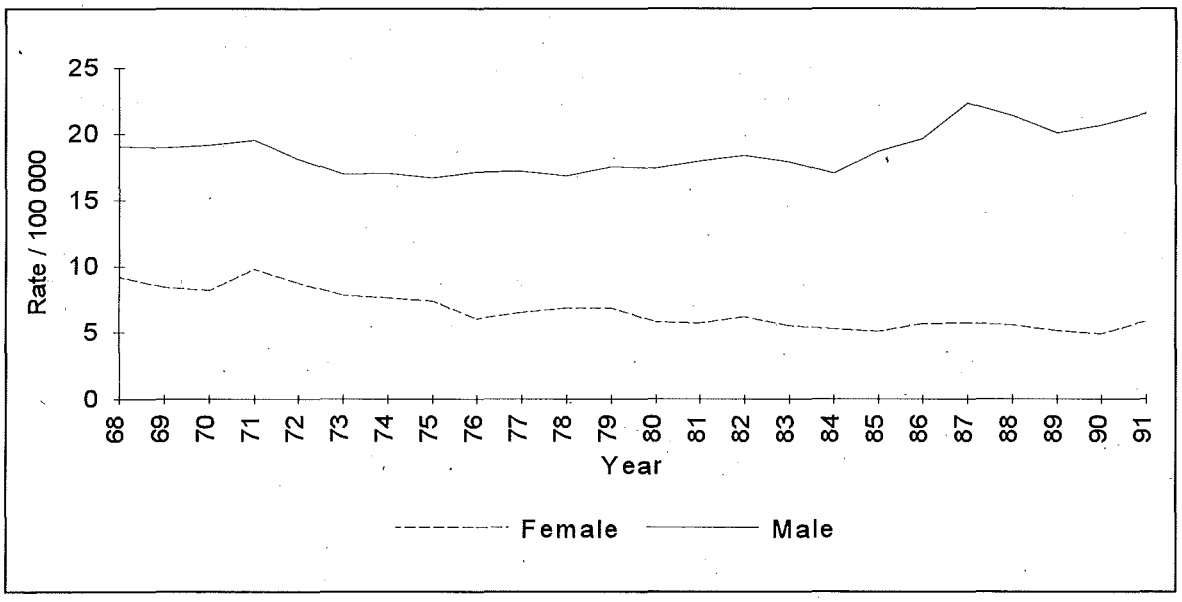
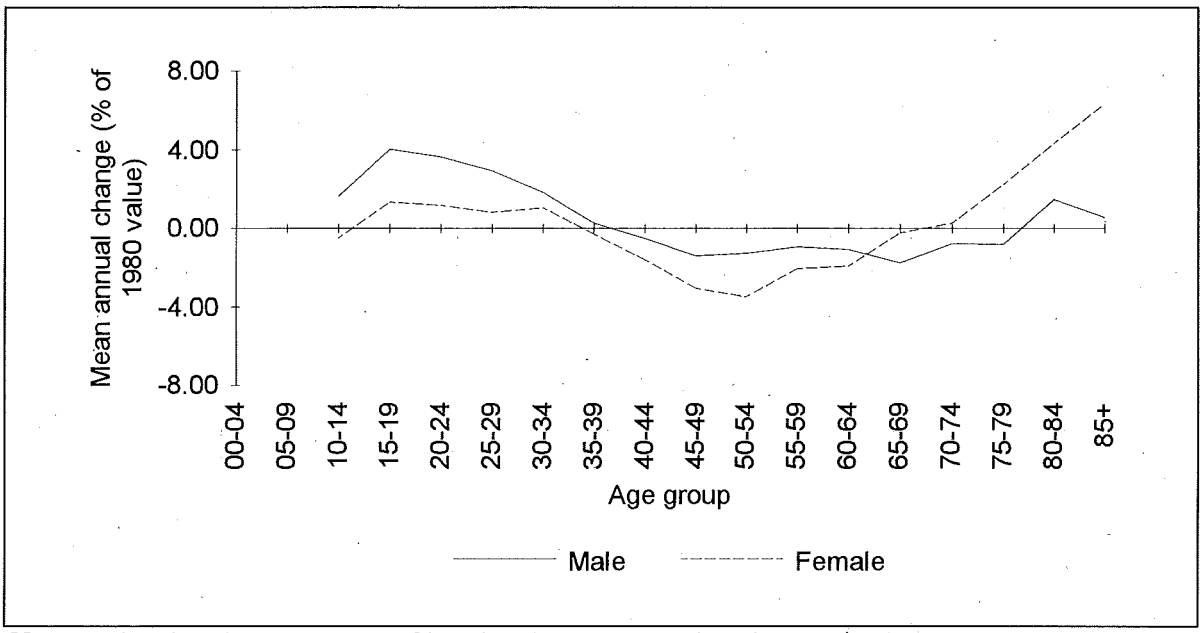
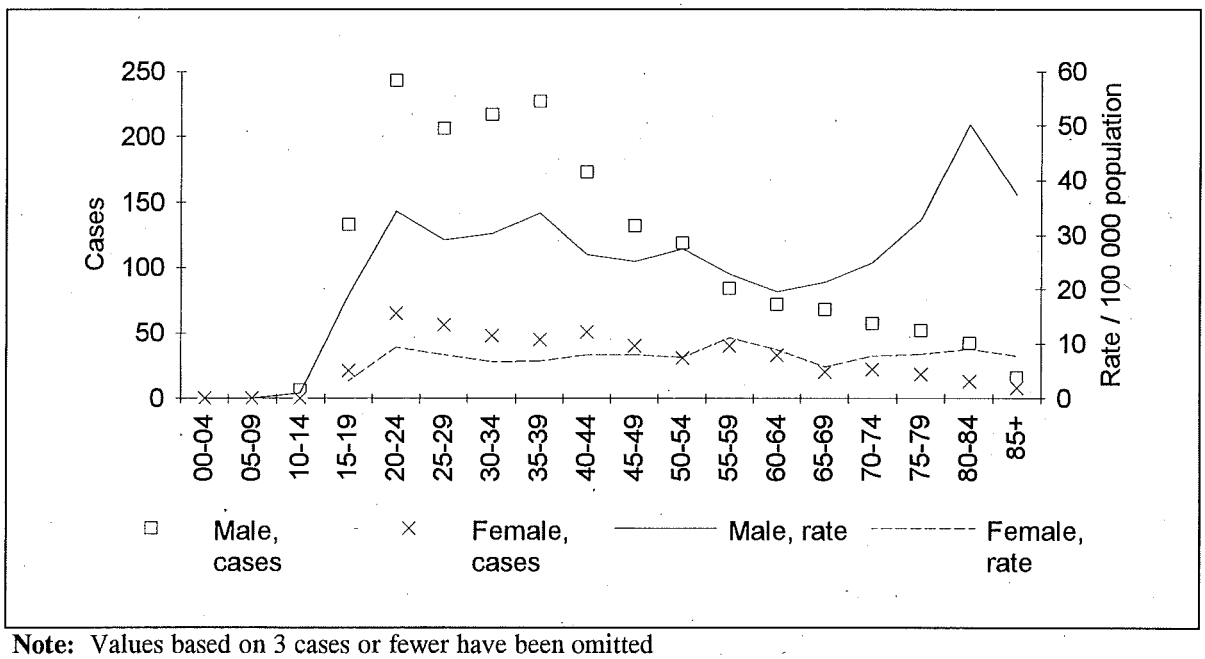


Figure 1.21B: Mean annual change in injury mortality rates, suicide, Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.21C: Injury mortality incidence rates and counts, suicide, Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.11 Homicide

Homicide rates (E-codes E960–E969) have shown a slight, gradual upward trend in the past couple of decades, though with considerable year-to-year fluctuation. The number of deaths attributed to homicide in 1991 was 354 (M207; F147) (Figures 1.22A–C). From 1968–91 the upward trends were more marked in early and late adulthood than in mid-life.

Figure 1.22A: Homicide deaths, age standardised rates, Australia 1968–91

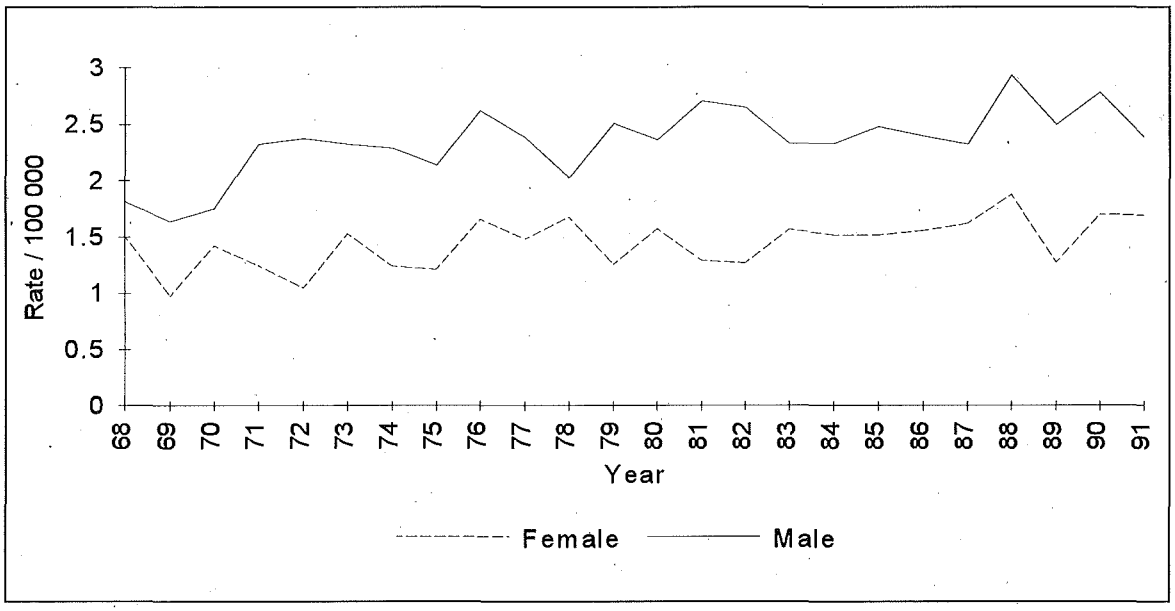
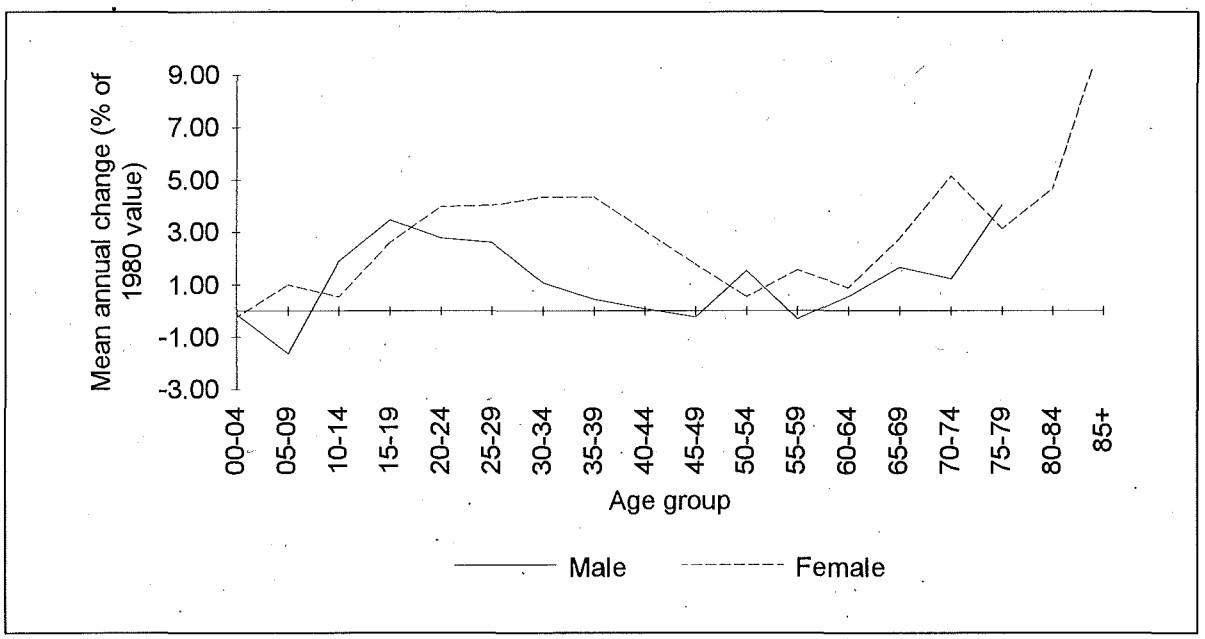
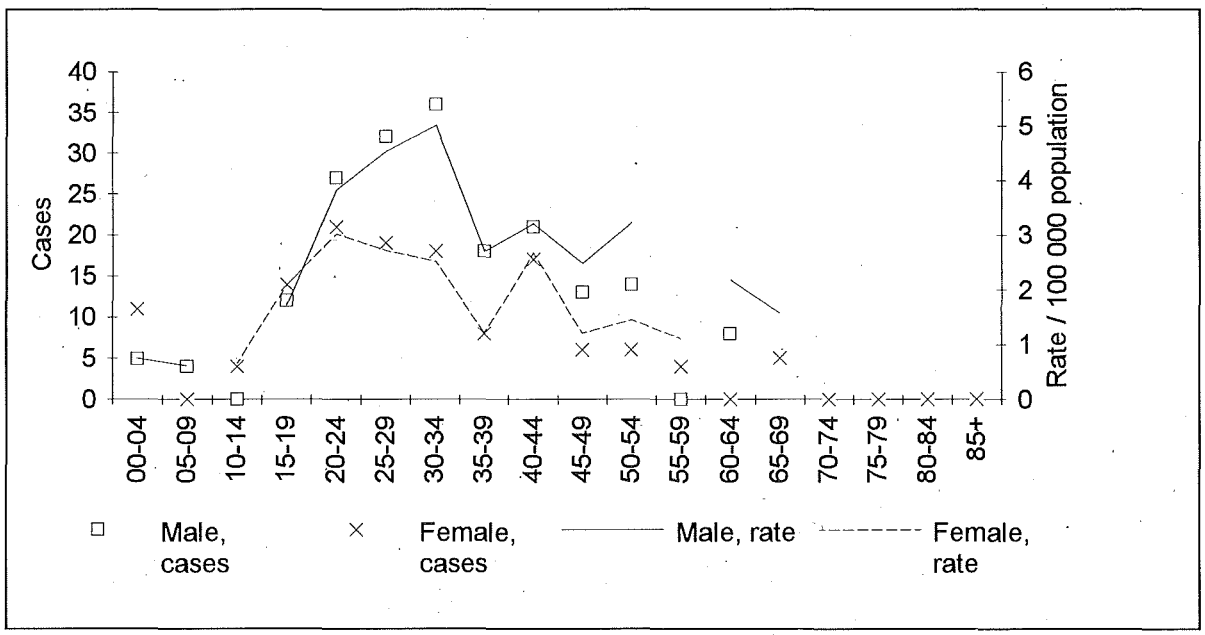


Figure 1.22B: Mean annual change in injury mortality rates, homicide, Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.22C: Injury mortality incidence rates and counts, homicide, Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.4.12 Undetermined intent

The category 'undetermined intent' (E-codes E980–E989) was introduced with the 8th revision of ICD in 1968 to provide coders with a category for use when information on the role of human intent in a death is lacking: most commonly the deaths are suspected, but not certain, suicides[15,16]. It appears that the use of the category increased in the 1980s, following a decline during the first 15 years that it was available. The reason for the pattern is not certain (Figs 1.23A–C).

Figure 1.23A: Undetermined intent deaths: age standardised rates, Australia 1968–91

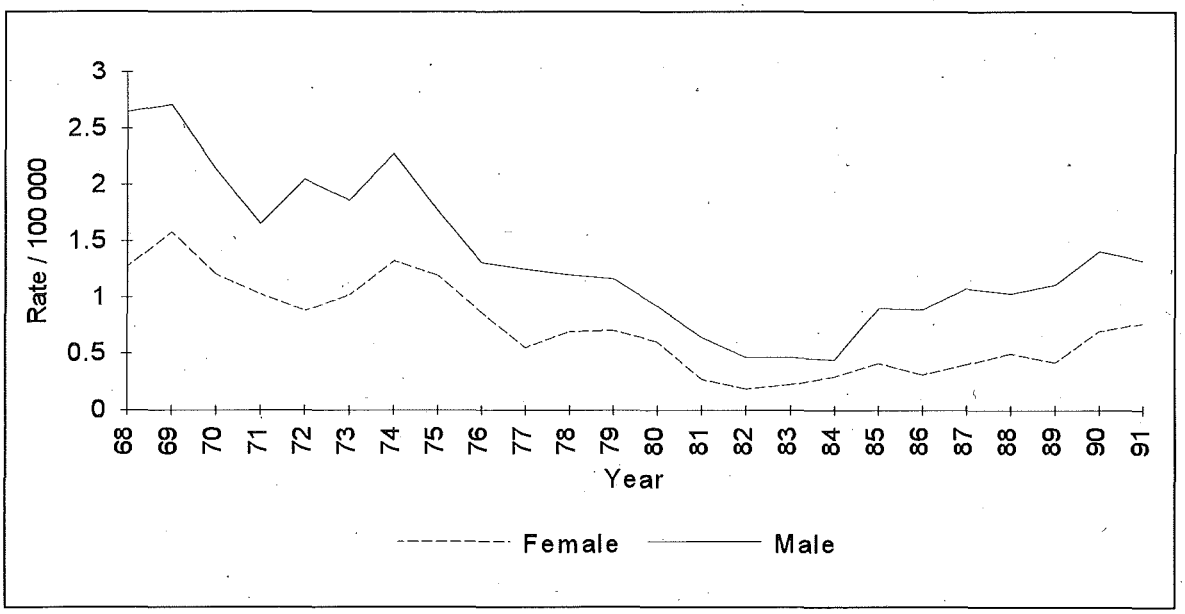
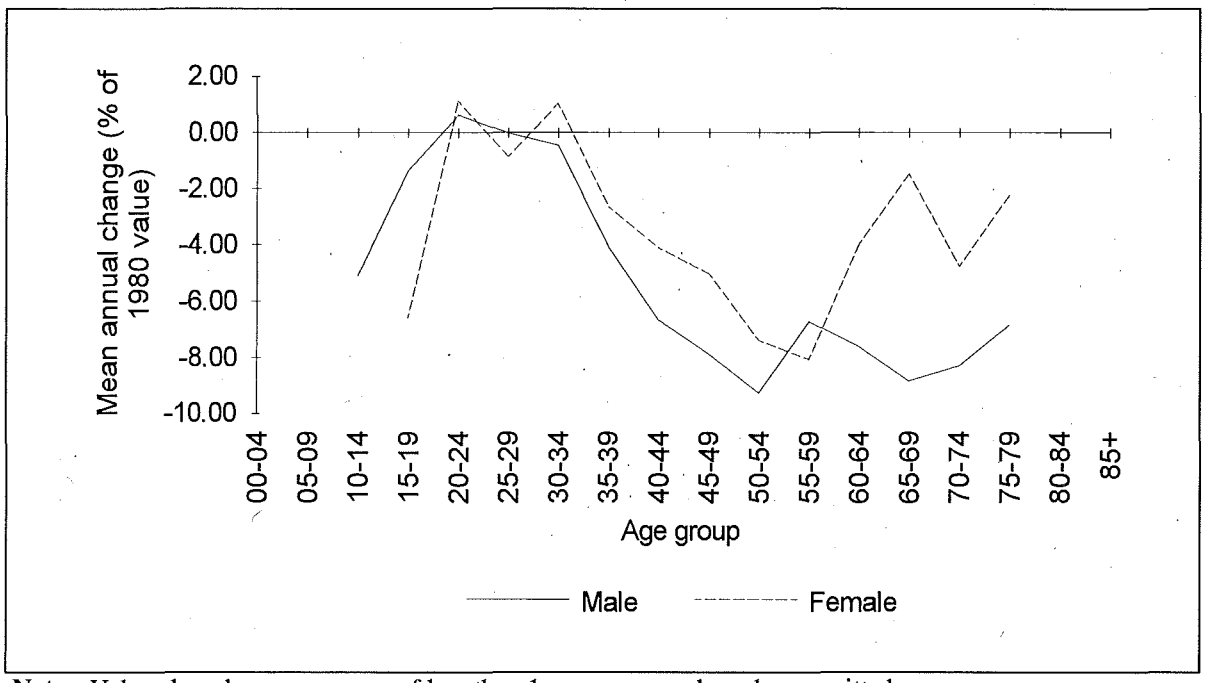
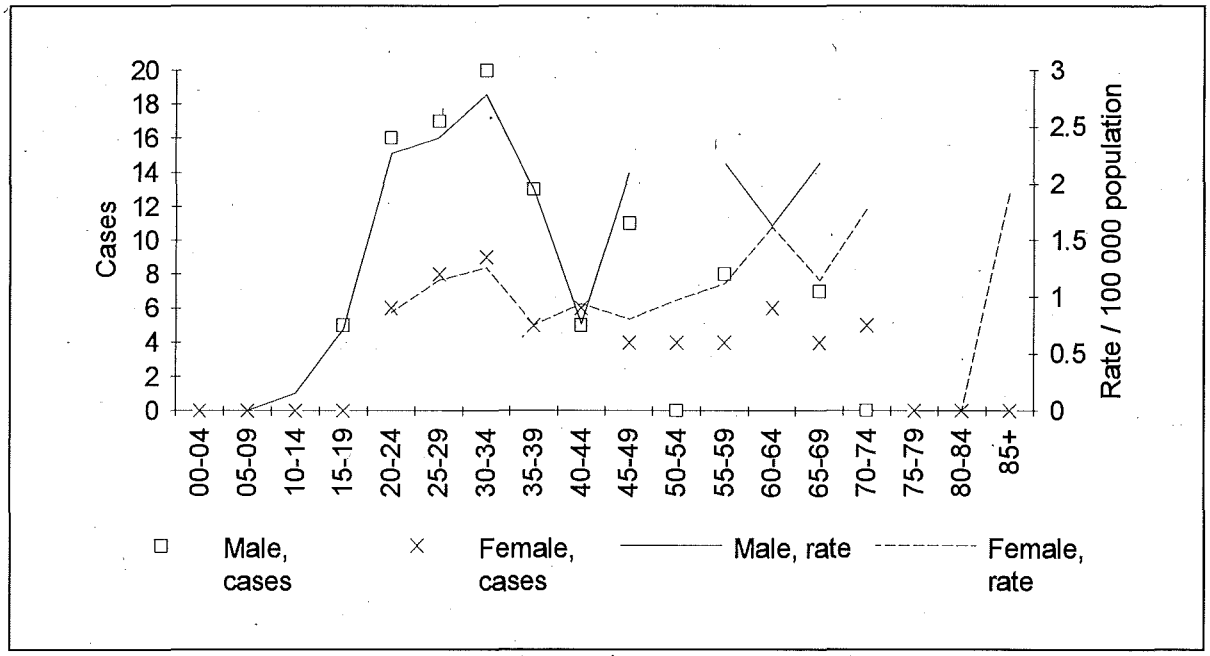


Figure 1.23B: Mean annual change in injury mortality rates, undetermined intent, Australia 1968–91



Note: Values based on an average of less than 1 case per year have been omitted

Figure 1.23C: Injury mortality incidence rates and counts, undetermined intent, Australia 1991



Note: Values based on 3 cases or fewer have been omitted

1.5 Temporal variation

Injury occurrence changes over time. Earlier sections have examined patterns in mortality over recent decades. In addition, cyclic variation can be found, at several time-scales: annual, weekly, and daily.

Annual variation reflects seasonal environmental factors together with associated variations in human activities. For example, the three weeks from late December to mid-January are the most common period for summer vacations in Australia. Disproportionately large numbers of several categories of injury deaths are seen in this period, notably 'water vehicle accidents', 'environmental factors', and 'drowning'.

Variation by day of week reflects the differing pattern of activities on different days. Motor vehicle crash deaths are much more frequent on Fridays, and weekends than on other days. Deaths associated with aircraft, water vehicles, drowning and homicides are all relatively common on weekends. In contrast, suicide is a little more common on Mondays than on other days. Injury frequency varies by hour of day, generally reflecting diurnal patterns of activity — commuting, working, engaging in recreation, and resting.

1.6 Sociodemographic and geographic variation

Injury occurrence is not distributed evenly through the population. Preceding sections have shown that males experience higher rates of most types of injury than females, and that injury rates vary with age (differently for different types of injury). In this section, a brief introduction will be given to variation of injury occurrence with several other sociodemographic factors, and with geographic location.

In common with many diseases, injury rates differ between 'haves' and 'have-nots'. 'socioeconomic status' (SES) is a complex and sometimes loosely-defined concept which, nonetheless, has enduring popularity as a shorthand way of describing the variation in the many social and economic factors which contribute to the health, happiness and well-being of individuals and groups. The ABS Index of Relative Social Disadvantage[17] has become a commonly used indicator in Australia, in large part because of its ready availability. Like some other indicators, this one is a composite of several measures, in this instance drawn from the Census of Population and Housing. No single measure can capture the whole of the picture, and particular indicator measures may be better than others for analysis of particular health outcomes.

Australian studies have found associations, similar to those reported for other countries, between individual indicators of socioeconomic status (often occupation), and mortality (e.g. McMichael).[18] A strength of these studies is that the unit of analysis is the individual, enabling more reliable analysis of causal relationships than is generally possible with aggregate data. The studies have limitations, mainly related to source data.

For example, data on occupation in mortality collections has, until recently, been limited to adult males, limiting the scope of analysis. Moreover, the quality of the occupation data has been questioned, and occupation is an imperfect proxy for socioeconomic status.

In the absence of good SES data at an individual level, much analysis concerns associations between characteristics of groups of people ('ecological studies') at various geographical levels. Most such studies carry the risk of drawing a false conclusion that associations found in aggregate data necessarily imply associations at individual level (the 'ecological fallacy'). However, the approach has attractions, particularly when aggregate data are for small areas, and can lead to useful findings.[19]

Substantial analysis of relationships between health outcomes and social indicators has a short history in Australia,[20] but has been advanced considerably in recent years. Atlases of social health have been produced, first for South Australia (1989),[21] and for Australia (1992).[22]

The *Social Health Atlas of Australia*[22] relates available measures of health outcome (rates of mortality, hospital admissions) to a range of social and demographic factors likely to contribute to health status. Of relevance here is that certain specific causes of death and illness are distinguished, including injuries (defined as 'accidents, poisoning and violence'). Separate analyses were reported for mortality among persons 15–64 years of age, and for those 15–24 years of age. The ABS index of relative socioeconomic disadvantage and a number of other indicators are used in analysis.

The social health atlas provides substantially more detailed analysis of socioeconomic contributions to health than previous studies, both in terms of geographic areas and segments of the population studied. This is important in the context of planning preventive programs, as coarse 'whole-population' indicators often provide an inadequate basis for identifying needs and targeting implementation.

Some of the data from the atlas is shown in Table 1.11 which shows correlation coefficients between injury occurrence (focusing on injury mortality in the age group 15 to 64 years) and a number of socioeconomic indicators which might be expected to be predictors of injury. These coefficients measure the relationship between SES in each of a large number of relatively small geographic areas, and health outcomes in the same areas. Values a long way from zero (whether positive or negative) indicate strong associations, with a value of one representing complete correlation. The square of the coefficient represents the proportion of all variation in the health index that is accounted for by the particular measure of SES under consideration. Note that the ABS index shows a negative correlation with most injury indicators because it is coded so that low scores mean high relative disadvantage.

It can be seen that many of the SES indicators explain 25 to 50 per cent of variation (broadly similar coefficients are seen for mortality at all ages, and for hospital morbidity). Social health atlas data for Hobart show much stronger associations than those for other capital cities, a surprising observation which requires further study.

The proportion of single-parent and low-income families in an area, unemployment rates, the proportion of Aboriginals and Torres Strait Islanders, and the ABS composite Indicator of Relative Social Disadvantage, were the indicators most strongly correlated with injury rates. Indicators associated with certain migrant populations (poor proficiency in English language; proportion of non-English speaking background residents) showed little correlation with injury rates.

Table 1.11: Injury mortality at ages 15–64 years, 1985–89 (correlation matrix)

Selected indicators	Sydney	Melbourne	Adelaide	Perth	Hobart
Single parent	0.50	0.60	0.57	0.24	0.59
Low-income families	0.48	0.56	0.72	0.30	0.82
High-income families	–0.35	–0.24	–0.39	0.17	–0.79
Unskilled and semi-skilled workers	0.33	0.06	0.49	–0.04	0.72
Unemployed	0.48	0.55	0.71	0.41	0.8
Unemployed 15–19	0.58	0.51	0.65	0.41	0.70
Left school aged 15 or less	0.20	0.05	0.38	–0.30	0.81
Aboriginal or Torres Strait Islander	0.54	0.57	0.56	0.05	0.65
NESB > 5 yrs resident	0.04	–0.11	0.31	–0.05	–0.67
NESB < 5 yrs resident	0.05	0.18	0.49	0.20	–0.33
NESB: poor English proficiency	0.16	0.14	0.34	0.13	–0.07
Housing authority dwelling	0.36	0.43	0.51	0.01	0.61
ABS SES Index	**–0.53**	**–0.54**	**–0.75**	**–0.34**	**–0.74**

NESB = non-English speaking background; SES = socioeconomic status
Source: *A Social Health Atlas of Australia* 1992[22]

A study of the effects of income and environment upon health, commissioned by the National Health Strategy program, and published under the title *Enough to Make You Sick*[23] provides some data illustrating aspects of the sociodemographic variation of injury occurrence.

Employment status is associated with injury mortality though the association is not simple. The National Health Strategy study found that unemployed males aged 25–54 had rates of death in road crashes about half those for employed males. Conversely, rates of suicide were, if anything, slightly higher in the unemployed group. Note that the *Social Health Atlas of Australia* found positive correlations between unemployment and overall injury mortality (Table 1.11), though some of these were not judged significant ('unemployed' in Sydney and Perth, and 'unemployed 15–19' in Perth).

Marital status is even more strongly associated with injury mortality than is unemployment. For both males and females, rates of suicide are about three times as high and road crash deaths are twice as high, for persons who are divorced, separated, or who were never married than for married persons, and twice as high for road crash deaths.

Residence in non-metropolitan locations is, to some extent, a predictor of low socioeconomic status. (Injury in non-urban settings is considered in more detail in Chapter 4.) Persons normally resident in non-metropolitan areas were about 1.5 times more likely to die in road crashes than were metropolitan residents. Conversely, women resident in non-metropolitan areas were 26 per cent less likely to commit suicide than metropolitan women. All-ages male suicide rates were similar for the two regions (but see Chapter 7 for discussion of age-specific suicide differentials). Boys from non-metropolitan areas had rates of drowning nearly twice those of metropolitan boys.

Mathers, analysing mortality data for the National Health Strategy,[24] considered mortality due to all external causes, and due to the selected injury categories shown in Table 1.12. SES was measured according to the ABS Index of Relative Social Disadvantage.

Table 1.12: Injury mortality rates in lowest socioeconomic quintile, as ratios of rates for the highest quintile, Australia 1985–87

	Age group (years)							
	0–14		15–24		25–64		65+	
	M	F	M	F	M	F	M	F
Motor vehicle crash	1.4	2.2	1.4	1.6	1.7	1.7	1.2	1.1
Drowning	2.6	1.1	–	–	–	–	–	–
Homicide	–	–	3.7	3.0	–	–	–	–
Suicide	–	–	1.3	1.3	1.8	1.5	1.0	0.6
All injury and poisoning	**1.9**	**–**	**1.4**	**1.4**	**2.0**	**1.7**	**1.1**	**1.2**

– Not available

Source: Mathers 1992[24]

The findings confirm the expected association between low SES and elevated injury mortality. This pattern was less marked in the elderly, and reversed for suicide among elderly females. At younger ages, when the highest and lowest quintiles are compared, the relative ratio for the lowest ranged from 1.3 to 3.7. The greatest differentials were for homicide at ages 15–24, for both males and females (M:3.7; F:3.0).

Occupation provides another index of social status ('occupational prestige'). In Australia, data on occupation have, until recently, been available only for adult males. Mathers found rates for males in the lowest prestige occupations to be about twice those for the highest prestige quintile.

Jolly[25] has shown a consistent association between socioeconomic status and injury rates among children. A similar pattern was found in two geographic areas, and persisted across all age groups and injury types considered. Income was found to be the most important component of SES as a predictor of child injury rate. Injury rates for the highest SES quintile were approximately three times as high as those for the lowest quintile.

Geographic, social, economic, ethnic and other factors interact in complex and incompletely understood ways to influence health, and much work remains to be done in this area. While analyses like those provided by the *Social Health Atlas of Australia* are more useful than those previously available, they remain limited in their ability to identify with high probability, specific, potentially remedial social factors which contribute to injury occurrence in particular groups within the population. The critical weakness is the lack of data at an individual level, on both health status and socioeconomic (or other factor) status. Large surveys, such as the National Health Survey, have some potential to provide such data. However, general purpose sample surveys of practicable size are unable to provide adequately accurate estimates for specific problems or small areas (or population sectors).

Despite the limitations, the available data for injury in Australia confirm the finding common to many other types of ill-health, and for other countries, that social and economic disadvantage are significantly associated with health disadvantage. These data alone could be interpreted in two ways: SES disadvantage leads to ill-health (or to injury), or the converse. For example people with lower incomes are more likely to drive old motor vehicles, which carry higher risk for road injury. On the other hand, people who have been injured seriously may tend to have lower incomes than they might otherwise have had. Most injuries, however, do not result in disability likely to cause a decline in the person's socioeconomic status. Hence, it is likely that much of the observed association is attributable to the effect of SES on injury risk.

Identification of associations of injury risk with SES does not necessarily reveal the exposures and mechanisms whereby these people in low SES groups experience high rates of injury. Variation in risk exposures with SES needs to be studied. Limited data relevant to injury are available, and these are usually by-products of research for other purposes, and generally do not meet the needs of injury research very well. For example, data in the 1989–90 National Health Survey enable analysis of associations between alcohol consumption and SES, and these can be related to injury rates.

Studies of interactions like these are not technically difficult, given current computer-based methods and the existing level of social investment in data collection. In practice, however, measures to ensure the preservation of individual confidentiality limit opportunities to carry out such work in Australia. By way of contrast, in a country such as Sweden, in which cross-linkage of a variety of data that are based on an individual identifier is common, powerful studies can be done quite simply and for little marginal cost. For example, it is possible to study the effect on subsequent family income (derived from taxation records) of road injury of various degrees of severity (derived from hospital and insurance data). Both longitudinal and cross-sectional studies are facilitated by such linkage.

1.7 Exposure to risk factors for injury

Injury occurrence is the main focus of this chapter. For some purposes, counts of injury frequency are an appropriate measure (for example, estimating the requirement for clinical services). Other purposes, such as planning public health programs, also require information in forms that take account of levels of risk experienced by particular sectors of the population. Much of the information in this report is in the form of estimated rates of injury per unit of population.

A third form of information takes account of the level or duration of exposure to particular risk factors for injury. For example, occupational injury is often measured in terms of injuries per million hours worked, and a common measure of road fatalities is incidence per 100 million kilometres travelled. These indices can be interpreted as measures of the safety of a system (such as public roads, or a workplace), and may be suitable measures for evaluating the effectiveness of preventive interventions.

Assessment of risk per unit exposure depends on the availability of data on exposure. Even in the settings of road safety and occupational safety, availability of exposure data tends not to be very great. Until recently, little or no useable exposure information has been available

for other settings in which injury occurs. Recently, however, exposure data relevant to sports injuries and to domestic injuries have begun to be collected. Notable are two sample surveys of domestic safety conducted by ABS in consultation with injury researchers.[26,27] These have provided injury researchers, in many cases for the first time, with information on the frequency and distribution in the population of factors such as smoke detectors, electrical safety switches, dogs, firearms, and swimming pools (fenced and unfenced) (see Chapter 3).

1.8 Discussion

Injury mortality has declined substantially since 1970. While decline is evident in many categories of injury, the decline in road deaths accounts for the largest part of the improvement. Suicide (and a few less common categories of injury) have gone against the general trend. Trends in injury morbidity remain less clear. The available information suggests improvements, but to a smaller extent than has been seen for mortality.

While the overall indices are generally favourable, complacency is not warranted. First, the total burden of injury is still large, and prospects for further reduction are good. Second, other causes of mortality (and, probably, morbidity) are improving at about the same rate as injury. For males, the proportion of all deaths that is attributable to injury was higher in 1991 than for any time in the previous 70 years. Third, the injury experience of particular sectors of the community is much worse than average. While much work remains to be done to identify and characterise these risk groups, information already available (some of which is presented in this report) points to several areas of concern: Aboriginal and Torres Strait Islander peoples, persons of low socioeconomic status and young adult males.

Effective prevention of injury in these and other parts of the community will, increasingly, require a focused and very specific approach. Problem identification, priority setting, and the design, implementation and evaluation of interventions will require methods enabling specific injuries and risk factors to be identified. Past experience can be a guide. Many aspects of road trauma, and control of accidental poisoning in children through packaging, are examples of the benefits of such specific programs. Some of the substantial problems confronting us now, such as suicide and injury associated with falls in the elderly, may pose special problems and require novel methods (new approaches, such as community-based prevention, are emerging). The history of injury control in the past few decades justifies optimism that application of systematic and focused measures will bear fruit.

1.9 References

1. Mathers CD, Greenhill DW. Injury prevention – monitoring targets towards 2000. A statistical report to the National Better Health Management Committee. Canberra: Australian Institute of Health, 1990.
2. Australian Institute of Health and Welfare. Nation health data dictionary, institutional healthcare, version 2. Canberra: Australian Institute of Health and Welfare, 1993.
3. Australian Bureau of Statistics. Causes of death, Australia 1991. Cat. no. 3303.0. Canberra: ABS, 1992.
4. Gillett S, Liu Z, Solon R. Hospital utilisation and costs study 1989–90, Volume 2. Canberra: Australian Institute of Health and Welfare, Health Services; Series no. 4, AGPS, 1993.

5. World Health Organization. International classification of diseases (9th revision), clinical modification (ICD9-CM). Geneva: WHO, 1975.

6. Australian Bureau of Statistics. National health survey 1989–90, Australia. Cat. no. 4364.0. Canberra: ABS, 1991.

7. Australian Bureau of Statistics. Disability and handicap, Australia 1988. Cat. no. 4120.0. Canberra: ABS, 1990.

8. d'Espaignet E, van Ommeren M, Taylor F, Briscoe N, Pentony, P. Trends in Australian mortality 1921–1988, Mortality series no 1. Canberra: Australian Institute of Health, 1991.

9. Family Medicine Research Unit. Survey of morbidity and treatment in Australian general practice 1990–91. University of Sydney (undated).

10. National Injury Surveillance Unit. Ad hoc report on Injury Surveillance Information System data collection (unpublished).

11. Harrison JE, Frommer MS, Ruck EA, Blyth FM. Deaths as a result of work-related injury in Australia, 1982–1984. Med J Aust 1989;150:118–125.

12. Federal Office of Road Safety. 'Fatal file' data-base. Canberra: FORS, 1990.

13. Blyth, FM. An evaluation of the Abbreviated Injury Score and Injury Severity Score: the Work-Related Fatalities Study, Australia 1982–84. Treatise, Master of Public Health, University of Sydney, 1990.

14. Victorian Injury Surveillance System/Victorian Institute of Forensic Pathology Deaths Data Collection.

15. Charlton J, Kelly S, Dunnell K, Evans B, Jenkins R, Wallis R. Trends in suicide deaths in England and Wales. Population Trends 1992;No. 69.

16. Ruzicka LT, Choi CY. Suicide mortality in Australia, 1970–1991. J Aust Population Soc 1993;10(2).

17. Australian Bureau of Statistics. Socioeconomic indexes for areas. (Information paper) 1990, Cat. no. 1356.0. Canberra: ABS.

18. McMichael AJ. Social class (as estimated by occupational prestige) and mortality in Australian males in the 1970s. Community Health Studies 1985; 9:220–230.

19. Elliott P, Cuzick J, English D, Stern R. (eds) Geographical and environmental epidemiology: methods for small area studies. Oxford University Press, 1992.

20. McGlashan N. The geography of health trends and prospects: an open agenda. Australian Geographic Studies 1988; 26:184–201.

21. South Australian Health Commission. A social health atlas of South Australia. Adelaide: SAHC, 1990.

22. Glover J, Woollacott T. A social health atlas of Australia. Commonwealth Department of Health, Housing and Community Services and South Australian Health Commission. ABS Cat. no. 4385.0, 1992.

23. National Health Strategy. Enough to make you sick. National Health Strategy 1992; Research paper No. 1, ISBN 1038 9229.

24. Mathers C. Health differentials project - Univariate results for national health project. Canberra: AIH, 1992 (unpublished report).

25. Jolly DL. The socioeconomic context of child injury in Australia. MPH thesis, University of Adelaide, 1992

26. Australian Bureau of Statistics. Safety in the home, Melbourne (November 1992). Cat. no. 4387.2. Canberra: ABS, 1993.

27. Australian Bureau of Statistics. Household safety, Sydney (November 1992). Cat. no. 4387.1. Canberra: ABS, 1993.

Chapter 2 Transport-related injury

2.1 Introduction

The problem of transport-related injury is overwhelmingly a problem of road transport. A recent report by the Bureau of Transport and Communications Economics[1] showed that 94 per cent of the total cost of transport crashes in Australia is due to road crashes.

Population-based age and sex-specific death rates for crashes on road and rail, in the air and on water are shown in Table 2.1. Death rates for the specified non-road crashes do not exceed 2/100 000 in any age or sex group, whereas the rates for motor vehicle crashes on road are higher than 40/100 000 in some groups (i.e. males aged 15–24 years, and 75 years and older).

A discussion of trends in transport crashes between 1968 and 1991 has already been provided in Section 1.4.

Table 2.1: Injury fatalities involving transportation:† annual average rates per 100 000 population, Australia 1989–91

	Age group (years)								
Mode of injury death	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75 +
Male									
Railway	*	*	0.4	1.3	0.7	0.4	0.6	0.6	1.2
Watercraft	*	0.3	0.2	0.7	1.0	1.2	1.4	0.9	0.6
Aircraft	*	0.0	0.0	0.8	1.4	1.2	0.9	0.7	0.0
Motor vehicle, traffic	4.8	6.1	6.8	43.0	28.0	14.7	15.1	21.3	40.3
Motor vehicle, non-traffic	0.8	0.4	0.5	1.1	0.7	0.5	0.6	0.4	1.2
Non-motor road vehicle	*	*	0.2	0.1	0.3	0.3	0.5	0.3	0.8
Vehicles, other	0.0	0.0	0.0	*	0.1	0.1	0.0	*	0.0
Total transport	**5.7**	**7.0**	**8.1**	**47.0**	**32.1**	**18.4**	**19.2**	**24.1**	**44.1**
Female									
Railway	*	*	*	0.2	0.1	0.1	0.2	*	0.4
Watercraft	0.2	*	0.0	0.1	0.2	0.1	0.0	0.0	*
Aircraft	0.0	*	0.0	0.2	0.3	0.2	*	*	0.0
Motor vehicle, traffic	3.3	4.4	3.0	14.8	7.7	6.2	8.9	12.9	18.8
Motor vehicle, non-traffic	0.9	*	*	0.3	*	0.1	0.3	0.4	0.4
Non-motor road vehicle	0.0	0.0	0.3	0.2	0.1	0.1	*	*	*
Vehicles, other	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Total transport	**4.5**	**4.7**	**3.5**	**15.8**	**8.4**	**6.8**	**9.5**	**13.6**	**19.8**

* 3 or less cases during three-year period

† Cases with external cause codes (E-codes) in the range E800–E848

In New South Wales, 1991–92 hospital separation rates for the specified non-road crashes did not exceed 18/100 000 in any age (sex) group, whereas rates for motor vehicle traffic crashes exceeded 120/100 000 in males (Table 2.2).

Table 2.2: Injury inpatient separations involving transportation:† mean annual rate per 100 000 population, NSW, 1991–92

Mode of injury death	Age group (years)								
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75 +
Male									
Motor vehicle, traffic	67.9	117.0	161.6	500.1	293.6	181.4	154.6	155.8	267.0
Motor vehicle, non-traffic	16.3	28.4	80.3	84.5	41.1	22.4	21.2	19.8	30.9
Non-motor road vehicle	49.3	117.0	208.1	75.9	47.5	33.3	27.4	16.8	11.0
Railway transport	*	0.0	*	5.6	3.5	2.7	3.9	3.0	6.0
Water transport	*	*	2.8	16.3	17.1	10.4	5.0	5.1	*
Air transport	0.0	*	*	7.1	11.4	4.1	2.7	2.5	*
Vehicles, other	19.9	33.9	152.2	66.0	35.5	20.2	7.3	*	13.9
Total transport	**155.7**	**297.7**	**606.8**	**755.6**	**449.8**	**274.6**	**222.1**	**204.6**	**331.8**
Female									
Motor vehicle traffic	46.1	56.4	68.9	215.5	138.9	122.9	137.4	160.4	186.4
Motor vehicle non-traffic	12.8	12.0	11.9	11.6	5.7	5.7	6.5	7.8	17.4
Non-motor road vehicle	26.1	89.6	169.4	66.8	31.2	19.1	10.8	7.4	2.3
Railway transport	0.0	*	*	*	*	0.7	1.5	3.9	5.8
Water transport	0.0	*	*	6.5	2.7	1.6	3.8	2.6	*
Air transport	0.0	0.0	0.0	1.6	2.5	0.5	1.5	0.0	2.3
Vehicles, other	14.3	31.8	59.9	31.3	22.0	16.0	4.6	6.1	5.8
Total transport	**99.3**	**190.8**	**311.6**	**333.8**	**203.4**	**166.3**	**166.2**	**187.8**	**221.3**

* 3 or less cases during three-year period

† Cases with external cause codes (E-codes) in the range E800–E848

In view of the overwhelming importance of road crashes in transport-related injury, the remainder of this chapter deals exclusively with the characteristics of road injury. Trends and 1991 data for rail, water and air transport are shown in Chapter 1 (Figures 1.11, 1.13 and 1.14).

Despite large reductions in occurrence and a relatively low death rate per vehicle[2] or vehicle kilometres of travel,[3] Australia continues to rank among the countries having both high levels of motorisation and high death rates per person from road injury.[2] Epidemiologically, road crashes pose a substantial health problem in Australia because of high vehicle ownership and extent of travel. Road crashes in Australia account for more years of life lost during the working age span than do all forms of heart disease, and over half the loss through all cancers.[4]

The direct and indirect costs of road crashes in Australia now amount to more than $6000 million per year. In the next decade, one in every ten Australian families will be directly affected by a road death or serious injury.[5]

Trends in road deaths over the last 20 years were presented in Chapter 1 (see Figure 1.12) and will not be re-iterated here, except to note that deaths have declined substantially. Part of the cause of recent declines has been the effect of declining economic activity in Australia.[6]

The significance of road injury as a public health problem is represented not only in statistics on life lost and economic cost, but also in the quality of life of those that survive. Available data demonstrate that quality of life can be dramatically reduced.[7] Since road injury affects a much younger age group than do chronic diseases, such as heart disease and cancer, the societal impact of road crashes on the quality of life of young victims is particularly disturbing.

2.2 Literature review

The literature on transport-related injury is extensive and cannot be readily summarised within the scope of the current study. However, a number of references are central to an understanding of the field.

The report by Trinca et al.[8] is worthy of special mention. While the focus of the report is at the level of global safety on the road, data comparing Australia with other countries is presented. More importantly, details are provided on the strategies which are available for injury reduction in any country.

The road transport system comprises a complex interaction of three principal components: the driver, the vehicle and the road infrastructure. In depth investigations have shown the significant role that drivers, and other road-user factors, play in road crashes.[9,10,11]

It would be difficult to put a comprehensive program of road safety countermeasures into place without first understanding the causal factors and the means to tackle them. Evans' book, *Traffic safety and the driver,* contains a thoughtful review of these issues.[12] Torpey et al.[13] and Ogden[14] have analysed the cost-effectiveness of various countermeasures.

The difficulties with, and lack of effectiveness of, driver training and education programs, and a number of other traditional road safety countermeasures, which focus on human factors, are highlighted by Nairne et al.[15] Generally, information, education or health promotion activities that are not integrated within a broader program of behaviour change have little chance of actually influencing road safety. Promotion and legislation concerning helmet wearing by cyclists[16] and random breath testing[17] are notable examples of successful human factor countermeasures in a field where successes are rare.

Detailed accounts of recent activities in Australia in the area of vehicle factors, especially related to occupant protection, are presented in the Inquiry into Vehicle Occupant Protection[18] and in two reports published by the Federal Office of Road Safety.[19,20] The New Car Assessment Program, which incorporates head injury criteria for vehicles, is anticipated to improve vehicle safety in Australia as it has overseas.

2.3 Available data

Over the last 20 years, deaths from road crashes have declined substantially. However, this has not been matched by a corresponding level of reduction in non-fatal injury. Between 1988 and 1990, road deaths decreased by 20 per cent, whereas admissions to hospital decreased by only 12 per cent.[21,22]

In 1990, there were 2318 road injury fatalities, nearly 40 000 hospital separations and nearly 120 000 hospital accident and emergency department attendances, with a ratio of fatalities:hospital admissions:attendances of 1:17:50.[21,22,23]

A priority of the NISU Road Injury Information Program has been to create a National Road Injury Database using hospital data. A recent report from this database presents more comprehensive data than have been available before on the incidence and severity of road injuries in Australia.[22] The following sections are drawn primarily from that report.

2.3.1 Age

Figures 2.1 and 2.2 show that hospital admissions peak in the 15–19 year age bracket, whereas fatalities peak in 20–24 year olds. Age-specific death rates for motor vehicle traffic crashes presented in Table 2.3 show that 15–24 year olds have the highest death rates. While admission rates for the young are high, they are not especially high for elderly road-users.

An approximation of the case fatality rate (actually the number of fatalities due to road injury per 100 hospital separations due to road injury) for each age group is presented as a ratio in Table 2.4. The ratio is highest in the elderly and lowest in 5–14 year olds. That is, the elderly are more likely than the young to die from the injuries sustained in road crashes.

Figure 2.1: Road injury hospital separations by age group, Australia 1990 (case numbers, n = 39 626)

Figure 2.2: Road fatalities by age group, Australia 1990 (case numbers, n = 2164)

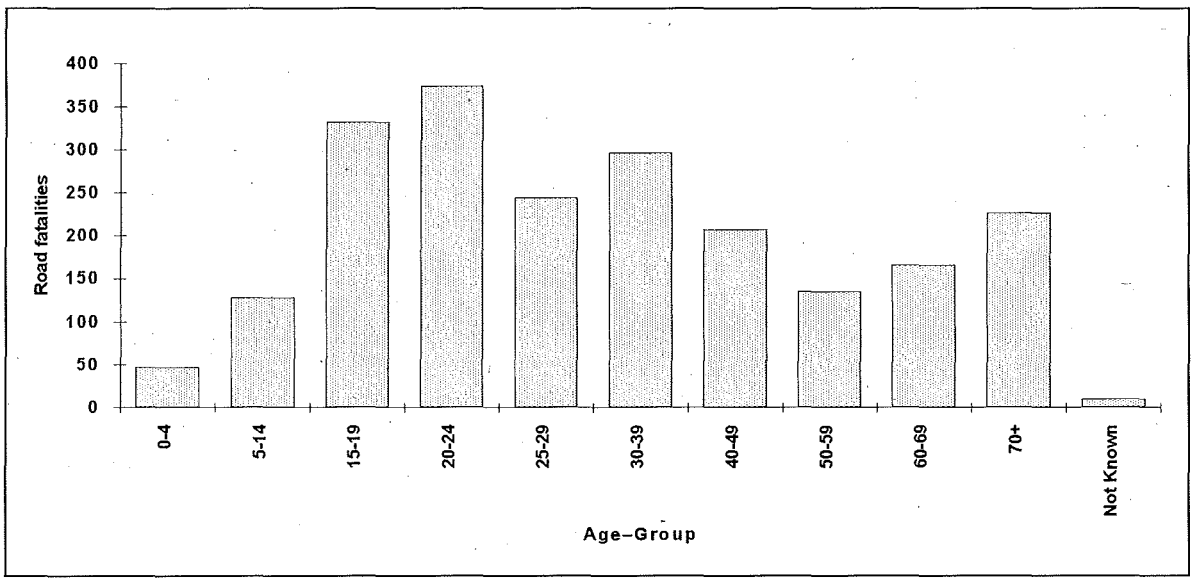


Table 2.3: Road fatalities and hospital separations by age group, Australia 1990

Age group (years)	Fatalities			Hospital separations		
	Number 1990	Rate per 100 000†	% change 1988–90	Number 1990	Rate per 100 000†	% change 1988–90
0–4	47	4	–17.5	1151	91	–17.5
	2.2%			2.9%		
5–14	128	5	–8.6	5779	231	–6.9
	5.9%			14.6%		
15–19	332	24	–21.1	7266	553	–14.0
	15.3%			18.3%		
20–24	374	28	–24.0	6138	457	–15.0
	17.3%			15.5%		
25–29	244	17	–27.4	4216	316	–13.4
	11.3%			10.6%		
30–39	296	11	–17.8	5310	198	–7.6
	13.7%			13.4%		
40–49	207	9	–10.0	3306	146	–9.3
	9.6%			8.3%		
50–59	135	9	–28.6	2286	150	–11.5
	6.2%			5.8%		
60–69	165	12	–9.8	1912	140	7.3
	7.6%			4.8%		
70+	226	18	–21.0	2256	180	–14.1
	10.4%			5.7%		
Not known	10	*	*	6	*	*
	0.5%			0.0%		
Total	**2164**	**13**	**–19.8**	**39626**	**232**	**–11.6**
	100%			**100%**		

* Number of cases too low; † Age-specific rates

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]

Source: Fatalities: FORS Fatality File 1988 and 1990[21]; hospital separations: State and Territory hospital morbidity collections

2.3.2 Road-user type

Comparison of the proportions of admissions and fatalities by road-user type (Figures 2.3 and 2.4) shows that vehicle occupants predominate in both types of outcome. They comprise 45 per cent of admissions and 64 per cent of fatalities. Pedestrians make up a larger proportion of fatalities than admissions (18% and 12%, respectively). Pedal cyclists, who account for 16 per cent of admissions, comprised only 4 per cent of fatalities.

Table 2.4: Road deaths per 100 road injury hospital separations by age, Australia 1990

Age group (years)	Ratio
0–4	4.1
5–14	2.2
15–19	4.6
20–24	6.1
25–29	5.8
30–39	5.6
40–49	6.3
50–59	5.9
60–69	8.6
70+	10.0

Figure 2.3: Road injury hospital separations by road-user types, Australia 1990 (n = 39 626)

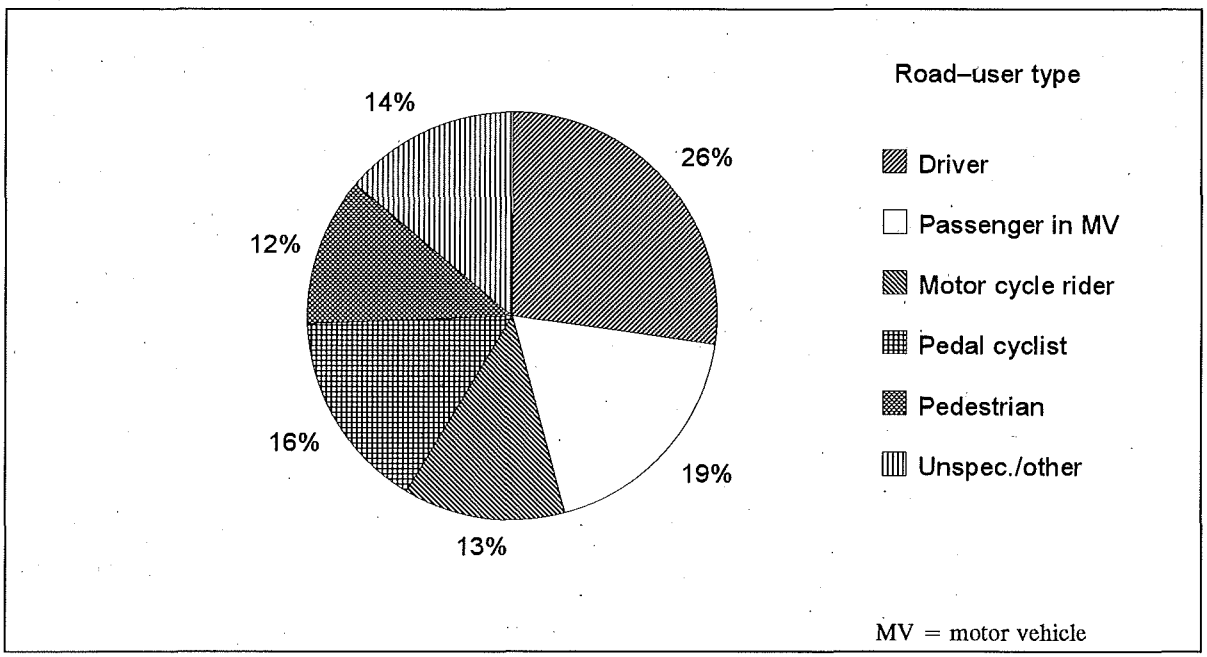
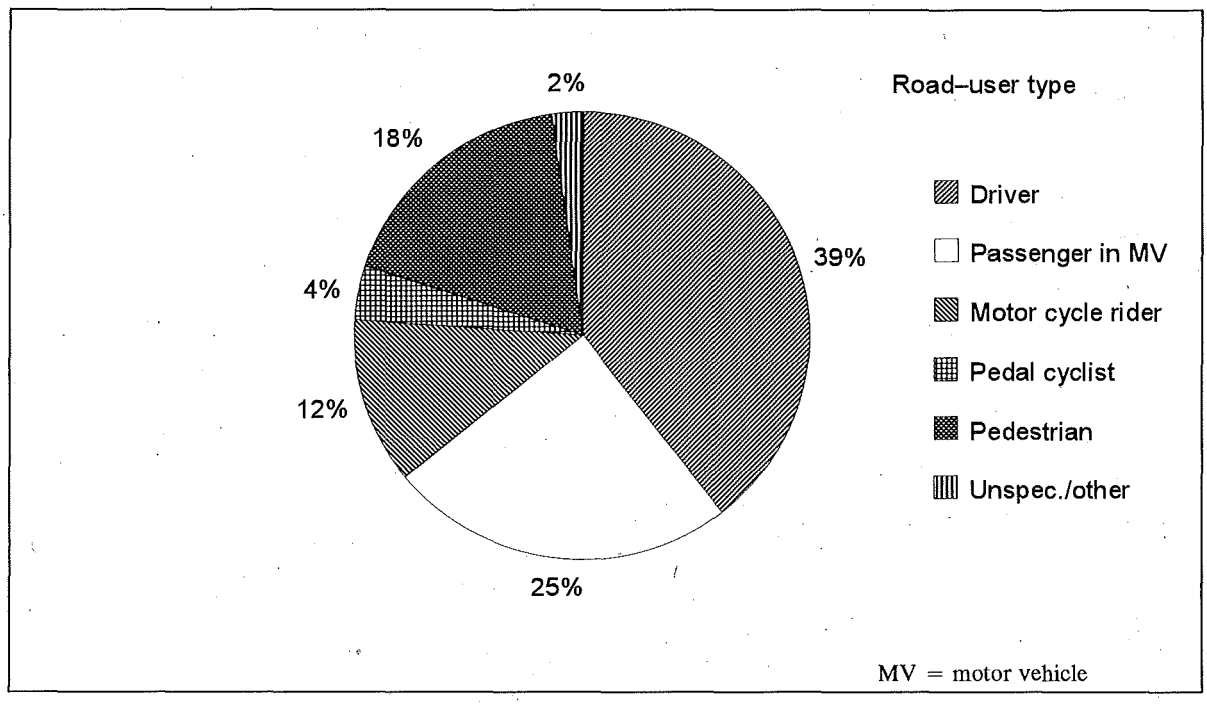


Figure 2.4: Road fatalities by road-user type, Australia 1990 (case numbers, n = 2164)



Variations in fatalities and separations by age group and road-user type are presented in Tables 2.5 and 2.6. Young road users (i.e. 0–14 years) die primarily as passengers in motor vehicles and as pedal cyclists, whereas fifteen to twenty-four year olds die as drivers and passengers in motor vehicles. Road-users aged 70 and above are the only adult group to die more frequently as pedestrians than as drivers.

Table 2.5: Road fatalities by age group and road-user type, Australia 1990 (case numbers and row percentages)

Age group (years)	Road-user type						Total
	Driver	Passenger in motor vehicle	Motorcycle rider	Pedal cyclist	Pedestrian	Unspec./ other	
0–4		25		2	16	4	47
		53.2%		4.3%	34.0%	8.5%	100%
5–14	1	44	2	23	56	2	128
	0.8%	34.4%	1.6%	18.0%	43.8%	1.6%	100%
15–19	122	102	55	16	27	10	332
	36.7%	30.7%	16.6%	4.8%	8.1%	3.0%	100%
20–24	154	97	73	6	35	9	374
	41.2%	25.9%	19.5%	1.6%	9.4%	2.4%	100%
25–29	98	42	57	7	34	6	244
	40.2%	17.2%	23.4%	2.9%	13.9%	2.5%	100%
30–39	150	52	44	7	38	5	296
	50.7%	17.6%	14.9%	2.4%	12.8%	1.7%	100%
40–49	117	30	16	6	34	4	207
	56.5%	14.5%	7.7%	2.9%	16.4%	1.9%	100%
50–59	69	33	1	4	28		135
	51.1%	24.4%	0.7%	3.0%	20.7%		100%
60–69	67	55	2	4	37		165
	40.6%	33.3%	1.2%	2.4%	22.4%		100%
70+	75	57		2	91	1	226
	33.2%	25.2%		0.9%	40.3%	0.4%	100%
Not known	2	5	1		2		10
	20.0%	50.0%	10.0%		20.0%		100%
Total	**855**	**542**	**251**	**77**	**398**	**41**	**2164**
	39.5%	**25.0%**	**11.6%**	**3.6%**	**18.4%**	**1.9%**	**100%**

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]
Source: FORS Fatality File 1990[21]

2.3.3 Injury severity

The abbreviated injury scale (AIS; values 1–6) and injury severity scores (ISS; a range of values up to 75 derived from AIS values) are widely used measures of the severity of injury.[24] These scales estimate the probability that an injury will result in death. McKenzie et al.[25] have published a system for deriving severity scores from ICD9-CM codes, commonly used in classifying Australian hospital admissions data. While the system is limited by incompatibilities between the two classifications, it is capable of providing useful insights into morbidity data (see O'Connor 1993[22] for further details).

The distribution of AIS and ISS across admissions and fatalities are presented in Tables 2.7 and 2.8. The high population-based rate of moderate injury among admissions is notable (i.e. 117/100 000). The greatest reduction in road injury admissions between 1988 and 1990 occurred in the 'critical' severity category. There is evidence of a substantial decline in most ISS injury severity categories for hospital separations.

Table 2.6: Road injury hospital separations by age group and road-user type, Australia 1990 (case numbers and row percentages)

Age group (years)	Road-user type						Total
	Driver	Passenger in motor vehicle	Motorcycle rider	Pedal cyclist	Pedestrian	Unspec./ other	
0–4	3	389		322	311	127	1151
	0.2%	33.8%		27.9%	27.0%	11.1%	100%
5–14	50	917	189	3115	1030	478	5779
	0.9%	15.9%	3.3%	53.9%	17.8%	8.3%	100%
15–19	1562	1682	1279	1114	598	1031	7266
	21.5%	23.1%	17.6%	15.3%	8.2%	14.2%	100%
20–24	1900	1162	1271	408	452	946	6138
	31.0%	18.9%	20.7%	6.7%	7.4%	15.4%	100%
25–29	1281	626	1001	331	308	670	4216
	30.4%	14.8%	23.7%	7.8%	7.3%	15.9%	100%
30–39	1950	764	874	397	477	848	5310
	36.7%	14.4%	16.5%	7.5%	9.0%	16.0%	100%
40–49	1340	599	294	221	350	501	3306
	40.5%	18.1%	8.9%	6.7%	10.6%	15.2%	100%
50–59	893	438	122	155	335	343	2286
	39.1%	19.1%	5.3%	6.8%	14.7%	15.0%	100%
60–69	662	445	68	105	347	284	1912
	34.6%	23.3%	3.6%	5.5%	18.1%	14.9%	100%
70+	695	574	38	98	544	306	2256
	30.8%	25.5%	1.7%	4.4%	24.1%	13.6%	100%
Not known	2	1			3		6
	33.3%	16.7%			50.0%		100%
Total	**10 338**	**7598**	**5135**	**6266**	**4754**	**5535**	**39 626**
	26.1%	**19.2%**	**13.0%**	**15.8%**	**12.0%**	**14.0%**	**100%**

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]
Source: FORS Fatality File 1990[21]

Injury severity is distributed fairly uniformly across road-user type at least for fatalities (Table 2.9). Admissions show a different pattern. Table 2.10 shows that pedestrians have the highest average ISS. Comparison of the distribution of AIS scores of pedestrians and all road-users, shows a greater proportion of pedestrians at each AIS level above minor injury. Motorcycle riders have an elevated proportion of moderate to serious injuries, whereas pedal cyclists have a substantially higher proportion of moderate injuries compared to other road-user types, and a lower proportion of more severe injuries.

Table 2.7: Road fatalities and road injury separations, by abbreviated injury scale (AIS), Australia 1990 (case number, rate per 100 000 and per cent change in number since 1988)

AIS scores*	Fatalities		Hospital separations					
	1990 Maximum AIS		1990 AIS of principal diagnosis		% change in number 1988–90	1990 Maximum AIS (all diagnoses)		% change in number 1988–90
	Number	Rate per 100 000	Number	Rate per 100 000		Number	Rate per 100 000	
1 (minor)	2	<0.1	7276	43	–12.2	6329	37	–9.7
	0.1%		18.4%			16.0%		
2 (moderate)	25	0.1	20037	117	–11.4	20014	117	–13.0
	1.2%		50.6%			50.5%		
3 (serious)	182	1	5831	34	–8.7	7339	43	–12.1
	8.4%		14.7%			18.5%		
4 (severe)	774	5	1298	8	–7.8	1638	10	–8.8
	35.8%		3.3%			4.1%		
5 (critical)	542	3	524	3	–18.6	605	4	–29.8
	25.0%		1.3%			1.5%		
6 (maximum injury)	359	2	0	0	0	0	0	†
	16.6%							
9 (unspec.)	280	2	4660	27	–15.3	3701	22	–2.9
	12.9%		11.8%			9.3%		
Total	**2164**	**13**	**39626**	**232**	**–11.6**	**39626**	**232**	**–11.6**
	100%		**100%**			**100%**		

†Percentage change not calculated for fatalities, due to changes in FORS coding procedures between 1988 and 1990

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]

Source: Fatalities: FORS Fatality File 1988 and 1990[21]; hospital separations: State and Territory hospital morbidity collections

Table 2.8: Road fatalities and road injury hospital separations, by injury severity score (ISS), Australia 1990 (case number, rate per 100 000 and per cent change in number since 1988)

ISS*	Fatalities 1990 Number	Fatalities 1990 Rate per 100 000	Hospital separations 1990 Number	Hospital separations 1990 Rate per 100 000	Hospital separations % change in number 1988–90
0–4	3 0.1%	< 0.1	20626 52.1%	121	–2.0
5–9	26 1.2%	0.2	10112 25.5%	59	–20.0
10–14	60 2.8%	0.4	2748 6.9%	16	–13.7
15–19	115 5.3%	0.7	1506 3.8%	9	–10.1
20–24	183 8.5%	1	623 1.6%	4	–13.4
25–29	313 14.5%	2	630 1.6%	4	–27.0
30–34	195 9.0%	1	177 0.4%	1	–21.3
35–39	190 8.8%	1	101 0.3%	0.6	42.3
40–44	185 8.5%	1	48 0.1%	0.3	–17.2
45–64	237 11.0%	1	18 0.0%	0.1	†
65–74	16 0.7%	0.1	1 0.0%	< 0.1	†
75	361 16.7%	2	0	0	†
Unspecified	280 12.9%	2	3036 7.7%	18	–29.6
Total	**2164** **100%**	**13**	**39626** **100%**	**232**	**–11.6**

* ISS values are derived from AIS scores and show a range of increasing severity up to 75
†Percentage based on less than 50 cases for 1988
Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]
Source: Fatalities: FORS Fatality File 1990;[21] hospital separations: State and Territory hospital morbidity collections

Table 2.9: Road fatalities by road-user type, mean injury severity score (ISS) and maximum abbreviated injury scale (AIS) score, Australia 1990 (case numbers and row percentages)

Road-user type	Mean ISS score	Maximum AIS (1)	(2)	(3)	(4)	(5)	(6)	(9)	Total
Driver	41.3	1 0.1%	7 0.8%	76 8.9%	302 35.3%	199 23.3%	155 18.1%	115 13.5%	855 100%
Passenger in motor vehicle	40.8	0	8 1.5%	43 7.9%	182 33.6%	131 24.2%	91 16.8%	87 16.1%	542 100%
Motorcycle rider	40.3	0	3 1.2%	24 9.6%	90 35.9%	70 27.9%	42 16.7%	22 8.8%	251 100%
Pedal cyclist	35.1	0	1 1.3%	7 9.1%	30 39.0%	19 24.7%	9 11.7%	11 14.3%	77 100%
Pedestrian	39.7	1 0.3%	4 1.0%	29 7.3%	162 40.7%	116 29.1%	49 12.3%	37 9.3%	398 100%
Unspec/ other	47.9	0	2 4.9%	3 7.3%	8 19.5%	7 17.1%	13 31.7%	8 19.5%	41 100%
Total	**40.7**	**2** **0.1%**	**25** **1.2%**	**182** **8.4%**	**774** **35.8%**	**542** **25.0%**	**359** **16.6%**	**280** **12.9%**	**2164** **100%**

AIS scores: 1 – minor, 2 – moderate, 3 – serious, 4 – severe, 5 – critical, 6 – maximum injury, 9 – unspecified

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]

Source: FORS Fatality File 1990[21]

2.3.4 Body region injured

Patterns of injury by body region are shown in Table 2.11, both for the principal diagnosis in each case and for all diagnoses. The table shows that the injury rate (for principal diagnosis) to the lower extremities is 47/100 000 compared with 45 for the head; 33 for upper extremity; 16 for the chest and 12 for the spine. Head injuries (for principal diagnosis) declined by 23 per cent between 1988 and 1990, compared with a 12 per cent decline for all body regions.

Table 2.10: Road injury hospital separations by road-user type, mean injury severity score (ISS) and abbreviated injury scale (AIS) score of principal diagnosis, Australia 1990 (case number and row percentage)

Road-user type	Mean ISS score	AIS–principal diagnosis (1)	(2)	(3)	(4)	(5)	(9)	Total
Driver	6.8	2241 21.7%	4906 47.5%	1348 13.0%	343 3.3%	131 1.3%	1368 13.2%	10338 100%
Passenger in motor vehicle	6.6	1575 20.7%	3442 45.3%	1149 15.1%	275 3.6%	117 1.5%	1040 13.7%	7598 100%
Motorcycle rider	6.8	660 12.8%	2789 54.3%	1096 21.3%	135 2.6%	69 1.3%	388 7.5%	5135 100%
Pedal cyclist	5.0	1102 17.6%	4059 64.8%	582 9.3%	130 2.1%	40 0.6%	353 5.6%	6266 100%
Pedestrian	7.9	587 12.3%	2434 51.2%	977 20.6%	266 5.6%	127 2.7%	362 7.6%	4754 100%
Unspecified/ other	5.3	1111 20.1%	2407 43.5%	679 12.3%	149 2.7%	40 0.7%	1149 20.8%	5535 100%
Total	**6.4**	**7276 18.4%**	**20037 50.6%**	**5831 14.7%**	**1298 3.3%**	**524 1.3%**	**4660 11.8%**	**39626 100%**

AIS scores: 1 – minor, 2 – moderate, 3 – serious, 4 – severe, 5 – critical, 9 – unspecified
Note: For further details, refer to O'Connor PJ. Road Injury in Australia.[22]
Source: State and Territory hospital morbidity collections

For each road-user group, Table 2.12 shows case numbers and rates of injury by body region, and changes in case numbers from 1988 to 1990. Reductions were observed for most categories, though not all. For pedal cyclists, the body region to show the greatest reduction between 1988 and 1990 was the head. Head injuries decreased by 16 per cent, while injuries to the face increased by 14 per cent. The reduction in head injuries could reflect to some extent the effects of increased helmet wearing, (though much of the effect of helmet laws will have occurred after 1990).

Table 2.11: Road injury hospital separations by body region of injury for principal diagnosis and all diagnoses, Australia 1990 (case number, rate per 100 000 and per cent change in number since 1988)

Body region	Principal diagnosis*			All diagnoses**		
	1990		Per cent	1990		Per cent
	Number	Rate per 100 000	change in number 1988–90	Number	Rate per 100 000	change in number 1988–90
External	6756 17.0%	40	–13.6	20115 26.9%	118	–9.4
Head	7719 19.5%	45	–23.3	9968 13.3%	58	–27.8
Face	2136 5.4%	13	–14.1	4728 6.3%	28	–14.2
Chest	2640 6.7%	16	–4.2	5797 7.8%	34	–9.0
Abdomen	1014 2.6%	6	–9.5	1976 2.6%	12	–5.0
Spine	1994 5.0%	12	–4.5	3182 4.3%	19	–12.0
Upper extremity	5570 14.1%	33	–3.7	9921 13.3%	58	–7.5
Lower extremity	8070 20.4%	47	–6.6	13686 18.3%	80	–12.1
Unspecified/other	3727 9.4%	22	–8.8	5334 7.1%	31	37.9
Total	**39626 100%**	**232**	**–11.6**	**74707 100%**	**438**	**–10.8**

* 'Principal diagnosis' is the principal injury recorded for a separation
** 'All diagnoses' refers to all injuries recorded for a separation
Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]
Source: State and Territory hospital morbidity collections

When the severity of injury is broken down by road-user type and body region of injury for admissions (principal diagnosis only, Table 2.13), it can be seen, for example, that a higher proportion of pedestrian head injuries are serious to critical than are driver head injuries (39% and 22%, respectively). Pedal cyclists are the road-user group with the lowest proportion of admitted head injuries in the serious to critical range (15%).

Table 2.12: Road injury hospital separations, by road-user type and body region of principal diagnosis, Australia 1990 (case number, row percentage, rate per 100 000 and per cent change in number since 1988)

Road-user type	Body region–principal diagnosis									
	External	Head	Face	Chest	Abdomen	Spine	Upper extremity	Lower extremity	Unspec/ other	Total
Driver	1934	1874	763	1254	247	728	944	1514	1080	10338
	18.9%	18.1%	7.4%	12.1%	2.4%	7.0%	9.1%	14.6%	10.4%	100%
Rate per 100 000	11	11	5	7	1	4	6	9	6	
% change 1988–90	2.4%	–19.2%	–18.4%	3.6%	–13.0%	12.3%	–5.7%	–11.0%	0.7%	
Passenger in motor vehicle	1410	1473	477	756	313	598	745	1010	816	7598
	18.6%	19.4%	6.3%	9.9%	4.1%	7.9%	9.8%	13.3%	10.7%	100%
Rate per 100 000	8	9	3	4	2	4	4	6	5	
% change 1988–90	–25.9%	–22.6%	–20.5%	–14.4%	–2.8%	–0.7%	–11.5%	–15.1%	–12.4%	
Motor cycle rider	783	578	143	149	131	165	1105	1794	287	5135
	15.2%	11.3%	2.8%	2.9%	2.5%	3.2%	21.5%	34.9%	5.6%	100%
Rate per 100 000	5	3	0.8	0.9	0.8	1	7	11	2	
% change 1988–90	–9.6%	–31.4%	–10.6%	–15.3%	–27.2%	–25.7%	–6.8%	–16.4%	–33.3%	
Pedal cyclist	989	1707	359	58	171	73	1663	983	265	6266
	15.8%	27.2%	5.7%	0.9%	2.7%	1.2%	26.5%	15.7%	4.2%	100%
Rate per 100 000	6	10	2	0.3	1	0.4	10	6	2	
% change 1988–90	–2.0%	–16.3%	14.0%	–7.9%	0%	–1.4%	9.3%	3.3%	–4.3%	
Pedestrian	622	1210	93	119	69	61	442	1841	297	4754
	13.1%	25.5%	1.9%	2.5%	1.4%	1.3%	9.3%	38.7%	6.3%	100%
Rate per 100 000	4	7	0.5	0.7	0.4	0.4	3	11	2	
% change 1988–90	4.5%	–10.6%	–32.6%	–6.3%	–13.8%	–57.9%	–5.6%	–5.3%	–10.0%	
Unspec/other	1018	877	301	304	84	368	672	928	982	5535
	18.4%	15.9%	5.4%	5.5%	1.5%	6.7%	12.1%	16.8%	17.7%	100%
Rate per 100 000	6	5	2	2	0.5	2	4	5	6	
% change 1988–90	–24.5%	–25.6%	–24.8%	–7.3%	–16.0%	–13.4%	–15.2%	2.0%	–24.9%	
Total	**6756**	**7719**	**2136**	**2640**	**1014**	**1994**	**5570**	**8070**	**3727**	**39626**
	17.0%	**19.5%**	**5.4%**	**6.7%**	**2.6%**	**5.0%**	**14.1%**	**20.4%**	**9.4%**	**100**

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]; **Source:** State and Territory hospital morbidity collections

Table 2.13: Road injury hospital separations by road-user type, body region of principal diagnosis and abbreviated injury scale (AIS) score of principal diagnosis, Australia 1990 (case number and row percentage)

	AIS–principal diagnosis						
	(1)	(2)	(3)	(4)	(5)	(5)	Total
Driver							
External	1532	399				3	1934
	79.2%	20.6%				0.1%	100%
Head	1	1465	105	181	116	5	1874
	0.1%	78.2%	5.6%	9.7%	6.2%	0.3%	100%
Face	303	296	7			157	763
	39.8%	38.8%	0.9%			20.6%	100%
Chest	121	754	289	61		29	1254
	9.7%	60.1%	23.0%	4.8%		2.3%	100%
Abdomen		182	15	44	6		247
		73.4%	6.2%	17.8%	2.6%		100%
Spine	202	129	330	50	9	8	728
	27.7%	17.7%	45.3%	6.9%	1.2%	1.1%	100%
Upper extremity	60	723	116	1		43	944
	6.3%	76.7%	12.3%	0.1%		4.6%	100%
Lower extremity	19	955	483	5		53	1514
	1.2%	63.0%	31.9%	0.3%		3.5%	100%
Unspecified/other	3	4	4			1070	1080
	0.2%	0.4%	0.4%			99.0%	100%
Total	**2241**	**4906**	**1348**	**343**	**131**	**1368**	**10338**
	21.7%	**47.5%**	**13.0%**	**3.3%**	**1.3%**	**13.2%**	**100%**
Passenger in motor vehicle							
External	1152	257				1	1410
	81.7%	18.2%				0.1%	100%
Head		1090	117	169	94	3	1473
		74.0%	8.0%	11.5%	6.4%	0.2%	100%
Face	159	205	3			111	477
	33.3%	43.0%	0.5%			23.2%	100%
Chest	77	481	148	30		19	756
	10.2%	63.6%	19.6%	4.0%		2.5%	100%
Abdomen		222	41	47	2		313
		71.0%	13.2%	15.1%	0.8%		100%
Spine	108	76	367	28	19		598
	18.0%	12.7%	61.3%	4.7%	3.2%		100%
Upper extremity	53	578	61			52	745
	7.1%	77.6%	8.2%			7.0%	100%
Lower extremity	24	531	412			44	1010
	2.3%	52.5%	40.8%			4.4%	100%
Unspecified/other	3	3			1	809	816
	0.3%	0.3%			0.2%	99.2%	100%
Total	**1575**	**3442**	**1149**	**275**	**117**	**1040**	**7598**
	20.7%	**45.3%**	**15.1%**	**3.6%**	**1.5%**	**13.7%**	**100%**

continued

Table 2.13 (continued)

	AIS–principal diagnosis						
	(1)	(2)	(3)	(4)	(5)	(9)	Total
Motorcycle rider							
External	477	306					783
	61.0%	39.0%					100%
Head		398	45	77	57	1	578
		68.7%	7.8%	13.3%	9.9%	0.2%	100%
Face	50	79			1	12	143
	35.2%	55.4%			0.9%	8.5%	100%
Chest	17	32	81	9		10	149
	11.2%	21.5%	54.4%	6.0%		6.9%	100%
Abdomen		80	12	35	4		131
		61.1%	8.9%	26.9%	3.1%		100%
Spine	8	13	130	4	8	3	165
	4.9%	7.7%	78.8%	2.3%	4.7%	1.6%	100%
Upper extremity	70	935	83	1		16	1105
	6.4%	84.6%	7.5%	0.1%		1.4%	100%
Lower extremity	37	946	741	9		62	1794
	2.1%	52.7%	41.3%	0.5%		3.5%	100%
Unspecified/other		1	3			284	287
		0.5%	0.9%			98.6%	100%
Total	660	2789	1096	135	69	388	5135
	12.8%	54.3%	21.3%	2.6%	1.3%	7.5%	100%
Pedal cyclist							
External	766	223					989
	77.4%	22.6%					100%
Head		1453	107	112	36		1707
		185.1%	6.2%	6.6%	2.1%		100%
Face	191	125	1			42	359
	53.2%	34.8%	0.4%			11.7%	100%
Chest	5	19	31	1	1		58
	8.8%	33.2%	53.4%	2.3%	2.3%		100%
Abdomen	13	134	4	14	1	4	171
	7.6%	78.6%	2.3%	8.4%	0.8%	2.3%	100%
Spine	5	8	54	3	3	1	73
	7.1%	10.6%	73.6%	3.5%	3.4%	1.8%	100%
Upper extremity	95	1500	59			9	1663
	5.7%	90.2%	3.5%			0.5%	100%
Lower extremity	27	597	326			32	983
	2.8%	60.8%	33.2%			3.3%	100%
Unspecified/other			1			263	265
			0.5%			99.5%	100%
Total	**1102**	**4059**	**582**	**130**	**40**	**353**	**6266**
	17.6%	**64.8%**	**9.3%**	**2.1%**	**0.6%**	**5.6%**	**100%**

continued

Table 2.13 (continued)

	AIS–principal diagnosis						
	(1)	(2)	(3)	(4)	(5)	(9)	Total
Pedestrian							
External	509	111	1			1	622
	81.8%	17.8%	0.2%			0.2%	100%
Head		730	131	224	122	3	1210
		60.4%	10.8%	18.5%	10.1%	0.2%	100%
Face	33	47	1			11	93
	36.1%	51.1%	1.4%			11.4%	100%
Chest	13	36	52	11	1	5	119
	11.1%	30.3%	43.8%	9.4%	1.0%	4.4%	100%
Abdomen		45	6	15	1		69
		66.2%	9.3%	22.6%	1.9%		100%
Spine	1	1	44	12	3		61
	2.1%	2.1%	72.7%	18.9%	4.2%		100%
Upper extremity	13	375	49			5	442
	3.0%	84.8%	11.1%			1.2%	100%
Lower extremity	16	1084	692	4		45	1841
	0.8%	58.9%	37.6%	0.2%		2.5%	100%
Unspecified/other	1	4				292	297
	0.4%	1.3%				98.3%	100%
Total	587	2434	977	266	127	362	4754
	12.3%	51.2%	20.6%	5.6%	2.7%	7.6%	100%
Unspecified/other							
External	758	260					1018
	74.5%	25.5%					100%
Head		673	65	104	35		877
		76.7%	7.4%	11.8%	4.0%		100%
Face	121	111	5			65	301
	40.1%	36.7%	1.7%			21.4%	100%
Chest	31	174	82	14		4	304
	10.3%	57.0%	27.0%	4.4%		1.3%	100%
Abdomen		63	6	13	1		84
		75.3%	7.7%	15.4%	1.6%		100%
Spine	117	68	159	14	4	6	368
	31.8%	18.4%	43.2%	3.8%	1.0%	1.7%	100%
Upper extremity	66	531	34			41	672
	9.8%	79.0%	5.0%			6.1%	100%
Lower extremity	17	527	327	5		53	928
	1.9%	56.7%	35.2%	0.5%		5.7%	100%
Unspecified/other		1				981	982
	0.1%					99.9%	100%
Total	**1111**	**2407**	**679**	**149**	**40**	**1149**	**5535**
	20.1%	**43.5%**	**12.3%**	**2.7%**	**0.7%**	**20.8%**	**100%**

AIS scores: 1 – minor, 2 – moderate, 3 – serious, 4 – severe, 5 – critical, 9 – unspecified
Source: State and Territory hospital morbidity collections; O'Connor PJ. Road Injury in Australia[22]

2.3.5 Nature of injury

A more detailed breakdown of the body region of injury for admitted road injuries is presented in Table 2.14. Intracranial injury (excluding skull fracture) makes up 16 per cent of the principal diagnoses, with a population-based rate of 38/100 000. Between 1988 and 1990, intracranial injuries for principal diagnoses declined by 25 per cent, the greatest decline of any injury type.

Lower limb fractures are also high among principal diagnoses, with a rate of 35/100 000. However, these injuries have not declined much over recent years. Fractures of the spine, trunk and upper limbs, which also comprise a substantial proportion of principal diagnoses, have decreased only slightly over recent years.

2.3.6 Length of stay in hospital

Vehicle occupants make up 45 per cent of road injury admissions (Figure 2.3) and 45 per cent of total occupied bed days due to road injury (Figure 2.5). Only 12 per cent of hospital separations are pedestrians (Figure 2.3), but they comprise 19 per cent of total bed days (Figure 2.5). Figure 2.6 shows that pedestrians have a substantially higher average length of stay than any other road-user group.

Figure 2.5: Road injury hospital bed occupancy by road-user type, Australia 1990 (bed days, n = 317 369)

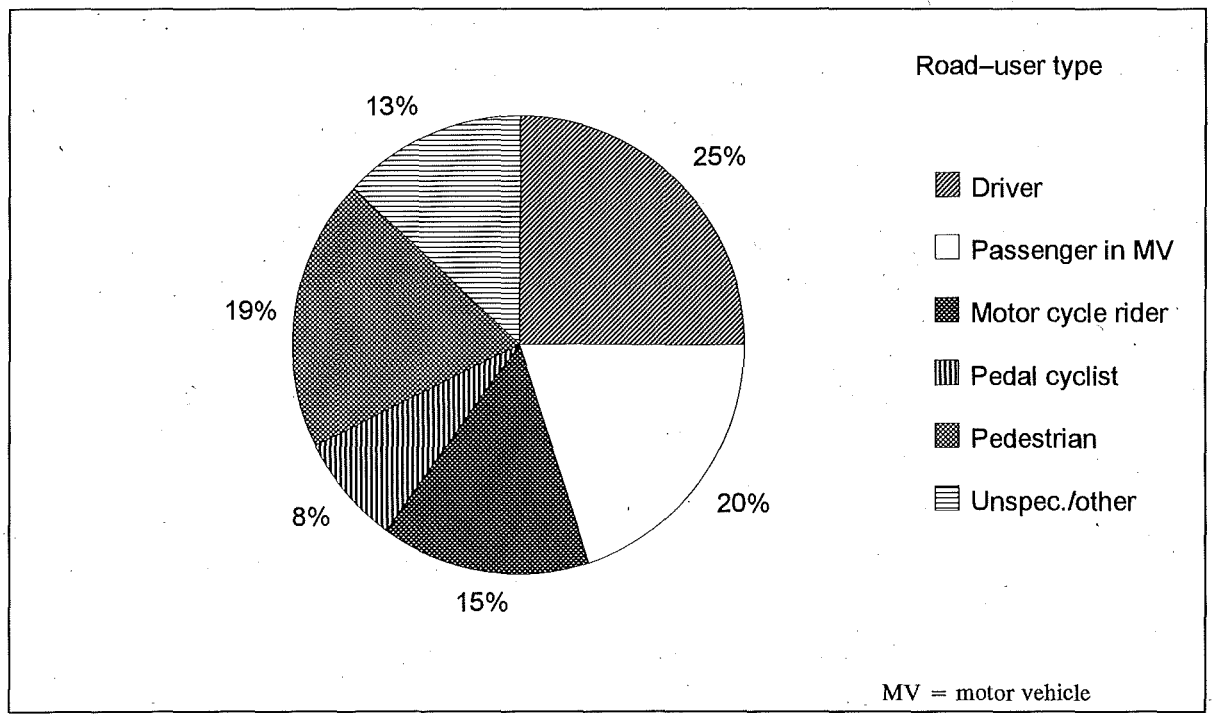


Table 2.14: Road injury hospital separations, by nature of injury for principal diagnosis and all diagnoses, Australia 1990 (case number, rate per 100 000 and per cent change in number since 1988)

Nature of injury*	Principal diagnosis			All diagnoses**		
	1990		Per cent	1990		Per cent
	Number	Rate per 100 000†	change in number 1988–90	Number	Rate per 100 000†	change in number 1988–90
Fracture of skull	2544	15	–14.8	4457	26	–18.1
	6.4			6.0%		
Fracture of spine/trunk	4416	26	–2.1	8175	48	–9.7%
	11.1			11.0%		
Fracture of upper limb	4694	28	–3.1	8150	48	–8.3%
	11.8			10.9%		
Fracture of lower limb	6004	35	–6.1	9289	54	–11.9%
	15.2			12.5%		
Dislocation	776	5	–10.1	1652	10	–12.3%
	2.0			2.2%		
Sprains/strains of joints and adjacent muscles	862	5	–8.0	1660	10	–17.3%
	2.2			2.2%		
Intracranial injury excluding skull fracture	6465	38	–24.9	8194	48	–29.1%
	16.3			11.0%		
Internal injury of chest, abdomen and pelvis	1442	8	–10.0	3545	21	–8.8%
	3.6			4.8%		
Open wound of head, neck and trunk	2841	17	–15.6	7891	46	–19.6%
	7.2			10.6%		
Open wound of upper limb	807	5	–9.0	2127	13	–4.0%
	2.0			2.9%		
Open wound of lower limb	1184	7	–10.5	2785	16	–6.4%
	3.0			3.7%		
Injury to blood vessels	92	0.5	37.3	225	1	–2.2%
	0.2			0.3%		
Superficial injuries	844	5	–20.6	3911	23	–4.8%
	2.1			5.2%		
Contusion with intact skin surface	1857	11	–7.5	5242	31	–4.1%
	4.7			7.0%		
Crushing injury	66	0.4	–24.1	96	0.6	–33.2%
	0.2			0.1%		
Foreign body through orifice	12	0.1	‡	41	0.2	–18.0%
	0.0			0.1%		
Injury to nerves/ spinal cord	204	1.2	–10.1	513	3	–18.4%
	0.5			0.7%		
Other	4516	27	–10.4	6648	39	6.9%
	11.4			8.9%		
Total	**39626**	**232**	**–11.6**	**74601**	**437**	**–12.3%**
	100%			**100%**		

*Nature of injury categories based on ICD-9 injury and poisoning chapter

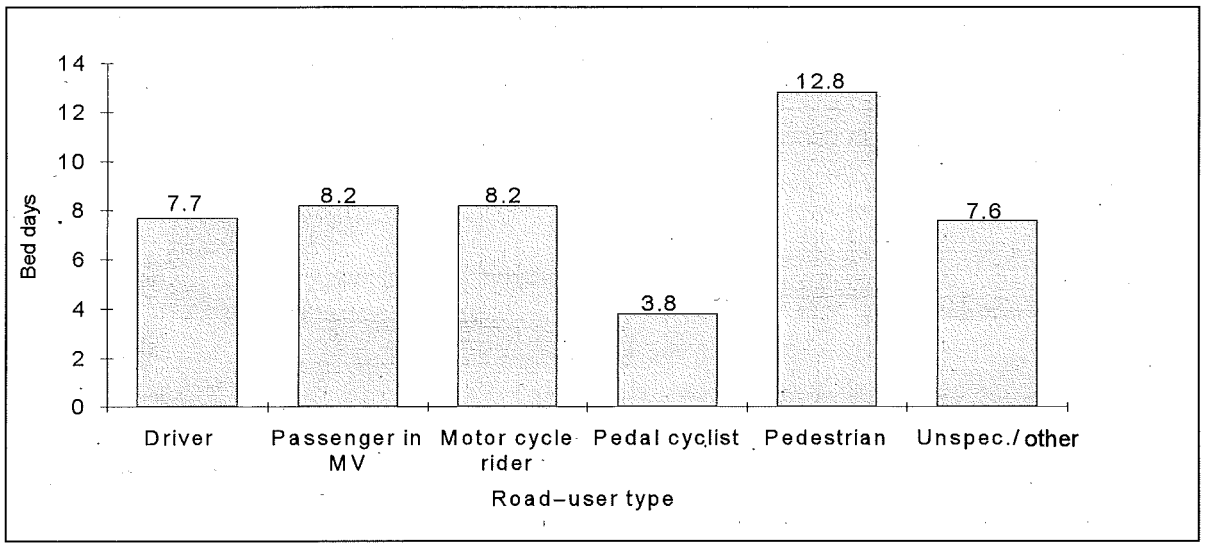
**'All diagnoses' refers to all injuries recorded for a separation. Principal diagnosis is the principal injury recorded for a separation

†The denominator for rate calculation is the estimated resident population for 1990, based on the 1991 census

‡Percentage based on less than 50 cases for 1988

Source: State and Territory hospital morbidity collections

Figure 2.6: Road injury hospital separations, mean length of stay by road-user type, Australia 1990



Thirty-six per cent of the total occupied bed days for road injury are used by cases with lower limb injuries (Figure 2.7). Average length of stay is highest for spinal injury and lower limb injuries (Figure 2. 8).

Figure 2.7: Road injury hospital bed occupancy by body region of principal diagnosis, Australia 1990 (bed days, n = 317 369)

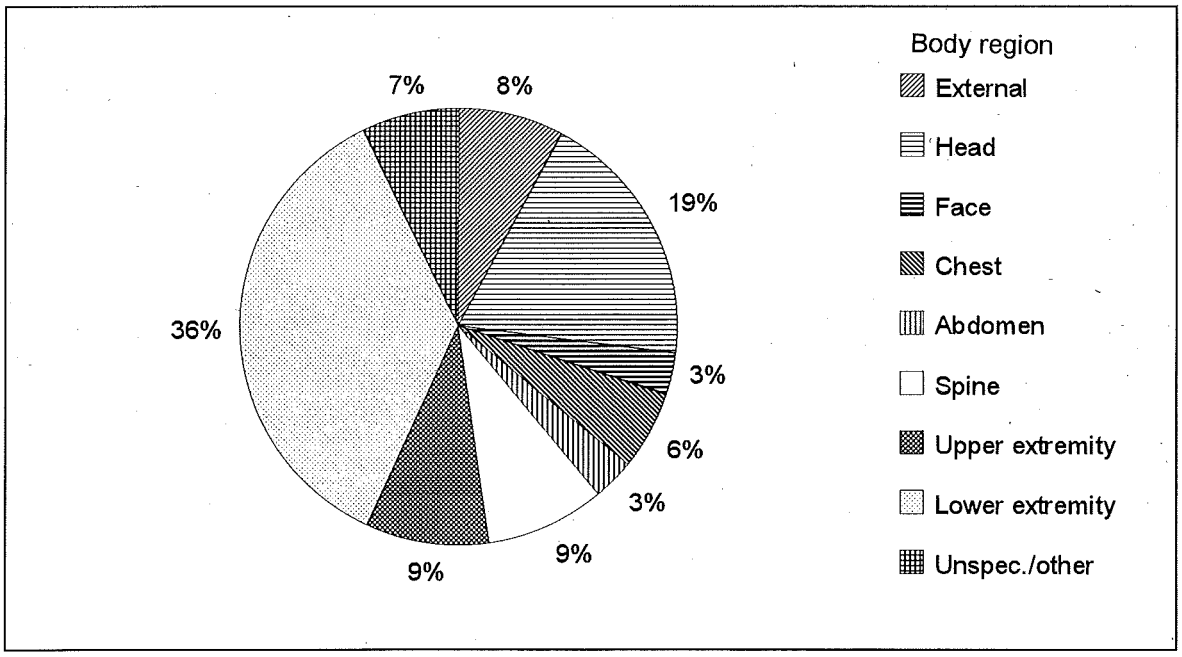
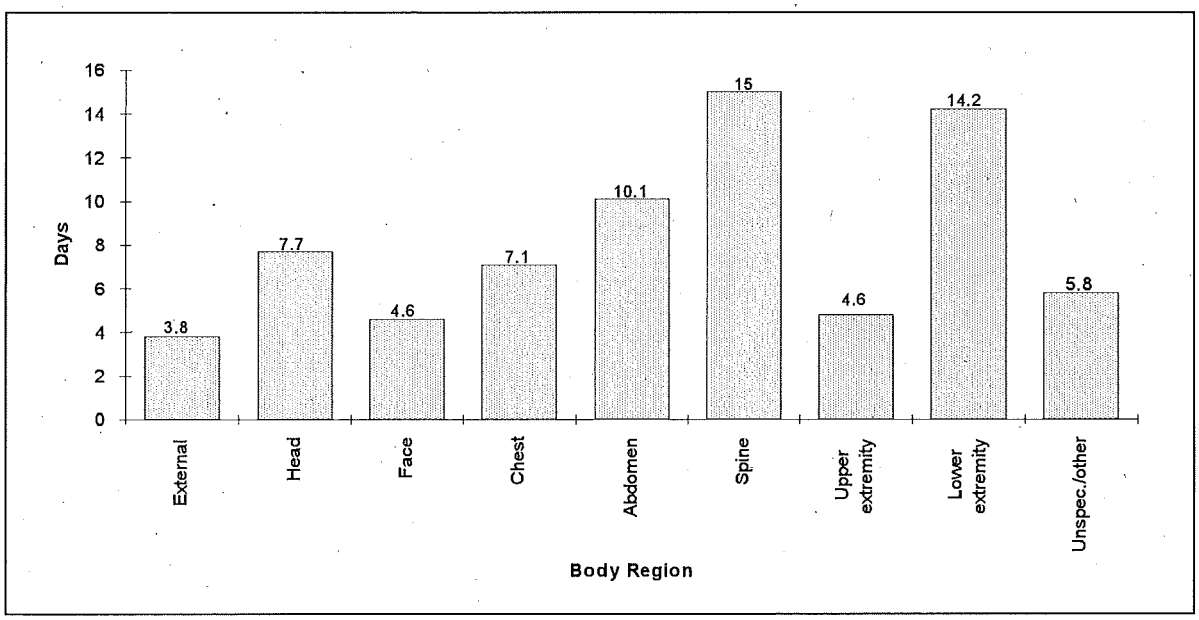


Figure 2.8: Road injury hospital separations, mean length of stay by body region of principal diagnosis (bed days), Australia 1990



2.3.7 Timing of death in road crashes

The timing of death in relation to provision of treatment or transport is presented in Table 2.15. Vehicle occupants make up the majority of cases that die at any time before or after provision of treatment or transport. Twenty-two per cent of drivers die instantaneously in road crashes compared with 11 per cent of pedestrians, 13 per cent of cyclists, 18 per cent of motorcycle riders and 21 per cent of passengers. Half of all cases that die in hospital are vehicle occupants. Pedestrians make up more than a quarter of the cases that die in hospital.

2.3.8 Alcohol involvement

Alcohol is the single most important human factor in road crashes. The relationship between risk of crash involvement and level of alcohol in the blood has been shown to be strong and exponential. Borkenstein et al.[26] found that crash risk in the blood alcohol concentration (BAC) range 0.10–0.149 g/dL was more than 10 times that of drivers having a BAC in the range 0.05–0.99 g/dL.

A recent report by Attewell and Dowse[27] showed that, of Australian road fatalities in 1988 tested for BAC, around 40 per cent of cases involving pedestrians, motorcyclists and drivers had a BAC in excess of 0.05 g/dL. Pedestrians had the highest percentage of BACs in excess of g/dL units. Recently, problems with data on alcohol involvement in road crashes have been detected and are the basis of a study by Trembath for the NISU Road Injury Information Program. The problems include under-enumeration and also bias in data on both fatalities and hospital separations.[28]

Table 2.15: Road fatalities, by road-user type and timing of death, Australia 1990 (case numbers and row percentages)

Road-user type	Timing of death (code)*							Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Driver	184	399	44	28	187	1	12	855
	21.5%	46.7%	5.1%	3.3%	21.9%	0.1%	1.4%	100%
Passenger in motor vehicle	111	230	32	17	148		4	542
	20.5%	42.4%	5.9%	3.1%	27.3%		0.7%	100%
Motorcycle rider	45	107	15	5	78		1	251
	17.9%	42.6%	6.0%	2.0%	31.1%		0.4%	100%
Pedal cyclist	10	19	2	3	42		1	77
	13.0%	24.7%	2.6%	3.9%	54.5%		1.3%	100%
Pedestrian	42	112	20	24	197	1	2	398
	10.6%	28.1%	5.0%	6.0%	49.5%	0.3%	0.5%	100%
Unspecified/other	10	16	1	1	12		1	41
	24.4%	39.0%	2.4%	2.4%	29.3%		2.4%	100%
Total	**402**	**883**	**114**	**78**	**664**	**2**	**21**	**2164**
	18.6%	**40.8%**	**5.3%**	**3.6%**	**30.7%**	**0.1%**	**1.0%**	**100%**

*Code: (1) Instantaneous; (2) died at scene before medical or ambulance assistance; (3) died at scene during medical or ambulance assistance; (4) died in transit to hospital; (5) died in hospital; (6) died after leaving hospital; and (7) not known

Note: For further details, refer to O'Connor PJ. Road Injury in Australia[22]

Source: FORS Fatality File 1990[21]

2.4 Discussion

Haddon,[29,30] in his pioneering work on the causes of injury, developed a matrix which has been used extensively in injury prevention. An example of the application of Haddon's matrix to categorise interventions for prevention of road injury, was undertaken by Baker et al.[31] (Figure 2.9). Pre-event countermeasures aimed at the 'host' focused on driver vision testing, fatigue, alcohol consumption, driving experience and judgment. Countermeasures aimed at the crash event human factors focused on seatbelt use and physical condition (e.g. presence of osteoporosis). Post-crash events focused attention on age, physical condition and first aid skills.

The categorisation of prevention options is an essential first step in the development of national plans but Haddon's matrix in itself does not cover the issue of deciding priorities among options.

Figure 2.9: An application of Haddon's matrix to the prevention of motor vehicle injury

	Time phase		
	Pre-event	**Event**	**Post-event**
Host (human)	Driver vision Intoxication Experience Judgment Fatigue	Safety belt use Osteoporosis	Age Physical condition First aid skills
Vehicle	Brakes, tyres etc. Centre of gravity Load Ease of control	Vehicle size, speed etc. Automatic restraints Vehicle crash worthy Load containment	Fuel system integrity
Physical environment	Road factors – divided road – surface – curves – visibility etc. Signals, signs Intersections	Guard rails Fixed objects Other vehicles Median barriers Embankments	Communications Emergency services Rehabilitation services
Sociocultural environment	Alcohol attitudes Laws Speed limits Social norms	Safety belt attitudes Safety belt laws Child restraint laws Bike helmet laws	Trauma support Training of personnel

When designing countermeasures that focus on road injury and other public health problems, attention needs to focus on five factors: the incidence, severity, community concern, problem manageability and cost-effectiveness. Early work in road injury prevention gave considerable emphasis to problem incidence and severity. More recently, responding to resource restrictions with an emphasis on a more strategic approach, road safety authorities have given more attention to the assessment of community concern for road safety, manageability of the problem and, especially, to cost-effectiveness.[6,15,32] This approach emphasises the potential for small targeted gains to add up to substantial aggregate safety benefit.

Much of the information presented in this report has not been available before, and will enable a better targeting of safety problems. For example, information on the rate of head injury in road crashes in Australia will enable development of goals for a targeted level of reduction in such injury. Also information on the apparent severity of pedestrian injury and lower limb injuries may lead to a shift in priorities in treatment of crash victims. The NISU Road Injury Information Program is working to improve the national road injury data to facilitate improved monitoring and prevention of road injury.[33]

There is also a need for an improved level of analysis of road safety problems and countermeasures in Australia to enable better priority setting. This analysis must include comparison of countermeasure options, taking into account information on communities' interests and concerns, data on the manageability of the problem and also on cost–benefit ratios.

2.5 References

1. Bureau of Transport Economics. Social cost of transport accidents in Australia. Canberra: Australian Government Publishing Service, 1992.
2. Anderson PR, Adena MA, Montesin HJ. Trends in road crash fatality rates, summary report: Australia 1970–90. Canberra: Federal Office of Road Safety, 1993.
3. Federal Office of Road Safety (FORS). Analysis of fatal road crashes 1984–85, Canberra, Australia: FORS, 1988.
4. Ginpil S, Schneider R, Stone S. Years of potential life lost through road crashes: 1990. A comparison with other causes of death. Canberra: Federal Office of Road Safety, 1992.
5. National Road Safety Strategy. Canberra: Federal Office of Road Safety, 1992.
6. Pettitt AN, Haynes MA, Low Choy S. Factors affecting fatal road crash trends. Canberra: Federal Office of Road Safety, 1992.
7. Oxley JA and Fildes BN. Pilot study of the long term effects of road crashes. Canberra: Federal Office of Road Safety, 1993.
8. Trinca G, Johnston I, Campbell B, Haight F, Knight P, Mackay M, McLean AJ, Petrucelli E. Reducing traffic injury—a global challenge. Melbourne: Royal Australasian College of Surgeons, 1988.
9. Sabey BE. Road safety and value for money, Transport and Road Research Laboratory (Supplementary Report 581). Berkshire: Crowthorne, 1980.
10. McLean AJ. Adelaide in-depth accident study 1975–79, Road Accident Research Unit. Adelaide: University of Adelaide, 1979.
11. Treat JR. Tri-level study of the causes of traffic accidents: an overview of the final results. Proceedings 21st Conference. Vancouver, Canada: American Association for Automotive Medicine, 1977.
12. Evans L. Traffic safety and the driver. New York: Van Nostrand Reinhold, 1991.
13. Torpey S, Ogden K, Cameron M, Vulcan P. Indicative benefit/cost analysis of road trauma countermeasures. Clayton, Victoria: Monash University Accident Research Centre, 1991.
14. Ogden KW. Benefit/cost analysis of road trauma countermeasures: rural road and traffic engineering programs. Clayton, Victoria: Monash University Accident Research Centre, 1992.
15. RJ Nairne and Partners. A review of the cost-effectiveness of road safety measures. Adelaide: Road Safety Division, SA Department of Transport, 1987.
16. Cameron MH, Heiman L, Neiger D. Evaluation of the bicycle helmet wearing law in Victoria during its first 12 months. Clayton, Victoria: Monash University Accident Research Centre, 1992.

17. Cameron MH, Strang PM. Effect of intensified random breath testing in Melbourne during 1978 and 1979. Proceedings 11th ARRB Conference, 1980;Vol 11, Part 5. Melbourne: Australian Road Research Board.

18. Inquiry into vehicle occupant protection. Social Development Committee of the Victorian Parliament, Melbourne, 1990.

19. Fildes BN, Lane JC, Lenard J, Vulcan AP. Passenger cars and occupant injury. Canberra: Federal Office of Road Safety, 1992.

20. Monash University Accident Research Centre. Feasibility of occupant protection measures. Canberra: Federal Office of Road Safety, 1992.

21. Federal Office of Road Safety (FORS). 'Fatal File' data-base. Canberra: FORS, 1990. (Produced alternate years.)

22. O'Connor PJ. Road injury in Australia, Road Injury Information Program. Adelaide: National Injury Surveillance Unit, 1993.

23. KPMG Peat Marwick. Estimating the incidence of hospital accident and emergency department attendances for road injury. Road Injury Information Program. Adelaide: National Injury Surveillance Unit, 1993.

24. American Association for Automotive Medicine, Committee on Injury Scaling. Abbreviated injury scale, 1990 revision. Des Plaines, Illinois: AAAM, 1990.

25. MacKenzie EJ, Steinwachs DM, Shankar B. Classifying trauma severity based on hospital discharge diagnosis. Validation of an ICD-9CM to AIS-85 conversion table. Medical Care 1989;27:4.

26. Borkenstein RF. The role of the drinking-driver in traffic accidents. Department of Police Administration, Indiana University, Grand Rapids, 1964.

27. Attewell RG, Dowse MJ. Fatal crash types - analysis of 1988 fatality file. Canberra: Federal Office of Road Safety, 1992.

28. Trembath R. Investigation of missing values of BAC in road injury databases. Adelaide: Road Injury Information Program, National Injury Surveillance Unit, 1993.

29. Haddon W. Energy damage and the ten countermeasure strategies. Journal of Trauma 1973;13, 4:321–331.

30. Haddon W. Advances in the epidemiology of injuries as a basis for public policy. Public Health Reports 1980;95,5:411–420.

31. Baker SP, O'Neill B, Karpf RS. The injury fact book. Lexington Books, USA, 1984.

32. Federal Office of Road Safety and The Roy Morgan Research Centre. Community attitudes to road safety—community attitude survey wave VI (CR 101). Canberra: Federal Office of Road Safety, 1992.

33. O'Connor PJ. Needs and opportunities for improved road injury surveillance. Adelaide: Road Injury Information Program, National Injury Surveillance Unit, 1992.

Chapter 3 Injury in residential settings

3.1 Introduction

The definition of 'residential injuries' may differ between studies and data sources. Generally, this term refers to injuries which occur in settings where people reside, including private homes, nursing homes and day care centres. The term 'home injuries' is more selective, referring to those injuries that occur in the home and immediate surroundings, such as the garage and yard.[1] This section focuses on home injury as it accounts for a major proportion of injury in residential settings.

In the United States, home injuries make up more than one-fifth of all unintentional injury deaths (which excludes homicides/suicides) and approximately one-third of all disabling injuries.[2] In Victoria, close to 40 per cent of injury deaths seen by coroners (including homicides/suicides) occur in residential settings, and 91 per cent of these are in private homes.[3] Fifty-two per cent of injuries to children under the age of 15 occur in the home.[4]

3.2 Literature review

3.2.1 Brief overview of international literature

The proportion of injuries that occur at home has been increasing, particularly as the frequency and rates of traffic injury are decreasing in some countries. In fact, in some industrialised countries, the total number of fatal injuries occurring at home is equal to or exceeds the number of fatal traffic injuries.[5] Two hospital Emergency department based studies of injury presentations found that the proportion of all injuries that occurred at home was 38 per cent (Norway) and 39 per cent (United States).[6,7] In general, children and older people are known to be at greater risk of injury and a large proportion of injury sustained by these two groups occurs at home. One Swedish study found that the home was the location of injury for 46 per cent and 40 per cent of injured older people and children, respectively.[5] Overall, however, the availability of data on home injury is variable, particularly for non-fatal home injuries, and there are few comprehensive reports on injury in the home to be found in the international literature.

Literature from the United States identifies the three leading causes of fatal home injury in that country as falls, fires or burns, and poisonings in that order.[1,2,8] A British study that included institutions also identified falls as the leading cause of fatal injury.[9] Leading causes of non-fatal injury that occurs at home have been less well documented—comprehensive data is generally unavailable. In a 12-month study of injuries (including both fatal and non-fatal injuries) in a Swedish rural municipality, the leading causes of injury were identified as falls, collision (crash) and blows (hits).[5]

The best described risk factors for home injury are age (children and older people), sex (male), lower socioeconomic status and positive blood alcohol level at the time of injury.[1] These factors have also been well documented as risk factors for injury at other locations. Age as a risk factor is generally a reflection of changing vulnerability at different ages.

Males appear to have a greater level of physical activity and a higher degree of risk-taking. Socioeconomic status is possibly related to the standard of housing, education levels and access to information and safety products. The role of alcohol in traffic injury is well described and it is highly likely that it operates to increase the risk of home injury in similar ways (for example, by slowing reaction times).

While comprehensive studies of home injury are scant in the international literature, studies on the major causes of home injury, such as falls, fires or burns and poisoning, are numerous. In some cases, risk factors have been identified. However, there are few studies that focus on the characteristics of the home which contribute to a higher risk of injury. There is also no exposure data reported for home hazards or home safety features.

Falls

In the United States, falls are the most significant cause of both fatal and non-fatal injury, particularly for children under five years of age and for adults over 65 years of age. Falls are the second leading cause of unintentional injury death and are the most common cause of hospital admissions for trauma. Falls in the home accounted for 40 per cent of all fall deaths[10]—the circumstances for fatal home falls vary according to age. For children, the majority of fatal falls are from a relatively high level, whereas for adults in their working years, fatal home falls are most often from buildings and ladders. Older people have the highest death rate from home falls and, while a significant number are falls from one level to another, many are falls on the same level.[10]

There is a vast literature on falls among older people. The aetiology of these falls is undoubtedly multifactorial resulting from the combination of a number of well-identified risk factors. However, neither the exact role of each risk factor, nor their interaction, has been fully determined. Risk factors have been grouped into intrinsic factors, such as age-related decline, medication, certain medical conditions, disorders of gait and balance; and extrinsic factors, such as environmental hazards including slippery floors and stairs. Table 3.1 lists intrinsic fall risk factors for older people for which there is moderate to strong evidence.

Environmental factors such as poor stairway design and repair, inadequate lighting, slippery floors, unsecured mats and rugs, and lack of non-skid surfaces in bathtubs and bathrooms have all been implicated by patient-reported descriptions of falls. However, there have been few conclusive studies on the risk associated with specific environmental factors. There is little information relating to the location and prevalence of various home hazards or the risk attributable to specific hazards. In addition, the understanding of the contribution of environmental factors to a fall in persons with intrinsic predisposing risk factors is quite limited.[11]

Fires and burns

Residential fires are of particular concern because of the nature and potential severity of the injuries. Fires and burns were the fourth leading cause of unintentional injury death in 1988 in the United States, where it is estimated that house fires caused 73 per cent of all deaths from fires and burns (80 per cent of unintentional injury deaths).[10] Risk factors for fatal residential fires have been found to be heating equipment and smoking materials, particularly associated with cigarette smoking.[12,13] A large proportion of fatal residential

fires have been attributed to heating equipment (39%) and cigarettes (31%).[12] For those fires related to heating equipment, space and kerosene heaters are more likely to be factors in fatal fires, in contrast to non-fatal fires, where wood stoves (fireplaces) and cooking were found to be significant factors.[12]

Table 3.1: Measures of intrinsic risk factors for falls among older people

Type of risk factor	Measure
Demographic	Age greater than 80, men
General health and functioning	Activities of daily living (ADL) Instrumental ADL (IADL) Mobility impairment Past history of falls
Medical conditions	Arthritis Stroke Parkinson's disease Dementia Incontinence
Musculoskeletal and neuromuscular	Reduced knee, hip or ankle strength Reduced grip strength Hip or knee pain (arthritis)
Sensory	Impaired visual acuity
Gait, balance, physical performance	Gait abnormalities Reduced walking speed Postural sway Impaired dynamic balance Impaired tandem gait, one leg balance Difficulty arising from chair
Cognitive, psychological	Reduced mental status test score Depression
Medication use	Sedatives, hypnotics, anxiolytics Antidepressants Number of medications

Source: adapted from Nevitt 1990[11]

Alcohol

Alcohol has been recognised as a major factor in fire-related deaths and the role of alcohol has been studied extensively. In a comprehensive review of alcohol and residential, recreational and occupational injuries, a strong relationship was found between alcohol and fires because of the association between alcohol and smoking.[2] An alcohol-intoxicated person who falls asleep while smoking is less likely to be roused by smoke and, therefore, more likely to be killed by toxic fumes or to be less capable of escaping the flames. The presence of an alcohol-impaired person has been found to be the strongest independent risk factor for death in the case of a residential fire.[12] It was also

concluded that smoke detectors were more protective against death in fires involving young children and when no one present was impaired by alcohol or drugs or had a physical or mental disability.[12]

Poisoning

Deaths by poisoning have decreased dramatically over the last 15 years, particularly among children under the age of five years.[1] This has chiefly been due to the introduction of childproof packaging of drugs, medications and household detergents. Other factors contributing to this decline include dose limits per package and improved emergency management of poisoning, especially through poison information centres. However, the rate of poisoning in adults, particularly through ingestion of drugs and medications, and breathing of motor vehicle exhaust gases, has not declined and remains a significant problem.[1]

3.2.2 Australian literature

As is the case for the international literature, there are few Australian studies that present an overview of home injury at either the State or national level. There are, however, both mortality and morbidity home injury data available for Victoria, and Monash University Accident Research Centre has recently completed an overview of home injury in that State.[14,15]

Of the total injury deaths, for which there was a coronial finding in Victoria between July 1989 and June 1990 (n=1698), 36 per cent occurred in the home — second only to deaths in transport (46%).[3] A further 4.7 per cent occurred in other residential locations, including hospitals, nursing homes and prisons. Close to half of the home injury deaths were as a result of self-inflicted (intentional) injury, nearly 40 per cent were unintentional, another 7 per cent were assaultive and the remaining 6 per cent were of unknown intent. A summary of the analysis of fatal and non-fatal injury occurring in homes is found in Section 3.3, below.

3.3 Available data

3.3.1 Mortality and hospital inpatient morbidity

National data for home injury mortality rates are not readily available. Information from coroners has not, in the past, been well organised as a body of data and computerised files of coroners' investigations are rare anywhere in the world. Under a pilot program in Victoria, however, data from coronial inquests are now being coded for electronic data entry. In this Coroners' Facilitation System database, information on 'unnatural' deaths (i.e. injury deaths including homicides and suicides) that occurred between 1 July 1989 and 30 June 1990 have been published in raw form by the State Coroner's Office.[3]

Table 3.2 shows home injury mortality rates in Victoria by age and intent over a 12-month period. Note that the numerator for some cells is small and in these cases, therefore, the rate will not be stable.

Table 3.2: Home injury mortality rates per 100 000 population, Victoria 1989–90

Age (years)	Overall mortality rates* n=625			Unintentional n=241			Intentional – self harm n=302			Intentional – assaultive n=42		
	All	M	F	All	M	F	All	M	F	All	M	F
0–4	12.0	16.5	7.3	11.3	15.2	7.3	0.0	0.0	0.0	0.6	1.3	0.0
5–9	2.3	2.5	2.0	1.6	1.9	1.3	0.0	0.0	0.0	0.6	0.6	0.7
10–14	0.6	1.1	0.0	0.3	0.6	0.0	0.3	0.6	0.0	0.0	0.0	0.0
15–24	13.4	19.2	7.3	4.2	5.8	2.5	7.1	11.3	2.8	1.1	0.8	1.4
25–34	20.4	31.0	9.9	6.3	10.6	2.0	10.0	15.4	4.7	2.1	2.4	1.7
35–54	16.0	21.3	10.6	4.3	5.1	3.6	9.5	13.9	5.0	1.3	1.2	1.4
55–64	17.9	26.0	9.8	7.0	8.8	5.1	9.1	15.1	3.1	0.3	0.5	0.0
65–74	18.1	22.7	14.3	7.2	5.9	8.2	10.2	16.0	5.5	0.0	0.0	0.0
75+	36.6	57.5	25.0	21.1	25.5	18.7	13.7	30.3	4.5	0.6	0.0	0.9
All ages	**14.9**	**20.6**	**9.2**	**5.7**	**7.3**	**4.2**	**7.2**	**11.1**	**3.3**	**1.0**	**1.0**	**1.0**

* includes unknown intent

Source: Victorian State Coroner's Office 1991[3]

Overall, the male mortality rate for each age group was higher than that for females, particularly in the 25–34 year age group where the male rate is three-times higher. There are only two categories in the above table where this does not hold true: unintentional injury in the 65–74 year age group and intentional assaults in the age groups 15–24, 35–54, and 75 years and above. For males and females, the mortality rate was highest for the 75 years and over age group. The pattern of fatality rates seen in Table 3.2, particularly in the first column, is similar to that observed for all injuries in Australia and the United States.[10,16]

Sixty-nine per cent (426) of those who died as a result of home injury were male. A high proportion of those who died were in the young and middle adult age groups, particularly males aged between 25 and 34 years (16.8%) and males aged between 34 and 54 years (17.4%). The frequency of female deaths, while much lower than that for males, was highest in these same age groups, with a second similar peak in the 75 year and above age group.

Alcohol use was known to be a factor in 9.9 per cent of all unintentional, intentional assaultive and unknown injury deaths within the home.

Tables 3.3 and 3.4 list the major causes of home injury death and the associated hazards for adults and children, respectively. Only unintentional injury is shown for children since this accounted for 90 per cent of the child home injury deaths.

Table 3.3: Major causes and the associated hazards of home injury death for adults, Victoria 1989–90

Rank	Unintentional		Intentional self harm		Assaultive	
	Major cause	Associated hazards/agents	Major causes	Associated hazards/agents	Major cause	Associated hazards/agents
1	Overdose of one or more drugs +/- alcohol	Illegal drugs, medication, alcohol	Hanging	String, twine or rope, alcohol	Shooting	Firearms, alcohol
2	Falls	Alcohol, steps/stairs, ladders	Shooting	Firearms, alcohol	Stabbing	Knives, cutlery, alcohol
3	Fire related	Cigarettes, alcohol, heaters, electrical wiring	Overdose of one or more drugs +/- alcohol	Medication, alcohol	Bashing	Various instruments no patterns evident

Source: Victorian State Coroner's Office 1991[3]

Table 3.4: Major causes and associated hazards of unintentional home injury death for children, Victoria1989–90

Ranking	Major cause	Unintentional home injury associated hazards (agents)
1	Drowning	Swimming pools, baths
2	Choking/suffocation	Bedding, food fragments
3	Hit/crushed	Various objects – no patterns evident

Source: Victorian State Coroner's Office 1991[3]

The most comprehensive and readily accessible information on non-fatal injuries occurring at home in Victoria is that provided by the Victorian Injury Surveillance System (VISS). VISS collects information on injury presentations to the Emergency departments of five major metropolitan hospitals in Melbourne and both campuses of one major regional hospital in Victoria. Preliminary work indicates that the pattern of home injury in Victoria is consistent with national injury surveillance data.[17]

Hospital admission and Emergency department presentation rates for home injury are not available on either a national or State basis, as the population denominator for collection regions is usually ill-defined. However, an indication of these rates may be obtained from the VISS data for the Latrobe Valley region, a well-defined geographical region (Table 3.5). The extent to which these data may be generalised is unknown, since the Latrobe Valley is a regional area in Victoria with a slightly different age structure to Victoria. A high proportion of its employed population also work in energy industries[18]. Nonetheless, the pattern of higher presentation and admission rates for children under

5 years; and higher admission rates adults over 50 years is likely to be a stable pattern for home injury.

Table 3.5: Home injury hospitalisation and Emergency department rates for the Latrobe Valley, 1991–92

Age group	Annual home injury hospitalisation rate per 100 000 population	Annual home injury Emergency department presentation rate per 100 000 population
All ages	304	3741
Under 5 years	503	8606
Over 50 years	358	2317

Source: Victorian Injury Surveillance System

From a total of 109 289 injuries collected in the VISS database to February 1993, over one-third of injuries for all ages (35.3%) occurred in the home of the injured person or in another home. A further 2 per cent occurred in other residential locations, including residential institutions such as nursing homes. The proportion of non-fatal injury occurring in homes is four-times the proportion of VISS-recorded injuries on public roads. The current admission rate for home injuries in the VISS database is 16 per cent for all ages, compared to a slightly higher 20 per cent for injuries occurring on public roads. Non-fatal home injury occurs most frequently to those aged under 10 years followed by the 20–29 year age group. Table 3.6 shows the major hazards or factor categories for non-fatal home injury among adults and children.

Further details concerning each of these categories can be found in the original publication.[15] However, a brief discussion of the top three hazards or factor categories for adults and children is pertinent here.

For adults, the leading category was structures, including stairs and steps, floors and flooring materials, and doors. Injuries associated with stairs and steps were most often due to falls and almost 50 per cent of these were slips. Water, dogs and alcohol were other factors often associated with stair and step injury. Poisoning among adults mainly involved drugs and medications and 58 per cent of these were sedatives and tranquillisers. The most common kitchenware item associated with injury was knives and 50 per cent of these injuries occurred while preparing food or cooking.[15]

Table 3.6: Major categories of hazards associated in the VISS database with non-fatal home injury among adults and children

Ranking	Adults		Children	
	Associated hazard/agent/factor category	Per cent	Associated hazard/agent/factor category	Per cent
1	Structures	16.7	Furniture	18.4
2	Poisoning and ingestion hazards	11.5	Sport and recreation	13.9
3	Kitchenware	9.0	Structures	12.5
4	Workshop tools	7.7	Poisoning and ingestion hazards	11.8
5	Garage and yard items	7.4	Animals	5.5
6	Furniture	6.6	Garage and yard items	4.1
7	Environmental factors	4.9	Kitchenware	4.0
8	Food and drink	4.4	Environmental factors	3.8
9	Animals	4.0	Food and drink	3.7
10	Sport and recreation	3.1	Nursery equipment	3.1

Note: More than one hazard may be recorded for each injury
Source: adapted from Routley & Valuri 1993[15]

For children, the leading category was furniture, including chairs, beds, cabinets and tables. Chairs and stools were the most common furniture item — over half of these injuries were caused by falls. Sport and recreation home injuries among children involved bikes, swings, play equipment and trampolines. The most common structural items associated with injury were doors, stairs and steps. Finger-jam door injuries have previously been found to involve the hinge side of the door in 60 per cent of cases.[19] At least 75 per cent of the injuries associated with steps and stairs were caused by falls.[15]

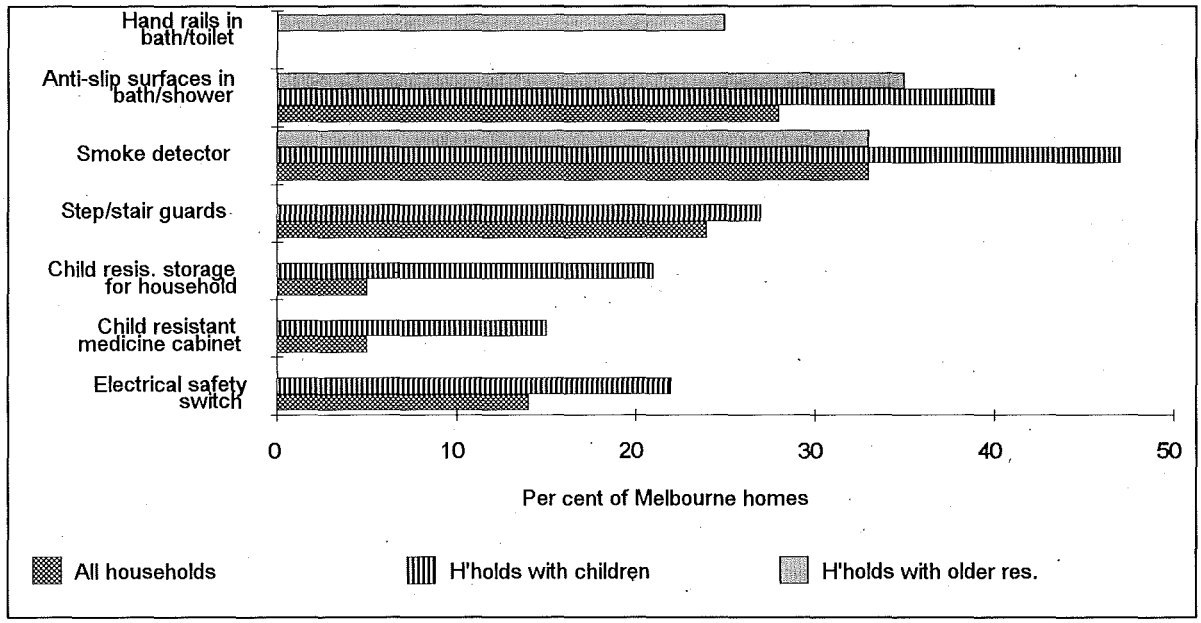
Product-related injury frequently occurs within the home. Discussion of product-related injury may be found in Chapter 5.

3.3.2 Home safety features

In 1992, in conjunction with the Victorian Department of Health and Community Services, the Australian Bureau of Statistics (ABS) conducted a survey on the prevalence of hazards and safety products in homes throughout the Melbourne Statistical Division.[20] For the first time in Australia, the survey results give an important additional perspective of home injury; that is, exposure to hazards and injury-reducing features. A similar study of household safety has been conducted in Sydney.[21] Figure 3.1 presents a summary of the findings for the Melbourne survey and Table 3.7 shows a comparison of home safety measures found for households with young children in Melbourne and Sydney.

It is apparent that safety features are not widespread in Melbourne households. Unfortunately, it is difficult to relate the survey findings to the mortality data, due to the temporal differences in the data. However, Table 3.8 indicates how some of the survey findings may relate to the more common non-fatal home injuries that were discussed above. The collection period of the non-fatal home injury data overlapped with the home safety survey.

Figure 3.1: Safety features in Melbourne homes (per cent), 1992



Note: Approximately 4,000 households were surveyed. For the purposes of this survey, young children were defined as those aged 4 years or less, and older residents were defined as those aged 60 years or more[20]

Table 3.7: Prevalence of home safety measures (per cent): households with young children, Melbourne and Sydney, November 1992

	Melbourne	Sydney
Electrical safety switches	22	21
Smoke detectors	47	10
A resident who had undertaken first aid training, including CPR (resuscitation) in the last 3 years	23	14*
Child resistant medicine cabinets (cupboards)	15	14
Child resistant cupboards to store household cleaners	21	21
Baby walker	16	–
Steps and stairs inside the house, with stair guards fitted	20	–
Percentage of swimming pools with a fence surrounding the perimeter of the pool area	79	92
Child resistant gates surrounding swimming pool	35	70; 82**
Anti-slip surfaces in the bath and shower	40	–

*Melbourne survey includes any resident of the house, whereas Sydney refers to the persons usually responsible for the care of young children

**Self-closing gates 82%, self-latching 70%

Sources: Published[15,16] and unpublished findings of ABS household surveys. The ABS surveys were based on a sample of approximately 4000 households in the Melbourne Statistical Division and approximately 3000 households the Sydney Statistical Division, and were conducted in November 1992

In the Melbourne survey[20] smoke detectors were most popular in the Outher Eastern Region (40 per cent) followed by the South Eastern and Inner Eastern Regions. There were least in the Inner Melbourne Regions (15 per cent), possibly because of the high percentage of rental accommodation in this area. Overall, 14 per cent of households had an electrical safety switch but 16 per cent of households who owned their own homes had a safety switch, compared to 7 per cent of households who rented. Further information from the Melbourne study was as follows.

Pools

- 89 500 households (8 per cent) had an outdoor pool.
- 37 per cent of households with pools (33 100) had a fence surrounding the perimeter of the pool area.
- 16 per cent of pools had fences with child-resistant gates.

Injuries

- 74 800 households (7 per cent) reported an injury to an usual resident occurring in or around the home and requiring medical attention in the period 12 months prior to the survey.
- The injury occurred most frequently in the yard (33 per cent). Within the dwelling, injuries occurred most frequently in the kitchen.
- The most common cause of the injury was a fall (43 per cent). Falls accounted for the majority of injuries to young children and older residents.

Table 3.8: Selected non-fatal home injury types and prevalence of related hazards and safety products

Injury type or hazard, non-fatal home injury, VISS, 1992	Relevant exposure from home safety survey, Melbourne, 1992[20]
Falls involving steps or stairs	24% households had inside steps or stairs, 2% had stair guards 27% households with young children had inside steps or stairs, 5% had stair guards
Falls involving slips in the shower/bath	28% households had anti-slip surfaces in bath or shower, 28% for households with older residents and 40% for households with young children
Poisoning among children under 5 years	15% households with young children had a child-resistant cupboard for medicines, 21% for household cleaners, 47% for home maintenance products (including lockable shed)
Dog bites among children under 5 years	35% households with young children had a dog

3.4 Discussion

While the most detailed data on home injuries presented here has been for Victoria, the basic patterns are likely to be consistent among all the States and Territories, perhaps with some regional variations due to climatic, architectural and demographic differences. It is important that these regional variations be identified to facilitate tailoring of interventions to local conditions.

Although the all-age rate of home injury deaths is low compared to that of fatality rates for motor vehicle traffic crashes (see Chapter 2) and suicide (see Chapter 7), the fatality rate for home injury among some groups, for example males 25–34 years and males 75 years and over, equals or exceeds the all–age fatality rate for motor vehicle traffic crashes. In addition, a significant proportion of fatal and non-fatal injury occurs in homes.

A mixed strategy of legislation, education and engineering interventions is generally recommended for injury prevention and, given the private nature of the home, a balance between these approaches would seem to be even more important. There is currently a range of regulations and standards in place in some Australian States that serve to reduce home injuries. These include regulations relating to pool fencing, smoke detectors, circuit breakers and safety glass. Building codes also serve an injury prevention purpose. Kidsafe (the Child Accident Prevention Foundation of Australia) has established a series of guidelines for the design of safe houses. At least two display homes that incorporate the guidelines have been built in Victoria. A similar display home is also being built in South Australia. However, legislation, standards and codes are not always consistent between States and Territories.

In Australia, there have been a number of injury prevention programs targeted at home injuries among the two most at-risk age groups — children under 15 years of age and adults 65 years and over. Kidsafe is currently conducting a home safety campaign and the Victorian division has recently been funded by the Victorian Health Promotion Foundation for a 12-month home safety project. This project is to consist of a range of strategies that include the development and promotion of safety products based on research findings, lectures for builders and other relevant professions, and general promotion and education. In addition, a number of community-based injury prevention programs have targeted child injury (including home injury) with varying degrees of success.

Similarly, a number of fall prevention programs have been implemented to reduce fall injury among older people. While successes have been claimed,[22] few of these programs have been subjected to rigorous injury outcome evaluation.

The home safety surveys in Melbourne and Sydney[20,21] have given an initial indication of the penetration of safety products and the prevalence of home hazards in the community. Research is required to further quantify exposure to various home hazards and safety features, as well as to quantify exposure to various home-based activities and parts of the home. Such exposure data has great utility in prioritising interventions and in establishing the potential effectiveness of particular interventions.

Close to half the fatal home injuries in Victoria are the result of self-inflicted harm and a further seven per cent are the result of harm caused by others. While some of the traditional injury prevention strategies may contribute to a reduction in intentional home injury deaths (for example, reducing the availability of firearms), the prevention of intentional injury will require a multidisciplinary approach with an emphasis on social issues. Intentional injury is further discussed in Chapters 7 and 8.

Finally, evaluation of home injury prevention programs and specific interventions is critical for a strategic and systematic approach in reducing home injury. An important element of evaluation and continuing research is the ability to monitor changes in rates and frequencies. In the case of home injury, monitoring would be greatly facilitated by a national computerised coronial database, reliable and consistent identification of the home as a location variable in all levels of injury data — particularly hospital inpatient data — and continuing injury surveillance in a number of hospital Emergency departments.

Unlike the road sector, which is in the public domain, the home, as a location of injury, is mainly in the private domain and less accessible to regulation and legislation. Future reduction of home injury may therefore require incentives for home owners and renters to increase the safety of their home, as well as building regulations and legislation that are related to home safety.

The development and marketing of new injury prevention technology could improve home safety. However, such innovation requires a culture in which home safety has some priority, and in which new products can be made readily available, such as through subsidy schemes.

The number of safety products and features in homes could also be improved by the following measures:

- setting an example through public housing by adopting a safe design code;
- incorporating home safety into architecture, building and industrial design courses to increase the focus on home safety issues among professionals who design and build homes; and
- incorporating home safety issues into the building, community services and environmental health sections of local government.

3.5 References

1. United States National Committee on Injury Control and Prevention. Injury prevention: meeting the challenge. New York: Oxford University Press, 1989.
2. Smith GS, Kraus JF. Alcohol and residential, recreational, and occupational injuries: a review of the epidemiologic evidence. Ann. Rev. Public Health, 1988; 9:99–121.
3. Victorian State Coroner's Office. Unnatural deaths collated from the findings of the State Coroner. Melbourne: State Coroner's Office, 1991. [Printout from Coroners' Facilitation System database.]

4. Ozanne-Smith J, Vulcan AP, Heffernan-Coman, C. Watson W. Child accident and injury prevention in other than road accidents Part 1: Overview of child injuries in Victoria. Melbourne: Monash University Accident Research Centre, 1991.

5. Schelp L, Svanstrom L. One-year incidence of home accidents in a rural Swedish municipality. Scand. J. Soc. Med. 1986; 14:75–82.

6. Sahlin Y, Stene TM, Lereim I, Balstad, P. Occurrence of injuries in a defined population. Injury 1990; 21:155–157.

7. Fife D, Barancik JI, Chatterjee BF. Northeastern Ohio trauma study: II. Injury rates by age, sex, and cause. American Journal of Public Health 1984; 74(5):473–478.

8. Neutra R, McFarland R. Accident epidemiology and the design of the residential environment. Human Factors 1972;14(5):405–420.

9. Alphey RS, Leach, SJ. Accidental death in the home. Royal Society of Health 1974; 3:97–102 and 144.

10. Baker S, O'Neill B, Ginsberg MJ, Li G. The injury fact book (second edition). New York: Oxford University Press, 1992.

11. Nevitt, MC. Falls in older persons: risk factors and prevention, in the second fifty years: promoting health and preventing disability. Washington, DC: National Academy Press, 1990.

12. Runyan C, Bangdiwala SI, Linzer MA, Sacks JJ. Risk factors for fatal residential fires. New England Journal of Medicine 1992; 327(12):859–863.

13. Baker, S. What keeps the home fires burning? New England Journal of Medicine 1992;327(12):887–888.

14. Day L, Routley V, Valurie J, Oxley J, Ozanne-Smith, J. Home injury in Victoria. Melbourne: Monash University Accident Research Centre, 1993.

15. Routley V, Valuri J. Home injuries. Hazard 14. Melbourne: Victorian Injury Surveillance System, 1993.

16. Harrison J. Nature and dimensions of injury in Australia, in short course on injury research and prevention. Melbourne: Monash University Accident Research Centre, 1992.

17. Scott I. Home injury to children. Australian Journal of Early Childhood 1992;17(3):18–24.

18. Penny M, Hawkins C, Ozanne-Smith J. Injury surveillance in the Latrobe Valley. Melbourne: Victorian Injury Surveillance System, 1992.

19. Ozanne-Smith J. Child accident and injury prevention research in other than road accidents, Part 2: Finger jam injuries to children in doors. Melbourne: Monash University Accident Research Centre (in preparation), 1993.

20. Lazzaro V. Safety in the home, Melbourne, November 1992. Cat. no. 4387.2. Canberra: Australian Bureau of Statistics, 1993.

21. Farrell D. Household safety, Sydney (November 1992). Cat. no. 4387.1. Canberra: Australian Bureau of Statistics, 1993.

22. South Australian Health Commission The 'Make It Safe' program for preventing falls at home among the aged. Injury Surveillance Monthly Bulletin 46. Adelaide: South Australian Health Commission, 1993.

Chapter 4 Injury in non-urban settings

4.1 Introduction

Injury mortality and morbidity rates among non-urban populations, both in Australia and overseas, are generally higher than those for urban populations. In comparison to those who live in urban regions, rural dwellers are exposed to a larger number and a wider variety of hazards which impinge on their health and well-being. Many of these hazards, such as farm machinery and animals, play a significant role as factors in injury causation among rural dwellers. In addition, there are certain characteristics of rural life and work, such as remoteness and the presence of children in the workplace, that have been postulated to be factors in the higher injury mortality and morbidity rates seen in non-urban areas.[1]

Injury research or prevention in non-urban regions has been hampered by the lack of comprehensive and analytical data, and the limited resources and effort given to prevention. The literature, both in Australia and other countries, is characterised by a lack of well controlled and conducted epidemiological studies of specific risk factors for rural injury. In addition, few rural injury prevention programs have been evaluated in terms of injury outcome.

4.2 Literature review

4.2.1 Brief overview of international literature

The international literature on non-urban injury research and prevention generally falls into four categories. The first category is characterised by case series studies on a particular injury type, such as specific machinery-related injuries, or injuries of a particular anatomical site, such as hand injuries. Case series studies are useful for identifying the mechanisms of a particular injury type. However, for the purposes of determining priorities and developing strategies, a second category called overview studies is used. This type of study requires comprehensive overview data to identify the most severe and most frequent injury issues as prevention priorities. These are mainly descriptive and often limited to a particular geographical area. The third category relates to prevention and the fourth relates to treatment, particularly in trauma centres. This section of the review will concentrate mainly on the second and third categories, briefly outlining the current literature.

It appears that the most comprehensive international published study on injury in rural areas has been in Sweden. In a Swedish rural municipality, 10 per cent of all injuries occurred on farms. Approximately 48 per cent of these farm injuries were work related and 52 per cent were classified as home injuries. The majority of farm-related injuries in this area occurred during repair and maintenance activities, animal care, and vehicle and machine use. Common injury types were falls, crushes and eye injuries.[2]

Since farming is a high risk occupation for non-urban injury, many international studies have focused only on work-related farming injuries and have been largely descriptive in nature. Machinery, tractors, animals and vehicles, particularly motor bikes, are common agents of injury.[3–7] Unsuitable working methods (especially those related to lifting and carrying), the technical design of the workplace and lack of practical safety gear have been identified as

leading contributing factors in farm-related work injury.[4,7,8] Falls and drowning have been identified as common mechanisms of injury to farm children, in addition to those hazards identified for adults.[9–11]

Different patterns appear in the literature for fatal and non-fatal non-urban injury. Tractors dominate the international literature as an agent of fatal injury, while farm machinery, vehicles and animals are more common as agents of non-fatal injury. Falls are a frequent mechanism of non-fatal injury.[4,6]

Tractor-related injury is the most frequently studied specific non-urban injury in the international literature, since tractors account for a large proportion of farm-related deaths — approximately 40 per cent of those involved in unprotected tractor roll-overs die.[12] Early studies indicated that roll-over protective structures (ROPS) used in conjunction with seatbelts were 100 per cent effective in preventing fatalities in the event of a tractor roll-over incident. Legislation requiring ROPS for all tractors in a number of European countries has been associated with a dramatic decrease in fatalities related to tractor roll-overs. The lowest rate of tractor roll-over fatality is seen in Sweden (currently 1/100 000 farmers per year).[13] The effectiveness of ROPS seems to be related to design. For example, West German studies show that the two-pillar bow ROPS is less effective than other design.[14]

The need for legislation to achieve a decrease in tractor roll-over fatalities remains controversial in the international literature. In the United States, legislation requires ROPS and seatbelts to be fitted on all employee-driven tractors manufactured after 1977. In addition, there is a voluntary agreement by tractor manufacturers that has seen the fitting of ROPS and seatbelts in almost all new tractors sold in the United States.[12] The decrease in the annual tractor-related fatality rate from 14.9/100 000 tractors in 1970 to 7.2/100 000 tractors in 1988 has been cited as evidence of the effectiveness of the current regulations and the voluntary code.[12] Others, however, have declared the voluntary code to be ineffective in some parts of the United States.[15]

Very few studies have analysed the potential risk factors for rural injury. In Canada, higher relative risk ratios have been found for farm owner-operators, male sex, beef farmers as opposed to diary farmers, and farm owners less than 30 years and greater than 70 years of age.[16] Shearing of sheep has been identified as a high risk activity by one New Zealand study.[4] Involvement in sports and a high degree of risk-taking behaviour have been identified as risk factors for injury among rural adolescents in Maryland, USA.[17]

Alcohol consumption has long been identified as a risk factor for motor vehicle crashes and subsequent injury, and has been implicated as a risk factor for injury in other settings.[18] A recent study in the United States confirmed the strong association of alcohol consumption with trauma deaths resulting from motor vehicle crashes in rural areas. A strong association was also demonstrated between alcohol use and gunshot wounds, burns, stabbings and falls in rural areas.[19]

In addition to injuries associated with various types of farming and other rural-based occupations, residents in non-urban regions have a higher mortality and morbidity rate for motor vehicle crashes. In some reports, death rates have varied more than 100-fold.[20] Proposed contributors to the excess in death rates include road characteristics, travel speeds, seatbelt use, types of vehicles and availability of emergency care.[20,21]

The majority of rural injury prevention programs reported in the international literature have aimed to provide health and safety information in addition to, in some cases, technical consulting on specific issues.[22–26] There are also some examples of preventive health services that provide clinical health services as well as health and safety education.[24,25,27] The impact of any of these programs on injury outcome has not been evaluated. To date, the most successful rural injury prevention program reported in the literature, achieved a reduction of 27 per cent in home injury in addition to a 28 per cent reduction in occupational injury. For the agriculture, forestry, hunting and fishing groups, the reduction was 23 per cent. There was a reported reduction in injury in farm homes of 50 per cent. This program used a community and local organisation approach incorporating four key features: information, education programs, the use of checklists by care givers, organisations and others, and finally environmental change. The evaluation design provided for pre-test, post-test measures of injury incidence and also included a control community.[28]

There is conflicting evidence in the literature concerning the impact of trauma centres in non-urban areas on the treatment of injury.[29–31] Further analysis of these studies would be required to resolve their apparently different conclusions.

4.2.2 Australian literature

There is little published literature on the topic of non-urban injury in Australia. This is despite the fact that in Australia, as is true in other countries, non-urban regions generally have higher injury mortality and morbidity rates than urban regions.

A major study of Australian work-related fatalities found rural-based occupations to be the most dangerous. Of the occupation groups for which rates were reported, two of the three with the highest rates are primarily non-urban: mining; and a group including farmers, foresters, fishing workers and hunters. The latter group had a work-related mortality rate of 22.09/100 000 workers, 2.7 times that for the Australian labour force in general.[32] When compared to other industries, children and older people were over-represented in farm work-related fatalities. The main factors identified in a study of 224 deaths were tractors and associated implements (39 per cent), powered machinery (30%) and horses (6%)[32] (see Section 10.2.2).

Other studies have confirmed the significance of farm machinery (including tractors) as a factor in farm injury mortality for both adults and children. They have also noted motor vehicles (adults and children) and bodies of water such as dams (children) to be important factors.[33] A recent study in New South Wales found that children living in non-urban areas have significantly higher injury mortality rates, particularly for vehicle passengers, and for death due to fire.[34] A comparison of suicide rates in urban and other regions of Australia is found in Chapter 7.

In addition to a higher mortality rate, those living in non-urban areas also have a higher rate of hospital admission for injury. A New South Wales study has estimated by extrapolation from a pilot study of 70 farmers, an annual injury hospitalisation rate of 134/1000 farmers.[1] In Victoria, injury hospitalisation rates for children and older people (greater than 75 years) living in rural areas have been shown to be up to 3 and 1.6 times, respectively, the rate for those living in the Melbourne metropolitan region.[35,36] Horses, farm machinery, and tools

(including tractors) and road vehicles (especially motorbikes) have been identified as significant factors for farm injuries requiring hospitalisation.[33]

Agents most commonly associated with Emergency department injury presentations in non-urban areas are vehicles (especially motorbikes), animals, and environmental factors.[33,37] In the Latrobe Valley in Victoria, farm injuries have a slightly higher admission rate (11%) than for all injuries presenting to the Latrobe Regional Hospital (9%).[37]

As in other countries, such as the United States, road crashes are a significant cause of injury in non-urban areas and are associated with greater vehicle damage and more severe injuries than those that occur in metropolitan areas.[38] The higher rate of road crash injury in non-urban areas has been attributed to greater speed, higher blood alcohol concentrations, lower levels of seatbelt usage and road characteristics.[39–42]

4.2.3 Common themes in international and Australian literature

Comprehensive rural injury data is lacking in most countries, partly due to the specific difficulties of both data collection and the identification of farm injuries in some databases. To date, most studies have been descriptive, identifying hazards at a broad level of categorisation; for example, animals and machinery. Circumstances leading up to the injuries relating to the main hazards are rarely examined and there are very few epidemiological studies of specific risk factors for rural injuries.

Most countries find a different hazard pattern for fatal and non-fatal injury and for minor and severe injury. The exposure and involvement of children and older persons is often noted. In both Australia and New Zealand, there appears to be a lower relative frequency of agricultural machinery-related injuries compared with the United States and Europe, and an increased frequency of back-related animal handling injuries.[4,43]

4.3 Available data

4.3.1 Rural injury data

National data relating to injury mortality and morbidity rates in non-urban areas, although partially available, have not been collated and presented in the literature. Mortality data for non-urban areas could be extracted from the ABS database by place of usual residence and matched with population denominators to calculate injury mortality rates for urban and non-urban areas. This analysis could be extended to include mortality rates for the major causes of injury death.

National injury hospitalisation rates for non-urban areas have also not been compiled. However, in Victoria, injury hospitalisation rates have been mapped by postcode for children (0–14 years) and by health region for older people (Table 4.1). Injury hospitalisation rates for children living in Melbourne metropolitan postcode regions were found to be mainly under 1500/100 000 per year. In comparison, rates for children living in postcode regions in other areas of Victoria were mainly over 1000/100 000 per year, with some as high as over 3000/100 000 per year.[35] In the case of older people, the injury hospitalisation rate was significantly higher for those living in health regions outside the Melbourne metropolitan region.[36]

Table 4.1: Injury rates in non-urban settings, Victoria

Injury or poisoning leading to ...	Annual rate for rural areas	Annual rate for metropolitan areas	Data source
Hospital admission	1000–4000 per 100 000 children (0–14 years)	mainly under 1500 per 100 000 children	Ozanne-Smith et al. 1991[35]
	6000–6750 per 100 000 older people (> 75 years)	4000–5000 per 100 000 older people (> 75 years)	Fildes 1992[36]
Emergency department presentation	14 100 per 100 000		VISS, Latrobe Regional Hospital, 1991–92[37]

Since injury surveillance in this setting tends to collect data from ill-defined regions, which creates difficulties in defining the denominator, rates for Emergency department injury presentation are not generally available. The Emergency department presentation rates shown in Table 4.1 are for the Latrobe Regional Hospital, which collects injury data for a well-defined regional (rural) centre in Victoria. This data collection is continuing and further analysis (e.g. presentation rates by age and sex) would be possible.

4.3.2 Farm-related injury

The availability of farm-related injury mortality and morbidity data is variable. Mortality data shown in Table 4.2 is based on work-related fatalities on Australian farms, 1982–84. In general, hospital admission data does not identify farm-related injury hospitalisations, therefore national or even State-based rates are difficult to obtain. The hospitalisation rate shown in Table 4.2 was based on a pilot survey of 70 farmers in New South Wales.[1] Emergency department presentation rates are shown for a regional (rural) region of Victoria.

Table 4.2: Farm-related injury rates

Injury or poisoning leading to ...	Annual rate for farm injury	Comparison rates	Data source
Death	19.4 per 100 000 farm workers	8.1 per 100 000 Australian labour force	Ehrlich et al. 1993[32] Harrison et al. 1989[47]
Hospital admission	13 400 per 100 000 farmers (280 per 1000 farms)		Clarke & Wolfenden 1991[1]
Emergency department presentation	1302 per 1000 farms in Latrobe Valley		Day 1993*

*Monash University Accident Research Centre, unpublished data

Table 4.3 lists the factors identified in the literature review as significant in fatal and non-fatal injury in non-urban areas of Australia. The National Farmsafe Secretariat has identified

interim priorities for farm-related injury prevention as: tractors and linkages, farm machinery, agbikes, horses, and farm dams and waterways.[33]

Table 4.3: Factors identified in Australian literature as important in fatal and non-fatal injury in non-urban settings

Fatal injury	Non-fatal injury
Tractors	Horses
Powered machinery	Farm machinery and tools (including tractors)
Horses	Motor vehicles
Motor vehicles	Motor bikes
Dams	Environmental factors

4.3.3 Motor vehicle-related injury

State-based data collections for motor vehicle injury have the capacity to identify injuries occurring in urban and non-urban regions. A similar analysis at the national level does not seem to be occurring. Preliminary analysis of Victorian and New South Wales data indicate that the road traffic fatality rate for regional (rural) areas is 2.7 and 2.6 times higher than that for the capital city region.

4.4 Prevention programs in Australia

Legislation

Occupational health and safety legislation applies to all workplaces, including farms. Farmers who employ labour have a general responsibility under this legislation to provide a safe and healthy working environment. Specifically, dangerous machinery must be properly guarded, noise exposure levels must not exceed standard levels, and manual handling work practices must be designed to reduce injury risk. However, many of the regulations only apply to farms where outside labour is employed, so the effectiveness of legislation is limited. In addition, there is considerable resistance within the farming community to the introduction of further legislation.

Since tractors are a significant cause of deaths on Australian farms, most States have legislation requiring roll-over protective structures to be fitted to at least new tractors. Currently, the exact details of the legislation vary from State to State. It was planned that by 1 July 1994, national regulations concerning ROPS for tractors would come into effect, bringing all States and Territories into compliance, and requiring ROPS to be fitted to most tractors.

The weight of the evidence is heavily on the side of the effectiveness of ROPS, especially when combined with seatbelt use. However, it seems that particular design types may be less effective than others. A study under consideration by Worksafe Australia proposes to address those aspects of tractor design, including ROPS, which result in severe injury and death. In addition, the study proposes to address the issue of design and implementation of effective ROPS on older tractors.

Given the limited reach of occupational health and safety legislation, the resistance to further legislation and the difficulty with enforcement, the potential of legislation as a tool for injury prevention in non-urban settings appears to be restricted.

National Farmsafe movement

Despite inadequate rural injury data, there is considerable interest in injury prevention in rural areas. As the result of FARMSAFE '88, the first national conference on rural occupational health and safety, there has been increasing commitment from a number of government bodies to address rural health and safety issues. A new national body has been created, Farmsafe Australia, with a secretariat located at the Agricultural Health Unit, Moree, New South Wales. Key components of Farmsafe Australia's strategy include the establishment of a national network for occupational health and safety service and information delivery, a review of relevant legislation, development of improved data sets on rural injury and the support of awareness and information campaigns directed at farmers.

A primary aim of Farmsafe Australia is to create a framework for the establishment of community-driven farm health and safety programs. Since 1988, State Farmsafe committees have been established in some States, and New South Wales, in particular, has progressed rapidly to establish prevention programs through locally-based farm safety action groups.[1,45] A rural child injury prevention project is being conducted under the auspices of such an action group in Gloucester, New South Wales.[45] This project is effectively providing a demonstration project for the Farmsafe movement and, if successful in reducing injury, will provide a useful model. In addition, there are at least two community-based programs for injury prevention operating in rural areas in Australia, that are not included in the Farmsafe network (for example, Parkes, NSW and Latrobe Valley, Victoria). Both programs will have process and injury outcome components in evaluation of their effectiveness.[46]

4.5 Discussion

Rates for injury mortality and morbidity in non-urban settings in Australia are generally higher than those for urban areas. Currently, national data are inadequate for the purposes of clearly defining the nature and dimensions of non-urban injury in Australia, and of monitoring trends.

The lack of a national computerised coronial database has hindered research and prevention in all injury categories, including injury in non-urban settings. Currently, the availability of hospitalisation data differs among the States and Territories. While it may be possible to disaggregate rural injury hospitalisations, it is frequently difficult to identify the location of the injurious event; for example, farm and home. Location is collected in some hospitalisation data but varies in its completion rate—making monitoring of trends very difficult.

There are a number of rural (regional) hospitals which currently collect injury data for Emergency department presentations. However, these data collections are specialised and labour intensive and will, therefore, be unlikely to continue over any long period of time. The move toward computerisation of Emergency departments opens up the possibility of routine collection of injury data in the larger rural and regional hospitals. Nonetheless, many small

country hospitals will not be computerising in the near future and any ongoing collection of injury data will need to rely on a register system.

While improvements are made to the collection of injury data for non-urban settings, collation of all available State, local and industry data regarding injury in non-urban settings is an important initial priority. In addition, detailed studies are required to define the causal mechanisms of priority injury categories. Interventions designed to address these causal mechanisms need to be implemented in demonstration programs. Finally, well designed evaluations of the demonstration programs are required before dissemination and wider adoption of the interventions. Locally-based prevention programs would benefit from accessibility of local data. It would be important for intervention programs aimed at other injury categories, for example home injury or intentional injury, to recognise the special needs of non-urban communities.

The setting of interim priorities and the establishment of a national Farmsafe movement provide the starting point for a coordinated systematic national approach to rural injury in Australia. The momentum of the Farmsafe movement has reached different points in different States and Territories, with New South Wales being the most advanced. However, without adequate data sources, financial resources and support networks, the momentum may not be maintained.

4.6 References

1. Clarke L, Wolfenden K. Community organisation to reduce injury on Australian farms. Health Prom. J. of Aust. 1991; 1(2):17–22.
2. Schelp L. The occurrence of farm-environmental injuries in a Swedish minicipality. Accid. Anal. Prev. 1992; 24(2):161–166.
3. Cogbill TH, Steenlage ES, Landercasper J, Strut PJ. Death and disability from agricultural injuries in Winsconsin: a 12-year experience with 739 patients. J. Trauma 1991; 31(12):1632–1637.
4. Steele D. Severe injuries to farmers and farm workers in New Zealand. Wellington, New Zealand: Institute for Human Safety and Accident Research, 1993.
5. Cameron D, Bishop C. Farm accidents in adults. Brit. Med. J. 1992; 305:25–26.
6. Stueland D, Zoch T, Stamas P, Kreig G, Boulet W. The spectrum of emergency care of agricultural trauma in central Wisconsin. Am. J. of Emerg. Med. 1990; 8(6):528–530.
7. Jansson, BR. The yield of systems for continous and periodic injury surveillance in emergency care with emphasis on farm-work-related accidents. Scand. J. Soc. Med. 1987;15(4):247–252.
8. Cameron D, Bishop C, Sibert J. Farm accidents in children. Brit. Med. J. 1992;305:23–25.
9. Schelp L, Svanstrom L. One-year incidence of occupational accidents in a rural Swedish municipality. Scand.J. Soc. Med. 1986;14:197–204.
10. Stueland A, Layde P, Lee B. Agricultural injuries in children in central Wisconsin. J. Trauma 1991;31(11):1503–1509.
11. Rivara FP. Fatal and non-fatal injuries in children and adolescents in the United States. Pediatrics 1985;76(4):567–573.

12. Division of Safety Research, National Institute of Occupational Safety and Health. Public health focus: effectiveness of rollover protective structures for preventing injuries assoicated with agricultural tractors. Morbidity and Mortality Weekly Report 1993;42(3):57–59.

13. Springfeldt B. Overturning of Tractors – International Experiences. Sweden: Royal Institute of Technology, 1991.

14. Springfeldt B. Effects of occupational safety rules and measures with special regard to injuries: advantages of automatically working solutions. Doctoral dissertation. Stockholm, Sweden: Royal Institute of Technology, 1993.

15. Karlson T, Noren J. Farm tractor fatalities: the failure of voluntary safety standards. Am. J. Pub. Health 1979;69(2):146–149.

16. Brison R, Pickett C. Nonfatal farm injuries in eastern Ontario: a restrospective survey. Accid. Anal. Prev. 1991;23(6):585–594.

17. Alexander C, Ensminger M, Somerfield M, Kim Y, Johnson K. Behavioral risk factors for injury among rural adolescents. Am. J. of Epi. 1992;136(6):673–685.

18. Smith G, Kraus J. Alcohol and residential, recreational, and occupational injuries: a review of the epidemiologic evidence. Ann. Rev. Pub. Health 1988;9:99–121.

19. Rutledge R, Messick W. The association of trauma death and alcohol use in a rural state. J. Trauma 1992;33(5):737–742.

20. Baker SP, Whitfield RA, O'Neill B. Geographic variations in mortality from motor vehicle crashes. N. Engl. J. Med. 1987;316(22):1384–1387.

21. Williams FL, Lloyd OL, Dunbar JA. Deaths from road traffic accidents in Scotland: 1979–1988. Does it matter where you live? Public Health 1991;105(4):319–326.

22. Farm Safety Association. Safety programs of the Farm Safety Association in Ontario, Canada. Am. J. Ind. Med. 1990;18(4):409–411.

23. Sandfort D. Reaching the difficult audience: an experiment to provide occupational health services to farmers and ranchers in Colorado, USA Am. J. Ind. Med. 1990;18(4):395–403.

24. Pratt D. The Bassett Farm safety and health project. Am. J. Ind. Med. 1990;18(4):391–393.

25. Gay J, Donham K, Leonard S. Iowa Agricultural health and safety service project. Am. J. Ind. Med. 1990;18(4):385–389.

26. Husman K, Notkola V, Virolainen R, Nuutinen J, Tupi K, Penttinen J, Heikkonen J. Farmers' occupational health program in Finland, 1979–1988: from research to practice. Am. J. Ind. Med. 1990;18(4):379–384.

27. Hoglund S. Farmers' health and safety programs in Sweden. Am. J. Ind. Med. 1990;18(4):371–378.

28. Schelp L. Community intervention and accidents: epidemiology as a basis for evaluation of a community intervention programme on accidents. Karolinska Institute, Sundyberg, Sweden, 1987.

29. Maio RF, Green PE, Becker MP, Burney RE, Compton C. Rural motor vehicle crash mortality: the role of crash severity and medical resources. Accid. Anal. Prev. 1992;24(6):631–642.

30. Rutledge R, Messick J, Baker CC, Rhyne S, Butts J, Meyer A, Ricketts, T. Multivariate population-based analysis of the association of county trauma death rates. J. Trauma 1992;33(1)29–37.

31. Wenneker WW, Murray DH, Ledwich T. Improved trauma care in a rural hospital after establishing a level II trauma centre. Am. J. Surg. 1990;160(6):655–657.

32. Erlich SM, Driscoll TR, Harrison JE, Frommer MS, Leigh J. Work-related agricultural fatalities in Australia, 1982-1984. Scand. J. Work Environ. Health 1993:19;162-7

33. Clarke, L. Profile of farm health and safety: a preliminary report prepared for the National Farmsafe Secretariat. Agricultural Health Unit, Moree, New South Wales, 1992.

34. Carey V, Vimpani G, Taylor R. Childhood injury mortality in New South Wales: geographical and socio-economic variations. Journal of Paediatrics and Child Health 1993;29:136–140.

35. Ozanne-Smith J, Vulcan P, Heffernan-Colman C, Watson, W. Child accident and injury prevention Research in other than road accidents, Part 1: overview of child injuries in Victoria. Melbourne: Monash University Accident Research Centre, 1991.

36. Fildes B. (ed). Injury prevention among the elderly: falls at home and pedestrian accidents. Melbourne: Monash University Accident Research Centre, 1992.

37. Victorian Injury Surveillance System. Report on farm injury in the Latrobe Valley. Melbourne: Monash University Accident Research Centre, 1992.

38. Ryan G, Barker J, Wright J, McLean J. Human factors in rural road crashes. Aust. J. Pub. Health 1992;16(3):269–276.

39. Jamieson K, Allen J, Moore B, Scott J, Wilson C. Rural traffic crashes - a study of road accidents within 100 miles of Brisbane in December 1969 and January 1970. Brisbane: Royal Brisbane Hospital, 1974.

40. Dorsch M, Lane J, McCaul K, MacLean S, McLean J, and Somers, R. Rural road accident study. Melbourne: NHMRC Road Accident Research Unit, University of Adelaide, and Nicholas Clark and Assoicates, 1985.

41. King K. Rural traffic crashes in Queensland 1984. Canberra: Report CR 45 Federal Office of Road Safety, 1986.

42. Armour M, Carter R, Cinquegranra, C, Griffith, J. Study of single vehicle rural accidents Volume 1: accident data report. Melbourne: Report GR/89–4 Vic Roads, 1989.

43. Webster M, Bath P, Lush D. The pattern and frequency of injury and illness among farm workers in NSW. Proceedings of the 22nd Annual Conference of the Ergonomics Society of Australia and New Zealand, 1985.

44. Wolfenden K, Clarke L, Lower T, Murray-Jones S. Rural child injury prevention – a community based approach. Health Prom. J. Aust. 1991;1(2):23–27.

45. Moller J et al. (eds). Community based injury prevention: a practical guide. National Safety Council of Australia, South Australian Division Limited, 1992.

46. Harrison JE, Frommer MS, Ruck EA, Blyth FM. Deaths as a result of work-related injury in Australia, 1982–1984. Med J Aust 1989;150:118–125.

Chapter 5 Consumer product-related injury

5.1 Introduction

According to a review published by the Australian Consumers' Association,[1] product failures alone were estimated to account for 23 000 injuries in 1989. Product-related injury is an area offering considerable scope for progress towards injury reductions in Australia. However, product safety was identified by Nutbeam et al.[2] as a major component of the injury health goals and targets, data collections and research on product-related injury are so poorly developed and limited in Australia that no baseline population-based data were available for the published goals and targets. Because data are often published as internal documents of large product safety organisations, international information on product-related injury in recognised journals is also limited.

5.1.1 Definition

Product-related injury has been defined as 'tissue damage resulting from a chain of events involving an interaction between a product, the user (or bystander) and the environment. Such an injury usually results from an acute exchange of energy'.[2]

A useful categorisation of product-related injury is:

- injury related to physical failure of the product;
- injury related to inadequate design of the product;
- injury related to inadequate instructions; and
- other injury involving the product.[1]

An important definitional issue is the scope of the term 'product'. It is not usual to include such major structures as the family home or major items, such as a motor vehicle, in the term 'product'. This can, however, result in major oversights. For example, much non-transport related injury is associated with motor vehicles. Motor vehicle gassing deaths are equivalent to approximately 25 per cent of the road toll from road-user deaths.[4]

In considering product-related injury, it is also logical to determine the level of protection provided by safety products. This represents a major re-orientation from the traditional product failure focus but is an important step in injury prevention. Currently, responsibility for safety products is fragmented between many areas of government or falls, in some cases, into no particular jurisdiction.

5.2 Literature review

Traditionally, those charged with the responsibility for product safety have focused on product failures, relying heavily on consumer complaints for problem identification. While this is an important issue, modern approaches to prevention of product-related injury are based on broader definitions and categorisations, such as that given above in Section 5.1, and good quality epidemiological and risk factor data.[5,6] Nevertheless, the literature remains dominated by reports on product failures, liability issues and issues related to standards and market versus regulatory control.

5.2.1 The role of data

The collection of injury data allows systematic identification of injuries associated with specific products and has the potential to provide alerting information about new hazards. Data are also useful for monitoring changes in the rate of product-related injury in relation to legislative or design changes, and play an important part in creating public awareness of products associated with injury. Finally, research studies to identify specific countermeasures require injury data as a starting point.

Internationally, particularly in the United States and the Netherlands, large consumer safety institutions base much of their work on epidemiologically sound product-related injury data. The United States Consumer Product Safety Commission has responsibility for the National Electronic Injury Surveillance System (NEISS) and the Consumer Safety Institute in the Netherlands maintains the Home and Leisure Accident Surveillance System. In addition, they undertake substantial research programs aimed at improving product safety.[5,6]

The major sources of product-related injury data in Australia are:

- coronial databases (available only in Victoria and New South Wales);
- injury surveillance systems based on hospital Emergency departments, which provide quite detailed information about the products and circumstances associated with injury. Additional information can be obtained from research studies based on contacting an appropriate sample of injured persons, or families in the case of children, to obtain more specific information on particular product-related injuries;
- poisons information centre databases;
- motor vehicle crash databases linked to registration databases, which contain make and model information;
- complaints from the public (which are generally not computerised);
- fire department data; and
- databases held by industries in relation to specific products, but which are not usually accessible.

There is, possibly, additional scope for obtaining data from insurance registers and from business in the form of consumer complaints, market research, market pilots and consumer trials.[7] Another potential source of data is systematic collections of newspaper cuttings and complaints information.[8]

Van Weperen[8] identifies two stages for the use of injury data in interventions: priority setting and determination of the nature of the intervention. The role of injury data in monitoring the success of interventions could be added to this list.

5.2.2 The role of technical studies

Much of the published literature and research focuses on defective products and product liability and has been described as too bureaucratic in its approach,[9] and the universal relevance of technical research is not adequately recognised. In particular, anthropomorphic, ergonomic and other technical studies can be expected to have international application.

In summarising the findings of the European Consumer Safety Association's conference 'The Role of Accident Data', Rogmans reports that specific technical failures of consumer products account for a small proportion of all injuries. Furthermore, he states '... consumer safety policy depends on the understanding of all types of product-related injuries, including those which result from problems of design, ergonomics, user information and regulatory control, as well as those involving technical malfunction'.[10]

An important recent concept in the European literature is that of 'horizontal standards' or a hazard-oriented approach.[11] Here the hazard under consideration, for example entrapment hazards, is translated into parameters with one or more limiting values that represent the safety criteria which are applicable to a whole class of products. Feasibility studies indicate that there are no fundamental barriers to a system of hazard-oriented safety criteria for consumer products. A major advantage of horizontal over the usual vertical standards is the potential for their universal application to new and existing products, for which vertical standards may not exist.

5.3 Available data

5.3.1 State Coroner's Office death data

Table 5.1 lists product-related fatal injuries in Victoria for people of all ages during the years 1989–90. Injuries relating to persons, animals, environmental factors and miscellaneous factors are excluded from this table. Injuries associated with sports and recreational activities are also excluded due to the difficulty of distinguishing between the sporting product and the activity.

5.3.2 Emergency department data

Product-related injury presentations and hospital admissions for children aged less than 15 years at hospitals participating in the Victorian Injury Surveillance System are shown in Table 5.2. Similar data for adult product-related injury are provided in Table 5.3.

In addition to the data provided in Tables 5.2 and 5.3, the role of products related to recreational (play) activities was examined. Playground equipment and trampoline-related injuries peaked in the 5–9 years age group, while skateboard and roller skating (blading) peaked in the 10–14 years age group. In order of frequency of involvement, monkey bars and climbing apparatus were ranked highest, followed by slides, flying fox and see-saws.

Table 5.1: Products associated with fatal injuries, Victoria 1989–90

Product-related factors	All ages (n = 2145) No.	Per cent
Vehicles	930	43.4
–registered air or land		
–passenger car	657	30.6
–heavy truck (van) greater than 3 tonnes	105	4.9
–motorcycle	74	3.4
–other	94	4.4
Drugs, medications and alcohol	511	23.8
–alcohol	249	11.6
–barbiturates, sedatives, tranquillisers and psychotropics	4	0.2
–other	258	12.0
Packaging materials and containers	109	5.1
–rope or string	96	4.5
–other	13	0.6
Structures	100	4.7
–floor and flooring materials	17	0.8
–bridges	17	0.8
–handrails	8	0.4
–stairs and steps	7	0.3
–other	51	2.4
Guns	99	4.6
Carbon monoxide	88	4.1
Garage and yard items	55	2.6
–poles (excluding fence posts)	46	2.1
–other	9	0.4
Other poison and ingestion hazards	42	2.0
–cosmetic and personal item	15	0.7
–cleaning (maintenance compounds or chemicals)	13	0.6
–petrol	6	0.3
–other	8	0.4
Kitchenware	34	1.6
–knives	33	1.5
–other	1	0.0
Furniture	26	1.2
–bathtubs, showers and fittings	10	0.5
–other	16	0.7
Food and drink	22	1.0
–hot water	6	0.3
–meat, poultry and fish	4	0.2
–other	12	0.6
Swimming pools	16	0.7
Industrial (retail) plant or equipment	15	0.7
Workshop tools and appliances	7	0.3
Other	91	4.2

Source: Victorian State Coroner's Office. Unnatural deaths collated from the findings of the State Coroner. State Coroner's Office, Melbourne 1991.

Table 5.2: Products associated with child injury, 1989–92

Product-related factors*	0–4 years old (n=15 219)			5–9 years old (n=5895)			10–14 years old (n=5280)			Total (n=26 395)		
	No.	%	% admitted† (n=4059)	No.	%	% admitted† (n=1288)	No.	%	% admitted† (n=1230)	No.	%	% admitted† (n=6583)
Furniture	**3906**	**25.7**	**21.9**	**1085**	**18.4**	**13.5**	**503**	**9.5**	**6.1**	**5494**	**20.8**	**17.3**
–chairs, stools, sofas	1187	7.8	4.2	297	5.0	3.6	172	3.3	1.9	1656	6.3	3.6
–beds	780	5.1	2.5	204	3.5	1.6	62	1.2	0.3	1047	4.0	1.9
–cabinets, racks, shelves	565	3.7	5.1	96	1.6	1.6	36	0.7	0.4	697	2.6	3.5
–tables	423	2.8	2.4	93	1.6	1.2	33	0.6	0.6	549	2.1	1.8
–bunk beds	143	0.9	0.7	149	2.5	1.9	50	0.9	1.0	342	1.3	1.0
–bathtubs, showers & fittings	337	2.2	3.3	83	1.4	1.5	38	0.7	0.5	458	1.7	2.4
–space heaters, coolers	125	0.8	1.1	48	0.8	0.7	21	0.4	0.5	194	0.7	0.9
–other	346	2.3	2.8	115	2.0	1.4	91	1.7	1.0	549	2.1	2.2
Structures	**2165**	**14.2**	**13.4**	**1243**	**21.1**	**18.1**	**1243**	**23.5**	**14.2**	**4651**	**17.6**	**14.5**
–doors, gates	872	5.8	7.6	354	6.0	6.8	230	4.4	3.3	1456	5.5	6.6
–stairs, steps	595	3.9	2.0	266	4.5	1.9	353	6.7	1.8	1214	4.6	2.0
–floor, flooring materials	126	0.8	0.5	88	1.5	1.2	86	1.6	0.7	300	1.1	0.7
–windows	98	0.6	0.7	54	0.9	1.2	67	1.3	1.3	219	0.8	0.9
–other	474	3.1	2.6	481	8.2	7.1	507	9.6	7.2	1462	5.5	4.3
Poisoning/ingestion hazards	**2537**	**16.7**	**21.9**	**462**	**7.8**	**8.2**	**643**	**12.2**	**25.0**	**3642**	**13.8**	**19.7**
–drugs, medications	1234	8.1	13.7	57	1.0	2.1	268	5.1	17.3	1559	5.9	12.1
–cosmetics, personal items	451	3.0	2.0	202	3.4	3.0	168	3.2	2.8	821	3.1	2.4
–cleaning/maintenance compounds/chemicals	490	3.2	3.3	131	2.2	1.9	184	3.5	4.2	805	3.0	3.2
–pesticides	126	0.8	0.9				6	0.1	0.1	132	0.5	0.5
–coins	236	1.6	1.9	72	1.2	1.2	17	0.3	0.6	325	1.2	1.5
Vehicles	**1051**	**6.9**	**7.9**	**1067**	**18.1**	**29.1**	**1243**	**23.5**	**30.3**	**3361**	**12.7**	**16.2**
–vehicle doors	116	0.8	0.4	88	1.5	0.6	52	1.0	0.0	256	1.0	0.4
–other	935	6.1	7.4	979	16.6	28.5	1191	23	30.3	3105	11.8	15.8
Garage and yard items (excluding pesticides)	**435**	**2.9**	**3.0**	**545**	**9.2**	**9.5**	**434**	**8.2**	**6.6**	**1415**	**5.4**	**4.9**
–fences & fence posts	210	1.4	1.2	318	5.4	5.0	233	4.4	2.8	761	2.9	2.2
–other	225	1.5	1.7	227	3.9	4.5	201	3.8	3.8	654	2.5	2.7

Table 5.2: (continued)

Product-related factors*	0–4 years old (n=15 219)			5–9 years old (n=5895)			10–14 years old (n=5280)			Total (n=26 395)		
	No.	%	% admitted† (n=4059)	No.	%	% admitted† (n=1288)	No.	%	% admitted† (n=1230)	No.	%	% admitted† (n=6583)
Food and drink	**899**	**5.9**	**8.6**	**211**	**3.6**	**2.6**	**150**	**2.8**	**2.3**	**1260**	**4.8**	**6.3**
–tea, coffee, other hot beverage	280	1.8	2.9	23	0.4	0.2	13	0.2	0.2	316	1.2	1.8
–hot water	173	1.1	2.1	35	0.6	0.4	20	0.4	0.0	228	0.9	1.4
–other	446	2.9	3.7	153	2.6	2.1	117	2.2	2.0	716	2.7	3.1
Kitchenware	**639**	**4.2**	**5.0**	**237**	**4.0**	**2.9**	**260**	**4.9**	**3.0**	**1136**	**4.3**	**4.2**
–knives	115	0.8	0.4	117	2.0	0.9	174	3.3	1.9	406	1.5	0.8
–tableware & accessories	282	1.9	2.6	34	0.6	0.6	17	0.3	0.2	333	1.3	1.8
–other	242	1.6	1.9	86	1.5	1.4	69	1.3	1.0	397	1.5	1.6
Nursery equipment	**944**	**6.2**	**4.8**	**18**	**0.3**	**0.2**	**4**	**0.1**	**0.2**	**966**	**3.7**	**3.1**
–prams, strollers & pushers	287	1.9	1.4	4	0.1	0.1				291	1.1	0.9
–baby walkers & exercisers	169	1.1	0.8							169	0.6	0.5
–cots	127	0.8	0.5	5	0.1		1	0.0	0.1	133	0.5	0.3
–high chairs	130	0.9	0.6	1	0.0		1	0.0	0.1	138	0.5	0.4
–other	231	1.5	1.6	8	0.1	0.1	2	0.0	0.0	235	0.9	0.9
Toys	**673**	**4.4**	**2.7**	**201**	**3.4**	**2.8**	**82**	**1.6**	**1.1**	**956**	**3.6**	**2.4**
Packaging materials and containers	**510**	**3.4**	**2.7**	**186**	**3.2**	**2.3**	**203**	**3.8**	**2.9**	**899**	**3.4**	**2.7**
Industrial or retail	**244**	**1.6**	**1.3**	**149**	**2.5**	**2.3**	**121**	**2.3**	**1.2**	**514**	**1.9**	**1.5**
–grocery & shopping trolleys	100	0.7	0.5	17	0.3	0.1	10	0.2	0.2	127	0.5	0.3
–other	144	0.9	0.9	132	0.2	2.3	111	2.1	1.1	387	1.5	1.2
Craft and hobby equipment	**143**	**0.9**	**0.6**	**101**	**1.7**	**2.9**	**80**	**1.5**	**2.3**	**324**	**1.2**	**1.4**
- pins & needles	42	0.3	0.3	50	0.8	2.3	53	1.0	2.0	145	0.5	1.0
- other	101	0.7	0.3	51	0.9	0.5	27	0.5	0.3	179	0.7	0.4
Other	**1073**	**7.1**	**6.2**	**390**	**6.6**	**5.5**	**314**	**5.9**	**4.9**	**1777**	**6.7**	**5.9**

* Up to two factors can be recorded per case

† Including all admissions, transferrals, and deaths

Notes: Injuries relating to persons, animals, environmental factors, and miscellaneous factors are excluded from this table. Injuries relating to sports and recreation are also excluded as it is not possible to separate the sporting product from the sporting activity

Source: VISS: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

Table 5.3: Products associated with adult injury, 1989–92

Product-related breakdown factors*	15 years and over (n=20 112) No.	15 years and over (n=20 112) Per cent	% Admitted** (n=4455)
Vehicles – registered air or land	**4921**	**24.5**	**27.1**
Structures	**3287**	**16.3**	**12.1**
–stairs, steps	966	4.8	3.2
–concrete, other manmade outdoor surfaces	478	2.4	1.6
–floor, flooring materials	401	2.0	1.7
–doors, gates	338	1.7	1.0
–windows	208	1.0	1.0
–other	896	4.5	3.7
Drugs, medications and alcohol	**1974**	**9.8**	**24.6**
–barbiturates, sedatives, tranquillisers, psychotropic drugs	772	3.8	10.5
–alcohol	505	2.5	5.3
–aspirin	236	1.2	3.4
–other	461	2.3	5.5
Workshop tools and appliances	**1720**	**8.6**	**5.2**
–power grinders, buffers, polishers	462	2.3	0.7
–welding equipment	310	1.5	0.1
–saws	308	1.5	2.5
–other	640	3.2	1.9
Kitchenware	**1368**	**6.8**	**3.6**
–knives	935	4.6	2.6
–glasses	134	0.7	0.3
–slicers, choppers, grinders, mincers	85	0.4	0.2
–other	214	1.1	0.6
Industrial/retail plant or equipment	**1336**	**6.6**	**5.3**
Furniture	**1144**	**5.7**	**5.9**
–chairs, stools, sofas	374	1.9	2.0
–beds	165	0.8	1.8
–bathtubs, showers, fittings	156	0.8	0.8
–space heaters and coolers	134	0.7	0.4
–cabinets, racks, shelves	88	0.4	0.2
–tables	67	0.3	0.2
–other	160	0.8	0.6
Other poison and ingestion hazards	**843**	**4.2**	**3.4**
–cosmetics, personal items	369	1.8	1.7
–cleaning/maintenance compounds/chemicals	296	1.5	1.3
–nails, screws, carpet tacks or thumbtacks	165	0.8	0.2
–pesticides	13	0.1	0.1
Garage and yard items	**1079**	**5.4**	**5.1**
–ladders	407	2.0	2.5
–fences, fence posts	175	0.9	0.6
–powered gardening tools and equipment	163	0.8	1.0
–unpowered gardening tools and equipment	147	0.7	0.3
–other	187	0.9	0.7

Table 5.3: (continued)

Product-related breakdown factors*	15 years and over (n=20 112) No.	15 years and over (n=20 112) Per cent	% Admitted** (n=4455)
Food and drink	**654**	**3.3**	**2.1**
–meat, poultry, fish	275	1.4	1.2
–fruit, vegetables	131	0.7	0.2
–other	248	1.2	0.7
Packaging materials and containers	**501**	**2.5**	**1.3**
Hypodermic needles or syringes	**178**	**0.9**	**0.0**
Kitchen appliances	**134**	**0.7**	**0.3**
Rugs and mats	**86**	**0.4**	**0.7**
Other	**887**	**4.4**	**3.2**

* Up to two factors can be recorded per case
** Includes all admissions, transferrals, and deaths
Notes: Injuries relating to *persons*, *animals*, *environmental factors*, and *miscellaneous factors* are excluded from this table. Injuries relating to *sports and recreation* are also excluded as it is not possible to separate the sporting product from the sporting activity
Source: VISS: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

5.3.3 Demand for product-related information

Information on product-related injury is increasingly being requested by organisations who have a need for substantial data analyses and interpretation of existing data. VISS had, over a twenty-month period, more than 200 requests for information. Table 5.4, as an illustration of the demand for information, lists 30 requests by various organisations and the details available in the system on the product associated with the injury.

The 30 information requests listed in Table 5.4 represent approximately 14 per cent of requests to VISS for substantial data analyses and interpretation of product-related injuries over a twenty-month period.

5.3.4 Risk factor data

In order to determine the risk associated with particular products, it is necessary to know both the amount of exposure and the frequency of injury associated with the product. Similarly, it is necessary to determine the penetration into the community and usage of safety products to evaluate their effectiveness in protecting against injury.

While exposure to many products occurs in public places (bicycle helmets, playground equipment), little is known of exposure to the many products most frequently used in the private domain of the home. The Australian Bureau of Statistics conducted home safety surveys in Melbourne and Sydney in 1992 to address this lack of information.[12,13] (See Chapter 3.)

Table 5.4: Victorian Injury Surveillance System product-related information requests: examples from January 1991–August 1993

Organisation	Subject of request
Kidsafe (Child Accident Prevention Foundation of Australia)	Injuries from gas and electric stoves
CHOICE magazine	Kettle injuries
Herald-Sun	Deaths and respiratory problems related to baby powder inhalations
Emergency course, registered nurse	Camphor and moth balls and eucalyptus oil ingestions
Psychiatrist, Royal Children's Hospital	Matches versus cigarette lighters in flame burns started by children
Standards Branch, Department of Consumer Affairs	Exercise bike injuries
Monash University Accident Research Centre (MUARC)	All fork-lift truck injuries
CAPFA (Vic)	BBQs
Channel 9 News Extra	Escalator injuries
Division of Public Health, Tasmania	Bean bag injuries
Nunawading District Health Council	Needle stick injuries
Legal Firm	Bunk beds
State Coroner's Office	Cigarette lighter fluid inhalation
Illawarra Safe Community Project	Slippery floors in shopping centres
Injury Surveillance and Control Unit	Baby walker injuries
Private	Lawn mower injuries
Victorian Playgroup Association	Bubbly plastic wrapping injuries. Poisons from high salt content of play dough.
Child Safety Centre	Toy box injuries
ESSO	Injuries from concrete mixer chutes
QUIT	Ingestion of butts or nicotine products by children
ABC-TV	Safety plugs, child electrocution at home
Family Daycare	Electric fans, irons
ARK Australian Environmental Organisation	Injuries by dish washing detergent
Menzies Centre for Population Health Research	Tap and bucket scalds less than 5 years, 1989–91
John Curtin School of Medical Research	Data re: farm hazards or chemical (pesticide) poisonings
MUARC	Poisonings less than 5 years for 1989–92, number of cases by Theophylline or Nuelin
3LO ABC Radio	Radio interview: nursery furniture related injuries
Endeavour Tools	Chain saw injuries—residential and on the job
Australian Wool Corporation	Information on thermal injuries
Office of Fair Trading and Business Affairs	High chair injuries, use of restraints

Results from the surveys will assist in developing product safety targets, particularly when combined with relevant injury data. They will also provide the basis on which to determine appropriate methods for intervention. Clearly, where a product is associated with a high frequency of injury and a low rate of exposure, the countermeasures are likely to be different from a problem involving a low injury frequency and a low rate of exposure. In the case of the former, a product ban or mandatory standards may be considered, whereas warning labels may be sufficient in the latter case. Summary results of the Melbourne[12] and Sydney[13] surveys are shown in Section 3.3.2.

5.4 Product safety in Australia

At the time of writing, strategies and mechanisms for consumer product safety at a national level are being revised. The following paragraphs describe the situation in late 1993. A recent report by the Australian Consumers' Council reviews some aspects of the existing system and recommends changes.[14]

The Federal Bureau of Consumer Affairs addresses the issue of product safety on a national level.[15] Although it does not address product safety in specific age groups, the bureau often targets products designed for specific vulnerable groups; for example, the aged, the very young, the handicapped, and non-English speaking people. For instance, product safety in children includes almost half of the mandatory Australian Standards recognised by the bureau.

The Federal Bureau of Consumer Affairs receives information about product safety from a number of different sources; for example, the National Injury Surveillance Unit (NISU), the Commonwealth-State Consumer Product Advisory Committee, the Consumer Goods Advisory Committee, the Australian Customs Service, Consumer Interpol and the World Health Organization. However, the above databases and information points are generally 'reactive' and relate to products already found to be unsafe. The bureau has pointed to the need for a proactive agency designed to identify unsafe products before they reach consumers. Such an agency could access national injury data and identify and research consumer product-related injuries and their causes, develop intervention strategies, and implement and evaluate the effectiveness of the measures imposed.[15]

Examples of the types of matters investigated by the Federal Bureau of Consumer Affairs are: furniture flammability, swimming pool filters, baby walkers, baby carriers for bicycles, oven mitts, puller winches, eye protectors for motor cyclists, measuring of the audio output of hi-fi equipment, domestic smoke alarms and toy boxes. The bureau also plays a role in educating consumers about unsafe products and general safety issues. It produces and distributes newsletters about Australian standards (e.g. the newsletter *Minder*) and proposes safety requirements (e.g. *Safety standard for children's toys* and *Food additives: food for thought*). The bureau also plays a role in networking, whereby it informs companies, organisations and various community groups about safety requirements.[15]

Established Commonwealth Government safety standards should be met before products are allowed on the market. Standards Australia is the major standards development organisation in Australia. Standards are developed by committees of interested parties, with strong representation of manufacturers and distributors. Standards only become mandatory when

incorporated into either Commonwealth or State legislation. Under this system, few products are covered by mandatory standards. The standards set generally specify only minimum safety levels, with the result that products which meet a standard often do not incorporate additional, practicable safety features.[15]

In addition to Commonwealth safety standards, many manufacturers or safety authorities also incorporate voluntary safety standards; for example, industry codes of practice. Limitations of the industry codes of practice include the lack of enforceable penalties, and lack of a requirement for manufacturers to indicate to the consumer their compliance with a code of practice.[15]

Although voluntary standards are preferred, sometimes government must intervene to introduce and enforce mandatory Australian Standards. Since the establishment of the *Trade Practices Act 1974 (Cwlth)*, 18 mandatory consumer product standards have been implemented (e.g. bean bags in 1987) and a number of products have been banned from the market for an initial period of 18 months. Often suppliers initiate voluntary recalls of products because they are suspected to be unsafe or dangerous. Failure of a supplier to inform the bureau of a voluntary recall can attract a penalty of up to $10 000, and failure to comply with a compulsory recall may result in a $100 000 fine. In 1990, 309 products were recalled by suppliers and a further 51 were registered as 'alleged hazardous products'. Nineteen of the latter were classified as toys.[15]

In 1992, product liability legislation was strengthened, along lines used in Europe. The law is designed to give harmed consumers more rights to seek damages for their injuries[13].

Coronial systems in Australia have the potential to make effective product safety recommendations, particularly under the progressive *Victorian Coroner's Act 1985*.[16]

In recent years, progress has been made in Australia to improve product design or product safety of children's products or products hazardous to children, including: child-resistant closures, fireworks, children's nightwear, small parts in toys, dishwashing machine detergent, exercise bikes, nursery furniture and bunk beds. Marked progress has occurred in motor vehicle design, and in workplace safety.

5.5 Discussion

Compared with most other safety issues in Australia, product safety lacks adequate data collections (particularly rate data), and research and development. Although some issues, such as electrical safety, have been a high priority, other areas have been neglected. The Australian Consumer's Association[1] provides an important service to the community but because of the extent of the problem, as outlined above, this is inadequate.

However, the National Minimum Dataset for Injury Surveillance recently finalised by NISU has the scope to obtain product-related injury data in a one-line narrative.[17] Ensuring that this data item is of high quality is a particularly important task in order for product safety research to progress in the future. Centralisation and analysis of data will also be fundamentally important. Further progress towards the development of a national coronial

data system should also enhance the potential for identifying and preventing product-related injury.

In addition, a mechanism should be established for the dissemination of product-related injury data and countermeasure information by means of a coordinated clearing house function. A timely recommendation, made during the European Consumer Safety Association conference on the role of accident data, was for an international journal of consumer safety research to be established that would include accident analysis work.[9] The model of information sharing and problem solving between designers, manufacturers, government agencies, injury researchers, retailers and other stakeholders, which functioned well in the case of dishwashing machine detergent ingestions,[18] should be considered for extension to other issues.

Consumer Safety Authorities should take a pro-active systematic approach to examining product-related injury data, rather than accessing data only in response to consumer complaints. The latter approach risks considerable resource expenditure on minor issues, while major hazards may be ignored. As in overseas best practice in the United States and the European Community, Australian government departments with responsibility for product safety should be largely driven by injury data, and they should extend their scope from product failure to the full range of product-related injury.

Since other countries are undertaking much of the basic anthropomorphic, ergonomic and biomechanical work required for improved product design, it is probably appropriate for Australia to focus on identifying and implementing appropriate countermeasures to improve product safety. Close international links will ensure the transfer of new research knowledge. Alerting systems currently appear to operate in a patchy way across international boundaries, with long delays being noted in the case of Mistral fans,[15] for example.

Slow progress towards the development and adoption of standards can be a considerable barrier to progress in injury prevention. For example, revised playground and safe house design standards in Australia have been in the process of being formulated for years and remain unavailable. Australian standards applying to domestic glass existed for many years before they were incorporated into the Victorian building code. As in the European Community, Australia should also be wary of the potential shift to minimum product safety standards when common standards are adopted nationally.

In order to choose and appropriately target interventions, additional risk factor studies are required along similar, but more comprehensive lines, to the ABS Home Safety Surveys reported in Chapter 3, above. This data could be collected as part of the next ABS National Health Survey (scheduled for 1995) or further supplementary surveys should be considered as a means of monitoring risk and safety factors over time.

Importantly, further work is required to comprehensively review the scope for advances in product-related injury reduction in Australia. Considerably more literature is available for review than could be accessed within the constraints of this report. In particular, it is important to document those countermeasures which have proved successful elsewhere or have good potential for success, and also to document successful implementation strategies. Closer links are also recommended between those responsible for data, research, product

safety, industry, design, and undergraduate training in relevant disciplines such as architecture, building, engineering and design.

5.6 References

1. Australian Consumers' Association. An arm and a leg: the human and economic cost of unsafe products. Sydney: Australian Consumers' Association, 1989.
2. Nutbeam D, Wise M, Bauman A, Harris E, Leeder S. Goals and targets for Australia's health in the year 2000 and beyond. Report prepared by the Department of Public Health, University of Sydney for the Commonwealth Department of Health, Housing and Community Services, 1993.
3. Ozanne-Smith, J. The role of injury data in product safety. Proceedings child and product safety national conference. Melbourne: Child Accident Prevention Foundation of Australia, 1991.
4. Henderson, M. Victorian injury deaths and the potential for prevention. Hazard 1992;ed 11, Victorian Injury Surveillance System.
5. Simpson, B. Product safety reaearch at the United States Consumer Product Safety Commission. Proceedings of the workshop on product safety research in Europe. Amsterdam: European Consumer Safety Association, 1992.
6. Consumer Safety Institute. Summary of the Institute's princple activities. Amsterdam: Consumer Safety institute, 1990.
7. Rogmans, W. Review of various sources of information for consumer policy their strengths and weaknesses, the role of accident data. Amsterdam: European Consumer Safety Association, 1993.
8. Van Weperen, W. Utilisation of accident data, the role of accident data. Amsterdam: European Consumer Safety Association, 1993.
9. Larsen, SR. Safety product research programming and implementation. Proceedings of the workshop on product safety research in Europe. Amsterdam: European Consumer Safety Association, 1992.
10. Rogmans, W. Conclusions and recommendations, the role of accident data. Amsterdam: European Consumer Safety Association, 1993.
11. Van Weperen, W. A hazard-oriented approach to product safety criteria, Proceedings of the workshop on product safety research in Europe. Amsterdam: European Consumer Safety Association, 1992.
12. Farrell, D. Household safety, Sydney, November 1992, Cat. no. 4387.1. Sydney: Australian Bureau of Statistics, 1993.
13. Lazzaro, V. Safety in the home, Melbourne, November 1992, Catalogue No. 4387.2. Melbourne: Australian Bureau of Statistics, 1993.
14. Australian Consumers' Council. Safety in the making: product safety for the year 2020. Canberra: Australian Government Publishing Service, 1993.
15. Johnson, G. Children and product safety: the role of the Commonwealth. Proceedings child and product safety national conference. Melbourne: Child Accident Prevention Foundation of Australia, 1991.
16. Johnstone G. An avenue for death and injury prevention. In: Selby H, ed. The aftermath of death. Sydney: Federation Press, 1992. Chapter 10.

17. National Injury Surveillance Unit. National Minimum Dataset for Injury Surveillance. Adelaide: NISU, 1993.

18. Kynaston JA, Patrick MK, Shepherd RW, Pankaj VR, Cleghorn GJ. The hazards of automatic-dishwasher detergent. Med. J. Aust. 1989; 151:5–7.

Chapter 6 Sports-related injury

6.1 Introduction

In this chapter the term 'sports-related injury' is used to describe an injury resulting from formal and informal sporting activities and those recreational activities that are commonly categorised as 'adventure sports'. Bicycle-related injury is excluded from consideration, as are injuries related to playground equipment and swimming pools since these refer to play activities.

The prevention of sports injuries can be considered as a four-stage process:[1]

- identification and description of the nature and extent of the problem;
- identification of factors and mechanisms involved in their occurrence;
- introduction of measures for reducing future risk and/or severity; and
- evaluation of interventions.

The success of such an approach relies on both an effective sports injury surveillance system and epidemiological studies of aetiological factors that influence the occurrence of sports injuries. This approach would do much to provide the information which is currently lacking. It also requires the development, implementation and evaluation of appropriate countermeasures which could range from design solutions, to rule modifications and educational programs.

Limited data are currently available for sports injury and sports participation rates in Australia. Victorian data, which are more readily available than for most States and Territories, are primarily used to demonstrate the level of available data and the gaps that exist in current collections. An overview of recent sports injury literature is presented, with specific emphasis on several of the major sports and injuries presenting to hospitals.

6.2 Literature review

Sports and recreational safety promotion have been identified as a key public health issue by Egger in several reports,[2,3] and in the recently released Australian National Health Goals and Targets.[4] The Victorian Health Promotion Foundation (VHPF) has held a number of workshops on sports safety promotion to address and explore possible initiatives that would significantly contribute to a reduction in sports injuries in Victoria. These workshops have proceeded over the past 18 months, with high level representation from a wide variety of professional organisations that have direct interest in sports and sports injuries.

Apart from a limited number of studies in progress, little systematic epidemiological research has been undertaken on sports injury in Australia. In particular, there is a lack of available information on the circumstances of injury and potential points of intervention where countermeasures have been evaluated in the chain of events leading to injury. Hospital-based data collections identify sports injuries only in an aggregated manner for admissions and more detailed Emergency department data are collected in relatively few hospitals. No comprehensive general practitioner, sports medicine or other practitioner data are available

and where sports-based collections exist, they tend to concentrate only on elite players. In addition, information regarding participation rates and player hours in various sports is needed to determine the relative risks of different sports. The VHPF Working Party on sports injury surveillance has identified the need to examine the feasibility of establishing improved data collection methodologies for sports injury to provide sports injury surveillance.[5] Similarly, the National Sports Research Centre has identified injury surveillance as a priority that requires immediate attention and funding under the Applied Sports Research Program.[1]

The Australian National Health Goals and Targets[4] includes targets relating to sports and recreational injuries, including:

- increasing the availability of information on the risk of injury associated with sport and recreation;
- decreasing the rate of attendance at Emergency departments for sports injury;
- reducing the rate of attendance at Emergency departments for sports-related eye injuries and dental injuries; and
- reducing the rate of hospital admissions from head injuries associated with horse activity.

The limited information available on the incidence of sporting injury in Victoria indicates that sport and recreational activities are a common context for injury. For example, sports injuries are frequently moderately severe and represent at least 12 per cent of hospital admissions for unintentional injury in the age range of 10–29 years in Victoria each year.[6] Australian Rules football accounted for 1258 injuries (31% of sports injuries) to children aged less than 15 years who attended three Melbourne hospitals over the two years, 1989–90.[7]

As awareness of financial and community costs has grown, there has been a growing interest and concern in Australia over the incidence of sport-related injuries. Based on the report to the Better Health Commission (1986),[8] Egger estimated that about one million sports injuries occur annually, and that these result in direct and indirect costs totalling about $1000 million.[2]

Sport-related injuries in children in the 10–14 year age range (both boys and girls) were the single highest cause of attendance to the Emergency departments contributing data to the Victorian Injury Surveillance System (VISS; 1989–90).[7]

This awareness has also been reflected in the growth of the field of sports medicine and the availability of research funds generated by sporting bodies and associations to investigate injuries specific to their sport. During 1992, the Applied Sports Research Program has funded projects to study the incidence and aetiology of navicular stress fractures in athletes and to investigate knee injuries in netball players. In a three-year survey of Victorian Football League injuries Seward and Patrice were able to identify, from their sample of football players, a predominance of lower limb injuries and make specific recommendations for possible prevention of these injuries.[9] Another study, funded by the National Sports Research Centre, compared fast bowling techniques to determine those less likely to causes serious injury to junior fast bowlers.

Studies reported on sports injuries in the United States and Canada have described injuries in specific sports and recommended countermeasures.[10-12] In Canada, the mandatory use of certified face masks and helmets in minor-league players has been shown, for those wearing protection, to abolish head injures and reduce eye injuries by 90 per cent, with estimated cost savings of $10 million annually. Additionally, the use of squash and racquet ball eye guards in Canada has been shown to dramatically reduce the incidence of eye injuries and mandatory use of certified eye guards has now been adopted in the United States.[13-15]

Thus, while there has been an increased awareness of the existence of sport-related injuries, some successful countermeasures have already been applied to deal with a limited number of such injuries. The picture in Australia remains fragmented, which is in part due to the limitations in injury surveillance.

As defined by Last,[16] *surveillance* is the ongoing systematic collection, analysis and interpretation of health data that is needed to plan, implement and evaluate public health programs. In the realm of sports injuries, information currently forthcoming in Victoria is purely hospital based and aggregated for all sports from the hospital admission database that is supplied by those hospitals involved in the VISS.[6] Results of the VISS data,[7] showed that here were 2653 cases of sport-related injures presenting to the Royal Children's Hospital, Preston and Northcote Community Hospital and Western Hospital in the years 1989–90 for children under 15 years. However, as pointed out in that article, children with sports injuries also attend general practitioners, physiotherapists, podiatrists and other practitioners. Some injuries, because of their more serious nature, require immediate attention and are more likely to present to the Emergency departments of hospitals rather than other care centres.

Consequently, while VISS information is a very important means of identifying some sources of severe, acute injury, it has obvious limitations. To date, there are no national data on sports injuries (although two pilot surveys have been carried out by the Australian Sports Medicine Federation (ASMF) in 1983 and 1988).[6] While many professional bodies such as the ASMF, the Australian College of Sports Physicians, the Australian Sports Physiotherapists Association, and the Australian Council for Health, Physical Education and Recreation are concerned with sport-related injury prevention and treatment, their work is constrained by the lack of systematic surveillance.

A sports injury surveillance system which involves local sporting associations and clubs could do much to provide information on participation, and the circumstances of injuries. Such a system should take onto account the same design characteristics as those used for general injury surveilance systems.[17]

Limited information is available on injury and its prevention for many individual sports and recreational activities, and for certain injury types. A brief review follows for several of these. Assessments by the NSW Sporting Injury Committee of risk categories for a number of sports are shown in Tables 6.1 and 6.2.

6.2.1 Horse riding

As in the United States,[19,20] the total injury-related morbidity and mortality in Australia associated with horse riding is unknown. A recent review of the literature describing equestrian injuries in children and young adults found that, although the overall injury rate

was low, equestrian athletes are at risk of serious injury. Mortality studies in Australia and the United States have indicated that head injuries cause the majority of deaths (78% and 60%, respectively). Head injuries are also associated with 55 to 100 per cent of all hospitalisations of injured horse riders. Most of the non-fatal head injuries are concussions.

Table 6.1: Catastrophic injuries and risk categories of major sports considered by the NSW Sporting Injuries Committee (1983–88)

Sport	Accident cases encountered (1983–88)	Risk category*
Australian Rules	20	2
Basketball	–	4
Boxing	1	2
Cricket	2	4
Cricket (indoor)	1	–
Cycling	4	3
Gymnastics	1	4
Hockey	1	3
Netball	1	4
Pony riding	1	5
Rugby Union	24	1
Rugby League	81	1
Soccer	18	4
Squash	1	4
Touch football	3	4

*Risk category ratings are based on a score of 1–5 where: 1=high risk and 5=low risk
Note: Ratings have been developed by the NSW Sporting Injury Committee
Source: New South Wales Sporting Injuries Committee. Fourth Annual Report, 1989[18]

Table 6.2: The NSW Sporting Injury Committee ratings for high risk sporting activities

Sport	Risk category
Hang gliding	1
Mini motor-cycling	1
Motor sports racing	1
Spear fishing	1
Wood chopping	1
Grass skiing	2
Modern pentathlon	2
Parachuting	2
Skateboard riding	2
Snow skiing	2

Source: New South Wales Sporting Injuries Committee. Fourth Annual Report, National Sports Information Centre, Australian Sports Commission, Canberra, 1989[18]

In summary, the risk of serious head injury is higher for horse riders than for most other sports. However, few horse riders regularly wear protective head-gear. A recent study by Condie et al.[21] cites the perception that they are uncomfortable, expensive and inappropriate for some riding styles as major barriers to the use of protective head-gear. Indeed, a study of the biomechanical properties of the jockey skull-cap type of head-gear showed that they did

not perform well under lateral impact conditions and that bicycle helmets would have provided better protection.[22]

A campaign to promote the use of equestrian helmets has recently been reported as being a success.[21] A multifaceted approach of working with manufacturers to produce more acceptable helmets, mass education among the horse riding community and encouraging individual clubs and equestrian organisations to mandate a helmet policy is needed to reduce the risk of head injury. This sort of approach could also be implemented in Australia. A similar approach has been used to introduce mandatory helmet wearing for bicyclists and has already been shown to be effective in the Australian context.[23]

6.2.2 Australian Rules football

Very little research has been undertaken on non-elite players. Seward[9] undertook a three year survey of Victorian League injuries which he has recently compared with elite soccer and rugby. His study found thigh contusions (bruises) and hamstring and groin injuries to be the most common injuries.

The results of a hospital and community-based study of football injuries in children and adolescents undertaken by McMahon et al. have recently been released.[24] This study was undertaken in collaboration with the Victorian Football Development Corporation, the Australian Football League and the Victorian Injury Surveillance System. It assessed the incidence, nature and treatment of football injuries and the relative risks associated with modified rules football, compared with standard rules.

Seward[9] investigated children's football injuries at three Melbourne hospitals on the VISS database over the period 1989–90 and found that injuries to the fingers and lower arm, particularly fractures, were most frequent.[25] Modified rules were the principal recommendation.

The July 1993 edition of the Victorian Injury Surveillance System publication, *Hazard*, examined injuries to players aged 15 years and over who had presented, principally during 1992, to the Emergency departments of four Victorian hospitals. This study found face injuries caused by player contact, finger injuries caused mainly by the player contacting the ball, shoulder dislocations and fractured clavicles caused by player contact, and falls and ankle sprain (strains) caused when the player went for a mark or fell were the most frequent injuries. Head injuries, although not so frequent, were relatively severe.

The *Hazard* researchers recommended further research be undertaken to assess the incorporation of aspects of modified rules into senior games and the effectiveness of helmets, gloves, bicycle shorts, high or low cut boots, and ankle strapping.[26] The latter was also recommended by Seward.[9]

6.2.3 Cricket

Cricket injuries of children and adults were described in *Hazard* volumes 9 (1991) and 15 (1993) respectively.[25,26] Injuries caused directly by the ball accounted for 33 per cent of injury cases in children and 48 per cent in adults. Injuries directly from the bat represented 23 per cent of children's injuries, mainly to the face and scalp. The younger the child, the

more likely they were to be injured by the bat. Only two per cent of adult injuries were caused by the bat.

The head and face were the most frequently injured body parts for both children (40% injuries) and adults (26% injuries). Face and scalp bruising and cuts and lacerations were the most frequent injuries; concussion and face fractures, the most frequent admissions. Finger injuries, particularly fractures, were the second most frequent injury type.

The required use of helmets with face shields, softer bats for children and the effectiveness of low impact balls by players need to be investigated.

Egger[2] recommended adequate fitness preparation for cricket players since he believed the sport was often played by unfit players. Sudden twists and turns by unfit players can cause injuries such as sprains (strains), particularly to the ankle.

6.2.4 Basketball

According to volumes 9 and 15 of *Hazard*, the most frequent basketball injuries for children were finger injuries (31% injuries), whereas for adults ankle sprains (strains) were most common (28% injuries). Children were recommended to play modified rules involving a smaller, softer ball.[25,26]

ASMF[27] undertook a study entitled: ankle and knee injuries in elite and recreational netballers and basketballers. The study noted the main mechanisms of ankle injuries for both basketball and netball. Injuries were caused by landing, a sharp twist or turn, and treading on another players foot. This was consistent with the *Hazard* (vol. 15) findings.[26] The authors recommended that high boots be worn and correct landing techniques and ankle bracing and taping be investigated.

6.2.5 Netball

Hazard (vol. 9) noted the most frequent netball injuries for children were finger injuries caused by the ball hitting the fingers and lower arm injuries caused by falls. Knee injuries were negligible.[25]

For adults however, Egger,[2] ASMF,[27] and *Hazard* (vol. 15)[26] noted ankle, knee and hand injuries to be the most frequent injuries. Netballers were found to sustain five times more major and severe injuries than basketballers. In addition, players who had previously sustained knee injuries, were five-times more likely to incur them again. Ruptures of the anterior cruciate ligament of the knee were estimated to be at the rate of 0.4/1000 participants. These ruptures often require reconstruction and lengthy rehabilitation.[27]

Both *Hazard* (vol. 15)[26] and ASMF[27] recommended that the relationship between the cut of the shoe and ankle injuries, and the correct landing techniques to reduce ankle and knee injuries, be investigated. The bracing and taping of ankles, as recommended for basketball, to reduce injury, especially for those who have been previously injured, should also be investigated.

6.2.6 Soccer

Soccer injuries and rates have been well documented overseas.[2] *Hazard* (vol. 15) results were consistent in that adult injuries were generally to the lower limbs, particularly ankle sprains (strains) and resulted from contact in tackles or twists, and falls.[26] The International Soccer body (FIFA) introduced compulsory shin pads for players in both training and competition games around the world in an attempt to reduce such injuries.[2]

Egger[2] believed the education of coaches and trainers is below the level of other football codes and attempts should be made to upgrade this.

Children are most likely to suffer forearm fractures (13% injuries), usually the result of a fall.[25] Lower limb injuries, however, are also common for children. Rooball, a modified rules version of soccer, is recommended for children.

6.2.7 Eye protection

Sports-related eye injury is an important cause of vision loss. Many eye injuries can be prevented through proper supervision of play, enforcement of game rules and the use of eye protective devices.[11,14,28] Indeed the use of eye protection has been shown to prevent up to 90 per cent of all sports and recreational eye injuries in Canada.[11]

The activity causing most sports-related eye injuries varies from country to country. Nutbeam et al.[4] have recently identified squash, badminton and cricket players as a priority population for eye injury prevention. International studies have also targeted players of these sports because they are at particular risk of eye injuries that could be protected by eye-protective wear.

In an analysis of a Royal Victorian Eye and Ear Hospital (RVEEH) two-year dataset (November 1989 to October 1991), there were 700 cases of sport-related eye trauma (5% of all RVEEH eye traumas) including 154 admissions.[29] Sport-related injuries were more severe than non-sport eye injuries (22% of sport related cases were admitted, compared to 6% of other cases). The majority of these admissions were for hyphaemas (81%) and 19 per cent of the eyes were legally blind at the time of initial presentation. None of the sports participants had worn appropriate eye protection at the time of injury.[29]

The frequency of eye injury by sport presenting at RVEEH showed that squash (17% of injuries) presented most often, followed by Australian Rules football (16%), netball or basketball (12%), tennis (8%), indoor and outdoor cricket (each 7%) and badminton (3%).[29] Tennis, badminton and particularly squash were over-represented for eye injuries in relation to VISS presentations (VISS 2% tennis, 1% squash, 0.2% badminton).[29]

Protective eye wear is currently being encouraged in junior squash development programs, and an Australian standard exists, as of September 1992, for racquet sports (AS 4066). It was recommended in *Hazard* (vol. 15) that further research be undertaken to determine whether rule changes or improved enforcement of existing rules would reduce eye and other facial injuries in football.[30]

Because of the severity of many eye injuries and their long-term consequences for vision, there is an urgent need to increase awareness of the risk of eye injury. This should involve the education of players in safe techniques and the encouragement of the use of appropriate eye-protective wear in those at high risk of injury.[30] Preventive approaches to sports eye injures need to be implemented as a priority.

6.2.8 Cost-burden

Recreational and sporting injuries are a cost-burden on society. Costs to both individuals and the wider community are experienced in terms of the duration and nature of treatment, the sporting time lost, the amount of working time lost, permanent damage and disability, reduced quality of life and monetary costs.[31,32] Their prevention must be a major public health goal. This is particularly important because of the recent increase in community levels of participation in sports and leisure activities.[31] Because such activities are increasingly considered to be beneficial in many respects for society as well as individuals, there is every suggestion that participation levels will continue to increase. Unfortunately, increased participation rates equates to greater exposure to sports and recreational hazards, which could lead to an increase in the number of sports injuries.

The well-known health and other benefits of exercise need to be assessed in terms of a cost–benefit approach. For example, the benefits of the promotion of exercise for the prevention of conditions, such as cardiovascular disease and non-insulin dependent diabetes mellitus, need to be weighed up against potential injury risks. It is inevitable that health promotion activities in this country will change their focus to the promotion of 'safe activity' in the not too distant future. For this reason, the extent of the sports injury problem calls for preventive action based on the results of epidemiological studies since such promotion activities call for a strong scientific and medical basis.

6.2.9 The preventive approach to sports injury

Van Mechelen et al.[33] consider the prevention of sports injury problems to be based on a four-stage sequence of prevention:

- identification and description of the extent of the sports injury problem;
- identification of the factors and mechanisms that play a part in the occurrence of sports injuries;
- introduction of measures that could potentially reduce the future risk and (or) severity of sports injuries; and
- evaluation of the implementation step (by repeating step one).

It is clear that the success of such an approach relies on epidemiological studies of the aetiological factors that play a role in the occurrence of a sports injury.

Given the above framework for the prevention of sports injuries, it is important to develop a system of surveillance for these injuries. The lack of clear, coherent or relevant data for Australia makes this a priority. LaPorte et al.[34] have begun to explore this for the United States and have suggested an approach based on existing methods for the surveillance of communicable diseases. The suitability of such models for sports injuries in Australia would need to be assessed.

6.2.10 Exposure measurement

One of the major challenges of sports injury surveillance is defining and obtaining meaningful exposure data (e.g. the number of hours of sports participation).[33] This information is particularly necessary to facilitate the comparability of research reports. For ease of data collection, the most common measures of exposure reported have been a calendar period of time over which the data has been collected; for example, the number of injuries occurring per year or the number of days injured per year. However, these measures have well-known limitations in that they do not represent the numbers of injuries per exposure (participation) time. More appropriate exposure measures suitable for calculating sports injury incidence rates depend on the following factors:

- definition of 'sports injury' and 'sports participation';
- the method used to count injuries (prospective versus retrospective);
- the method used to establish the population at risk; and
- the representativeness of the sample.

6.3 Available data

6.3.1 Mortality

As classified at present, Australian routine mortality data identify only two categories of sports injury based on ICD9 E-codes E886.0 (fall on same level from collision, pushing or shoving, by or with other person in sports) or E917.0 (striking against or struck accidentally by objects or persons in sports) (Table 6.3).

Table 6.3: Identified sports injury fatalities: rates per 100 000 population, Australia, 1979–81 and 1989–91

Mechanism of injury	1979–81	1989–1991
Fall—same level: collision in sport (E886.0)	0.02	0.01
Collision in sport (E917.0)	0.04	0.00
All injuries	55.70	46.50

Occasional deaths are also known to occur in Australia for activities such as horse-riding, rock climbing, caving, snow skiing, water sports and hang-gliding. These are likely to be in addition to those coded in the above two categories.

Accidental drowning and submersion that occur during sports and recreational activities are assigned to E910.0 (accidental drowning and submersion while water-skiing), E910.1 (accidental drowning and submersion while engaged in other sport or recreational activity with diving equipment) or E910.2 (accidental drowning and submersion while engaged in other sport or recreational activity without diving equipment). These E-codes have not been accessed separately for the purposes of this report.

6.3.2 Hospital admissions data

As with mortality, hospital admissions identified using the few available ICD9 E-codes for general sports injuries (E886.0 and E917.0) will underestimate the actual incidence. This means that specific sports activities or mechanisms of injury cannot be readily obtained. The available data is shown in Table 6.4 but, since many sports injuries requiring hospitalisation are not defined by these mechanisms, these frequencies and rates are likely to be gross underestimates. In particular, many additional sports injuries would be expected to be subsumed by the injury category of overexertion, which is not specific to sport. When the peak age range for sports injury of 15–19 years is considered, the rates become 33.8 for 'fall — same level: collision in sport' and 125.7 for 'collision in sport'.

Table 6.4: Hospital admissions due to identified sport injuries, frequency and rates per 100 000 population, Victoria, July 1986–June 1991

	Hospital admissions	
Mechanism of injury	Yearly average frequency	Rate per 100 000 population
Fall–same level: collision in sport	480	11.6
Collision in sport	1771	42.6
All injury*	60381	1453.5

* Includes adverse effects

6.3.3 Emergency department data

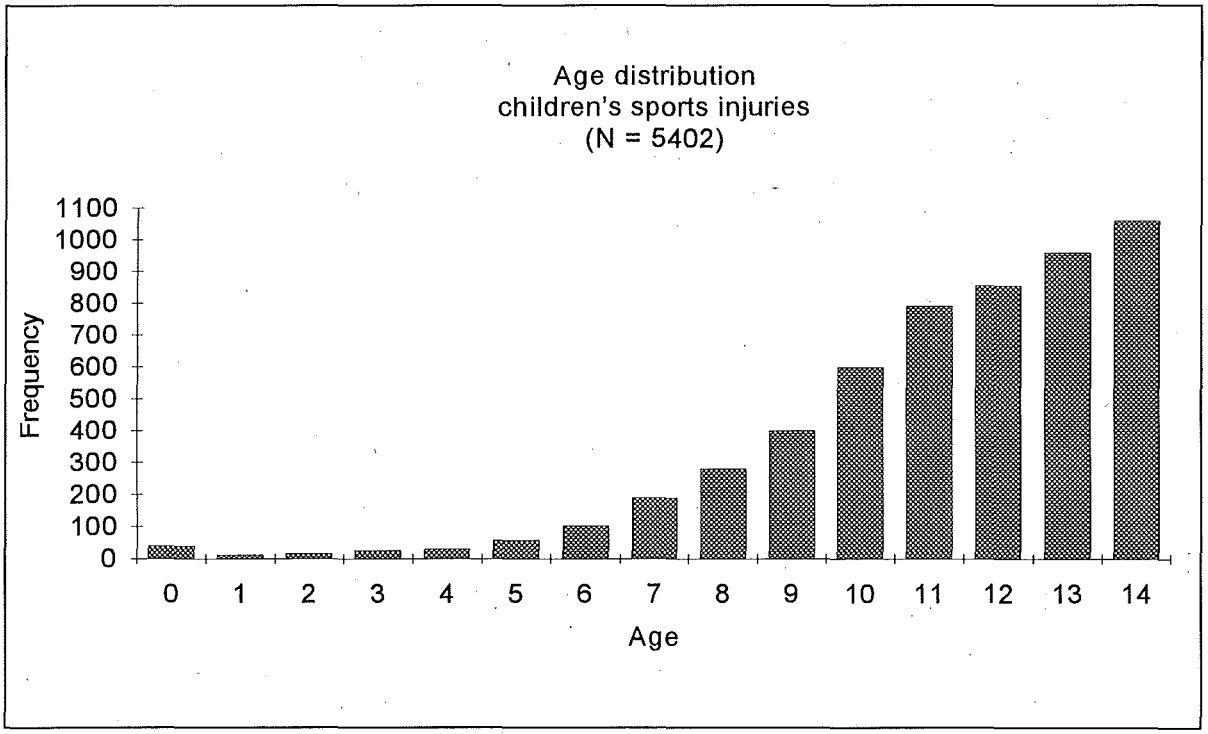
Fatal and catastrophic sport-related injuries are, fortunately, uncommon. Most sport-related injuries are not life-threatening, though they may result in significant disability and cost. Despite the rise in specialist clinical services for sport-related injury, many cases attend hospital Emergency departments. This section presents selected data concerning presentations to Emergency departments of hospitals in Melbourne that participate in VISS. VISS publications on sport-related injury may be consulted for further information.[25,26]

Table 6.5: Sport injuries for children less than 15 years, frequency and per cent by type of sport, 1989–92

All sports	Frequency of injury in children by sport			
	Injury presentations		Admissions	
	No.	Per cent	No.	Per cent
Football	1609	30	138	31
Soccer	788	15	61	14
Basketball	751	14	40	9
Cricket	452	8	43	10
Netball	293	5	11	3
Gymnastics	216	4	23	5
Physical education (schools)	218	4	17	4
Track and field	149	3	21	5
Baseball	116	2	12	3
Tennis	97	2	3	1
Martial arts	62	1	2	0
Hockey	68	1	8	2
Volley ball	51	1	4	1
Ball sports (other)	254	5	28	6
Sports not ball (other)	278	5	28	6
Total	5402	100	439	100

Source: VISS under 15 years: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

Figure 6.1: Sport injuries, ages 0 to 15 years, frequency by age, VISS 1989–92



Note: VISS under 15 years: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

Table 6.6: Sport injuries for children less than 15 years, percentage by nature of injury, VISS, 1989–92

	Nature of injury in children–percentage comparison				
Nature of injury	Football n=1678	Soccer n=823	Basketball n=785	Cricket n=488	Netball n=304
Cuts and lacerations	5	6	4	16	1
Bruising	18	27	16	29	15
Inflammation, swelling, oedema, pain	9	7	9	6	12
Fracture	30	30	29	20	22
Dislocation	3	2	2	1	1
Sprain (strain)	24	23	34	13	40
Concussion	6	3	2	4	2
Other	5	2	4	11	7
Total	**100**	**100**	**100**	**100**	**100**

Source: VISS under 15 years: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

Table 6.7: Sport injuries for children less than 15 years, percentage by body part injured, VISS 1989–92

	Injury in children by body part–percentage comparison				
Nature of injury	Football n=1678	Soccer n=823	Basketball n=785	Cricket n=488	Netball n=304
Head	6	4	4	7	2
Face and scalp	8	8	6	32	2
Upper arm (shoulder) or clavicle	7	5	3	4	3
Elbow or wrist or forearm	19	24	21	12	23
Hand	28	14	33	19	30
Trunk	6	4	3	3	2
Upper leg	2	2	1	1	1
Knee	7	11	8	5	8
Lower leg	4	6	2	2	2
Ankle	7	11	12	3	17
Foot	3	10	5	7	7
Other	3	1	2	5	3
Total	100	100	100	100	100

Source: VISS under 15 years: Royal Children's Hospital, Western Hospital, Preston and Northcote Community Hospital, 1989–92

Table 6.8: Sport injuries for adults greater than 15 years, frequency and per cent by type of sport, VISS and ABS 1989–92

Sport	Presentations (VISS)		Admissions (VISS)		Participants (ABS)	Estimate of relative risk**
	Number	%	Number	%	('000)*	
Aust. Rules football	1517	36	162	11	130.9	38
Soccer	602	15	49	8	57.1	35
Basket ball	511	12	27	5	139.8	12
Netball	371	9	21	6	159	8
Cricket	370	9	26	7	218.1	6
Rugby	95	2	8	8	8.6	37
Tennis	90	2	5	6	338.4	1
Hockey	79	2	6	8	32.7	8
Martial arts	70	2	7	10	20	12
Volleyball	68	2	4	6	53.9	4
Baseball	56	1	7	13	19.6	10
Squash	49	1	3	6	189.6	1
Other†	292	7	33	11	200.2	5
Total	4170	100	358	100	1378.3	10

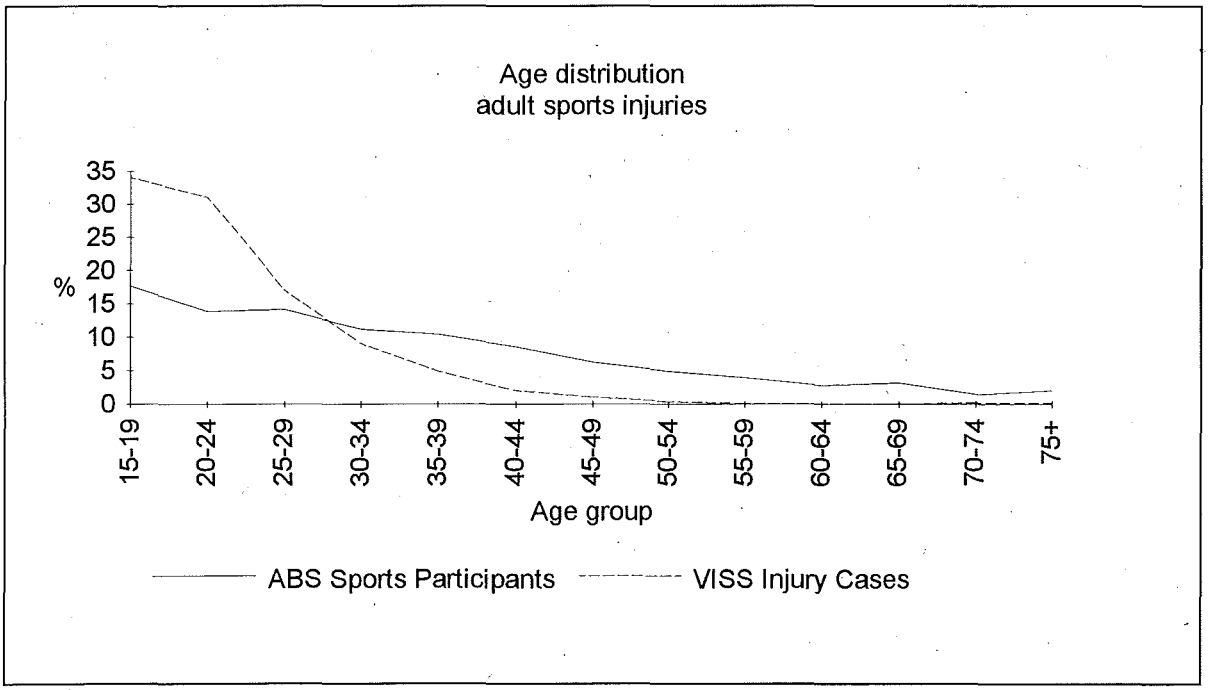
* ABS Sports Participation survey, Victoria, 1989[34]

** The rates in Column 7 are only a very rough estimate since the ABS figures relate to all of Victoria and the VISS statistics to the Emergency departments of VISS hospitals only. The formula used for this estimate is VISS presentations/ABS participants calculated relative to an index of 1 for tennis (the lowest risk sport)

†Sports included in 'other' are predominantly: boxing, lacrosse, physical education (schools), track and field, golf, badminton, horse riding, weight lifting, gymnastics and bowling (10 pin and lawn)

Sources: VISS 15 years and over: Western Hospital 2 years, Latrobe Regional Hospital, Preston and Northcote Community Hospital, Royal Melbourne Hospital 1 year

Figure 6.2: Sport injuries, ages 15 years and above, frequency by age, VISS and ABS 1989–92



Sources: VISS 15 years and over: ABS n=1 378 300, VISS n=4170; Western Hospital 2 years, Latrobe Regional Hospital, Preston and Northcote Community Hospital, Royal Melbourne Hospital 1 year. ABS Sports Participation survey, Victoria 1989[34]

Table 6.9: Sport injuries for adults greater than 15 years, percentage by nature of injury, VISS 1989–92

Nature of injury	Football n=1608	Soccer n=630	Basketball n=535	Netball n=388	Cricket n=398	Rugby n=100
Cuts and lacerations	7	6	6	2	11	8
Bruising	15	13	10	8	22	15
Inflammation, swelling, oedema, pain	11	12	8	15	17	14
Fracture	30	28	20	15	20	19
Dislocation	8	3	7	3	6	10
Sprain (strain)	21	33	45	54	19	26
Concussion	4	1	1	1	2	3
Other	4	4	3	2	3	5
Total	100	100	100	100	100	100

Note: Up to 3 injuries can be recorded per injury case
Sources: VISS 15 years and over: Western Hospital 2 years, LaTrobe Regional Hospital, Preston and Northcote Community Hospital, Royal Melbourne Hospital 1 year

6.3.4 Special studies

Studies, such as the Victorian-based Adolescent Health Study of 2500 adolescents in years 7, 9 and 11 at urban and rural secondary schools, have the potential to contribute to filling gaps in current knowledge in sports participation and injury rates. Stage one of this ongoing study will help to understand the extent of sports injury presenting to hospital, general practice and other practitioners. The results are also expected to confirm sports injury as one of the major health problems for adolescents.

Table 6.10: Sport injuries for adults greater than 15 years, percentage by body part injured, VISS 1989–92

Body Part	Football n=1 698	Soccer n=630	Basketbal l n=535	Netball n=388	Cricket n=398	Rugby n=100
Head	5	2	3	2	3	5
Face	15	9	10	5	23	20
Upper arm/shoulder/clavicle	12	6	3	3	6	16
Elbow/wrist/forearm	9	9	10	11	9	7
Hand	20	9	21	13	21	11
Trunk	7	5	2	1	7	11
Upper leg	2	3	0	1	0	3
Knee	8	13	8	14	9	9
Lower leg	4	10	3	3	3	3
Ankle	10	22	33	41	8	5
Foot	3	10	8	6	6	4
Other	5	2	2	1	5	6
Total	100	100	100	100	100	100

Note: Up to 3 injuries can be recorded per injury case
Sources: VISS greater than or equal to 15 years; Western Hospital 2 years; LaTrobe Regional Hospital, Preston and Northcote Community Hospital, Royal Melbourne Hospital 1 year

Current and proposed studies of injury presenting to general practice will also contribute to improved definition of the nature and dimensions of the sports-injury problem in Australia.

In addition, the National Sports Research Centre and the Victorian Health Promotion Foundation have jointly funded a feasibility study that commenced late in 1993, to determine improved sports-injury data collection methodologies. This study, undertaken by Monash University Accident Research Centre, includes a review of current injury and participation data systems, an analysis of overseas best practices, and an examination of the potential for sports-based data collections in the future.

The research programs of the National Sports Research Centre, the Australian Sports Medicine Federation, Health Promotion Foundations and the Public Health Research and Development Committee of the National Health and Medical Research Council have also funded research in specific sports (Australian Rules football, netball, basketball, gymnastics, equestrian sports) and specific sports injuries (e.g. eye injury in sport).

6.4 Discussion

A major area to be addressed in sports injury prevention is the establishment of improved data collection methodologies for both sports injury and participation rates. These data should be timely, nationally and internationally compatible, and disseminated for research, prevention and evaluation purposes.

The recently finalised National Minimum Dataset for Injury Surveillance,[36] which is compatible with the International Classification of Diseases (ICD) version 9, and also with the recently released version 10, should be considered as a logical core dataset for such collections. Implementation of nationally agreed sporting subcategories to supplement the sporting codes in the minimum dataset would greatly enhance future data collections and the potential to evaluate interventions.

A comprehensive systematic review of available sports injury countermeasures and their potential for success is urgently required. Interventions which have been proven to be successful elsewhere should be implemented as a priority.

In order to facilitate the implementation of research findings, closer liaison should be encouraged between researchers, sporting bodies, sporting equipment manufacturers and sports sponsors. The progress made towards eye protection in racquet sports in Australia is a good example of such cooperation.[37] A stronger focus of national sports safety networks on primary injury prevention would be expected to have greater benefits in terms of costs and sporting performance, than the existing major focus on secondary prevention (improved treatment following injury).

In addition, evaluation studies are required for countermeasures which have already been implemented. For example, evaluation of ASMF's Sports Training and Sports Awareness Courses, which have now been quite widely implemented, would guide the resource allocation to this intervention as well as providing feedback on the success or need for modification of particular components of the programs. Other countermeasures requiring evaluation studies are wrist guards in roller-blading and similar activities; knee and ankle

braces and taping, shin guards, and helmets in football and other sporting activities such as skiing. In addition, countermeasures, such as rule modifications; and exposure reduction, such as shorter quarters, fewer games, fewer players, reduced training, more interchange players and many others, need to be evaluated.

Where countermeasures are identified which have been proven to be effective, or are judged on biomechanical grounds to have good potential for prevention, there is scope for sports funding bodies, schools, municipalities responsible for sports and recreation centres, sports insurers, and the sporting associations to make playing of sports contingent on use of these countermeasures. A re-orientation of health funding (for example, through community health centres) from promoting exercise to the promotion of safe exercise also has the potential to encourage the adoption of countermeasure use and attitudinal changes.

6.5 References

1. National Sports Research Centre Newsletter July1992.
2. Egger G. Sports injuries in Australia. Canberra: Australian Government Publishing Service, 1990.
3. Egger G. Sports injuries in Australia: causes, costs and prevention. Health Promotion Journal of Australia, 1991;1 (1):28–33.
4. Nutbeam D, Wise M, Bauman A, Harris E, Leeder S. Goals and targets for Australia's health in the year 2000 and beyond. Report prepared by the Department of Public Health, University of Sydney for the Commonwealth Department of Health, Housing and Community Services, 1993.
5. Fong LP. Report to the Victorian Health Promotion Foundation's Sports Safety Promotion Working Party, 1992.
6. Langlois, JA, Hawkins, C, Penny, M, Brumen, IA, Saldana, R. Nonfatal injuries in Victoria: An overview. Clayton: Victorian Injury Surveillance System. Monash University Accident Research Centre, Victoria, 1992.
7. Victorian Injury Surveillance System. Hazard 1991;8.
8. Better Health Commission. Looking forward to better health, Volume 2, 1986. Canberra: Australian Government Publishing Service, 1986.
9. Seward HG, Patrick J. A three year survey of Victorian Football League injuries. Australian Journal of Science and Medicine in Sport 1992;24:51–54.
10. Janda JH, Wojtys EM, Hankin FM, Benedict ME, Hesinger RN. A three-phase analysis of the prevention of recreational softball injuries. Am. J. Sports Med. 1990;18:632–635.
11. Pashby TJ. Eye injuries in Canadian sports and recreational activities. Can. J. Ophthalmol. 1992;27:226–229.
12. McAuley E, Hudash G, Shields K et al. Injuries in women's gymnastics. The state of the art. The American Journal of Sport 1987.
13. Jones NP. Eye injury in Sport. Sports Med. 1989;7:163–181.
14. Stock JG, Cornell FM. Prevention of sports-related eye injury. Am. Fam. Physician 1991;44:515–520.
15. Ballance C. Ocular injuries in squash competitors. Nurs. Stand. 1992;6:25–27.

16. Last JM, ed. A dictionary of epidemiology, 2nd edition. New York: Oxford University Press, 1988:

17. Graitcer PL. The development of state and local injury surveillance systems. Journal of Safety Research 1987;18:191–198.

18. New South Wales Sporting Injuries Committee. Fourth Annual Report: National Sports Information Centre. Canberra: Australian Sports Commission, 1989.

19. Bixby-Hammett D, Brooks WH. Common injuries in horseback riding. A review. Sports Med. 1990;9:36–47.

20. Nelson DE, Bixby-Hammett D. Equestrian injuries in children and young adults. Am. J. Dis. Child 1992;146:611–614.

21. Condie C, Rivara FP, Bergman AB. Strategies of a successful campaign to promote the use of equestrian helmets. Public Health Rep. 1993;108:121–126.

22. Mills NJ, Whitlock MD. Performance of horse-riding helmets in frontal and side impacts. Injury 1989;20:189–192.

23. Finch CF, Heiman L, Neiger D. Bicycle use and helmet wearing rates in Melbourne, 1987 to 1992: the influence of the helmet wearing law. Report No. 45. Clayton, Victoria: Monash University Accident Research Centre, 1993.

24. McMahon KA, Nolan T, Bennett CM, Carlin JB. Australian Rules football injuries in children and adolescents. Med. J. Aust. 1993; 159:301–306.

25. Victorian Injury Surveillance System. Hazard 1991;9.

26. Victorian Injury Surveillance System. Hazard 1993;15.

27. Australian Sports Medicine Federation. Ankle and knee injuries in elite and recreational netballers and basketballers. Funded by: Victorian Health promotion Foundation, 1993.

28. Aburn N. Eye injuries in indoor cricket at Wellington Hospital: a survey January 1987 to 1989. New Zealand Medical Journal 1990;103:454–456.

29. Fong, LP. (in preparation). Sports eye injury preliminary results. Royal Victorian Eye and Ear Hospital.

30. Pashby T. Eye injuries in sports. J. Ophthalmic Nurs. Technol. 1989;8:99–101.

31. Avery JG, Harper P, Ackroyd S. Do we pay too dearly for our sport and leisure activities? An investigation into fatalities as a result of sporting and leisure activities in England and Wales, 1982–1988. Public Health 1990;104:417–423.

32. Sandelin J, Santavirta S. Occurrence and epidemiology of sports injuries in Finland. Ann. Chir. Gynaecol. 1991;80:95–99.

33. Van Mechelen W, Hlobil H, Kemper HC. Incidence, severity, aetiology and prevention of sports injuries. A review of concepts. Sports Med. 1992;114:82–99.

34. La Porte RE, Kohl HW, Dearwater SR et al. Surveillance of serious recreational injuries: a capture-recapture approach. Med. Sci. Sports Exerc. 1993;25:204–209.

35. Australian Bureau of Statistics, Sports participation survey, Victoria 1989. Cat. no. 4118.2. Canberra: ABS, 1990.

36. National Injury Surveillance Unit (NISU). National Minimum Dataset (Injury Surveillance). Adelaide: NISU, 1993.

37. Flynn, R. Protective eyewear, focus testing and evaluation: squash, raquetball and badminton. Unpublished report to the Vic Health Sports Safety Committee, 1993.

Chapter 7 Suicide and other self-injury

7.1 Introduction

Since 1990, suicide has been more common than motor vehicle crashes as a cause of death for males in Australia. Rates are rising, especially for young adult and adolescent males. The issue is attracting the attention of people in a variety of disciplines, notably psychiatry and public health. This section is largely restricted to public health approaches to suicide, and places emphasis on Australian literature.

7.1.1 Definitions

Many lethal or potentially lethal events in which self-destructive impulses play a part are either not recorded at all, or are not identified as such. For example, suicide by motor vehicle crash may be very difficult to distinguish from unintentional death from motor vehicle crash; and, similarly, suicide by drug overdose and unintentional overdose in a drug abuser.

The role of human intent is not always clear cut and may range from carelessness to reckless indifference to deliberate self-destruction. Traditionally, 'suicide' was an act of commission in which intent to cause self-destruction was the central issue (only in recent decades has suicide ceased to be a crime in most jurisdictions). Many potentially self-destructive acts may be engaged in for other reasons (e.g. recreational use of drugs, risky sports). At some point, engaging in extremely risky activities might be regarded as (attempted) suicide by omission of care, but this point is difficult to define.

Furthermore, suicide is an act that carries complex social and cultural significance, which may have important consequences for its measurement and control. For example, much has been written on the use of parasuicide ('suicidal gestures') as a means of indicating distress.

7.2 Literature review

Recent themes in the still modest, but expanding, body of Australian suicide literature are suicide by adolescents and young adults,[1,2] in rural areas,[1,3] among Aboriginal Australians,[4-6] and the role of firearms.[7-10] The latter topic is also prominent in international literature,[11] in which other topics are the suggested effects of media reports and personal knowledge of suicide cases in prompting suicides,[12-14] suicide in custody,[15] among the elderly,[16,17] and among immigrants.[18] The most numerous, however, are papers addressing suicide from a variety of psychiatric[19-23] and neuropathological[24,25] perspectives.

Goldney and Katsikitis,[26] Davis and Kosky[27] and other authors have pointed to changes in the age and sex distributions of suicide and attempted suicide in Australia during the past one to two decades. The chief changes are the rise in completed suicide rates for young males, and increasing prominence of males in rates of attempted suicide (previously, rates of attempted suicide, especially at young ages, were much higher for females than males).

Attention to the above aspects of suicide is not limited to Australia and some authors have presented international comparisons of suicide experience.[28-30] Diekstra[30] and Pritchard[28] have presented data showing that suicide rates in Australia and New Zealand rank high

among the countries examined for youths and young adults. However, rates at all ages in Australia are not particularly high in comparison with routine published data for other countries (e.g. refer to the WHO *World Health Statistics Annual*[31]), though the comparability of the data is not well established.

The following paragraphs, based mainly on Australian literature provide brief introductions to several contemporary suicide issues.

7.2.1 Youth suicide in rural areas

Dudley et al.[1] in a study of trends in youth suicide in New South Wales during the period 1964–88, found small changes in rates in large cities, but large increases in rural municipalities and shires. Youth suicide rates in the rural areas rose from 1.3 to 6.4 per 100 000 population per year. Males aged 15–19 years showed the greatest changes, rising from 3.9 to 20.7 per 100 000 population per year. Firearms were a common method in rural suicides.

In contrast, Cantor[3] using somewhat different methods to compare rates of suicide in urban and rural areas of Queensland during the five-year period 1986–90, did not find significantly greater rates in rural areas.

7.2.2 Suicide in Aboriginal Australians

Hunter has argued, on the basis of detailed studies in the Kimberley region, that in traditional Aboriginal societies suicide was rare[4] and remained so in the early years following major disruption of traditional society. Fifteen years or so later, however, the children of the generation who first experienced disruption, showed an increase in self-destructive behaviour.[5]

In part, Hunter's aim was to provide a context within which to understand the suicides in custody investigated by the Royal Commission into Aboriginal Deaths in Custody. Research conducted for the commission[32] showed that the very large over-representation of Aboriginal Australians among deaths in prison and in police custody reflects the equally large over-representation of Aboriginal Australians among people in custody. About one-third of the Aboriginal deaths in custody were attributed to suicide (in contrast, about half of the non-Aboriginal deaths were by suicide). About 90 per cent of the suicides were by hanging. Much attention was directed to a peak in hanging deaths in 1987, particularly involving young Aboriginal males in police custody.

7.2.3 Firearm availability and suicide

Accessibility is a major determinant of the method used for suicide. Whether reduction in accessibility leads to reduction of suicide, or simply to transfer to other means, is a controversial question. The answer may not be the same for all methods (see below).

The role of accessibility as a factor in use of firearms as a means of suicide is currently under scrutiny. Reflecting on recent Australian reports,[7–9] Goldney[10] has concluded that further restriction of the availability of firearms in the Australian community could be expected to have some positive effect on the occurrence of suicide, especially among males. The limited

strength of the available evidence is acknowledged in the reports. Reports from the United States have tended to be consistent with this conclusion.[11,33]

7.2.4 Other specific environmental factors

Apparent association between the replacement of highly toxic coal gas with less toxic natural gas in Britain with a persisting reduction of suicide rates is often cited as evidence that environmental change may affect suicide rates.[34] In Australia, displacement of highly lethal barbiturates by less lethal medications during the 1960s and 1970s seems to have led to sustained reductions in suicide rates, particularly for females (see Figure 7.7).

These instances have prompted consideration of whether other environmental changes offer potential in suicide control through restriction of access to means. The potential for control of some common means of suicide, notably hanging, drowning and jumping from high places, is limited. Special circumstances, such as prisons, provide greater opportunities for restriction of access to means (89 per cent of suicides in Australian prisons during the period 1980–88 were by hanging[35]). Motor vehicle exhaust is now the most common non-pharmaceutical means of suicidal poisoning in Australia. It has been noted that exhaust from most new vehicles is less toxic than that from older vehicles — a consequence of engineering changes prompted largely by environmental concerns. Further reduction of vehicle emissions may, in time, eliminate this as an effective means of suicide.

7.2.5 Demographic factors

Suicide rates have been found to vary with a number of demographic factors, the most important of which are age and sex (see data in Section 7.3, below). Among other demographic factors having established associations with suicide are marital status, immigration, and country of birth. Ruzicka and Choi have recently reviewed literature on these factors, and analysed their impact on Australian suicide rates since 1970.[36] They confirmed the previous finding of relatively high rates among those who are not married, whether never married, divorced, or widowed. The excess was particularly high for widowed males and for divorced females. Trends in rates within these groups have been affected substantially by differential changes in age structure. For example, most of the increase in suicide rates in the 'never married' group was attributable to changes in age structure.

Ruzicka and Choi also confirmed previous findings that suicide rates tend to be higher for immigrants than for non-immigrant counterparts in their country of birth. They also showed that country of birth is associated with suicide rate. Males in Australia who were born in New Zealand, Germany or Yugoslavia had significantly elevated suicide rates, while rates for men born in Italy or Greece were significantly lower than expected (case numbers were too small to allow analysis for many countries of birth).[36]

7.2.6 Social and cultural factors

Social and cultural determinants of suicide have long been studied. Theories originating with Durkheim's work, at the turn of the nineteenth century, on stresses resulting from social and economic change, continue to be influential.

Unemployment, as an important and common source of social and economic stress, has been a focus of work in this tradition. Morrell and colleagues[37] have reviewed literature on this

topic recently, and studied relationships between Australian unemployment rates and suicide rates in the period 1907–90. While female suicide rates fluctuated relatively little during the period, male rates showed peaks corresponding to periods of high unemployment, association being particularly strong at young ages (15–24) and for recent decades. While acknowledging the inherent limits of ecological study methods in deciding causality, the authors conclude that the study 'strongly supports the hypothesis that unemployment is significant as a predisposing factor for increasing the risk of suicide, particularly in males'.

7.2.7 'Contagions': information about suicide as a cause of suicide

During the mid-1980s, several authors published reports suggesting that exposure of adolescents to information about suicides, either through personal knowledge of cases[38] or via the mass media, increased the likelihood of 'copy cat' suicide.[12,13] A more recent study by Davidson and co-workers[14] did not confirm the earlier findings, although this issue cannot be regarded as resolved. The peak in numbers of deaths by hanging in police custody seen in several Australian States in 1987 might be an instance of this phenomenon.

7.2.8 Reporting suicide

In Australian culture, suicide tends to carry a stigma, which might lead families and professionals to under-report suicides (this stigma is not held in all societies). The 'undetermined intent' ICD category, available since 1968 for coding Australian deaths, might be expected to be used sometimes as a less stigmatising alternative to 'suicide'. However, use of the 'undetermined intent' category decreased during the first 15 years after it became available (see Figure 1.23A). Cantor found no indication that use of this category can explain major features of suicide data, and noted State-specific patterns in its use.[39]

The recording of suicidal acts might differ according to whether the person survives, leading to the possibility that mortality and morbidity data must be interpreted in different ways. It has been argued, for the United States, that such factors are not likely to compromise the validity or reliability of suicide mortality data.[40]

Non-fatal self injury is much less well described than completed suicide.[41] To a large extent, this reflects limitations in the data available. Hospital inpatient morbidity data have some potential (see later in this section), but are limited in scope. An Australian report on attempted suicide indicates the extent to which hospital inpatient data underestimates total incidence, and shows the dramatic effect that administrative changes can have on data.[27]

7.2.9 Predicting suicide

Clinicians have long been interested in predicting which individuals are likely to make suicide attempts, as the ability to do so with high specificity would enable preventive efforts to be focused onto a relatively small number of high-risk people. Prior attempt at suicide, along with factors such as drug abuse, previously diagnosed mental illness, low socioeconomic status, and unemployment are among the strongest predictors of suicide, both in the short and long term.[42,43] Unfortunately, the specificity of these factors is not very high, and they are common.

7.2.10 Preventing suicide

Prevention of suicide can be considered at the social and individual levels. Different strategies might be successful at one, or at both, of these levels. Some strategies act at both levels.

In general, literature on prevention at the individual level focuses on identification of individuals at risk, and the provision of various forms of psychiatric therapy or social support. To be practicable, intervention at this level depends on being able to identify persons at substantial risk with high specificity and at the appropriate time, and on the effectiveness of the preventive therapy. Suicide prevention, at a social level, depends on having reliable information on important risk factors and on having available means to change these.

As described above (predicting suicide), risk factors are known, but specificity is not very high. Knowledge of these risk factors and evidence that imitative suicide may occur has led to programs of suicide 'postvention', focusing on 'at risk' adolescents exposed to a completed suicide.[44] Some attempts at evaluating psychotherapeutic interventions have been reported without clear evidence of effectiveness in preventing subsequent suicide.[45]

Areas of suicide prevention that have received attention, largely at the social level, include: restriction of access to the means of suicide; control of exposure to violence in the media (this includes measures to prevent publicity about suicides); and, more generally, aspects of the social 'safety net' of measures to prevent extremes of poverty. Social planning measures, such as urban design, that are intended to enhance the quality of life were also included. As shown above, the literature offers little clear evidence of the effectiveness of most of these measures.

7.3 Available data

Australian mortality data have distinguished suicide from other causes of death for more than a century, though data prior to about 1920 have not often been presented (Morrell et al.[37] present age-standardised rates from 1907–90).

Figures 1.21A, B and C, in Chapter 1 of this report, summarise recent trends in age standardised suicide rates (since 1968), and current age-specific rates and case numbers in Australia. Reference is made to these figures at several points in this section.

Male suicide rates were about twice the female rates early in the period since 1968 (Figure 1.21A). Female rates have declined gradually throughout the period. In contrast, male rates fluctuated during the period, and have tended to rise since the mid-1980s. By the early 1990s, male rates were about four-times as high as female rates.

The proportion of male injury deaths accounted for by suicide is rising even more rapidly than the rate, reflecting substantial declines in deaths from other external causes (Table 7.1). Neither rates nor proportions of female suicide deaths have altered much in recent years, with the result that the M:F rate ratio for suicide has increased from 2.8:1 in 1979–81, to 3.8:1 in 1989–91.

While female suicide rates tend to fluctuate over time less than male rates, sustained movement of male and female suicide rates in opposite directions is unusual. But this has been the case since the mid-1970s in Australia (a similar pattern has been noted in England and Wales).[29]

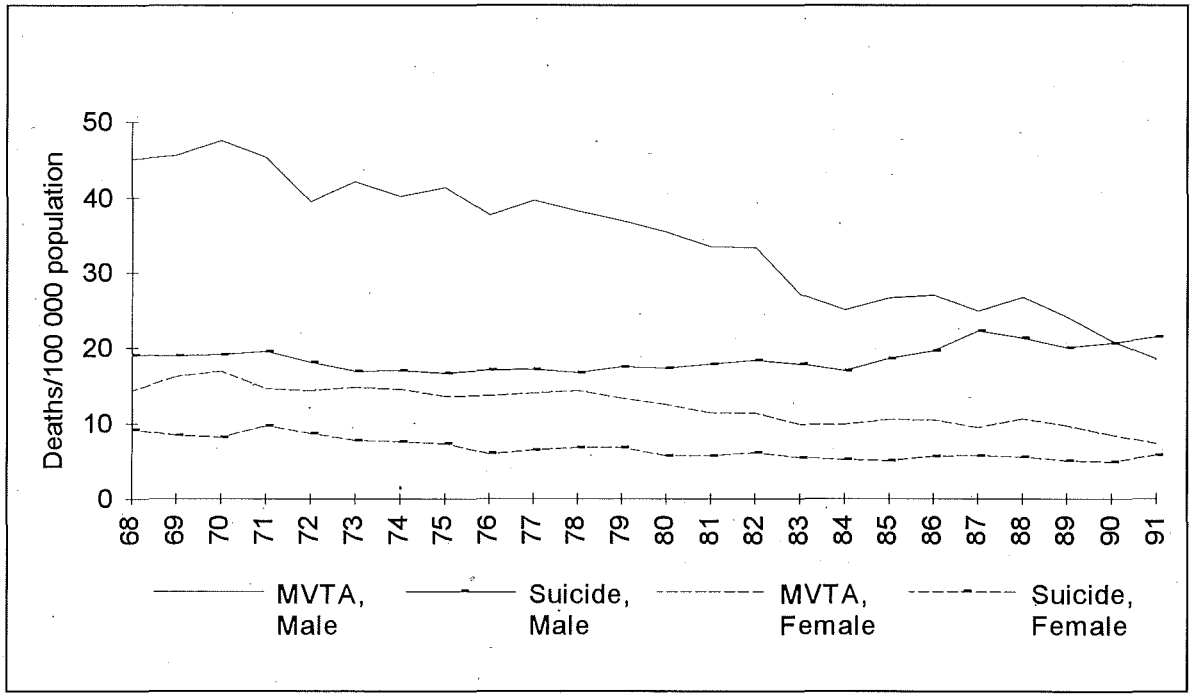
Table 7.1: Suicide and other external causes of mortality,† Australia: mean annual rate per 100 000 population during 1979–81 and 1989–91

	1979–1981		1989–1991	
	Male	Female	Male	Female
Suicide	16.6 (21.3%)	5.9 (17.9%)	20.5 (31.4%)	5.4 (19.5%)
Other external causes	61.6	27.4	44.9	22.3
Total	78.2	33.3	65.4	27.7

† All cases for which an ICD9 external cause code (E-code) was recorded

Figure 7.1 provides a stark indication of the increasing prominence of suicide as a cause of death for males. In 1970, road vehicle traffic crashes accounted for two-and-a-half times as many male deaths as suicide. In 1990, almost identical numbers of deaths were attributed to each cause and, in the two subsequent years, suicides have been more numerous than road deaths.

Figure 7.1: Rates of suicide and motor vehicle traffic accidents (MVTA), by sex, Australia 1968–91



Suicide rates vary with age (Figure 1.21C shows data for 1991). For males, rates rise from very low levels in childhood to about 30 per 100 000 at 20–24 years. Similar, or slightly lower rates are seen through most of adult life, before rising to a peak of about 50 per 100 000 at 80–84 years of age. The pattern for females is different — low childhood rates rising to a lower level (about 10 per 100 000) at 20–24 years, and remaining at about this level throughout the rest of adult life.

This pattern of age-specific rates has changed considerably in recent decades. As shown by Figure 1.21B, rates in the third and fourth decades of life have been increasing since 1968, while those in the fifth to seventh decades have tended to decline. Rates in extreme old age appear to have risen. The rise in rates early in adulthood has been more pronounced for males, while the decline in older adulthood has been more marked for females. In the longer term, the change in the age distribution of suicide has been much more marked for males (Figure 7.2) than for females (Figure 7.3).

Figure 7.2: Age distribution of suicide deaths for males, 1931 and 1991

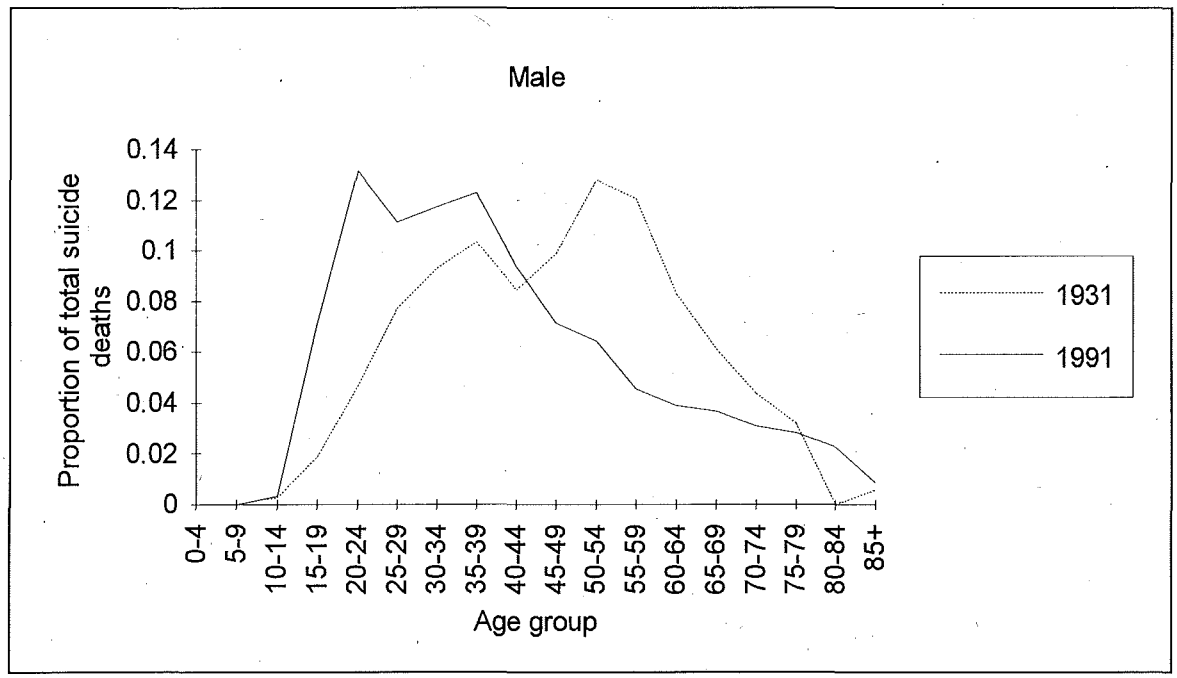
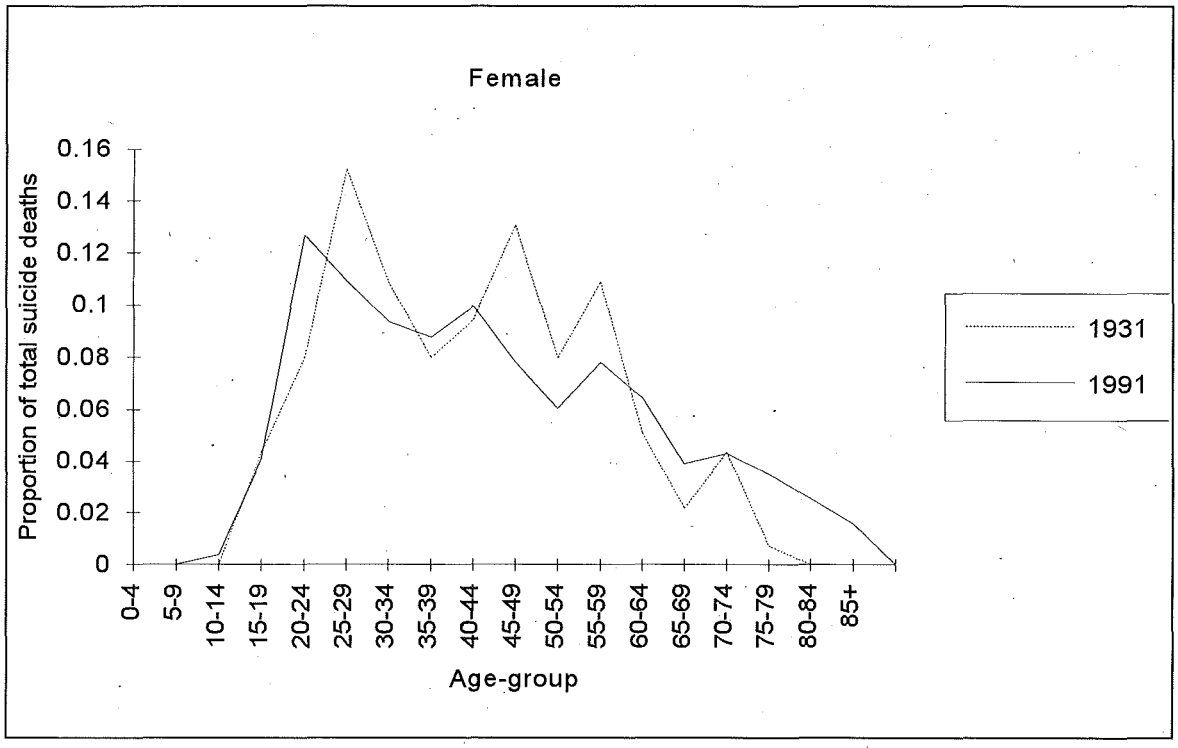


Figure 7.3: Age distribution of suicide deaths for females, 1931 and 1991



The use of particular modes of suicide varies with sex, age and other factors, and has changed over time. Figures 7.4 and 7.5 show, for males and females, proportions of suicides involving several common methods for each year from 1922–91. Standardised rates for the three most prominent methods are shown for a similar period in Figures 7.6 and 7.7. (For total rates of suicide, from all methods, see Figure 1.21A.)

Figure 7.4: Male suicide deaths: proportions by method, Australia, 1922–91

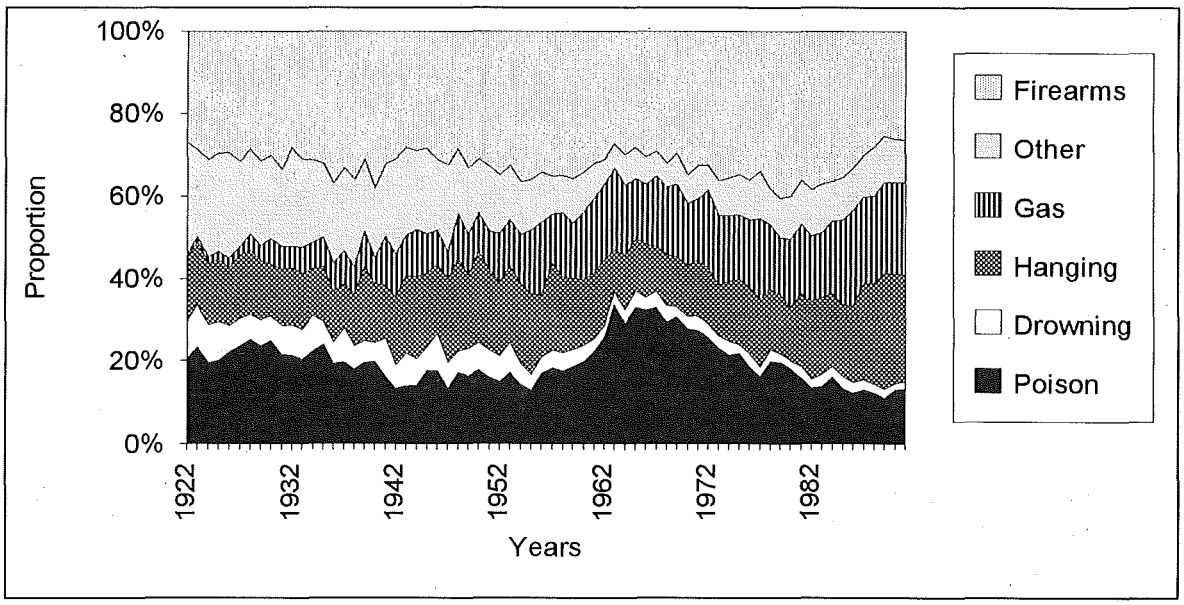
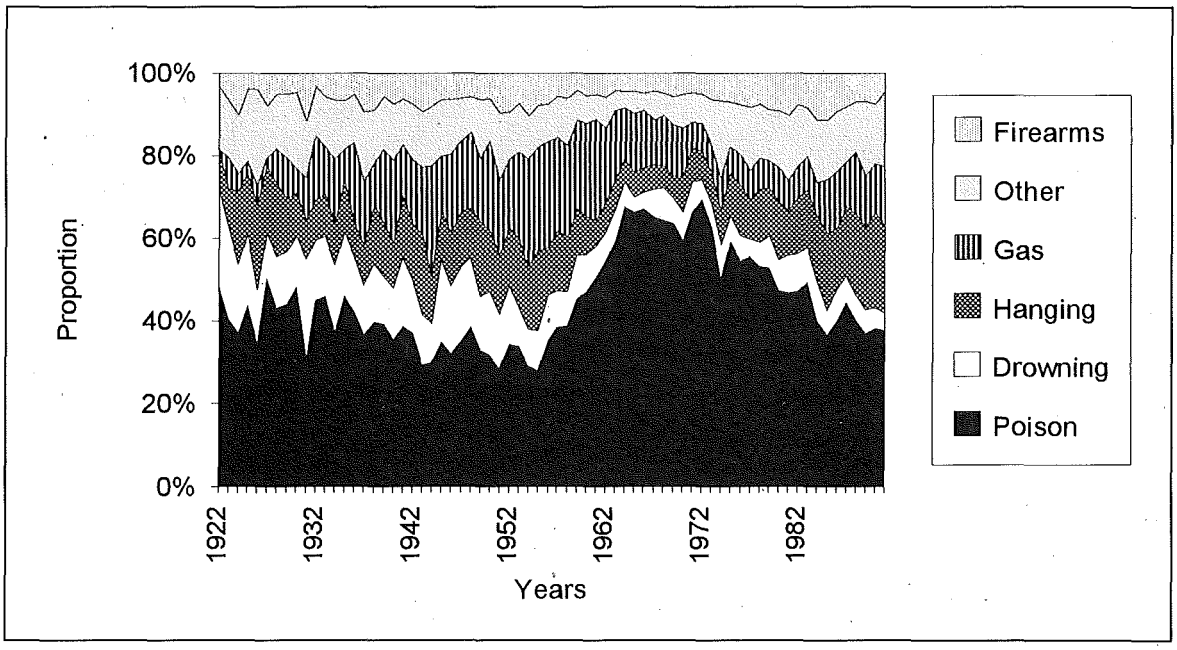


Figure 7.5: Female suicide deaths: proportions by method, Australia 1922–91



For males (Figures 7.4 and 7.6), firearms have been the dominant method for most of the period, rivalled only by poisoning by solids and liquids during the 1960s (the 'sedative epidemic') and by hanging in recent years.

For females (Figures 7.5 and 7.7), poisoning has long been the predominant means of suicide, overwhelmingly so during the 1960s and 1970s, when barbiturates and other hazardous tranquillisers were in widespread use. The low proportion of firearm suicides is notable, as is the recent rise in the rate of suicide by hanging.

Figure 7.6: Most prominent methods of male suicide, age standardised rates, Australia 1922–92

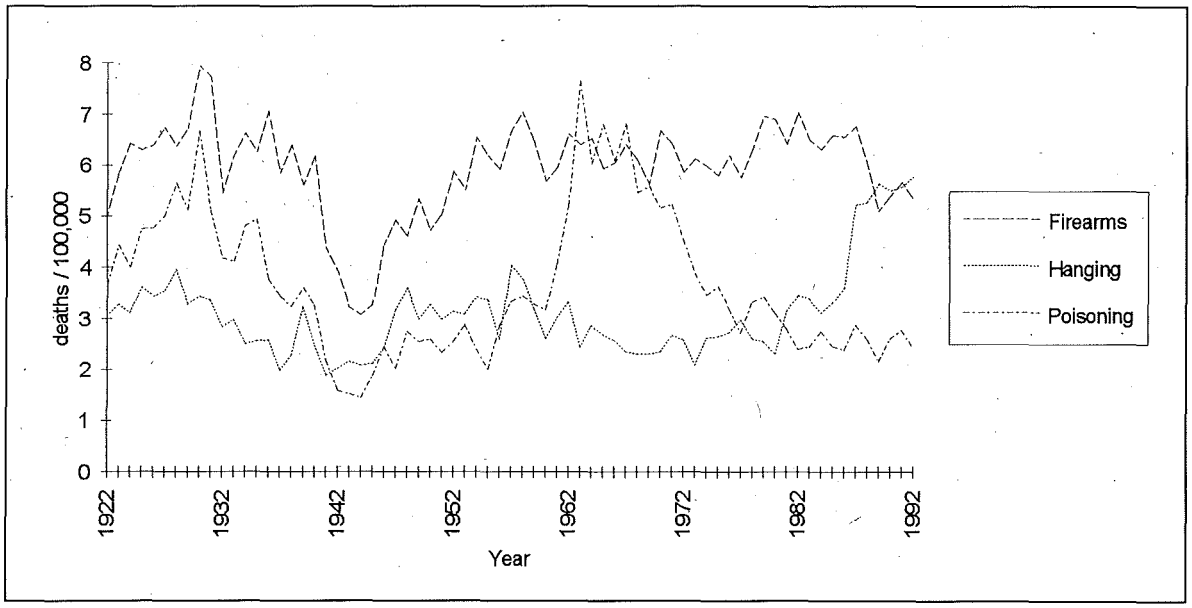
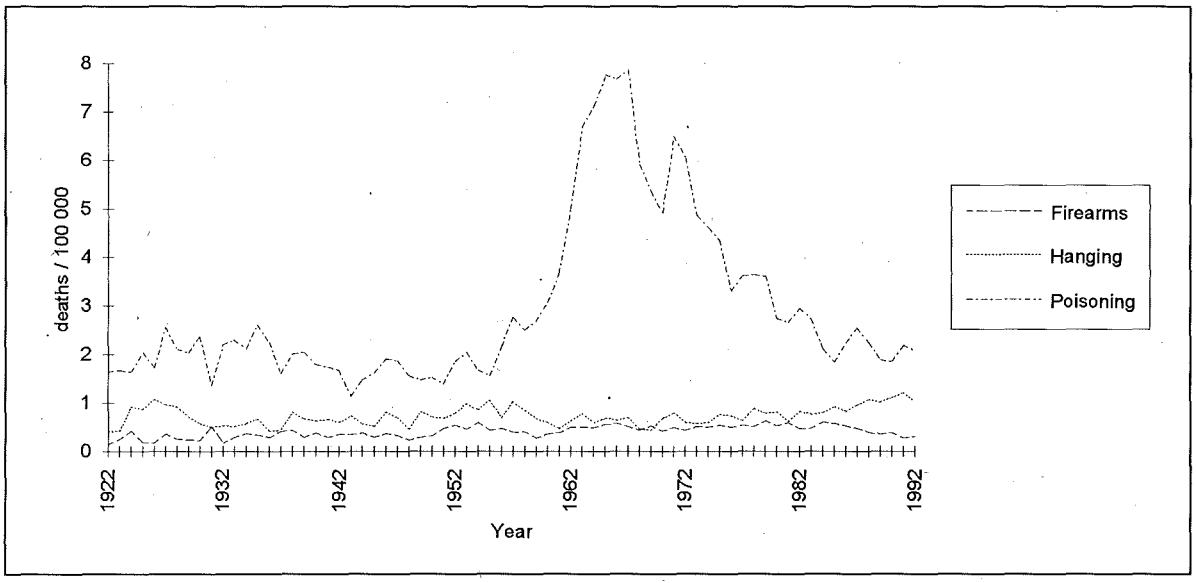


Figure 7.7: Most prominent methods of female suicide, age standardised rates, Australia 1922–92



Means of suicide do not, at present, vary greatly with age (Figure 7.8 and 7.9), though drowning tends to be used by older people and firearms are not used by older women. Age-specific differences were more marked earlier in the century (e.g. in 1929–31, poisoning accounted for three-quarters of female suicides in young adulthood, but less than one-quarter at ages over 50 years). Note that case numbers are small for the 10–14 age group.

Figure 7.8: Age-specific male suicide deaths: proportions by method, Australia 1989–91

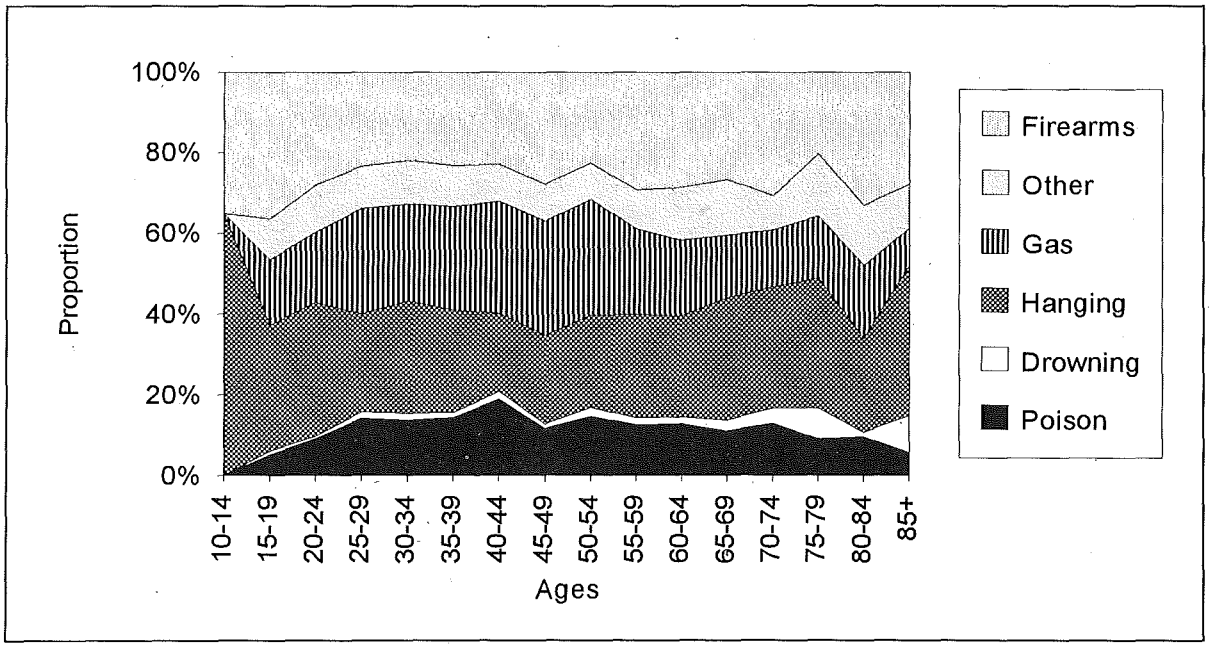


Figure 7.9: Age-specific female suicide deaths: proportions by method, Australia 1989–91

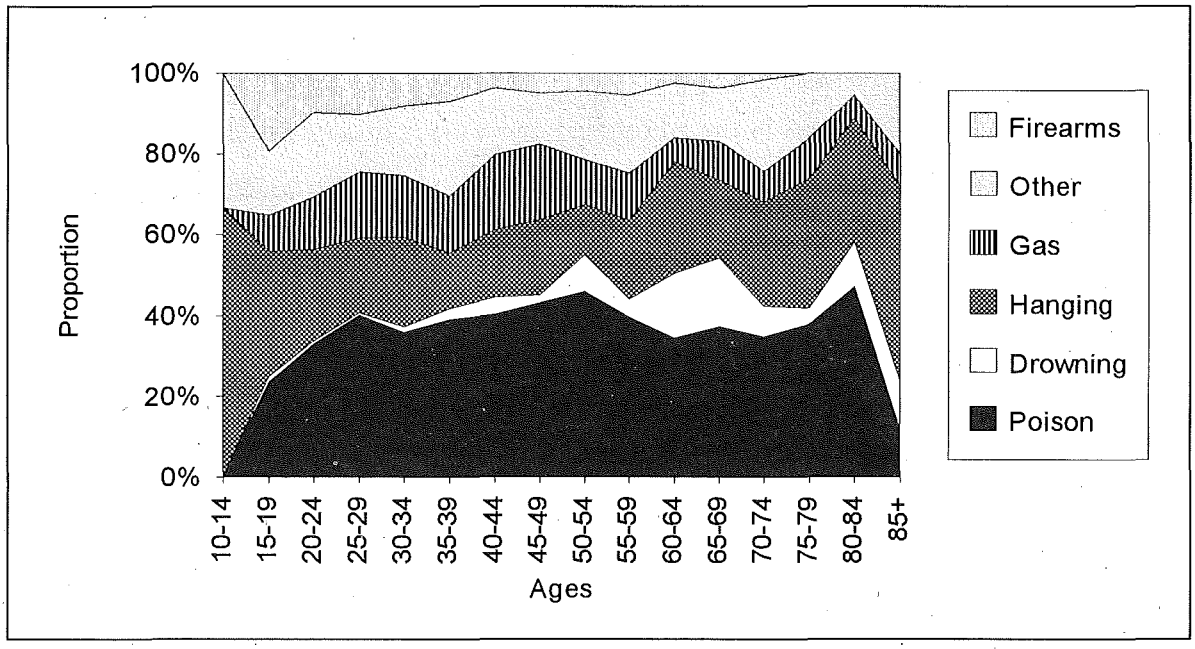


Table 7.2 shows the 1985–89 age-specific rates in Australia separately for people whose usual residence was in the Statistical District of a State or Territory capital city, and for all other persons. Rates for males are somewhat higher in areas other than capitals, especially in older age groups. In contrast, rates for females are higher in capitals at all ages. The high rate for elderly men resident outside capitals is noteworthy.

Table 7.2: Suicide rates per 100 000 population by locality of residence, males and females by age group, Australia 1985–89

Age	Male		Female		Persons	
	Capital city SD	Other	Capital city SD	Other	Capital city SD	Other
0–14	0.4	0.5	0.1	0.1	0.2	0.3
15–34	27.1	29.0	6.5	4.5	16.7	17.1
35–49	25.2	27.6	7.9	6.6	16.6	17.5
50–64	24.7	26.8	9.9	7.3	17.3	17.3
65–74	27.3	30.5	9.5	7.3	17.3	18.3
75+	36.6	43.3	9.7	6.5	19.0	21.3
All ages	**20.5**	**22.4**	**6.2**	**4.6**	**13.1**	**13.5**

SD = Statistical District

Source: Health Wiz National Social Health Database (Department of Human Services and Health)

Many, though not all, persons recognised as having undertaken parasuicide are admitted to a hospital. Figures 7.10 and Tables 7.3 and 7.4 show rates and proportions of hospital separations classified to suicide or parasuicide in New South Wales in 1991–92. Only at ages

15–24 are female rates substantially higher than male. For both sexes, the great majority of admitted suicide attempts involve self-poisoning. Other common methods tend to lead to rapid death or to 'near misses', with little or no injury. In either case, admission is unlikely.

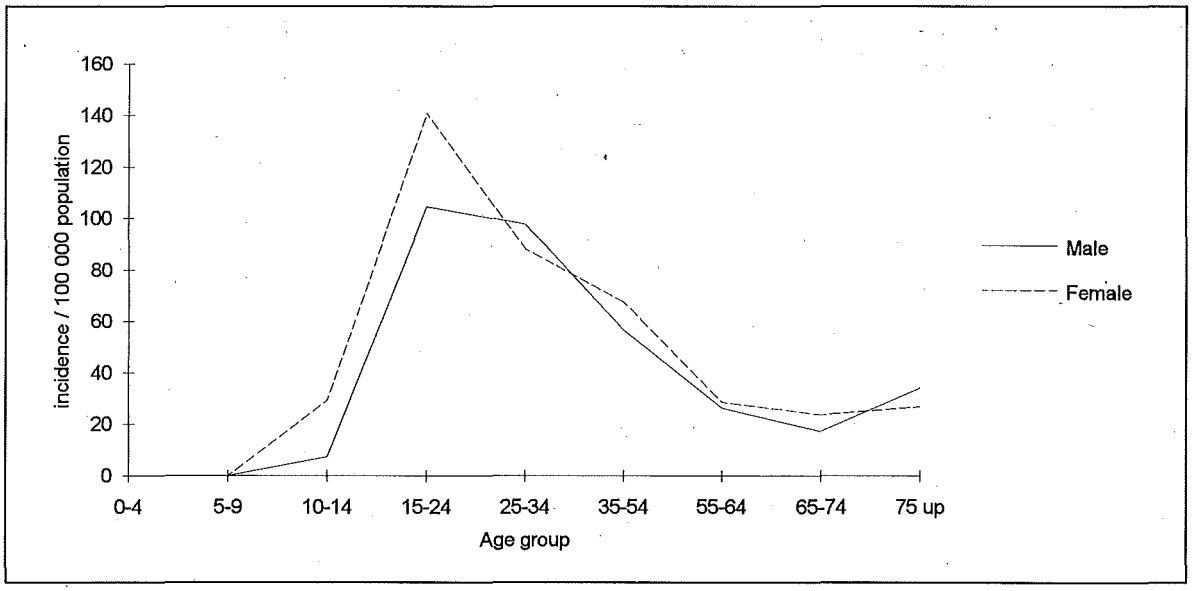
Overall, recorded suicide rates in the Aboriginal and Torres Strait Islander populations are similar to the rates for the non-indigenous populations. However, age-specific rates and methods used differ markedly (see Chapter 9).

Table 7.3: Inpatient separations for self-inflicted injury by sex (rate per 100 000 population), NSW 1991–92

	Sex	
Mode of injury	Male	Female
Motor vehicle exhaust	2.3	0.4
Hanging	1.0	0.3
Firearm	0.7	*
Poison, solids (liquids)	36.3	53.5
Cutting (piercing)	8.6	4.3
Unspecified (other)	3.9	2.0
Total intentional – self-inflicted	52.9	60.6

* Fewer than 4 cases

Figure 7.10: Hospital separations due to self-injury by age and sex, NSW 1991–92 (see also Figure 8.5 for Victoria)



7.4 Discussion

The rate of suicide for males in Australia is high and rising. While available data provide quite a detailed description (particularly of completed suicide), this is not equivalent to understanding the origins of the epidemic, nor how to control it.

The literature which seeks to interpret suicide and which advocates responses to it, has tended to be divided into two largely separate parts: that focusing on 'private pain' or mental illness, which advocates individual therapies; and the public health and sociological literature, which emphasises the impact of environmental factors, the effects of poverty and other stressors. A degree of polarisation is evident between proponents of these perspectives. In the face of the increasing size of the problem, it is difficult to argue that any single approach has unique validity.

Various factors interact in ways that may be complex. The complexity presents challenges to achieving understanding, though thoughtful and careful research can provide useful insights. For example, Hunter's work in the Kimberley region, based on detailed study using a variety of methods and in close association with a community, has done much to unravel relationships between social, economic and legal changes; the functioning of local communities and families; and individual behavioural responses to changed conditions. In this community, a manifestation of change has been a shift in patterns of death, including a marked rise in suicide (previously rare) among the generation born after major social disruption.[4,5]

While many approaches to prevention of suicide have been advocated, there is a lack of well evaluated, practicable interventions. A few environmental changes tend to be cited frequently as evidence of the potential of such approaches. For example, Kreitman[46] reported the decline in suicide rates in Britain following the replacement in the 1960s of toxic coal gas for domestic use with less toxic natural gas. It was argued that this was a true decline in suicides and not simply offset by increases in other means. In Australia, the decline in suicide (particularly of females) following the restriction of certain pharmaceuticals is the most compelling example. The extent of the impact of which environmental interventions are capable is not known, and evidence that such changes have an enduring beneficial effect on total suicide rates is limited.

If effective interventions are to be planned and implemented, a complex web of environmental and behavioural factors needs to be understood. Currently, the question of the potential benefit of further firearm controls is being debated. While stringent gun control has plausibility as a possible intervention (particularly because of the high lethality of the method), available research does not yet provide a clear guide to likely consequences (intended and unintended) of such a measure. In particular, is there reason to expect that further firearm restriction would lead to sustained reduction in harm (suicide and harmful parasuicide), rather than transferring to other methods? While better evidence of effectiveness of preventive interventions is desirable, it must be recognised that evaluation will often be very difficult (see also Section 8.2.2).

Suicide is a complex and poorly understood phenomenon. Many disciplines may be able to contribute to its understanding and control. The authors of the chapter on suicide in the

United States report *Injury Prevention: meeting the challenge* began with a paragraph which is apt here:[47]

> Knowledge about suicide is elusive. We try to count suicides yet we know that the numbers are wrong. We launch preventive programs without regard to whether they will work and then fail to evaluate them. It is time, therefore, to reassess what we think we know, to evaluate what has been done in the name of prevention, and to provide a firmer foundation for the development of new programs.

Attention to suicide has increased substantially in Australia in recent years, with establishment of professional and advocacy organisations, convening of a working party by the National Health and Medical Research Council, and organisation of conferences. These and other initiatives may provide the firmer foundation that is clearly needed if suicide prevention is to achieve the levels of success seen in controlling road trauma.

7.5 References

1. Dudley M, Waters B, Kelk N, Howard J. Youth suicide in NSW: urban-rural trends. Medical Journal of Australia 1992;156:83–88.
2. McKenna J, Edwards J, Williamson J. Youth suicide in the Australian Capital Territory. Australian Family Physician 1993;22:513–522.
3. Cantor CH, Coory M. Is there a rural suicide problem? Aust. J. Public Health 1993;17:382–384.
4. Hunter E. Out of sight, out of mind – 1. Emergent patterns of self-harm among Aborigines of remote Australia. Soc. Sci. Med. 1991;33:655–659.
5. Hunter E. Out of sight, out of mind– 2. social and historical contexts of self-harmful behaviour among Aborigines of remote Australia. Soc. Sci. Med. 1991;33:661–671.
6. Clayer JR, Czechowicz AS. Suicide by Aboriginal people in South Australia: comparison with suicide deaths in the total urban and rural populations. Medical Journal of Australia 1991;154:683–685.
7. Cantor CH, Lewin T. Firearms and suicide in Australia. Australian and New Zealand Journal of Psychiatry 1990;24:500–509.
8. Cantor CH, Brodie J, McMillen J. Firearm victims – who were they? Medical Journal of Australia 1991;155:442–446.
9. Snowdon J, Harris L. Firearm suicides in Australia. Medical Journal of Australia 1992;156:79–83.
10. Goldney RD. Firearms legislation and suicide (editorial). Medical Journal of Australia 1992;156:75
11. Kellerman AL, Rivara FP, Somes G et al. Suicide in the home in relation to gun ownership. New England Journal of Medicine 1992;327: 467–472.
12. Gould MS, Shaffer D. The impact of suicide in television movies. Evidence of imitation. New England Journal of Medicine 1986;315: 690–694.
13. Phillips DP, Carstensen LL. Clustering of teenage suicides after television news stories about suicide. New England Journal of Medicine 1986;315: 685–689.
14. Davidson LE, Rosenberg ML, Mercy JA et al. An epidemiologic study of risk factors in two teenage suicide clusters. Journal of the American Medical Association 1989;262:2687–2692.

15. Marcus P, Alcabes P. Characteristics of suicides by inmates in an urban jail. Hosp Community Psychiatry 1993;44:256–261.

16. Sorensen SB. Suicide among the elderly: issues facing public health. (editorial) American J. Public Health 1991;81:1109–10.

17. Meehan PJ, Saltzman LE, Sattin RW. Suicide among older US residents: epidemiologic characteristics and trends. American J. Public Health 1991;81: 1198–1200.

18. Raleigh VS, Balarajan R. Suicide levels and trends among imigrants in England and Wales. Health Trends 1992;24: 91–94.

19. Maltsberger JT. Dreams and suicide. Suicide and Life Threatening Behaviour 1993;23:55–62.

20. Caldwell CB, Gottesman II. Schizophrenia – a high-risk factor for suicide: clues to risk reduction. Suicide and Life Threatening Behaviour 1992;22:494–493.

21. Trovato F. A Durkheimian analysis of youth suicide: Canada, 1971 and 1981. Suicide and Life Threatening Behaviour 1992;22:413–427.

22. Appleby L. Suicide in psychiatric patients: risk and prevention. British Journal of Psychiatry 1992;161:749–758.

23. Cheung P. Suicide precautions for psychiatric inpatients: a review. Australian and New Zealand Journal of Psychiatry 1992;26:592–598.

24. Stenager EN, Stenager E. Suicide and patients with neurologic diseases. Methodological problems. Archives of Neurology 1992;49:1296–1303.

25. Nordstrom P, Asberg M. Suicide risk and serotonin. Int. Clin. Psychopharmacol 1992;6(Suppl 6):12–21.

26. Goldney RD, Katsikitis M. Cohort analysis of suicide rates in Australia. Archives of General Psychiatry 1983;40:71–74.

27. Davis AT, Kosky RJ. Attempted suicide in Adelaide and Perth: changing rates for males and females, 1971–1987. Medical Journal of Australia 1991;154:666–670.

28. Pritchard C. Youth suicide and gender in Australia and New Zealand compared with countries in the Western world 1973–1987. Australian and New Zealand Journal of Psychiatry 1992;26:609–617.

29. Charlton J, Kelly S, Dunnell K, Evans B, Jenkins R, Wallis R. Trends in suicide deaths in England and Wales. Population Trends 1992;No. 69:10–16.

30. Diekstra RFW. Suicide and attempted suicide: an international perspective. Acta Psychiatr. Scand. 1989;80(suppl 354):1–24.

31. World Health Organization. World health statistics annual 1992. Geneva: World Health Organization,1993.

32. Biles D, McDonald D, eds. Deaths in custody Australia, 1980–1989: the research papers of the criminology unit of the Royal Commission into Aboriginal Deaths in Custody. Canberra: Australian Institute of Criminology.

33. Brent DA, Perper JA, Allman CJ, Moritz GM, Wartella ME, Zelenak JP. The presence and accessibility of firearms in the homes of adolescent suicides. Journal of the American Medical Association 1991;266:2989–2995.

34. Kreitman N. Can suicide and parasuicide be prevented? Journal of the Royal Society of Medicine 1989;82:648–651.

35. Biles D, McDonald D, Fleming J. Australian deaths in prisons 1980–88: an analysis of Aboriginal and non-Aboriginal deaths. In: Deaths in custody Australia, 1980–1989. Eds David Biles and David McDonald. Canberra: Australian Institute of Criminology.

36. Ruzicka LT, Choi CY. Suicide mortality in Australia, 1970–1991. J. Aust. Population Assoc. 1993;10:101–117.

37. Morrell S, Taylor R, Quine S, Kerr C. Suicide and unemployment in Australia. Soc. Sci. Med. 1993;36: 749–756.

38. Farrell JW, Petrone ME, Parkin WE. Cluster of suicides and suicide attempts - New Jersey. Morbidity and Mortality Weekly Report (MMWR) 1988;37, no.14 (reprinted in 'Injury epidemiology and control'. MMWR Reprints, September, 1988:47–49.

39. Cantor CH, Dunne MP. Australian suicide data and the use of the 'undetermined' death category (1968–1985) Australian and New Zealand Journal of Psychiatry 1990;24:381–384.

40. O'Carroll PW. A consideration of the validity and reliabilty of suicide mortality data. Suicide and Life Threatening Behaviour 1989;19:1–16.

41. Birkhead GS, Galvin VG, Meehan PJ, O'Carroll PW, Mercy JA. The emergency department in surveillance of attempted suicide: findings and methodologic considerations. Public Health Reports 1993;108:323–331.

42. Nordentoft M, Breum L, Munck LK, Nordestgaard AG, Hunding A, Bjaeldager PAL. High mortality by natural and unnatural causes: a 10 year follow up study of patients admitted to a poisoning treatment centre after suicide attempts. British Journal of Medicine 1993;306: 1637–1641.

43. Hawton K, Fagg J, Platt S, Hawkins. Factors associated with suicide after parasuicide in young people. British Journal of Medicine 1993;306:1641–1644.

44. Hazell P. Postvention after teenage suicide: an Australian experience. Journal of Adolescence 1991;14:335–342.

45. Moller J. Efficacy of different strategies of aftercare for patients who have attempted suicide. Journal of the Royal Society of Medicine 1989;82:643–647.

46. Kreitman N. The coal gas story: United Kingdom suicide rates 1960–1971. Br J Prev Soc Med 1976;30:89–93.

47. National Committee for Injury Prevention and Control. Chapter 16: Suicide. In Injury Prevention: meeting the challenge. Americal Journal of Preventive Medicine 1989; suppl volume 5, No. 3.

Chapter 8 Interpersonal violence

8.1 Introduction

The National Committee on Violence, which was formed late in 1988 and published its major report, *Violence: directions for Australia*, (1990), did much to describe and explain the occurrence of violence in Australia, drawing together many of the disparate viewpoints and data that relate to this complex topic.[1] The committee offered a large number of recommendations for prevention and control of violence, some of which are reproduced later in this chapter. There has been no attempt here to go over the ground covered by the National Committee on Violence, and interested readers are encouraged to refer to the committee's report and other publications as a starting point for further reading.

The focus of this chapter is injury resulting from interpersonal violence, and its control, taking a public health perspective. The other major aspect of intentional injury, self-directed injury, is the subject of Chapter 7. Four facets of interpersonal violence are given special attention here: domestic violence; homicide; violence in schools; and child abuse. Injury in the indigenous Australian population resulting from interpersonal violence is considered in Chapter 9.

Somewhat fragmented data are available from several sources. Current data are provided in this chapter from coronial, health sector and crime statistics sources, as well as from recent research reported in the literature review. Although a large number of preventive measures have been identified from the literature, very few have been evaluated formally, and demonstrated to be successful.

8.2 Literature review

This section draws on the relatively limited Australian literature pertinent to public health dimensions of interpersonal violence, which is supplemented by, and contrasted with, literature referring to other countries. The United States is the source of much of the comparative information, reflecting the high and rising level of violent injury, and of preventive efforts, in that country. A useful general reference to the United States experience is *Violence in America: a public health approach.*[2]

Langlois et al.[3] analysed Victorian hospital admission injury data over a five-year period 1986–1991, and found that 22 760 cases were attributable to intentional injury (10% of all injury hospitalisations). For children aged less than 15 years, intentional injury accounted for 2 per cent of all injury hospital admissions.

These authors found that of all intentional injuries admitted to hospital, 52 per cent were due to self-inflicted injury and 48 per cent to injuries inflicted by others. Of injuries inflicted by others, 73 per cent were the result of an unarmed fight (brawl). Males were over-represented in every age group, particularly between the ages of 10 and 44 years. They also found a slight increase in hospitalisation rates for both self-inflicted injury and injury inflicted by others over the five-year period.[3]

The Victorian Injury Surveillance System (VISS) investigated the frequency of intentional injury presenting to the Emergency department of several Victorian Public Hospitals.[4] Findings showed that fights, assault, and intended self-harm made up a significant proportion of all Emergency department presentations for adults 15 years and over (13% of all adult-injury presentations). Reports from the State Coroner's Office stated that child abuse accounted for 4 per cent of injuries resulting in death for children, during the period 1989–90.[4]

Henderson reported on data collected from the Victorian State Coroner's Office during the period July 1989–June 1990.[5] Of the 1698 unnatural deaths recorded, two-thirds were unintentional and 26 per cent were self-inflicted. Four per cent of the deaths were the result of assault (n=56), and intent was unknown in 5 per cent of the cases. Of the 56 homicides recorded, 39 per cent refer to stabbing or cut throat, 25 per cent to shooting, 25 per cent to beating (bashing, assault), 7 per cent to choking (suffocation, strangulation), 2 per cent to drowning, and 2 per cent to other injuries.[6]

Major surveys of general practice presentations undertaken both in the Latrobe Valley and Australia wide, have not specifically identified intentional injury and, therefore, contribute very little to providing information from this data source.[7–9] Results of further general practice studies in progress in the Australian Capital Territory and proposed for the Latrobe Valley are expected to become available in 1994.

8.2.1 Domestic violence

United States literature on domestic violence is growing rapidly.[2,10–12] It has been estimated that as many as 95 per cent of cases of domestic violence go unrecognised by treating medical staff in the United States,[11] and that between 22 and 35 per cent of all women seeking emergency treatment do so as a result of abuse-related injury.[10] The New York Police Department Domestic Violence Prevention Program has reported that at least two police visits were made in 85 per cent of the cases prior to domestic homicide, and five visits in 50 per cent of the cases.[12]

Rounsaville and Weissman (1977)[13] in what may be the first published study of battered women attending a hospital Emergency department found that battered women accounted for 3.8 per cent of surgical admissions over a one-month period. All were offered follow-up psychiatric treatment, but only 35 per cent of the women kept their next appointment with the psychiatrist. The average period of abuse was 6.7 years; 48 per cent of the women were subject to abuse at least once a month; the majority of injuries occurred to the head and neck region; and 54 per cent of the women had attended the Emergency department before (only 15 per cent had been previously identified as victims of partner abuse);

In an English study of 50 women residing in a women's aid refuge, Pahl[14] found that 32 had confided problems of domestic violence with their general practitioner, 35 had called in the police, and 40 had spoken with a social worker. In reference to the 32 women who had confided in their doctor, 44 per cent claimed their physicians had not been helpful; for example, prescribing antidepressants and tranquillisers, or giving them inappropriate, irrelevant or unsympathetic information. In contrast, the most helpful doctors offered sufficient consultation time to delve into patients' marital problems, offered appropriate (often non-medical) long-term solutions, and documented the physical evidence of abuse that

could be used later in support of judicial proceedings or securing housing commission accomodation. Hence, medical treatment constituted only a small part of the physicians' role in treating domestic violence.

Goldberg and Tomlanovich (1984)[15] surveyed 492 Emergency department patients in a United States hospital and found that 22 per cent identified themselves as victims of domestic violence. The authors concluded that Emergency department personnel should be able to refine identification of domestic violence victims, and offer them appropriate assistance, including treatment and crisis intervention.

Brismar et al.,[16] in a European study in 1983–84, found that battered women comprised 9.1 per cent (n=117) of all women presenting to the hospital with injuries, and 3 per cent of all female hospital Emergency department presentations over that period. About half of the women accepted a program of treatment, including psychosocial support. The women who declined treatment tended to present with less serious injury patterns, and more often attended for the purposes of documenting their injuries with a view to future legal proceedings. Half of the battered women in the treatment group were immigrants compared to 24 per cent in the control group. Furthermore, the treatment group made higher use of both somatic and psychiatric care over the 10 years proceeding, than the age-matched controls.

While acknowledging praise for the medical profession for its detection of child abuse, Mullen[17] claims that it is lacking in its identification and treatment of victims of domestic violence. Women often present to 'doctors on numerous occasions with bruising, other soft tissue injuries, fractures and even marks of strangulation, without adequate enquires being made into the source of these injuries'. Anxiety states, depression, and non-specific complaints of physical disorder may serve as masks of physical abuse and are often overlooked as potential indicators of domestic violence. Mullen believes that the responsibility for detecting domestic violence largely resides with the physician, and that when a woman presents with evidence of being beaten, it is the physician's responsibility to find out the nature and origin of the physical trauma commonly present, despite her reluctance to disclose this.

Mullen[17] argues that domestic violence involves a complex cycle of violence which manifests throughout the generations of a family. He states that a woman who has grown up in an environment with domestic violence and has witnessed her own mother being abused, is more likely to enter an abusive relationship herself. Mullen claims that feelings of being trapped in the abusive relationship, fear of leaving, economic dependence, family responsibilities, and shattered self-esteem, all contribute to why a woman remains in the abusive situation. Pahl[14] takes this further by claiming that women often try to conceal the fact that they have been abused due to feelings of shame at not being able to achieve a 'normal' family relationship; the need to protect the abuser; and to protect children. For example, in a study of 100 battered wives from a Women's Aid Hostel in England, Gayford[18] found that 54 left their abusive husbands because the violence extended to their children.

Bergman and Brismar[19] found that of the 98 acutely battered wives who attended a surgical Emergency department, wife battering was recorded in only 18 per cent of patient medical records. All of these women had been hospitalised in the preceding ten years for similar

injuries and 73 per cent were already known to the social services. Bergman and Brismar concluded that not only does this suggest a deficiency in the identification of domestic violence victims in the Emergency department of hospitals, but that cooperation between medical and social services and the police is poor. Goldberg and Carey[20] list characteristics that should alert health care personnel to the possibility of domestic violence:

- repeated Emergency department visits for minor injuries
- history of being 'accident prone'
- soft-tissue injuries
- injuries on areas of the body normally covered by clothing
- implausible explanations for injuries
- simplistic or vague explanations for injuries
- psychosomatic complaints
- depression
- pain — especially chronic
- substance abuse in patient or spouse
- suicidal gestures or attempts
- psychiatric history in patient or spouse
- previous marriage counselling
- history of prior physical abuse
- history of observing someone else being abused
- history of sexual abuse

The Australian literature is more limited. A 1988 Queensland Domestic Violence Task Force Phone-In[21] prompted 856 reports of domestic violence over a four-day period.

In the report *Goals and Targets for Australia's Health in the Year 2000 and Beyond,* Nutbeam et al.[22] cited several reports. A Victorian study found that domestic violence comprised 23 per cent of serious assaults on civilians between 1987 and 1989. The 1987 Australian Bureau of Statistics National Victims of Crime Survey reported that 36 per cent of women had been assaulted in the home, compared with 10 per cent of men. Domestic violence has been specifically identified as a public health issue in the National Health Goals and Targets, and a target has been set to reduce morbidity resulting from domestic violence, with women as the priority population.[22]

The Victorian Parliamentary Social Development Committee 1988 report on community violence[23] made special reference to children, young people and families and included recommendations for raising public awareness and targeting child and spouse abuse. The committee acknowledged abuse in the home as a widespread problem; noted that the full nature and extent of family violence was unknown; isolated the need for comprehensive data collection; and suggested a number of ways in which this could occur. The committee also noted that Victorian police did not keep accurate statistics of child abuse related investigations — data was only available from the Community Policing Squads[21] (this problem may be solved during 1993 with the launch of the new Victorian police on-line database called 'LEAP').

The epidemiology of domestic violence that presents before the medical profession is being investigated by Roberts.[24] The study aims to investigate the prevalence of domestic violence presenting to the Emergency department of a public hospital, and to determine the rate of

detection of abuse by medical staff, and to test whether an education program would improve the detection and management of domestic violence by medical staff. Preliminary findings from Stage 1 of the study showed that 23.4 per cent of females and 11.8 per cent of males reported a history of abuse. The respondents who reported on a history of domestic violence were more likely than others to report that they had suffered violence as a child. Victims of child abuse also showed a tendency for domestic violence victimisation later in life.[25]

Almost 70 per cent of the victims had presented to the hospital Emergency department between the hours of 5.00 pm and 8.00 am, a time when few referral services were available.

Roberts' findings support suggestions that the Australian experience of domestic violence is similar to that observed in North America. Recommendations have been made on the basis of work to date that more referral sources be made available after hours, and that hospital personnel be trained to identify and respond to all suspicions of domestic violence. The principles and materials used in the training program designed by the investigators have been adopted by the Queensland Health Department for educating and training doctors and nurses in public hospitals in issues dealing with domestic violence.[24]

8.2.2 Homicide

Homicide has been defined by the National Committee on Violence as 'unlawfully and intentionally causing the death of another person'.[1]

In addition to the publications of the National Committee on Violence, some key recent sources of Australian analysis and data concerning homicide are the proceedings of a national conference held in 1992,[25] and a series of annual reports on homicides (instituted in response to a recommendation of the National Committee on Violence).[26,27]

Weatherburn and Devery[28] compared the rate of homicide across 32 countries based on the information provided by Interpol statistics for 1986 (International Criminal Police Organisation). While Northern Ireland ranked first and the United States second, Australia ranked twelfth in the international statistics. According to the World Health Organization annual *World Health Statistics* for the period 1984–87, however, Australia ranked seventeenth on the list of deaths by homicide, with a rate of 1.9 per 100 000 population.[29] Although the National Committee on Violence reports that these figures compare favourably with other western industrial societies, these findings must be referred to with caution as each country defines homicide differently and uses different methods for recording.[1]

Strang has provided an overview of homicide in Australia.[30] She noted that rates were probably higher in the nineteenth century than in the twentieth century, tended to decline from the end of the First World War until the end of the Second World War, and have risen since then. The National Homicide Monitoring Program recorded 351 homicides reported to police in Australia during the year from July 1990.

Fifty-eight per cent of the victims were males, one third of whom were aged less than 30 years. About half of the female victims were aged less than 30 years. Charges concerning these deaths were laid against 338 persons, 90% of whom were males. Sixty per cent of

identified offenders were aged less than 30 years. (No offender was identified in 45 incidents.)

Most victims, and most male offenders were single or divorced. In contrast, only 16 per cent of female victims were single or divorced. Employment status was known for two-thirds of offenders, and less than one-third of these were employed. The relationship with the offender was known for four-fifths of the victims. Amongst these, 26 per cent were spouses, and 24 per cent were friends and acquaintances. Only 5 per cent of offenders were known to have been strangers to the victim.

Indigenous Australians were over-represented, both as victims and offenders. In at least three-quarters of cases involving people of this racial background both victim and offender were indigenous Australians, and none of the remaining cases appeared to have been racially motivated.

About one-third of victims and two-thirds of offenders had a previous criminal record. In both groups, about half the convictions were for violent offences. Information on alcohol involvement was available for two-thirds of victims, of whom nearly half were affected. Equivalent information was available for half of the offenders, of whom two-thirds were affected.

About 60 per cent of incidents occurred in a domestic residence, nearly always the victim's own home (it was often the offender's home, too). About half of the incidents occurred on a Friday or Saturday, or during the early hours of a Sunday. Homicide rates were much higher in the Northern Territory than in other jurisdictions.

The weapon or method of attack was most often assault with bare hands or a blunt instrument (36 per cent of victims), a sharp instrument (33 per cent), or a firearm (23 per cent). Firearms used were mostly .22 calibre rifles or shotguns, handgun killings being uncommon (3 per cent of victims).

8.2.3 School violence

Martin[31] has defined violence in schools as circumstances in which 'a member of the school's community is intimidated, abused, threatened, or assaulted or has property deliberately damaged by another member of that community or the public in circumstances arising out of their activities in a school' (1993, p.1). According to the National Committee on Violence, a total of 21 incidents of violence in schools of approximately 45 000 students were reported in 1987 in the Australian Capital Territory.[1] Of these, 57 per cent refer to student–teacher violence. In the Northern Territory 88 students out of an education system containing some 29 000 students were reported for violence in 1986 (33% referred to student-teacher violence).[1]

A survey of 1335 South Australian teachers in 1990[31] reported the proportions who had dealt at least once in the previous week with physical destructiveness in the classroom (19.7%); physical aggression to teachers (3.1%); physical aggression to students (64%); verbal abuse to teachers (15.8%); and verbal abuse to students in the classroom (64.9%). Similar problems were reported outside of the classroom, with 28.8 per cent of teachers confronting situations of physical destructiveness; 3.6 per cent experiencing physical

aggression to teachers; 81.9 per cent dealing with physical aggression to students; 15 per cent with verbal abuse to teachers; and 81.8 per cent with verbal abuse to students, at least once during the week. The teachers commented on strategies to help deal with difficult pupil behaviour. The five most popular strategies and the percentage of teachers supporting them were smaller classes (51.9%); more student counselling (49.9%); more in-service training concerned with discipline (42.3%); firmer statements to pupils about 'do's and dont's' (40.1%); and more staff discussions (38.4%).[31]

Information from the New South Wales education department revealed that 59 ncidents of school violence had been identified between January and May 1993. Of these, 12 incidents resulted in serious injury or hospitalisation, and 18 involved weapons (10 of which referred to knives). Eight of the victims were teachers, and 23 were students.[31]

Jenkin[32] recently proposed a model policy for non-violent schools. The policy incorporates several components including: a philosophical base about the right of a school to be safe and non-violent; personnel, student and community considerations regarding the role and needs of all school members; programs, strategies and skills for both the prevention (e.g. curricular programs) and response to programs to help deal with violence in the school (e.g. welfare and disciplinary policy review, physical responses, timeout, corporal punishment, suspension, expulsion and exclusion, grievance procedures, crisis management strategy, and structural debriefing); processes for implementation of these programs (e.g. organisational decisions, strategy selection, service delivery modes, evaluation (review) and documentation); and, resources (i.e. human, material and administrative) required to implement the proposals.

The Victorian Injury Surveillance System[33] recently analysed the incidence of school injuries presenting to three hospital Emergency departments — The Royal Children's Hospital, Preston and Northcote Community Hospital and Western Hospital — and found, over the three-year period 1989–91, 133 cases of children who had been injured intentionally at school. Of these, 88 resulted from fights and quarrels, 30 from child assaults, 10 from intended self-harm, and 5 from child abuse. Eighty-six per cent of the children incurred injuries on the playground.

Of the 80 children injured in fights and quarrels on the school playground, 85 per cent were male and 88 per cent were aged between 10–14 years. Half of the injuries occurred at lunch-time and 14 per cent of all fight and quarrel injuries were severe enough to warrant hospital admission. The type of injuries incurred included 39 per cent hand injuries and 45 per cent head and face injuries. Thirty-three per cent of the injuries arising from fights and quarrels were fractures, while a further 25 per cent were diagnosed as bruising.[33]

Similarly, 83 per cent of the child assault injuries were incurred by males and 16 per cent required hospital admission. Almost half of the injuries occurred at lunchtime (46%) and 56 per cent of all child assaults resulted in head and facial injuries. Twenty-eight per cent of child assault injuries were fractures and 28 per cent bruising.[33]

It is not known how many intentional school-related injuries go unreported, are treated within the confines of school first-aid, or present to general practitioners. Clearly more research is required to investigate the incidence and nature of school violence. The Victorian Injury Surveillance System[33] recommends that since approximately half of the injuries occur during lunchtime recess, teacher supervision on the playground needs to be increased.

8.2.4 Child abuse

As defined by the United States National Committee for Injury Prevention and Control,[34] child abuse encompasses a wide range, including emotional and psychological abuse, verbal abuse, physical abuse, sexual abuse or exploitation, and neglect. Given that there is little agreement on the definition of child abuse, the committee claims that it is becoming increasingly difficult to define the magnitude of the problem. However, given that child abuse is a criminal offence, statistics are available on the number of reported cases coming before the law. In the United States, data collected on a national level suggest an incidence rate of 25.2 per 1000 child population. In addition, approximately 1200 deaths during 1986 were reported to be the result of child maltreatment. The incidence of child abuse reports has increased nearly two-fold in the past 10 years and in the United States, child abuse is now reported to be the fifth-leading cause of death in children under 18 years of age (one in every twenty deaths in childhood).[34]

According to the Australian National Committee on Violence,[1] the New South Wales Department of Family and Community Services has estimated that one in every eleven children born in New South Wales in 1987 would be a confirmed victim of child abuse by age 16 years. Child abuse is defined differently across Australian States and Territories, and national data are largely unavailable. The National Association for the Prevention of Child Abuse and Neglect (NAPCA) in Australia and Barnardo's Australia have suggested the need for more coordinated and standardised government responses to child abuse and neglect across the jurisdictions, and has called for uniform definitions and methods of reporting the problem.[1] The Royal Commission on Human Relationships, in 1977, called for the establishment of a National Research Centre on Child Abuse to collect data at a central level, to investigate the epidemiology of child abuse, identify risk factors, treatment programs, conduct evaluation studies, and to conduct training and education programs for both professionals working in the field and for families of victims. At present, some of these functions are being carried out by organisations such as the Australian Institute of Family Studies.[1]

Even where data systems are in place, cases may fail to be identified or reported. Although medical personnel in the United States are bound by law to report suspicion of child abuse, an evaluation in 1979–80 claimed that only half of the cases that met the criteria for mandatory reporting were actually reported to child protection authorities.[34] Belonging to lower socioeconomic classes and being black appeared to be the major factors determining whether medical authorities reported child abuse. Newberger[35] claims that physicians often confuse the task of reporting abuse when they assume the role of investigator rather than diagnostician. Evaluation of the mandatory reporting laws recently implemented in most Australian States and Territories[1] has not been reported to date.

The United States National Committee for Injury Prevention and Control[34] recommended that mandatory reporting laws be more efficiently monitored by the states, and that medical and health care professionals be better trained to help reduce the incidence of under-reporting or incorrect child-abuse reporting. They also proposed that the states coordinate data collection at medical, community and criminal levels. The committee also advocated better provision by states of training services for new parents. Child care groups and self-help organisations have also been identified as potential means for contacting at-risk parents and families.

8.3 Available data

8.3.1 Australian Bureau of Statistics death data

While the fatality rate for all injuries declined over the period 1979–81 to 1989–91, intentional injury rates increased both for self-inflicted injury and that inflicted by others (Table 8.1, Figure 8.1; see also Chapter 1, Figure 1.21A, 1.22A).

For both homicides and suicides, rates have tended to increase at ages 15–34, and to change little, or even decrease, later in adult life (Figure 8.1). The pattern of concentration of homicides in early adulthood has been more marked for males than females (Figure 8.2). As for most categories of injury, male homicide rates are higher than female. The ratio of M:F rates was smaller in 1989–91 (1.6:1) than it was a decade earlier (1.9:1).

The instrument of homicidal death has changed over the period 1979–81 to 1989–91, with cutting (stabbing) instruments replacing firearms as the major cause of death (Table 8.1). The change in ranking of these two most common types of instrument occurred in nearly all age groups (Figures 8.4 and 8.5).

Table 8.1: Intentional fatalities Australia, 1979–81 and 1989–91: mean annual rate per 100 000 population

Mechanism of injury	1979–81	1989–91
Self inflicted	11.2	12.9
Inflicted by others	1.9	2.1
–unarmed fight (brawl)	0.2	0.2
–firearm	0.7	0.5
–cutting (stabbing)	0.4	0.6
–child maltreatment	< 0.1	< 0.1
–other	0.6	0.7
Total intentional	13.1	15.0
All injuries	**55.7**	**46.5**

Figure 8.1: Homicide and suicide fatalities in Australia, mean annual rate by age, 1979–81 and 1989–91

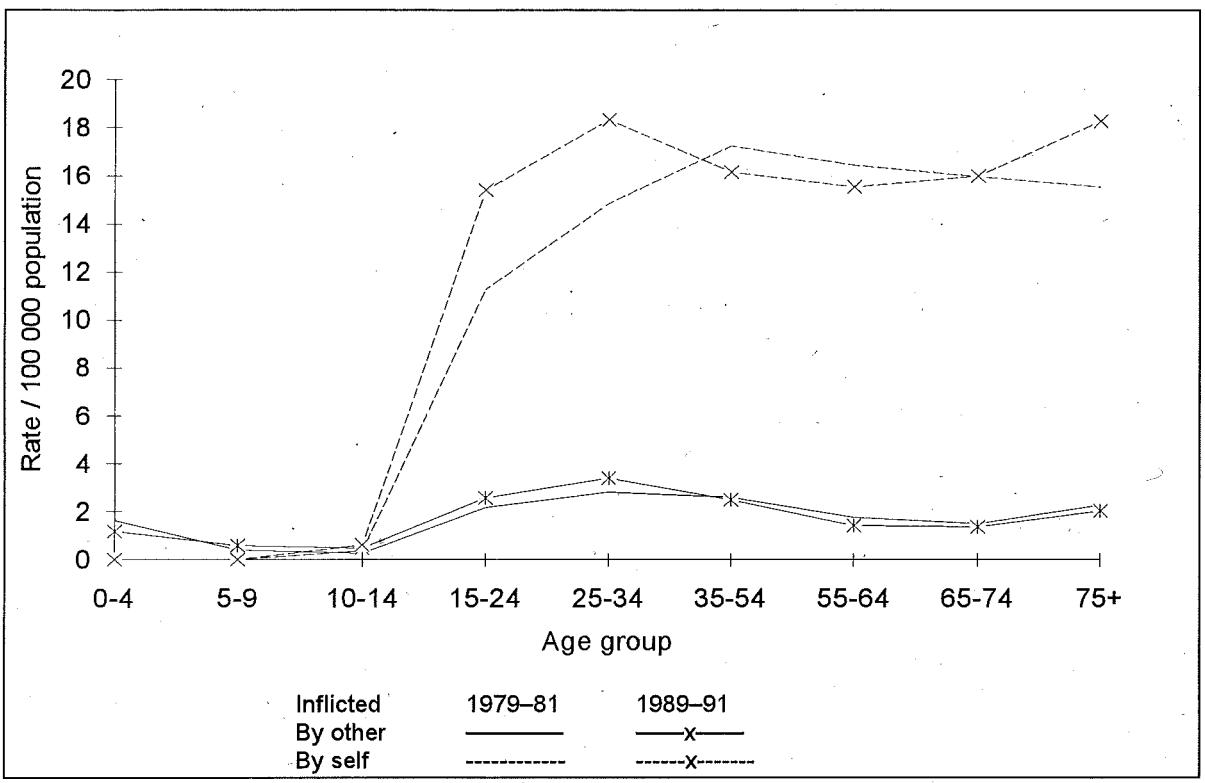


Figure 8.2: Fatalities inflicted by others, mean annual rate by age and sex, 1979–81 and 1989–91

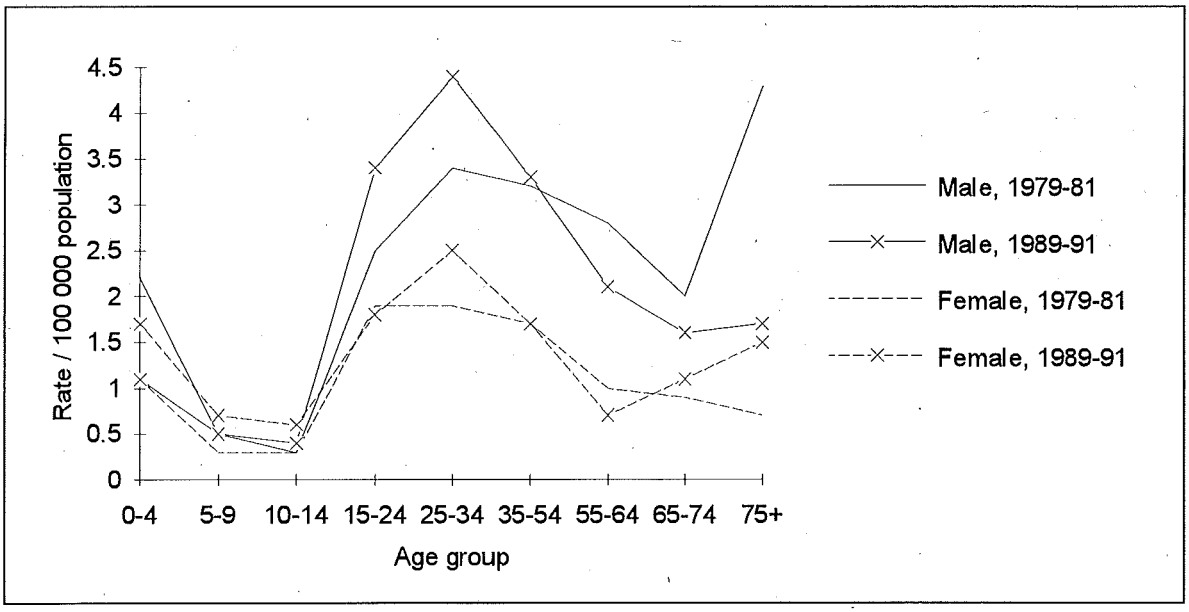


Figure 8.3: Fatalities inflicted by others, mean annual rate by age and type of violence inflicted, 1979–81

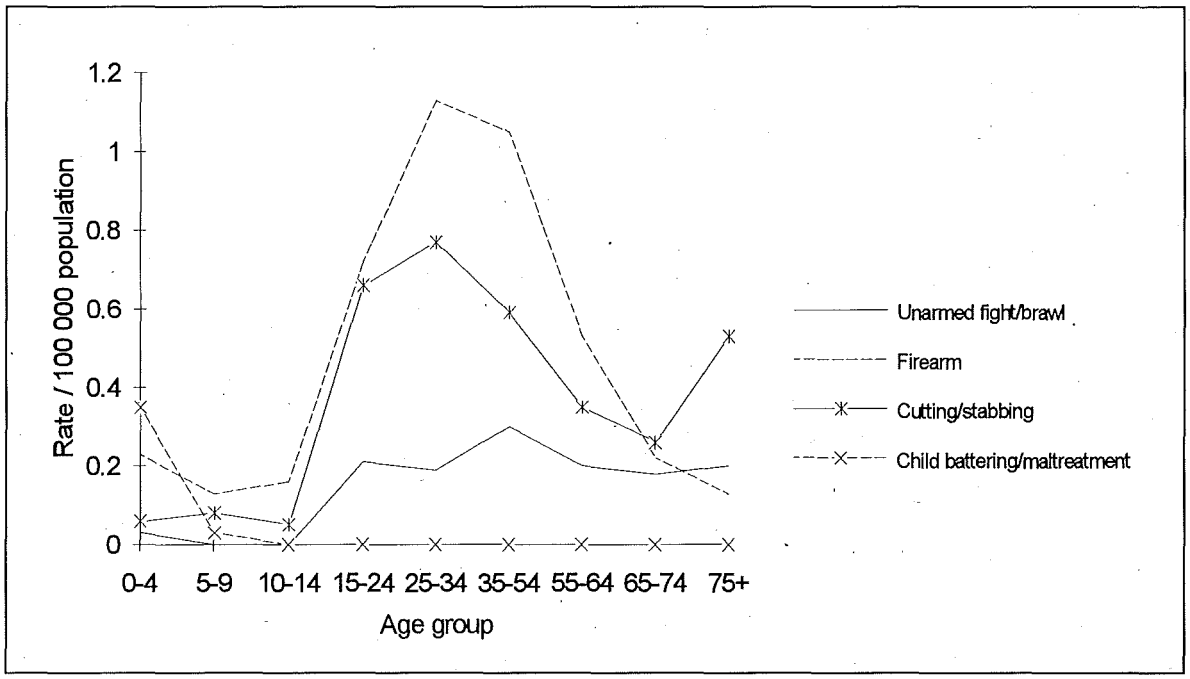
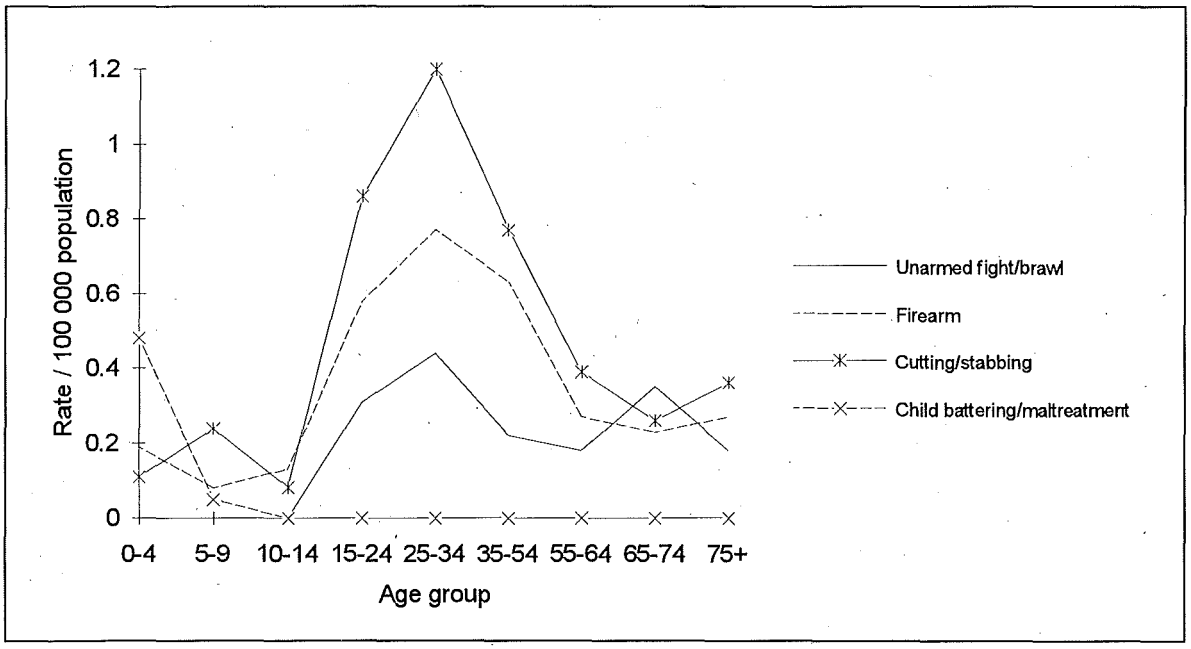


Figure 8.4: Fatalities inflicted by others, mean annual rate by age and type of violence inflicted, 1989–91



8.3.2 Hospital admissions data

This section makes use of Victorian public hospital separations data where the primary diagnosis was given an 'external cause' code. Care should be taken in making comparisons with other hospital separations data (e.g. New South Wales data in the Appendix) due to differences in scope and classification.

During the period July 1986 to June 1991, 3.6 per cent of all injury admissions in Victoria were attributed to interpersonal violence (Table 8.2). A similar proportion (3.9%) was seen in NSW in 1991–92 (Appendix, Table 40).

Male and female rates of hospital admission due to interpersonal violence in Victoria from July 1986 to June 1991 were similar at ages 0–9, and 65–84 years (Figure 8.5). Throughout adulthood, however, male rates were much higher than female rates. This contrasts with admissions attributed to self-inflicted injury, for which female rates are somewhat higher than male rates at most ages. In contrast with homicide mortality, admissions due to interpersonal violence most often result from unarmed fights. (Table 8.3 and Figure 8.6). Admissions from assault by stabbing (Figure 8.7) were one-seventh as common as unarmed fights, and firearm assaults were less frequent still (Figure 8.8).

Table 8.2: Intentional injury, hospital admissions Victoria, July 1986–June 1991: frequency and rates by age

Mechanism of injury	Annual average frequency	Mean annual rate per 100 000 population
Self inflicted	2389	57.5
Inflicted by others	2163	52.1
–unarmed fight/brawl	1579	38.0
–firearm	20	0.5
–cutting/stabbing	221	5.3
–child maltreatment	72	1.7
All injuries*	**60381**	**1453.5**

*Includes adverse effects

Figure 8.5: Intentional injury, hospital admissions, mean annual rate by age and sex, Victoria, July 1986–June 1991

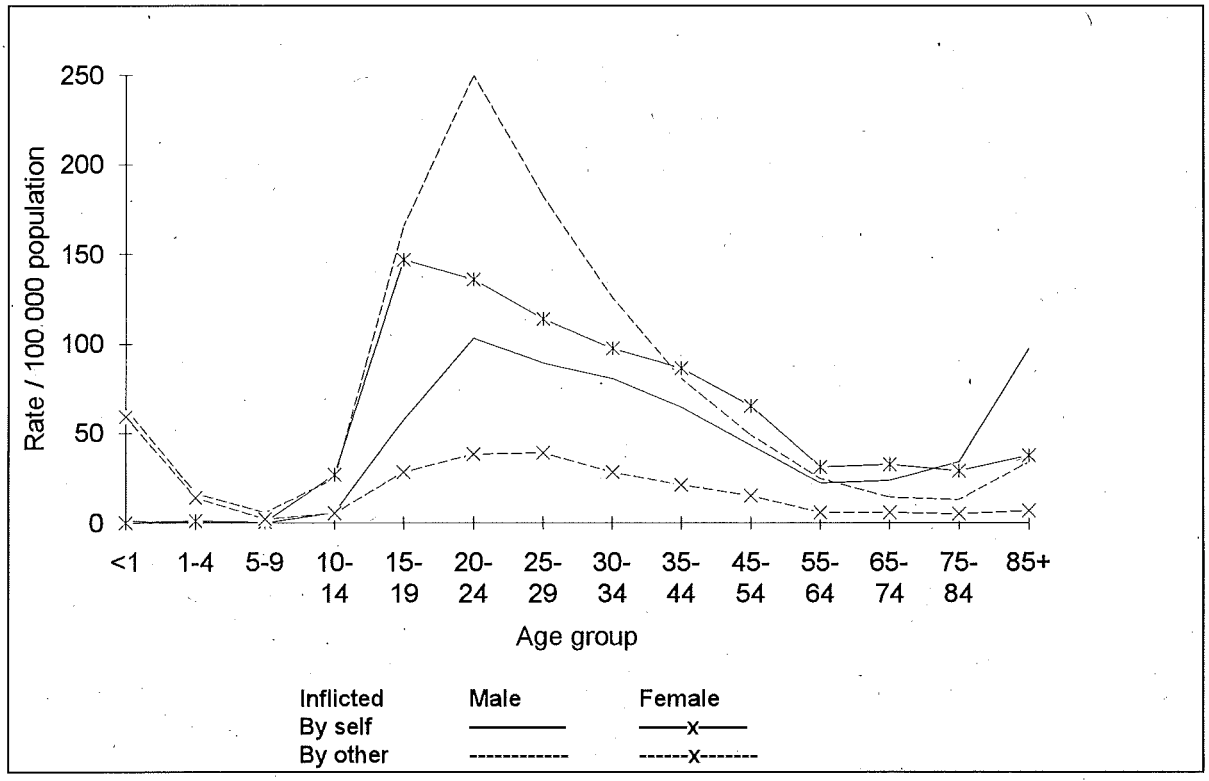


Figure 8.6: Unarmed fight (brawl) intentional injuries, hospital admissions, mean annual rate by age and sex, Victoria, July 1986–June 1991

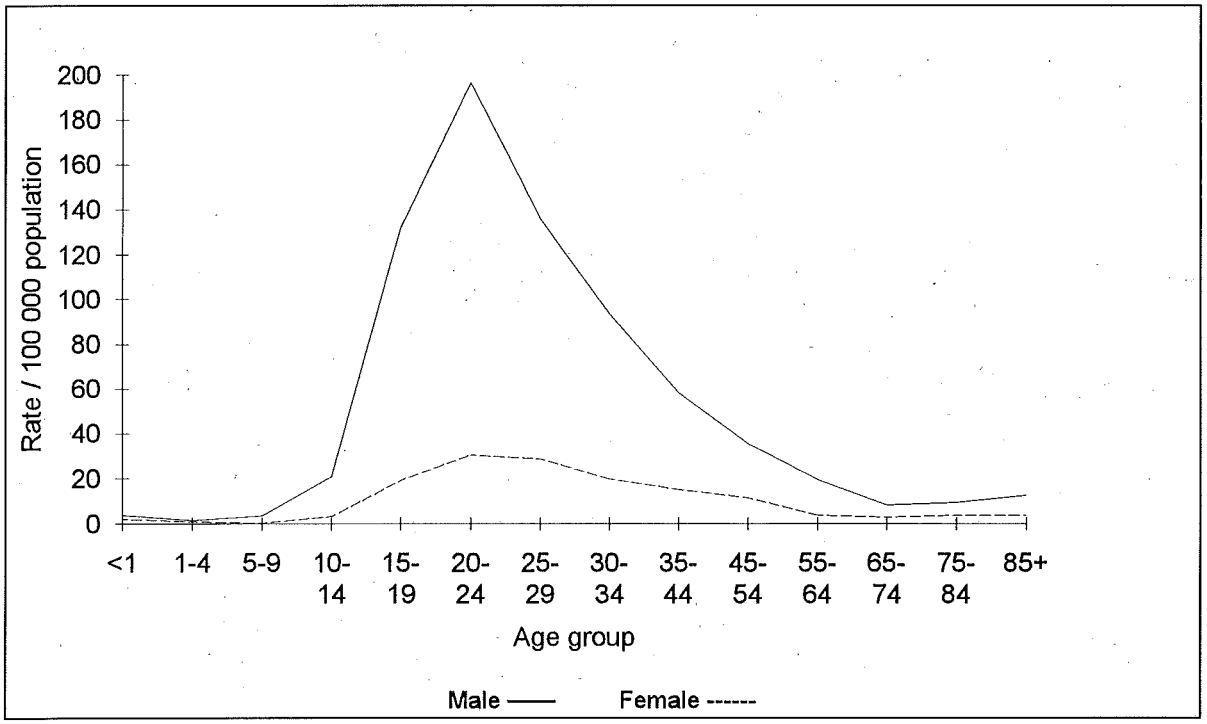


Figure 8.7: Cutting (stabbing) injuries, hospital admissions, mean annual rate by age and sex, Victoria, July 1986–June 1991

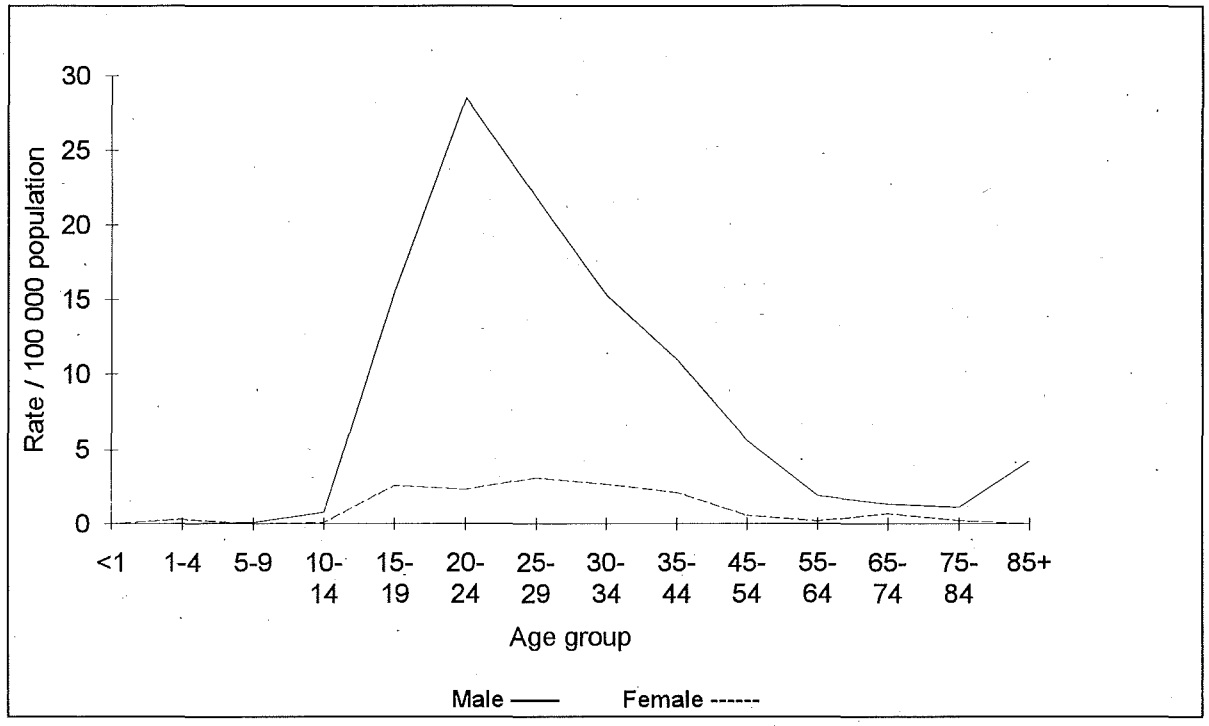
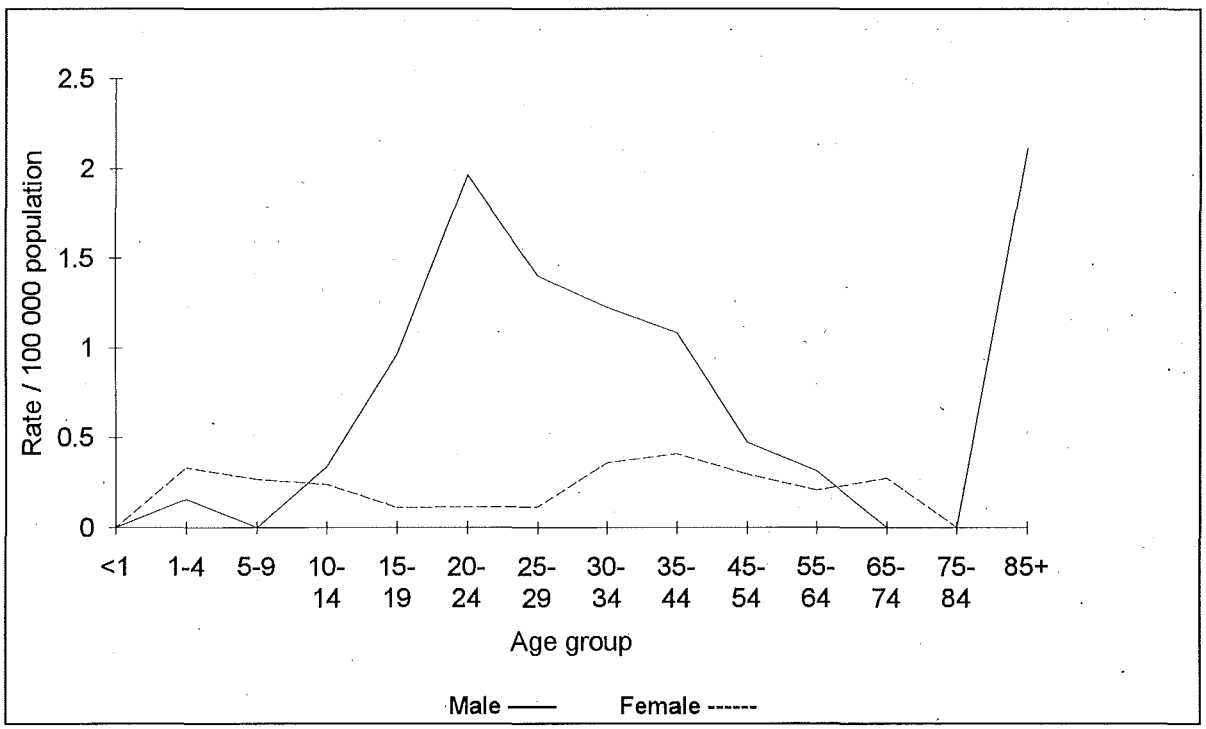


Figure 8.8: Firearm intentional injuries, hospital admissions, mean annual rate by age and sex, Victoria, July 1986–June 1991



8.3.3 Emergency department data

Emergency department intentional injury data from several Victorian hospitals are summarised in Table 8.3 (the data cannot be expressed as rates since the population denominator is unknown). For children less than 15 years of age, intentional injury represented 1.3 per cent of all injury presentation to these Emergency departments, while adult intentional injury represented 13 per cent of all injury presentations.

Table 8.3: Hospital Emergency department intentional injury attendances, Victoria 1989–92

	Intentional injury (per cent)	
	Child (< 15 years) (n=546)	Adult (> 15 years) (n=1652)
Fight (quarrel)	41	59
Intended self-harm	25	30
Assault	14	13
Child abuse	20	–

Source: VISS adult data: Latrobe Regional Hospital, Western Hospital, 1991–92
VISS child data: Royal Children's Hospital, Western Hospital and Preston & Northcote Community Hospital, 1989–1991

8.3.4 Crime statistics

Domestic violence

In 1991, the Women's Policy Unit[36] of the Queensland Government funded a Queensland Victims of Crime Survey which found that, although more men (5% of Queensland men) were assaulted than women (3% of Queensland women), assault against women was found to be largely perpetrated in the private sphere (38% of female assaults occurred in or around the home, compared with 11% for men).[36] Sixty-five per cent of women who were assaulted knew the offender, 31 per cent of the women were assaulted by a former or current partner, and 16 per cent of these assaults involved rape, attempted rape or sexual assault. Only 34 per cent of the women assaulted had reported the incident to the police, yet 65 per cent of women incurred a physical injury as a result of the assault. However, the Women's Policy Unit warns that violence against women is often under-reported in crime victims surveys.[36]

Homicide

For the financial year 1989–90, the National Homicide Monitoring Program reported 330 homicides Australia-wide, with 65 per cent of the victims being males.[26] Thirty-six per cent of the homicides resulted from unarmed assault, 33 per cent involved knives, and 25 per cent were due to firearms. More than two-thirds of the incidents occurred in the victim's own home, and 36 per cent of all homicides involved a family member. Of the 211 cases in which there was information concerning precipitating factors, at least 30 per cent involved intimates or the breakdown of a relationship. Eighteen per cent specifically related to family or domestic violence.

The rate of homicide Australia-wide increased from 1.9 per 100 000 population in 1989–90 to 2.1 per 100 000 population in 1990–91.[27] During 1990–91, a total of 351 homicides were

recorded in Australia, 58 per cent involving male victims.[27] The pattern of occurrences did not differ greatly from that seen for 1989–90.

Indigenous Australians
Although indigenous Australians comprised 12 per cent of homicide victims Australia-wide in 1989–90, they made up 75 per cent of the victims of homicide in the Northern Territory.[26] This is in line with findings that the rate of homicide in the Northern Territory is five-times the rate of other Australian States and Territories.[1] During the period 1990–91, indigenous Australians comprised 13 per cent of the national victim population.[27]

8.4 Firearms control

The National Committee on Violence reported that approximately 40 per cent of homicides in Australia are carried out with a firearm.[1] In recent years, the proportion has been lower (see Table 8.1). Gun control as a means of reducing homicide has become a subject of vigorous debate, particularly in the United States.

The issue of firearms control was given close attention by the National Committee on Violence, whose period of activity coincided with a peak in public debate on the topic in Australia, prompted by the recent occurrence of two mass shootings. In its report the committee noted that 'No other subject which the committee has considered ... has elicited such a degree of intense comment as has the proposal to restrict access to firearms' (p.173). While recognising that further firearm control would not have much impact on the subculture of 'professional criminals', the committee noted that only a small proportion of deaths from firearms involve this group, and that 'the vast majority of firearm homicides are unplanned and impulsive, and in all likelihood would not occur if such a lethal weapon was not to hand' (p.174). The committee therefore made recommendations intended to discourage further increase in the proportion of the population possessing firearms, and 'to ensure as far as possible that firearms are used only by responsible, skilled shooters'. The recommendations are reproduced in Section 8.5.1.

A position opposing further restriction has recently been presented on behalf of a gun-owners association.[37] The Sporting Shooters' Association of Australia estimated that for every homicide per year in Australia, there are 40 000 sporting and work guns in circulation. Furthermore, for every one gun homicide, there are approximately six gun suicides. The association notes that during the 10-year period 1980–90, there was a 30 per cent decrease in the proportion of homicides due to firearms, and an 82 per cent increase in knife homicides (see also Table 8.1). The association claims that homicide and suicide rates are independent of gun ownership density. (Well-controlled studies of this association have yet to be reported.)

The Sporting Shooters' Association argues that the introduction of stricter gun control or gun confiscation laws would effectively punish responsible shooters at the expense of only marginal reductions in homicide and suicide mortality, citing an estimated reduction of about 4%. The association believes that the aim of gun laws should be to prevent unsuitable persons from obtaining possession of guns, rather than restricting responsible gun owners. They support two systems for gun control. The first (the current system) requires a person to apply for a shooter's licence at a local police station and to have their guns registered on a

to apply for a shooter's licence at a local police station and to have their guns registered on a police database. The second system would require a gun retailer to telephone police to check the customer's licence status to find out whether they are suitable for gun ownership. If they are eligible, an 'authority-to-sell number' would be issued and the gun would be registered to the owner.

The Public Health Association (PHA) of Australia shares the view of the National Committee on Violence that further control of firearms would reduce firearm injury, and is desirable for the advancement of public health. PHA adopted a policy on this issue in 1992.[38]

8.5 Proposals for prevention

8.5.1 National Committee on Violence recommendations

In 1990, the National Committee on Violence proposed three major strategies for reducing violence:[1]

- adopting a national strategy for the promotion of non-violent attitudes;
- reducing the factors that aggravate the risk and extent of violence; and
- improving the availability and accuracy of information about the incidence and nature of violence.

In relation to these, the committee recommended that all intervention programs and policies be subject to rigorous and independent evaluation to ensure their true effectiveness. Recommendations put forward by the National Committee on Violence are largely directed at the three high risk groups: children (especially less than one year of age); women subjected to violence in the home; and young males.[1]

The committee put forward a large number of recommendations intended to achieve the objective of controlling violence in the Australian community. The following recommendations refer to the issues which have been given special attention in this chapter.

Domestic violence

- 'Institutions which provide education and training for health and welfare professionals should offer training in the recognition, treatment (including counselling and support services) and management of victims of violence, especially domestic assault, sexual assault and child abuse. Issues relating to gender inequity, and its implications in relation to violence, should be included in this training. This should include provision for continuous in-service training' (Recommendation 14, p.133).

- 'All health service providers should develop specific procedures for the identification and treatment of victims of violence, especially domestic violence, sexual assault and child abuse' (Recommendation 15, p.133).

- 'Service provision to domestic violence and sexual assault victims should address the diversity of needs for people from non-English speaking backgrounds, Aboriginals and people with disabilities' (Recommendation 16, p.134).

- 'Funding by Federal, State and Territorial Governments for direct service providers and community education programs relating to domestic violence, sexual assault and child abuse should be increased' (Recommendation 17, p.134).

- 'Professional medical organisations and colleges should assist their members in the diagnosis and referral of victims of violence, especially victims of sexual abuse, domestic violence and child abuse' (Recommendation 133, p.237).

- 'Uniform domestic violence legislation should be developed. Such legislation should include the following essential features:
  - powers for police to enter and remain on premises to deal with domestic violence incidents and breaches of restraint orders, and to arrange assistance for injured parties;
  - a broadened definition of spouse to include partners from de facto and past relationships as well as traditional Aboriginal relationships;
  - provision for applications for restraint orders by police officers as well as by the victim;
  - power for the court to make a restraint order removing or limiting the defendant's access to the family home, whether or not the defendant has a legal or equitable interest in the premises;
  - parties to the proceedings should be able to apply to the court for a variation or revocation of an order;
  - the admission of hearsay evidence at the discretion of judicial authority;
  - the issuing of restraint orders on the balance of probabilities;
  - breaches of orders to be regulatory offences;
  - the ability for police to apply for restraint orders over the phone outside normal court hours;
  - the protection of police officers from civil liabilities and costs in normal circumstances; and
  - the authority to take offenders into custody where there is a reasonable belief that unless the person is removed, the spouse or a child of the house is in danger of suffering personal injury' (Recommendations 63–63.11, pp.183–184).

Child abuse

- 'The Federal Government should sign and ratify the United Nations Convention on the Rights of the Child as a signal of its commitment to the well-being of Australian children' (Recommendation 20, p.136).

- 'A national campaign for the prevention of child abuse should be conducted' (Recommendation 21, p.136).

- 'A national research centre on child abuse should be established by the Federal Government' (Recommendation 22, p.137).

- 'Agencies dealing with child abuse should undertake systematic evaluations of their child abuse intervention programs' (Recommendation 29, p.142).

- 'Parent effectiveness programs should be developed in conjunction with organisations dealing with young children and their parents to promote non-aggressive strategies for both parents and children' (Recommendation 37, p.148).

- 'Training in the recognition of child abuse should be an integral part of the teacher training curriculum. To this end, education authorities should utilise the expertise of those who provide services to abused children and their families' (Recommendations 38, p.148).

- 'All school students should be provided with information about what constitutes abuse, the importance of telling someone when abuse occurs, and appropriate individuals in whom they might confide' (Recommendation 39, p.149).

School violence

- 'Education authorities should include conflict resolution strategies as an integral part of school and other education curricula, and should evaluate their effectiveness' (Recommendation 31, p.145).

- 'Teacher training institutions should incorporate materials relating to non-violent conflict resolution, including an analysis of the gender basis of patterns of violence and violent behaviour, in their curricula' (Recommendation 32, p.145).

Firearms

- 'All Governments should take appropriate action to minimise death and injury arising from the accidental or intentional use of firearms by:
  - The enactment of uniform legislation throughout Australia to regulate the acquisition and possession of firearms.
  - The introduction, through the Australian Police Ministers' Council, for uniform guidelines for all Australian police forces in the enforcement of firearms legislation.
  - The development of a national gun control strategy aimed at (1) reducing the number of firearms in Australian society, (2) preventing access to those weapons by individuals who are not fit and proper persons, such as those who have been convicted of violent crime or who have demonstrated a propensity for violence' (Recommendations 54–54.3, p.175).

- 'The Federal Government should undertake the following action:
  - Mail order firearms: if the Federal Government has the constitutional power, the sale of mail order firearms should be prohibited. If it does not have such powers, and in the absence of uniform State and Territory licensing laws, the mail order sales of firearms should be restricted by using, for example, legislation relating to dangerous goods.
  - Rifle clubs established under the Defence Act should be brought under the ambit of State and Territory licensing and registration requirements' (Recommendations 55–55.3, pp.175–6).

- 'The Federal Government should use its corporation power under the Constitution, as well as its powers to regulate trade and commerce, and imports, in furtherance of a national gun control strategy' (Recommendations 56, p.176). 'The State and Territory Governments should undertake the following action:

- Prohibition of all automatic long arms and certain types of ammunition.
- Restriction of semi-automatic long arms to individuals with a specific need.
- Restriction of sales of ammunition by licensed gun shops only, to licensed individuals only for personal use of a specific firearm.
- Registration: all firearms should be registered in a computerised national firearms registry.
- Licensing: ownership or possession of a firearm to be restricted to those possessing a valid licence. The prerequisites for obtaining a shooter's licence should be those in existing legislation, together with the following:
  * must be over the age of 18 years
  * limited to fit and proper persons with good reason
  * a 28-day cooling-off period between application and grant of the licence, during which time appropriate checks can be made
  * training, competence and safety consciousness must be demonstrated to the licensing authority
  * hand gun licences should be restricted to authorised security personnel and members of pistol clubs, with weapons stored on the premises.
- Security: mandatory measures to be introduced for the safe-keeping of all weapons in an inoperable condition in secure storage, both by individuals and businesses, with appropriate penalties for non-compliance.
- Seizure: in the event of a licensed owner giving reason to believe that he/she is no longer a fit and proper person, for example, by using the weapon in a threatening way, there should be provision for mandatory seizure of all firearms in his/her possession.
- Restrictions on private sales: all sales of firearms, including second-hand sales, to be made through licensed gun dealers, and any change of registered owner should be notified through the proposed registration mechanisms.
- Amnesties: a permanent amnesty for the surrender of unauthorised firearms should be implemented, with conditions similar to those provided in the temporary amnesties which have been introduced from time to time in various jurisdictions' (Recommendations 57–57.9, pp.176–177).

8.5.2 Other recommendations

In addition to the above recommendations from the National Committee on Violence, the Public Health Association of Australia,[39] in 1992, acknowledged domestic violence as a public health problem and has called for the development and use of protocols to investigate the extent of the problem, to identify the prevalence of domestic violence, its causes, the severity, and the cost to the Australian community.

In October 1992 the National Committee on Violence Against Women[40] recommended that accident and Emergency department protocols be developed to improve identification and management of domestic violence in the medical arena.

8.5.3 Data needs

There is a clear need to synthesise existing data and to determine improved data collection methodologies that overcome the problem of under-reporting intentional injury. Work in progress on developing protocols for identification of domestic violence victims may prove

useful here. Linkage of data sources may be necessary to overcome potential biases in the health-sector, police and community services collections.

8.6 References

1. National Committee on Violence. Violence: directions for Australia. Canberra: Australian Institute of Criminology, 1990.
2. Rosenberg ML, Fenley MA, (eds). Violence in America, a public health approach. New York: Oxford University Press, 1991.
3. Langlois JA, Hawkins C, Penny M, Brumen IA, Saldana, R. Nonfatal Injuries in Victoria: an overview. – Victorian Injury Surveillance System, Clayton, Victoria: Monash University Accident Research Centre Victoria, 1992.
4. Routley V, Ozanne-Smith J. Intentional Injury. Hazard 1992; 13:6–11.
5. Henderson M. Victorian injury deaths and the potential for prevention. Hazard 1992; 11:1–11.
6. State Coroner's Office. Unnatural deaths. Victoria, Australia, 1989–90.
7. Bridges-Webb C. The Traralgon Health and Illness Survey: Part 3. Illnesses and their medical and hospital care. International Journal of Epidemiology 1974;3(3):233–246.
8. Bridges-Webb C. The Australian general practice morbidity and prescribing survey 1969 to 1974. Medical Journal of Australia 1976;(Special Supplement), 2(1):5–28.
9. Bridges-Webb C, Britt H, Miles DA, Neary S, Charles J, Traynor V. The Medical Journal of Australia 1992;(suppl),157:1–57.
10. Children's Safety Network. Domestic violence: a directory of protocols for health care providers. Newton, Massachusetts: Education Development Center, Inc, 1993.
11. Council on Scientific Affairs, American Medical Association. Violence against women: relevance for medical practitioners. Journal of the American Medical Association 1992;267 (23):3184–3195.
12. US Department of Health and Human Services. Monograph No. 7, 1981.
13. Rounsaville, B, Weissman, MM. Battered women: a medical problem requiring detection. International Journal of Psychiatry in Medicine 1977–78;8(2):191–202.
14. Pahl, J. The general practitioner and the problems of battered women. Journal of Medical Ethics 1979;5:117–123.
15. Goldberg, WG, Tomlanovich, MC. Domestic violence victims in the Emergency department. Journal of the American Medical Association 1984;251(24): 3259–3264.
16. Brismar B, Bergman B, Larsson G, Strandberg A. Battered women: a diagnostic and therapeutic dilemma. Acta Chir. Scandinavia 1987;153:1–5.
17. Mullen PE. Identifying domestic violence: the biggest step in management. Patient Management: Family Violence 1987:23–28.
18. Gayford JJ. Wife battering: a preliminary survey of 100 cases. British Medical Journal 1975;1:194–197.
19. Bergman B, Brismar B. Battered wives – measures by the social and medical services. Postgraduate Medical Journal 1990;66:28–33.
20. Goldberg, W, Carey, AL. Domestic violence victims in the Emergency setting. Topics in Emergency Medicine 1982:65–76.

21. Report of the Queensland Domestic Violence Task Force. Beyond these walls. Brisbane, 1988.

22. Nutbeam D, Wise M, Bauman A, Harris E, Leeder S. Goals and targets for Australia's health in the year 2000 and beyond. Department of Public Health – University of Sydney. Report prepared for the Commonwealth Department of Health, Housing and Community Services, Australia,1993.

23. Parliament of Victoria Social Development Committee. Second Report. Inquiry into strategies to deal with the issue of community violence: with particular reference to children, young people and families. Parliamentary Paper 1988;No. 41.

24. Roberts G. Domestic violence victims in Emergency departments. Second national conference on violence. Canberra: Australian Institute of Criminology, 1993.

25. Strang H, Gerul SA, (eds). Homicide: patterns, prevention and control. National Homicide Monitoring Program. Canberra: Australian Institute of Criminology, 1993.

26. Strang H. Homicides in Australia 1989–90. National Homicide Monitoring Program. Canberra: Australian Institute of Criminology, 1991.

27. Strang, H. Homicides in Australia 1990–91. National Homicide Monitoring Program. Canberra: Australian Institute of Criminology, 1992.

28. Weatherburn D, Deverey C. How violent is Australia? In: D Chappell, P Grabosky, and H Strang (eds) Australian violence: contemporary perspectives. Canberra: Australian Institute of Criminology, 1991:23–40.

29. World Health Organization. World health statistics, 1984–87. Geneva: WHO, 1990.

30. Strang H. Characteristics of homicide in Australia 1990–91. In: H Strang, S-A Gerull (eds) Homicide: patterns, prevention and control. Proceedings of a conference held on 12-14 May 1992. Canberra: Australian Institute of Criminology, 1993: 5-20. [AIC Conference Proceedings Series number 17.]

31. Martin R. Violence in Australian schools. Second National Conference on Violence, June 1993, Canberra: Australian Institute of Criminology, 1993.

32. Jenkin JB. Structuring A policy for a non-violent school. Second National Conference on Violence, June 1993. Canberra: Australian Institute of Criminology, 1993.

33. Routley V. Intentional Injuries in the School. Information Sheet, 1993.

34. The National Committee for Injury Prevention and Control. Chapter 12: Child abuse. Injury prevention: meeting the challenge. American Journal of Preventative Medicine, 1989.

35. Newberger, EH. Child abuse (Ch. 64: Violence). In JM Last, RB Wallace (eds) Public health and preventative medicine, 13th edition. Connecticut: Appleton & Lance, 1992:1021–34.

36. Women's Policy Unit. Women's experience of crimes of personal violence: a gender analysis of the 1991 Queensland Crime Victims Survey. Queensland Government, 1992.

37. Sporting Shooters' Association of Australia Inc. A gross obsession – or valid concern: a new system of gun control. Second National Conference on Violence, June 1993, Canberra: Australian Institute of Criminology, 1993.

38. Public Health Association of Australia (PHA). Policy statements 1992. Canberra: PHA, 1992.

39. Public Health Association of Australia. Domestic violence, policy statements 1992:12–14.

40. National Committee On Violence Against Women. National strategy on violence against women, 1992.

Chapter 9 Injury among indigenous Australians

9.1 Introduction

Available data show high rates of injury among people identifying themselves as indigenous Australians. The data are, however, limited and it is difficult to construct a detailed national picture. In particular, the mortality data available at the time of writing do not identify Aboriginal or Torres Strait Islander deaths which are registered in Queensland. Consequently, the available data are so incomplete for Torres Strait Islander deaths that it would be misleading to regard this chapter as providing insight into their injury experience.

9.2 Literature review

The health disadvantage of indigenous Australians relative to the remainder of the Australian population has become well defined, particularly since the 1960s.[1] During the 1980s and 1990s this situation has been increasingly analysed and described.[1,2]

Indigenous Australians have much in common with other dispossessed indigenous minority populations of the world, including American Indians and Maoris. While different in many ways, these populations share an experience of social disruption following imposed contact with an unfamiliar external culture. Dispossession and the consequent loss of control and autonomy manifest in many ways, and it has been argued that poor health is one.[4] The continuing social and economic disadvantage of the indigenous Australian population is shown by a wide range of indicators.[3] Poor health follows, according to this model, through sometimes complex mechanisms, from 'the physical conditions in which many are forced to live, the food they eat, the hazards of an impoverished or exploited environment, and the dwellings they inhabit'.[4] The spiritual and psychological consequences of social disruption both reflect and contribute to the environmental and health problems, with abuse of alcohol, other drugs, and narcotic inhalants as prominent factors.[5,6]

Conceptions of sickness and health in indigenous cultures differ importantly from those common in other sectors of the community, and from culture to culture. Approaches tend to be holistic, integrating, for example, relationships with people and land with the physical matters that are of such central concern to western medicine.[7]

Action within Aboriginal and Torres Strait Islander communities has been a prominent feature of the response to health problems. Landmarks include the establishment of the first Aboriginal medical service (AMS) at Redfern in 1971 and the formation of the National Aboriginal and Islander Health Organisation (an umbrella group of AMSs) in 1974. By the late 1980s nearly a hundred AMSs had been funded.

The greatly elevated injury rate of indigenous peoples has only recently received particular attention.[8,9] While a general recognition of the problem has emerged, the details, particularly at the national level, are not clear.[2]

A major constraint relates to the identification of Aboriginal and Torres Strait Islander cases, among all cases, in the main sources of data (mortality and hospital inpatient morbidity). Only in recent years has the routine mortality data collection available at a national level included an item to identify indigenous Australian deaths. Even now, data are not available for Queensland (though agreement has been reached to correct this deficiency) and, for several other States, the data is incomplete. Hospital inpatient morbidity collections have similar limitations. Consequently, much of the available literature relates to separate States, and national aggregations are uncommon. The Australian Institute of Health and Welfare, including the National Injury Surveillance Unit, is seeking to improve the data and to generate aggregate and regional data.[2,10,11]

A second problem arises because of changes to the way that the indigenous Australian population is determined in censuses. Estimates of the population have increased very rapidly in the course of the last three or four censuses.[3] While population growth may be rapid (with a large proportion of young people), other factors that are likely to have played a part are improved accuracy in recording and increasing willingness of individuals to self-identify as Aboriginal or Torres Strait Islander.[9]

The overall experience of injury among indigenous peoples is very high compared with that of the remainder of the population, whether measured in terms of mortality[2,8–10] or morbidity.[2,9,10] Equally striking is the different pattern of circumstances of injury and types of trauma experienced.

Analysis of South Australian health statistics[9] has shown that, while death rates (from all causes, and from injury) were high for indigenous peoples in South Australia during 1987–90, injury deaths as a proportion of all deaths were similar in the indigenous and non-indigenous populations, after adjustment for age and sex. In contrast, injury and poisoning contributed disproportionately to the two-fold excess in rates of hospital admission for indigenous people in South Australia in the period July 1988 to December 1990.

Similar analysis of diagnosis, at a more detailed level, found marked proportional excesses in admissions of indigenous people due to: 'intracranial injury without skull fracture'; 'open wound of head, neck and trunk'; 'toxic effects of alcohol'; 'contusion with intact skin surface'; and 'burns'. However, the proportions of admissions were relatively low for some other injury diagnoses (e.g. 'sprains and strains of joints').[9]

The same method was used to examine proportions of indigenous and non-indigenous admissions according to the 'external cause' of injury. Deliberate injury (including self-inflicted injury and injury inflicted by another person) showed a large relative excess, as did some less common categories (accidental poisoning — particularly cases involving alcohol; and accidental burns involving fire). In contrast, the proportions of admissions coded to 'motor vehicle accidents' were very similar for the two groups.[9]

The authors of the South Australian health statistics chartbook[9] noted that alcohol contributes substantially to the excess for injury admissions among indigenous people, and briefly surveyed literature on the sources of the problem, its extent, and on some responses to it, emphasising initiatives emerging from South Australian Aboriginal communities.

Injury mortality of some major types (e.g. road deaths) has been shown to be relatively great in non-metropolitan areas (e.g. see Section 1.6). Moreover, rates of overall mortality and hospital morbidity among indigenous peoples are higher in non-urban areas.[9] Most of the indigenous Australian population lives in non-metropolitan areas (72.2 per cent outside capitals, 1991 census)[3] unlike the rest of the population (36.4 per cent for whole population, 1986 census).[12] Part of the excess of injury rates for indigenous people may reflect this population distribution, though detailed study remains to be done.

In summary, available information gives a picture of high rates of mortality and morbidity from 'external causes', especially for cases involving interpersonal violence and motor vehicles, in a population having several well-defined socioeconomic characteristics also known to be associated with injury (e.g. poverty, residence in rural areas). Similar patterns have been observed in disrupted indigenous populations in other countries (e.g. United States and Canada). Suicide has been identified as a problem in some indigenous communities and among young Aboriginal males in custody.[13,14] (See also Section 7.2.2.)

9.3 Available data

9.3.1 Data issues

As already mentioned census estimates of the indigenous Australian population have increased much more rapidly in recent years than estimates for the whole population.[3,14] Census data relies on self-identification and part of the increase may be due to increasing willingness to identify as Aboriginal or Torres Strait Islander.[9] In sources such as deaths and hospitalisation records, aboriginality may be assigned on a different basis, however, such as the impression of a clinician. Rate estimates based on these case counts and census population estimates may be somewhat distorted, most likely in the direction of under-enumeration of cases.

Indigenous Australians differ from non-indigenous people in some ways that affect comparisons of the injury experience of the two groups, yet may not provide much insight into reasons for differences. For example, the occurrence of many types of injuries is age-related. The indigenous Australian population has a large proportion of young people (ages 0–4: indigenous 14%; other 7%) and a small proportion of older people (ages 55 and over: indigenous 6%; other 20%). Where the age distribution of a type of injury is important, age-specific rates have been presented. Where all-ages summary values are useful, they are presented as ratios of age and sex standardised rates (indigenous:non-indigenous).

Another difference is in the proportions of the populations living in remote areas (high for the indigenous population) and in metropolitan areas (low for the indigenous population). Injury rates are known to be higher in non-metropolitan areas than in metropolitan areas (see Section 1.6), and particularly in remote areas (e.g. Map 4.38 in the *Social Health Atlas of Australia*[15]). As yet, however, analyses are not available to show the extent to which differences in urban/rural/remote population distribution may account for injury experience.

Data on injury deaths of indigenous people have been derived from the routine national mortality data collection. The cases were all those registered in the years 1990 to 1992 for which a data item titled 'Aboriginal' was set to 'yes' (n=567) (referred to as 'indigenous' in this section). Annual average case numbers were calculated for various categories of deaths,

and rates were calculated using 1991 census population estimates. Similar case counts and rates were calculated for persons not recorded as 'Aboriginal' (referred to as 'other' and 'non-indigenous' in this section; n=18 055). Information on aboriginality was not available for deaths registered in Queensland, and injury deaths registered in that State were omitted from consideration (n=4337). Consequently, the data in this section cannot be regarded as describing the experience of the Torres Strait Islander population. In addition, because the general population estimates were of 'usual residents', persons usually resident in Queensland and registered elsewhere as injury deaths, were also omitted (n=168; none was recorded as being 'Aboriginal'). As the Queensland-registered cases included a small proportion usually resident elsewhere (n=193), some of the rates reported here are underestimates. The available population data for indigenous Australians were by place of enumeration on census night, which was the same statistical local area as place of usual residence for 95.4 per cent.[3] (The proportion enumerated in their State of usual residence would have been higher than 95.4 per cent.)

The next section contains several figures showing mortality rates for all injuries, and for particular categories of injuries, for indigenous and non-indigenous populations, by age. As an aid to assessing the relationship between age-specific rates in each population, ratios between them (indigenous:non-indigenous) have been charted. The ratios should be read against the right-hand axis of each figure.

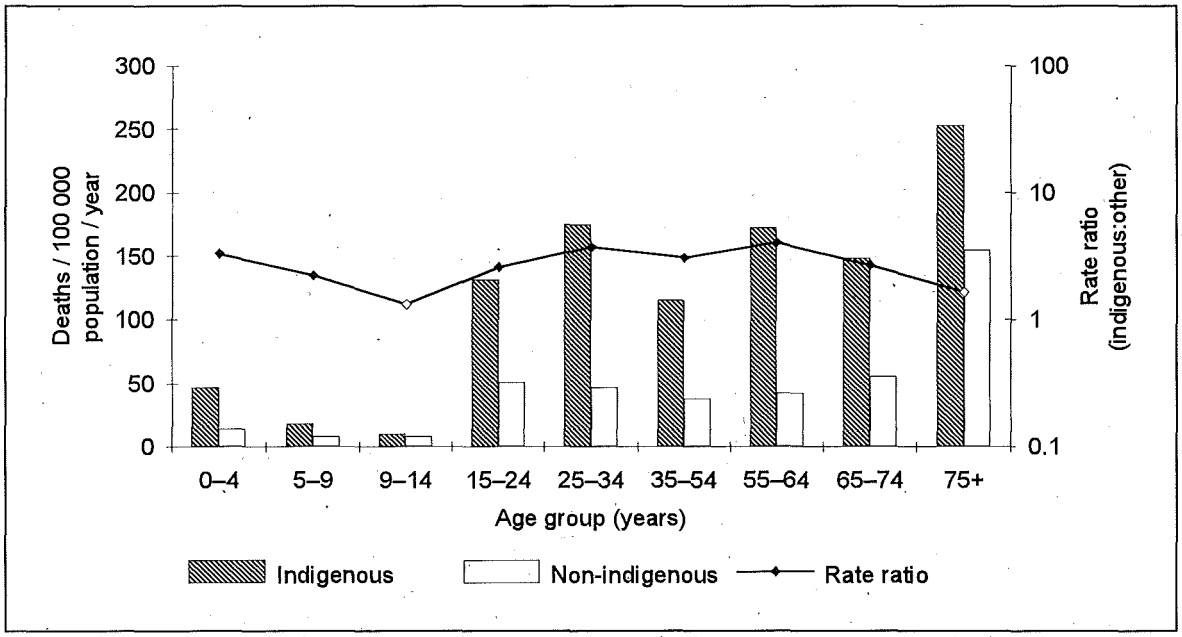
9.3.2 Injury mortality for indigenous Australians, 1990–92

In 1990–92 injury mortality rates were higher for indigenous Australians than for other Australians at every age group (Figure 9.1). The rate was higher for indigenous Australians by 2.9 times overall (standardised rate ratio; SRR). The age-specific ratio was lowest in mid-childhood (1.3) and at ages 75 and above (1.7), and highest during mid-life. Variation of rates with age showed similarities in the two populations. In both population groups, rates were relatively low in childhood, and rose to a higher level in adolescence. This persisted until old age, when the highest rates occurred.

While rates were highest in the oldest age groups, these accounted for few cases, reflecting the small size of the indigenous population in these age groups (Figure 9.2). This may be compared with Figure 9.3, which shows the larger proportion of cases in older age groups in the non-indigenous population. In both populations, most of the cases were at ages 15–54.

Male rates were higher than female rates except in childhood (Figure 9.4). The SRR for indigenous males to that for females was 2.8:1, similar to the M:F SRR of 2.7:1 in the non-indigenous population.

Figure 9.1: **Injury mortality, indigenous Australians and other Australians, Australia (except Qld) 1990–92**



Note: Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Figure 9.2: **Indigenous Australian injury mortality: age specific case counts and rates, Australia (except Qld) 1990–92**

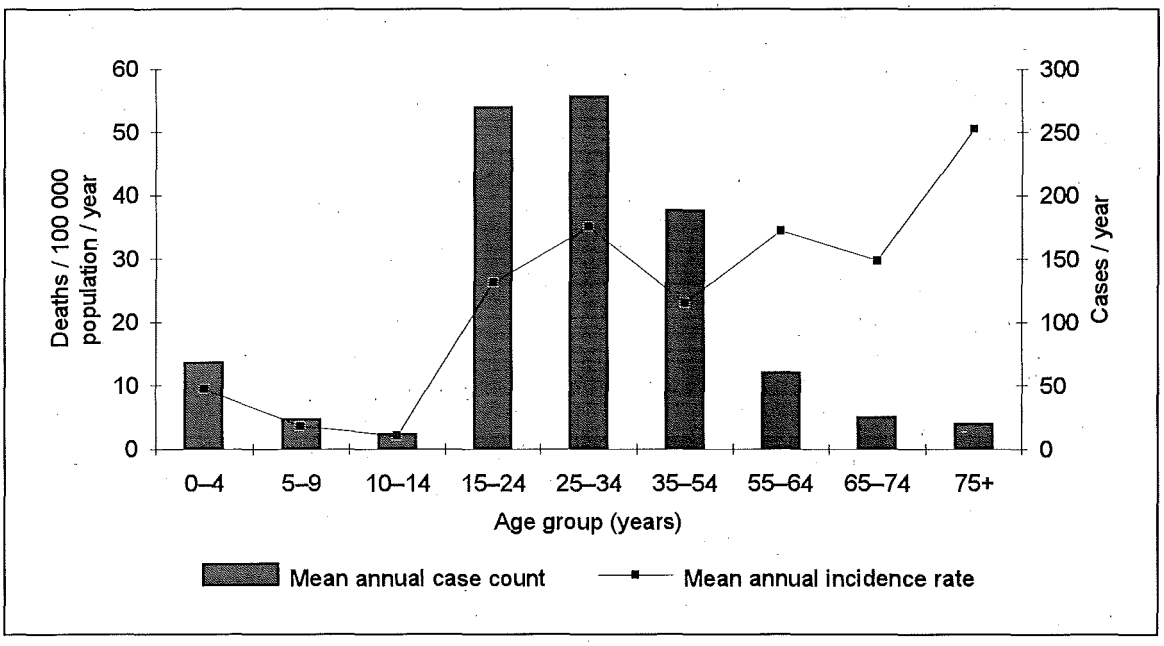


Figure 9.3: Non-indigenous Australian injury mortality: age specific case counts and rates, Australia (except Qld) 1990–92

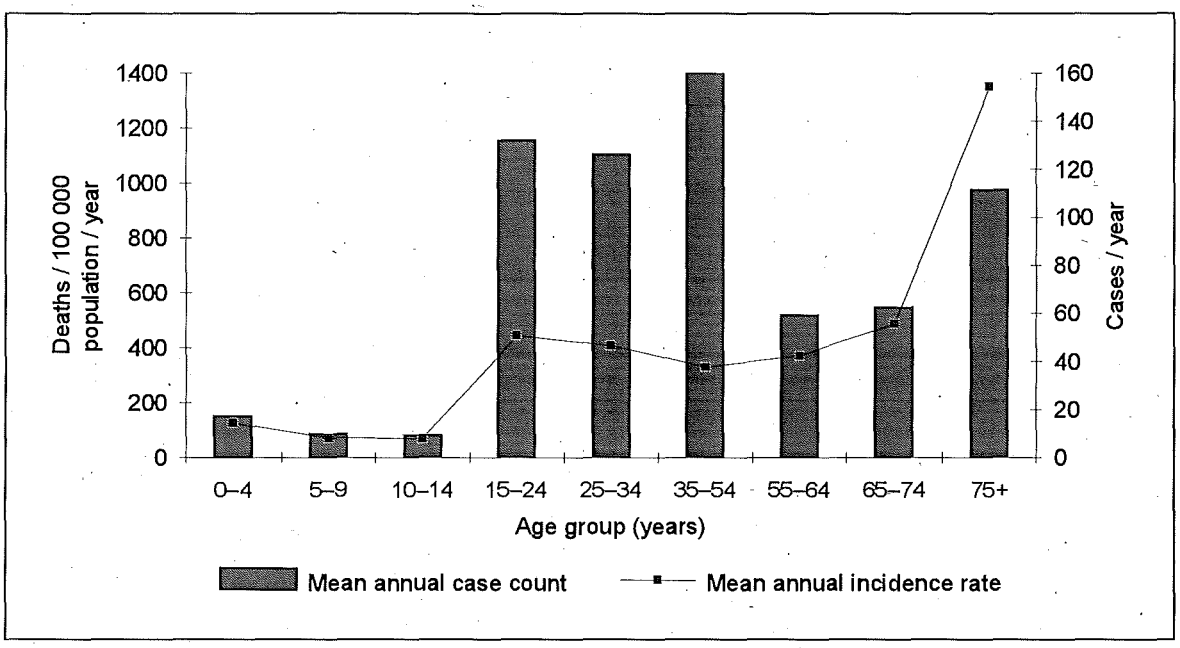
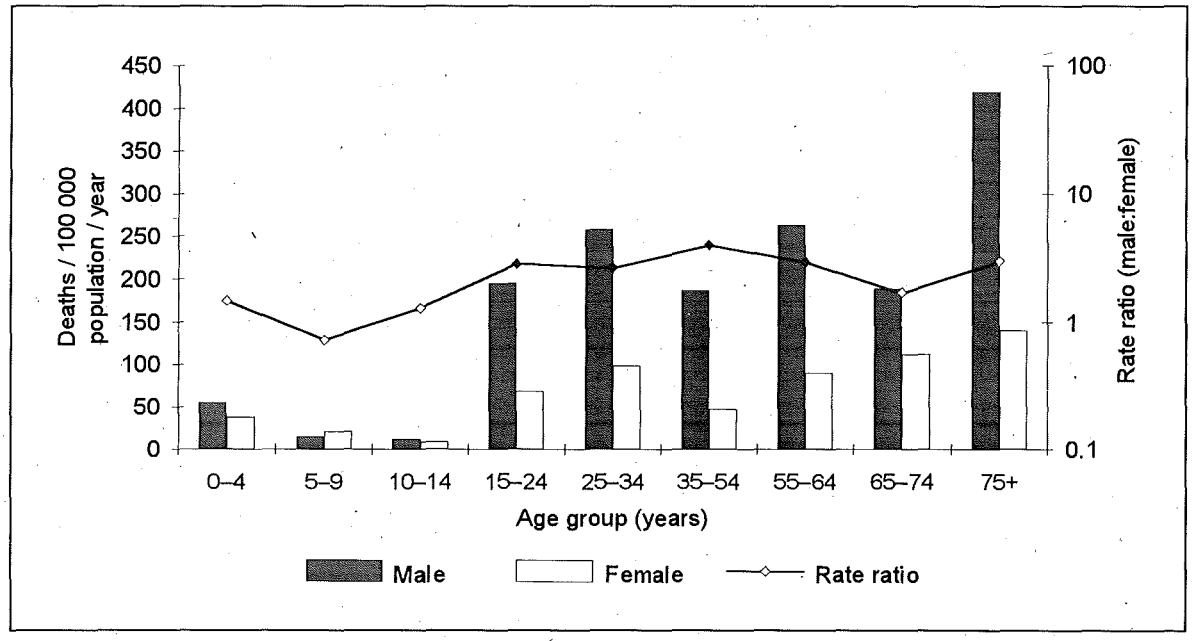


Figure 9.4: Indigenous Australian injury mortality: incidence for males and females by age group, Australia (except Qld) 1990–92



Note: Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

A marked difference is evident between indigenous and non-indigenous injury mortality in the proportion of cases which were attributed to suicide (high in non-indigenous population) and to interpersonal violence (high in indigenous population) (Table 9.1). Deaths recorded as non-intentional accounted for about two-thirds of indigenous and non-indigenous cases.

Table 9.1: Indigenous and non-indigenous, three-year external causes mortality case counts, proportions and standardised rate ratios, by attributed role of human intent, Australia (except Qld) 1990–92

	Population sector				Indigenous: non-indigenous standardised rate ratio
	Indigenous		Non-indigenous		
	Cases	Per cent	Cases	Per cent	
Non-intentional	380	67	11179	62	3.3
Suicide	67	12	5453	30	0.9
Interpersonal violence	101	18	756	4	10.8
Other and undetermined intent	19	3	667	4	2.6
All 'external causes'	**567**	**100**	**18055**	**100**	**2.9†**

† Difference between indigenous and non-indigenous rates is significantly different at the 5% probability level (assumes case numbers follow a Poisson distribution)

Age-specific indigenous:non-indigenous rate ratios indicate that the excess rates for the indigenous population are most marked in mid-life (Table 9.2). The following paragraphs will examine the mortality data on deaths from non-intentional injury, suicide and interpersonal violence in more detail.

Table 9.2: Indigenous:non-indigenous injury mortality: rate ratios by age and attributed role of human intent, Australia (except Qld) 1990–1992

	Age group								
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+
Non-intentional	3.1	2.3	1.3	2.4	4.0	4.3	6.2	3.9	1.8
Suicide	*	*	*	1.4	1.7	0.6	*	*	*
Interpersonal violence	4.0	*	*	13.2	13.8	9.9	15.0	*	*
Other/undetermined intent	*	*	*	2.7	4.1	4.1	*	*	*
All 'external causes'	**3.2**	**2.2**	**1.3**	**2.5**	**3.7**	**3.0**	**4.0**	**2.7**	**1.7**

* 3 or fewer indigenous cases during the three years 1990–92

Non-intentional injury deaths

Major categories of non-intentional injury deaths in the indigenous and non-indigenous populations are summarised in Table 9.3.

Table 9.3: Indigenous and non-indigenous non-intentional injury mortality: three-year case counts, proportions, and standardised rate ratios, Australia (except Qld) 1990–1992

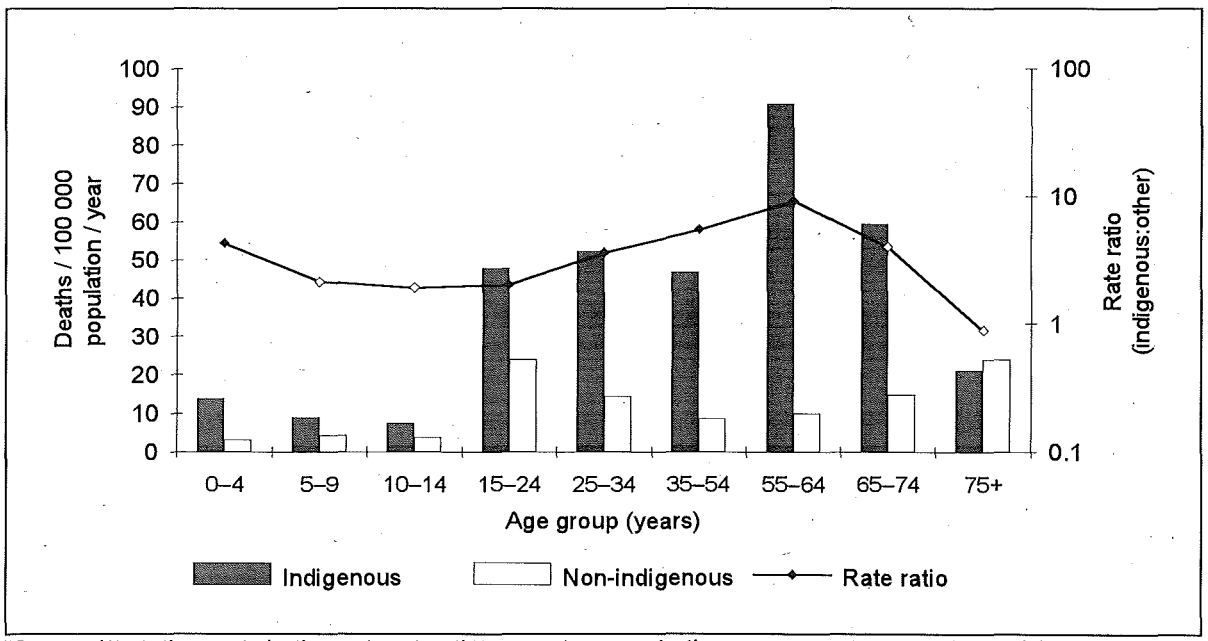
	Population sector				Indigenous: non-indigenous standardised rate ratio
	Indigenous		Non-indigenous		
	Cases	Per cent	Cases	Per cent	
Transport	224	59	5949	53	3.4
Drowning	33	9	621	6	4.8
Poison: medications, etc	14	4	456	4	2.2
Poison: other substances	27	7	95	1	17.5
Falls	14	4	2363	21	1.2
Fire, burns, scalds	20	5	336	3	10.5
Other non-intentional	48	13	1359	12	3.4
Total	**380**	**100**	**11179**	**100**	**3.3**

Transport-related deaths

Transport related deaths accounted for more than half of the non-intentional injury deaths in each group (indigenous: 59%; non-indigenous: 53%). Most of the transport cases involved motor vehicles in traffic (indigenous: 92%; non-indigenous: 88%).

In the non-indigenous population, motor-vehicle related (MVTA) death rates were highest at ages 15–24, and in old age. In contrast, the MVTA death rates recorded for the indigenous population in 1990–92 were highest at ages 55–74 (Figure 9.5).

Figure 9.5: Motor vehicle traffic deaths, indigenous and other, Australia (except Qld) 1990–92



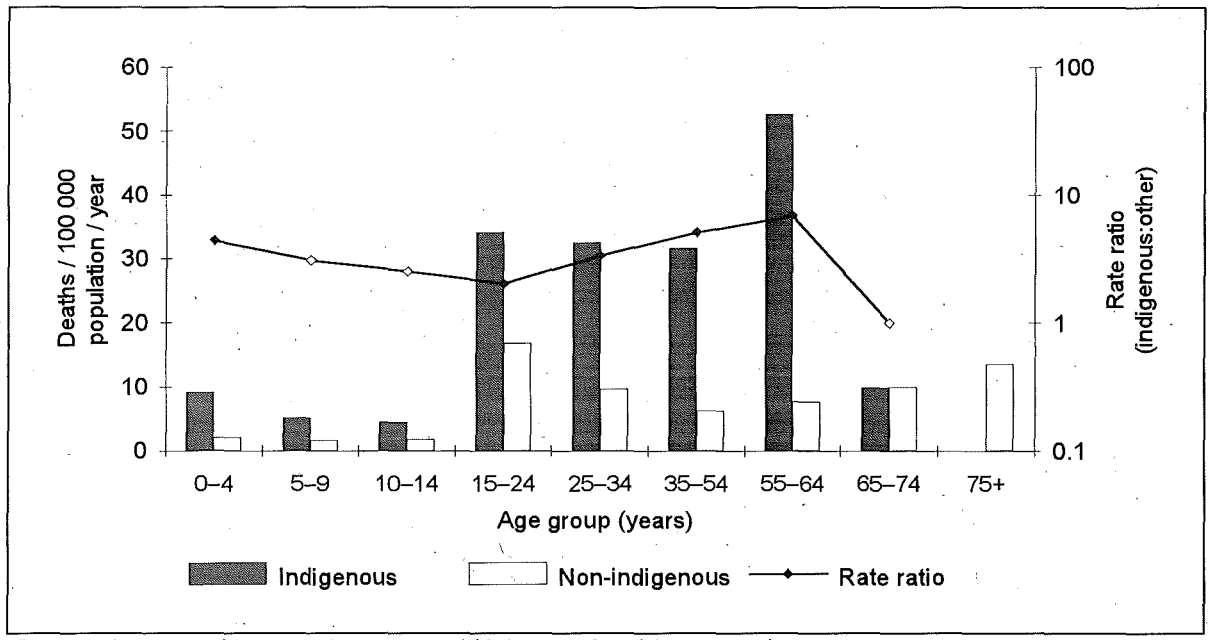
Note: Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Motor vehicle occupants (drivers and passengers) accounted for a similarly large proportion of the transport-related deaths in both groups (indigenous: 59%; non-indigenous: 59%). As for transport deaths in general, those related to motor vehicles showed high rates throughout adulthood for the indigenous group, contrasting with the peak at ages 15–24 for the non-indigenous group (Figure 9.6).

Mortality rates for pedestrians rose with age, both for indigenous and non-indigenous populations. Indigenous rates rose further and more rapidly than non-indigenous rates (Figure 9.7).

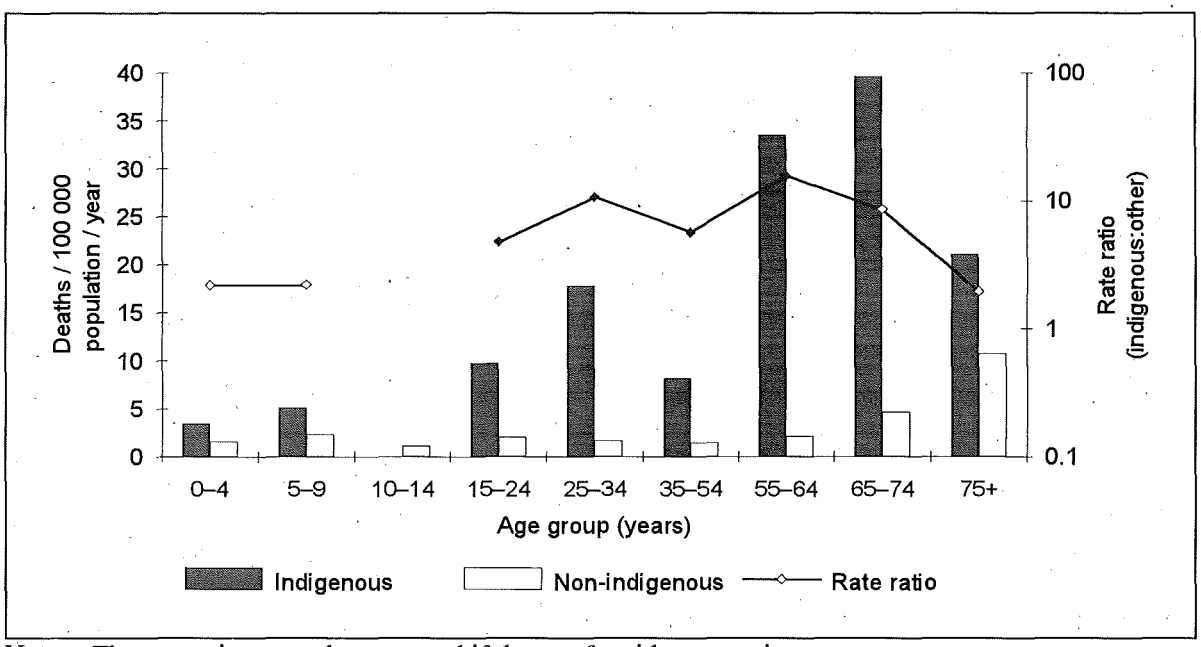
Motorcyclists (riders and passengers) made up a substantial, though minority, proportion of the non-indigenous transport deaths, but were uncommon among the indigenous transport deaths (indigenous: 1%; non-indigenous: 10%).

Figure 9.6: Injury mortality (motor vehicle occupants), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Figure 9.7: Injury mortality (pedestrians), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

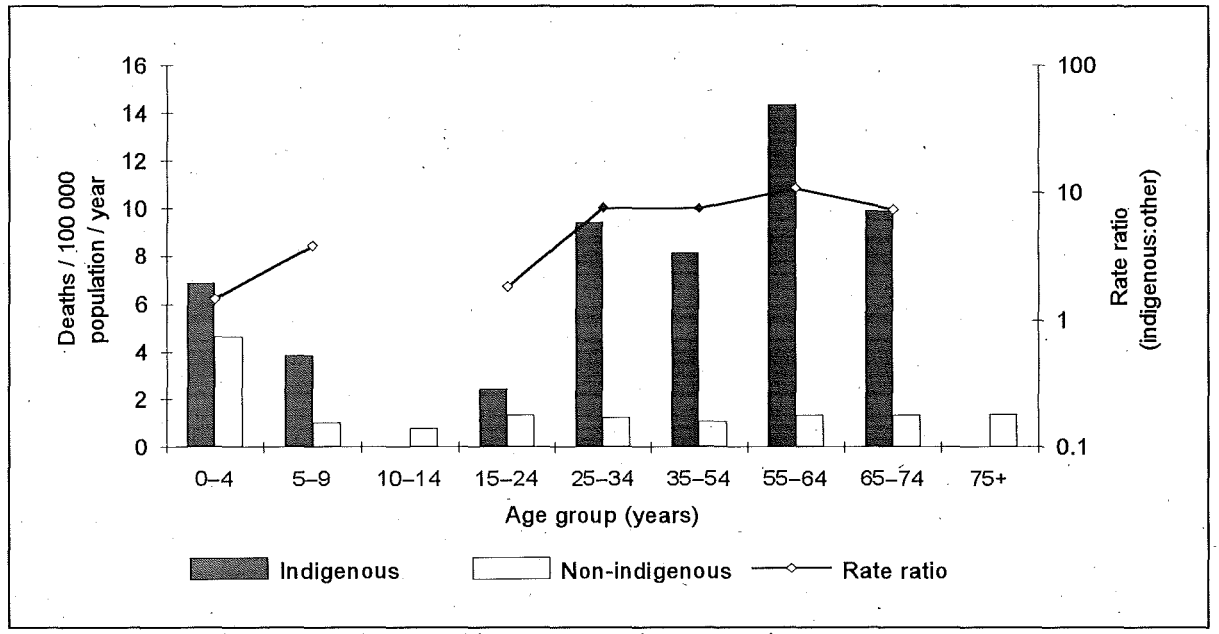
Drowning

Drowning accounted for 9 per cent of non-intentional injury deaths among indigenous for 6 per cent of the non-indigenous cases (this does not include drowning associated with water transport which is included in the 'transport' category). In both populations, rates were relatively high in the youngest age group (Figure 9.8). At older ages, drowning rates in the two populations were very different, remaining low in the non-indigenous population and rising sharply with age in the indigenous population.

Poisoning

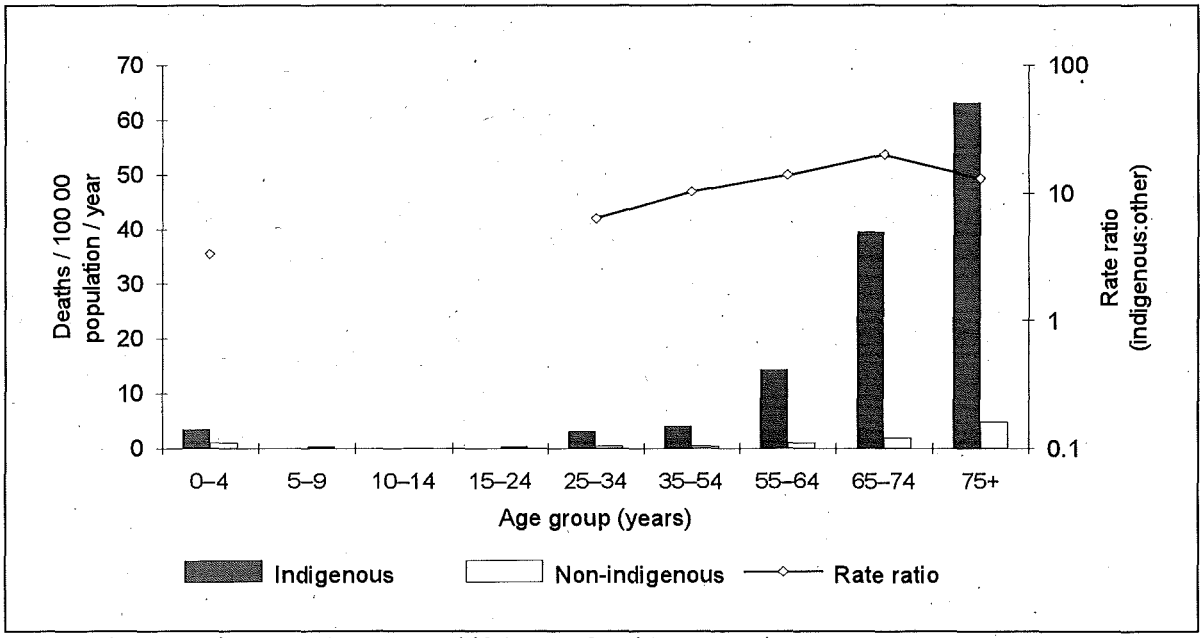
Non-intentional poisoning accounted for 11 per cent of injury deaths among indigenous people, and 5 per cent of non-indigenous cases. Most of these cases (27/41) involved substances other than drugs, medicinal substances etc. In contrast, 83 per cent of the non-indigenous cases involved drugs, medicenal substances etc. Opiates were prominent among cases in this category (indigenous: 43%; non-indigenous: 41%). A category including petroleum products and solvents accounted for more than half of the non-drug poisoning deaths among indigenous peoples (almost all of the cases were in the age group 15–24). The petroleum products and solvents category was much less prominent among the non-indigenous deaths from non-drug poisoning (7%). This was one of very few categories of injury deaths for which the number of recorded indigenous cases (n=15) exceeded the number in the much larger non-indigenous population (n=7).

Figure 9.8: Injury mortality (drowning), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Figure 9.9: Injury mortality (fire, hot objects etc.), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Falls

Deaths recorded as involving falls accounted for 21 per cent of non-intentional deaths in the non-indigenous populations, but for only 4 per cent of indigenous cases. The difference is largely due to the fact that much higher rate of deaths from falls occur in old age (e.g. see Chapter 1, Figure 1.17C) and the indigenous population in these age groups is small. The incidence rate of falls in the oldest age group (75 years and older) was quite similar in the two populations (indigenous: 84/100 000; non-indigenous: 87/100 000), though the case number was very small in the indigenous group (n=4).

Effects of fire, hot objects, etc

Fire, hot objects, etc. accounted for 5 per cent of non-intentional injury deaths among indigenous people and for 3 per cent of non-indigenous cases. In both groups, rates were highest in old age, the rise in rates being much more marked for indigenous than non-indigenous peoples (Figure 9.9).

Suicide

Suicide accounted for 30 per cent of non-indigenous injury deaths, and for 12 per cent of injury deaths among indigenous peoples. The age standardised rate of suicide was similar in the two populations (indigenous: 11.2; non-indigenous: 12.7). However, the distribution of suicide by age differed markedly — rates among indigenous people being relatively high in young adulthood, and low in later adulthood (Figure 9.10). In both groups, male standardised rates were much higher than female (indigenous: M19.7; F3.3, non-indigenous: M20.4; F5.2).

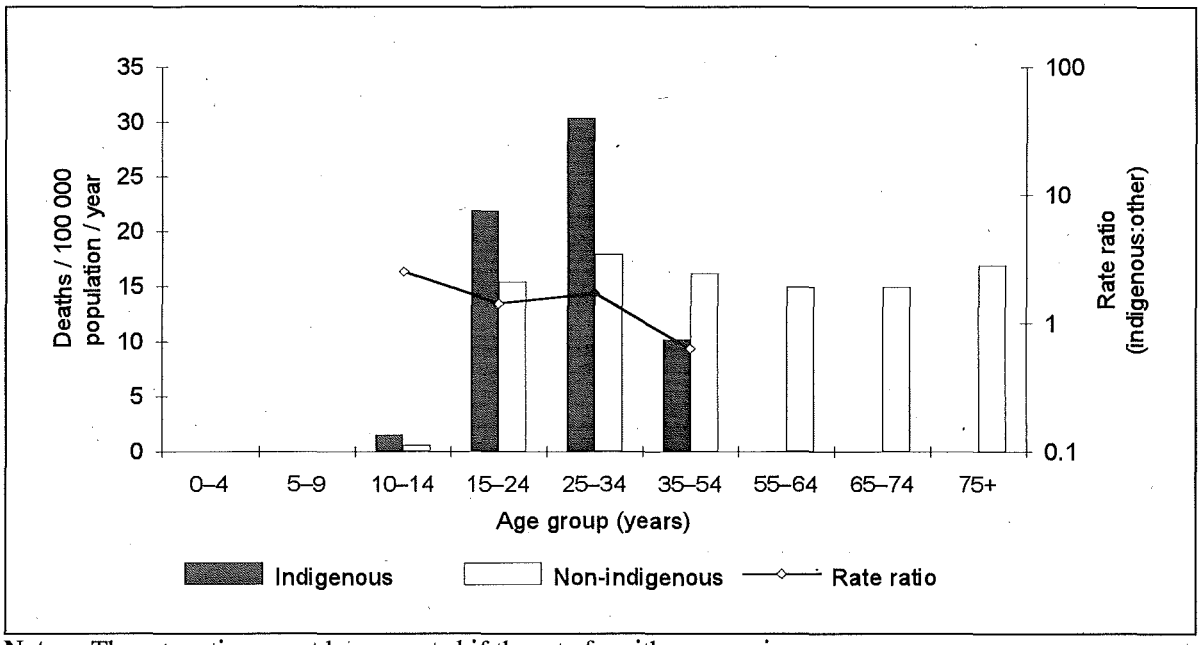
Reported method of suicide differed for the two groups. Considering ages 10–54 (all suicides among indigenous people were in this age range), hanging was relatively common in the cases concerning indigenous people, while poisoning was uncommon (Table 9.4)

Interpersonal violence

Recorded rates of death as a result of interpersonal violence were much higher in the indigenous population than in the non-indigenous population. The indigenous:non-indigenous rate ratio was around 10 through the age range 15 to 74 years (Figure 9.11). The standardised rate for indigenous females (16/100 000) was lower than that for males (23/100 000).

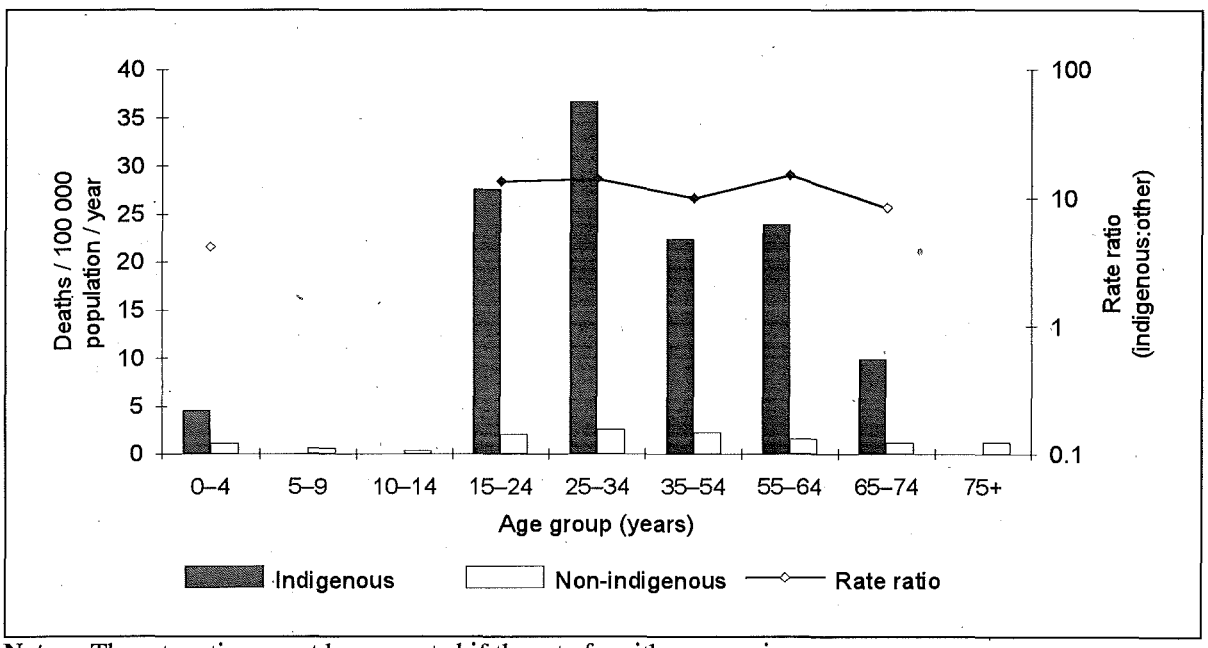
Recorded means of injury differed for the two groups. Among indigenous population deaths from interpersonal violence, stabbing and unarmed fights were relatively common and shooting was uncommon.

Figure 9.10: Injury mortality (suicide), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Figure 9.11: Injury mortality (interpersonal violence), indigenous and other, Australia (except Qld) 1990–92



Notes: The rate ratio cannot be computed if the rate for either group is zero.
Filled diamonds indicate that the difference between indigenous and other rates is significant at the 5% probability level (assumes Poisson case distribution).

Table 9.4: Suicide at ages 10–54 years, indigenous and non-indigenous: three-year case counts and proportions, by method used, Australia (except Qld) 1990–92

Method	Indigenous		Non-indigenous	
	Cases	Per cent	Cases	Per cent
Hanging	44	66	1314	24
Firearm	18	27	1038	19
Poison (solid, liquid)	2	3	967	18
Motor vehicle exhaust	1	1	1152	21
Other and unspecified	2	3	982	18
All methods	**67**	**100**	**5453**	**100**

Table 9.5: Homicide, indigenous and non-indigenous: three-year case counts and proportions, by method used, Australia (except Qld) 1990-1992

Means of injury	Indigenous		Non-indigenous	
	Cases	Per cent	Cases	Per cent
Unarmed fight, etc	14	14	58	8
Firearm	2	2	186	25
Stabbing, etc	52	51	249	33
Child battering, etc	1	1	18	2
Other/unspecified	32	32	245	32
All methods	**101**	**100**	**756**	**100**

9.3.3 Social health atlas

The *Social Health Atlas of Australia*[15] summarises many of the available indicators of Aboriginal and Torres Strait Islander health, including injury experience. Relevant findings are described here. (See Section 1.6 for further information on the atlas.)

For each of the geographical areas analysed in the atlas, the proportion of the population which was identified as indigenous Australian ('proportion Aboriginal') at the 1986 Census was used in calculating correlations between variables.

Moderate to strong correlations were reported between 'proportion Aboriginal' and 1985–89 injury mortality among 15–24-year-olds and, for the few areas where data were provided, with injury mortality at all ages. The correlations tended to be higher in rural areas than in large cities, accounting for up to 60 per cent of total variance in injury mortality rates. Correlations for 1989 hospital morbidity in cities were weaker than mortality correlations, and data were not available for rural areas.

Health status data from the 1989–90 National Health Survey on self-reported recent injury correlated weakly with 'proportion Aboriginal'. The data on injury incidence in the indigenous population would lead one to expect a strongly positive correlation. A possible explanation for the absence of the expected finding may be that indigenous people are less likely than the general population to self-report injury.

The atlas presents data derived from the 1989–90 National Health Survey on level of risk to health from alcohol consumption. In addition to a category for abstainers, three levels of risk to health were distinguished on the basis of self-reported consumption. — low, medium and high. 'Proportion Aboriginal' was positively associated with abstinence, and negatively associated with all levels of risk to health from alcohol consumption. In light of the known associations between alcohol consumption and many types of injury, and the prevalence of severe alcohol problems in some indigenous communities, these findings might seem surprising. They are, however, consistent with findings that indigenous communities tend to include a high proportion of abstainers and a small, but prominent, proportion of very heavy drinkers.[16]

9.4 Discussion

Indigenous Australians experience high rates of injury mortality and morbidity. Injury mortality for these groups exceed non-indigenous mortality most dramatically for transport-related causes in middle age; drowning in adulthood; poisoning with non-pharmaceutical substances (particularly petroleum products and solvents); effects of fire, etc. in later adulthood; suicide in early adulthood and (particularly) interpersonal violence throughout adulthood.

There are well-known associations between a number of exposure factors and injury: alcohol use, residence in non-metropolitan areas, poverty etc. Many of these factors are also common in indigenous Australian communities. The high rates of injury observed in the indigenous population are, to a considerable extent, attributable to these factors.

The attitudes and behaviours which contribute to individual injury risk, to the acceptance of preventive measures, and to the reactions to injury once sustained are often culture-specific. Thus, even though the injury patterns in indigenous populations are, in some respects, similar to those in other groups, it cannot be assumed that the same interventions will work. Little work has yet been done on culture-specific injury control for Aboriginal and Torres Strait Islander communities. These communities and their health workers have established a number of community-driven health initiatives that are capable of taking account of cultural issues. To date, these approaches have not been applied extensively to the problem of injury (though the overlapping issue of alcohol-related problems has been tackled in some areas).

This chapter demonstrates some limitations of the data presently available on injury in the Aboriginal and (especially) Torres Strait Islander populations. The identification of 'aboriginality' in data collections remains an issue. It is highly desirable that the same criterion be used in all major sources (census, health survey, mortality and inpatient collections). Important contributing factors, such as involvement of alcohol, are not recorded in routine data collections.

9.5 References

1. Franklin MA, White I. The history and politics of Aboriginal health. In: J Reid, P Trompf (eds.) The health of Aboriginal Australia. Sydney: Harcourt, Brace, Jovanovich, 1991.

2. Australian Institute of Health and Welfare. Australia's health 1992. Canberra: Australian Government Printing Service, 1992.

3. Castles I. Australia's Aboriginal and Torres Strait Islander population – 1991 census. cat. no. 2740.0. Canberra: Australian Bureau of Statistics, 1993.

4. Reid J, Lupton D. Introduction. In: J Reid, P Trompf (eds.) The health of Aboriginal Australia. Sydney: Harcourt, Brace, Jovanovich, 1991, p.xvi.

5. Hunter E. Out of sight, out of mind – 2. Social and historical contexts of self-harmful behaviour among Aborigines of remote Australia. Soc. Sci. Med 1991;33:661–671.

6. Brady M. Drug and alcohol use among Aboriginal people. In: J Reid, P Trompf (eds.) The health of Aboriginal Australia. Sydney: Harcourt, Brace, Jovanovich, 1991.

7. Mobbs R. In sickness and health: the socio-cultural context of Aboriginal well-being, illness, and healing. In: J Reid, P Trompf (eds.) The health of Aboriginal Australia. Sydney: Harcourt, Brace, Jovanovich, 1991.

8. Sleet DA, Albany P, Lee N, Stevens M. Injury in Western Australia. Perth: Health Department of Western Australia, 1991.

9. Kirke K, Divakaran-Brown C, Priest K, Roder D. South Australia health statistics chartbook. Adelaide: South Australian Health Commission, Public and Environmental Health Service, supplement 4: Aboriginal health.1993.

10. Thomson N, Briscoe N. Overview of Aboriginal health status in Western Australia, Northern Territory, South Australia, Queensland and New South Wales, Aboriginal and Torres Strait Islander Health Series 1–5. Canberra: Australian Institute of Health, 1991.

11. Australian Institute of Health and Welfare (AIHW). Publications and data catalogue, July 1993. Canberra: AIHW, 1993:41.

12. Australian Bureau of Statistics. Social indicators, number 5, 1992. Canberra: ABS, 1992:17.

13. Royal Commission into Aboriginal Deaths in Custody, National report. Canberra: Australian Government Publishing Service, 1991.

14. Howlett C. Deaths of young people in police and prison custody and juvenile detention, 1980–1992. Deaths in Custody 1993:5.

15. Glover J, Woollacott T. A social health atlas of Australia (two volumes). Commonwealth Department of Health, Housing and Community Services and South Australian Health Commission. ABS cat. no. 4385.0. Canberra: Australian Bureau of Statistics, 1992.

16. Reser JP. Aboriginal mental health: conflicting cultural perspectives. In: J Reid, P Trompf (eds.) The health of Aboriginal Australia. Sydney: Harcourt, Brace, Jovanovich, 1991, p.272.

Chapter 10 Work-related injury

10.1 Introduction

A large proportion of the adult population spends many hundreds of hours each year at paid work. In September 1991, 57 per cent of all Australians aged 15 years or more were employed, two-thirds for 35 hours a week or longer.[1] It is not surprising, therefore, that a considerable proportion of the injuries sustained by adults are related to work. Moreover, some occupations place those who follow them at risk of exposure to potentially dangerous processes substances or situations, such as moving machinery (including vehicles), electrical sources, reactive chemicals and high places. The risk of serious, sometimes life-threatening, injury is of special concern in these occupations. Some occupations involve tasks that place substantial physical loads on the body, such as heavy lifting and rapid or prolonged repetition of stereotyped movements. These can result in injury, following single or brief exposures or as the cumulative result of repeated or prolonged exposures (under some definitions, the latter category of conditions are classified as 'diseases').

The nature of work-related injury has changed over time. A century ago, a large proportion of jobs involved manual labour, often in rural industries. During the latter part of the nineteenth century, and for much of the twentieth, mechanisation occurred in many industries, manufacturing expanded and rural industries declined, in terms of number of workers. The latter part of the century has seen a great rise in service sector employment. These changes have affected the level and nature of injury risk for workers in particular jobs, as well as the overall rates and pattern of injury. Manual labour tends to place large numbers of workers at risk in the course of achieving a unit of output. Mechanisation often reduces the number of workers required to achieve the same output, but may increase or decrease the level of risk for these workers, or may leave it unchanged. Service sector occupations generally pose low risks of life-threatening injury, though some involve tasks which may lead to disabling injury.

Work-related injury and its control have been subjects for concern and for regulatory measures for more than a century. For most of this period, the approach to control relied on policing by government of corporate compliance with large numbers of highly specific regulations. In Australia, the 1980s was a period of increased activity, with a shift to a regulatory model designed to encourage the acceptance by employers and employees of responsibility for safety, and to place emphasis on safety performance.[2] National occupational health and safety administrative and research structures, at a low level since the late 1920s, were re-invigorated with the establishment in 1985 of the National Occupational Health and Safety Commission and its research arm, the National Institute for Occupational Health and Safety (together operating under the name Worksafe Australia).

This chapter provides an introduction to data on the occurrence of work-related injury in Australia. The emphasis is on national information, rather than information that may be available only for a particular State/Territory or region.

The desirability of having national statistics on the occurrence of work-related injury in Australia was stated in the early 1920s, when the Commonwealth Government and State Governments first met to consider occupational health and safety.[3] In following decades,

limited information became available in some States, and in some industries (notably mining). However, moves towards the development of national data on work injury did not get under way in earnest until the mid-1980s. Agreement was reached between States, Territories and the Commonwealth in 1987 to introduce a common standard for workers' compensation data.[4] Early in 1993, Worksafe Australia released the first national estimates of compensated work-related injury based on data approximating to this standard.[5] This report covered new claims in the financial year 1986–87, and was followed in October 1993 by a report for financial year 1991–92, based on data complying more completely with the data standard, but not including data for several major compensation systems (Victoria, Queensland, and Telecom).[6]

Special studies of the occurrence of work-related injury, at the national level in Australia, also began to be published in the late 1980s. The Work Related Fatalities Study (WRFS) conducted by Worksafe Australia was the first national study of work-related fatal injury in Australia.[7] Coroner records were studied to identify and analyse cases for the three-year period, 1982–84. The WRFS spawned a number of related projects, which considered, among other things, work-related deaths on farms,[8] deaths due to electricity,[9] in road crashes,[10] involving alcohol,[11] among immigrants,[12] and people whose occupation is fishing.[13] Comparisons were made between work fatality experience in Australia and that in the United States[14] and New Zealand.[15] A study of 'serious' occupational injuries (those resulting in work absence of six months or more) found large differences between States, which were largely attributed to deficiencies in data systems.[16]

Some companies and industries (particularly large and capital intensive ones) have instituted internal information systems capable of providing work-related injury statistics. These have, however, contributed little to the understanding of the overall national experience of work injuries for three reasons. First, only some companies have systems. Second, companies often regard the data collected as confidential, for commercial reasons. Finally, only in recent years has a data standard endorsed by key users been available[17] (though data standards had been proposed earlier).[18,19]

In principle, the routinely available sources of data on injuries generally — mortality data and hospital inpatient morbidity data — could provide information on work-related injury. In practice, they cannot do so at present, mainly because the classification system in use does not distinguish work-related cases from other cases (or does so in an inadequate way). Injury data collected in hospital Emergency departments using the Injury Surveillance Information System are able to distinguish work-related cases, but quantitative national estimates are difficult to derive from the group of participating hospitals. Relatively minor changes in classification of data in these systems could increase their value as sources of information on work-related injuries.[20]

10.2 Available national data

10.2.1 Overview

Compilations of workers' compensation data, prepared by Worksafe Australia, are beginning to provide a national picture of work-related injury. Care is required in interpreting these data, particularly because of the restricted scope of the collections. They include only those work-related injury cases for which workers' compensation was paid, and which resulted in

death, permanent disability, or temporary disability of at least one working week (5 days). Worksafe has estimated that about 75 per cent of employees come within the scope of workers' compensation provisions, but the proportion varies between industries (it is particularly low in agriculture, for example).[5] Furthermore, not all compensation systems have yet supplied suitable data (the most recent publication lacked data from three major workers' compensations systems — those of Victoria, Queensland, and Telecom — and from some smaller systems).

The Worksafe report includes only workers' compensation cases resulting in an absence of a working week or longer. A large proportion of compensated work injuries are excluded from this definition. For example, in the Northern Territory in 1991–92, 38.8 per cent of accepted claims involved no days of time off work, and another 24.9 per cent involved less than one week of time loss.[21] Thus, almost two-thirds of the Northern Territory cases fell outside the scope of the Worksafe report. Similarly, Worksafe has cited data showing that a little over 50 per cent of time-loss injuries in Western Australia in 1989–90 involved five days or less work absence.[22]

The most recent Worksafe publication of compensation-based data[6] includes cases classified as 'disease' as well as those classified as 'injuries'. Most tables in the report do not distinguish injury and disease cases. 'Injuries' accounted for 82 per cent of the cases overall, varying by industry sector (ranging from 'manufacturing', 75 per cent to 'recreation, personal and other services', 90 per cent), and by occupation (ranging from 'professional', 73 per cent, to 'sales and personal service workers', 87 per cent). Under the classification used for these data, 'disease' is defined as a condition which '...results from repeated or long-term exposure to an agent or event, for example loss of hearing as a result of long-term exposure to noise'. 'Disease' is distinguished from 'injury', which '...is the result of a single traumatic event where the harm or hurt is immediately apparent, for example a cut resulting from an accident with a knife or burns resulting from an acid splash'.[23] Some of the cases classified as 'disease' under this definition may be regarded, for some other purposes, as injuries (e.g. noise-induced hearing loss; activity-related soft-tissue conditions, such as tenosynovitis and 'RSI' (repetitive strain injury); disorders of intervertebral discs; and traumatic abdominal hernias). Such conditions make up a large proportion of 'disease' cases (e.g. musculoskeletal conditions accounted for 44 per cent of compensated 'disease' cases in South Australia in 1989–90).[22] It should, however, be kept in mind that the following data include the disease cases.

The Worksafe report of compensation data for 1991–92 includes three types of measure: case counts, cases per 1000 wage and salary earners, and cases per 1 million hours worked. Denominators for the rates are specific for age group, sex, and industry or occupation. In the report, the work-force based rates are called 'incidence rates', and the work-time based rates are called 'frequency rates' (these terms are conventional ones for occupational health and safety purposes).

Sex

In common with most other types of injuries, male case numbers and rates of work-related injuries are higher than female (Table 10.1). At least in part, the differences are attributable to differences in exposure to risks. Rates based on numbers of workers take some account of exposure, and rates based on hours worked do so more completely. As shown in Table 10.1, the M:F ratios are smaller when exposure is taken into account. At the still more comparable

level of specific occupation groups, male and female rates were even more similar. For only six of 33 occupation groups reported by Worksafe was the ratio of gender-specific compensation rates per million hours worked two-fold or larger; and, for three of these six groups, the female rate was higher than the male rate (occupation groups for which fewer than 50 male or female cases had been reported were omitted from consideration, to avoid being misled by rates based on small numbers).[6]

Table 10.1 New workers' compensation cases reported, by sex, 1991–92*

	Male	Female	M:F ratio
Cases	69 117	21 453	3.22
Cases per 1000 wage and salary earners	31.78	13.00	2.45
Cases per 1 000 000 hours worked	19.03	10.25	1.86

* Data from NSW, WA, SA, Tasmania, NT, Comcare and Australia Post. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence

Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92[6]

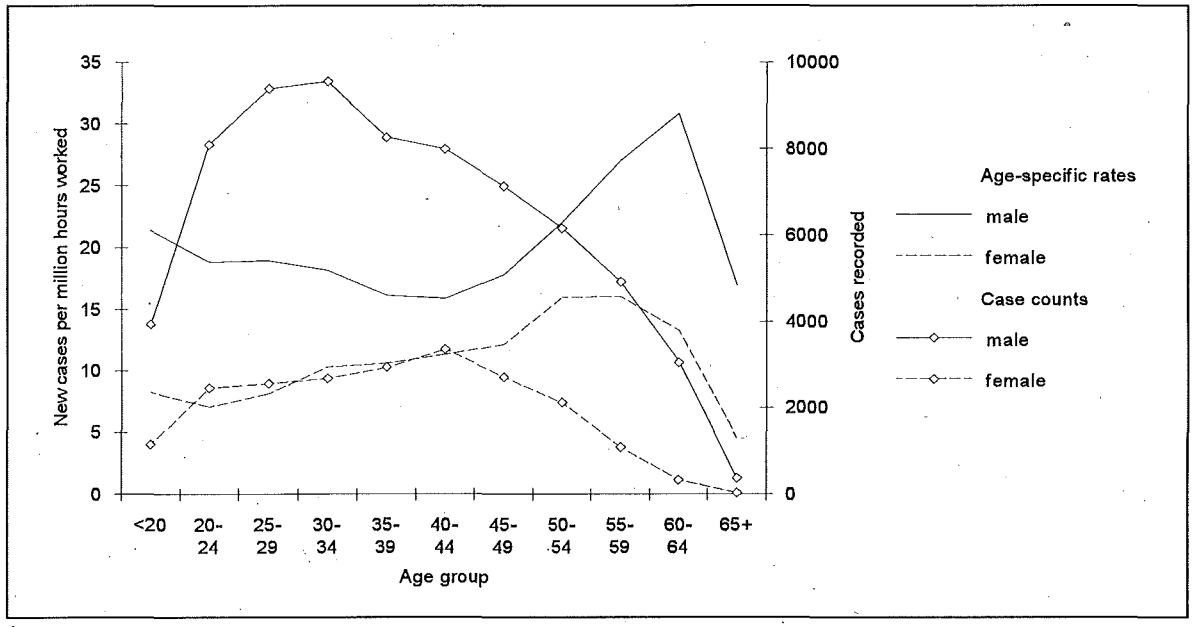
Age

Work-related injury rates tend to be higher in the latter part of working life. Figure 10.1 shows that the incidence of new workers' compensation cases per million hours worked was relatively high in the last third of working life, particularly for males. Male rates were relatively low in the middle third of working life. In contrast with incidence rates, the number of male cases was highest in the early part of working life, reflecting the age distribution of the workforce.[6]

The two measures of incidence (based on numbers of workers and on hours worked) are shown by age and sex in Figure 10.2. For each gender, the two measures varied in a similar way with age (except in the youngest age group). At nearly all ages, the ratio of male to female rates was smaller for the time-based measure than for the population-based measure.[6]

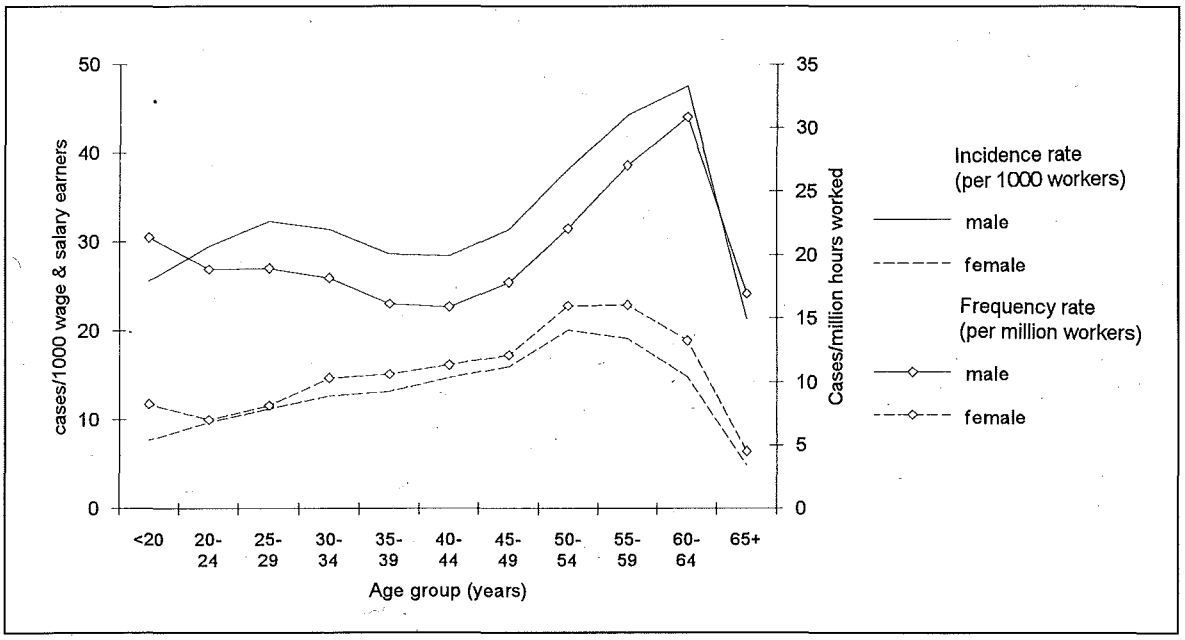
A pattern of age-specific rates similar to that shown above, though with a more marked rise in the latter part of working life, has been reported for work-related fatalities in Australia[7] (Figure 10.3). Incidence rates are shown for all work-related fatalities (crude rate: 8.1/100 000 employed persons) and for the subset, referred to as 'workplace fatalities' (4.8/100 000 employed persons), that excludes fatal road injuries sustained in the course of work (1.9/100 000 employed persons), and fatal injuries sustained while travelling to or from work (1.4/100 000 employed persons). The rates rose with age, steeply from age 65. Note that there is some uncertainty concerning the estimates of numbers of employees beyond usual retirement age. Moreover, working hours may have been relatively low in the older groups. Hence, the elevation of risk of work-related fatality in older groups may not be as great as this figure indicates.

Figure 10.1: **New workers' compensation cases reported, counts and incidence per million hours worked, by age and sex, 1991–92***



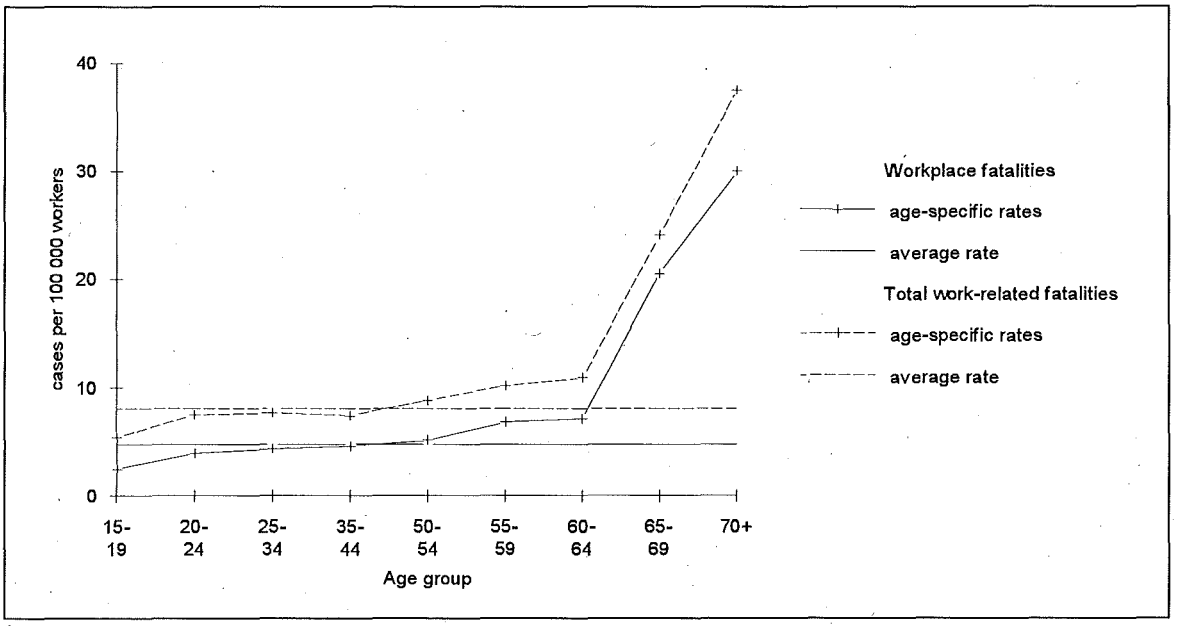
* Data from NSW, WA, SA, Tasmania, NT, Comcare and Australia Post. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence.
Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92.

Figure 10.2: **New worker's compensation cases reported: rates per 1000 workers and per million hours worked, by age and sex, 1991–92***



* Data from NSW, WA, SA, Tasmania, NT, Comcare and Australia Post. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence.
Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92.

Figure 10.3: Work-related fatalities: average annual incidence per 100 000 persons employed in he civilian labour force, by age, Australia 1982–84*



* 'Total work-related fatalities' includes work-related road deaths and deaths while commuting.
Source: Harrison et al. (1989)

Industry and occupation

Exposure to work-related hazards varies greatly with industry and occupation. For example, the mining industry has higher rates of work-related injury than industries such as finance and trade (Figure 10.4). Most of the difference relates to the high rate for males in the mining industry. This is largely attributable to very high rates among those men employed as miners (though this occupation group is not distinguished in the report under consideration here). Persons employed in the mining industry, but in administrative, professional and managerial positions, are likely to have injury rates similar to those of persons following these occupations in other industries.[6]

Differences between male and female rates are attributable, in part at least, to differences in exposure to hazards flowing from continuing gender-segmentation of many occupations. Note that the rate for females in the mining industry (Figure 10.4) is similar to the 'all industries' rate for females; very few females are employed in the high-risk occupations in the mining industry. Both male and female rates were above average for the 'agriculture' industry sector, and in the occupation group 'farmers and farm managers' (Table 10.2), groups in which gender-segmentation may be less strict.

Several industries stood out as having compensation claims 'frequency rates' well above the average for all industries. For males, ratios of industry-specific rates to the overall rate were high in mining (2.2); agriculture, forestry, fishing, hunting (1.6); and construction (1.6). For females, high ratios were found for public administration and defence (1.7); and agriculture, forestry, fishing, hunting (1.6).[6]

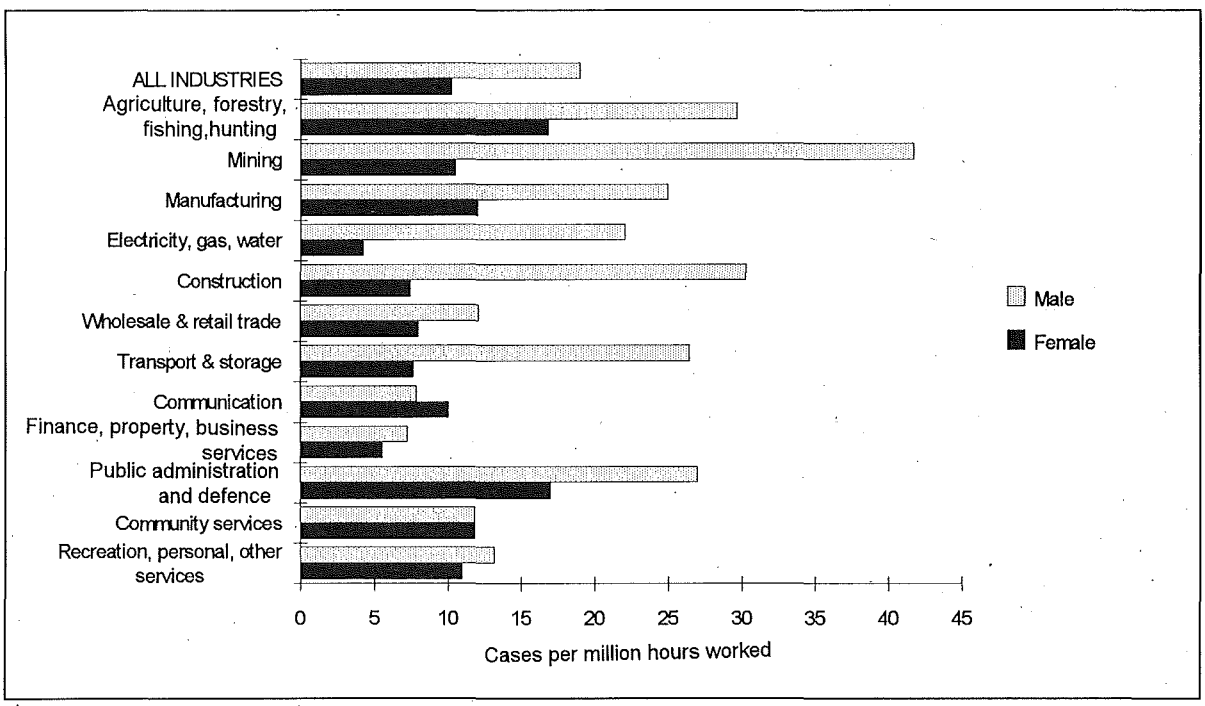
Table 10.2: New workers' compensation cases reported per million hours worked: 'agriculture' industry sector, and 'farmers and farm managers' occupation group, 1991–92*

	Male	Female	M:F rate ratio
All industries	19.0	10.3	1.9
Mining industry	41.7	10.5	4.0
Agriculture industry	27.5	16.5	1.7
Farmers and farm managers	16.4	10.0	1.6

* Industry data from NSW, WA, SA, Tasmania, NT, Comcare and Australia Post compensation authorities. Occupation data from NSW, WA, SA, Tasmania, and NT. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence

Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92[6]

Figure 10.4: New workers' compensation cases reported, by industry and sex, 1991–92*



*Data from NSW, WA, SA, Tasmania, NT, Comcare and Australia Post. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence

Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991-92[6]

As with industry groups, 'frequency rates' for several occupation groups were well above the all occupations mean. For males, high rate ratios were found for: labourers and related workers (2.0), plant and machine operators and drivers (1.8); and trades persons (1.4). The same three occupation groups had the highest ratios for females: labourers and related workers (3.4), plant and machine operators and drivers (1.6); and trades persons (1.5).[6]

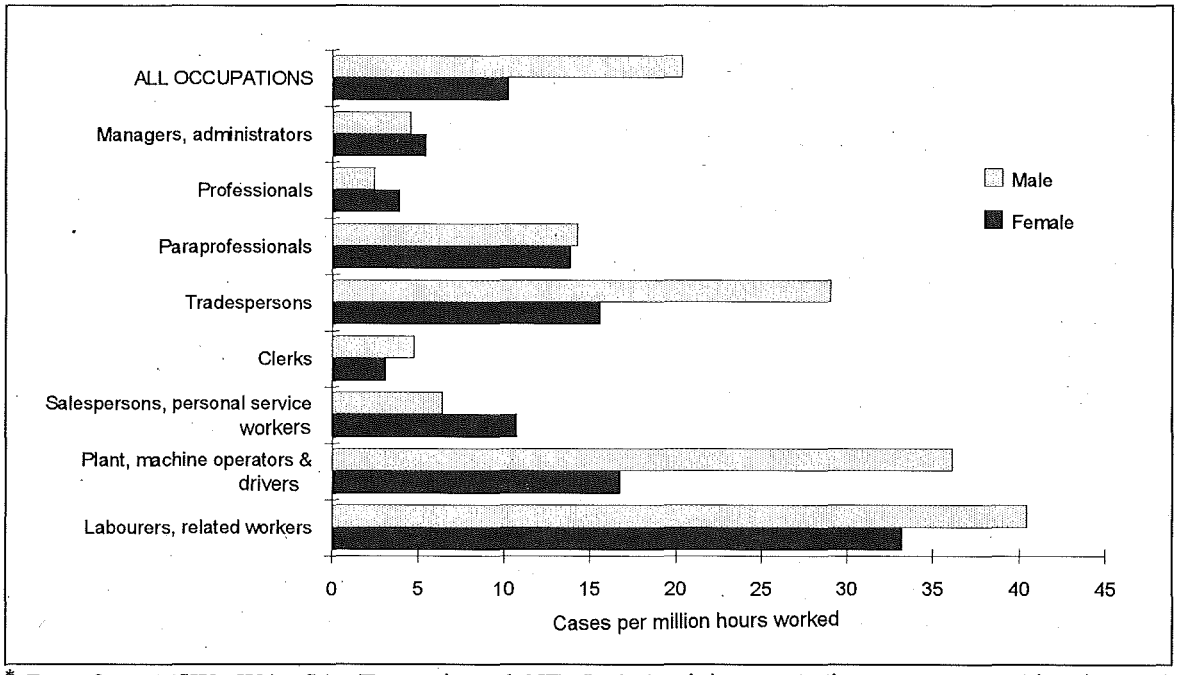
Duration of absence from work

Of compensated cases involving at least one week off work in 1991–92 (and for which the duration was known), 36 per cent had a duration of one week, 16 per cent had two weeks, and 9 per cent had three weeks. Another 19 per cent involved four to 13 weeks time loss, and 15 per cent involved periods longer than 13 weeks.[6]

Costs of workers' compensation

Worksafe Australia has published estimates of the cost of workers' compensation (for disease as well as injury).[22] Two estimates were given of the cost of workers' compensation in 1991–92. The estimate based on national accounts data was $4600 million (this includes a provision for outstanding liability), while that based on the ABS Major Labour Costs survey was $3800 million. Both sources indicate that the cost (when measured in constant value terms) has declined from a peak reached in the late 1980s.

Figure 10.5: New workers' compensation cases reported, by occupation and sex, 1991–92*



* Data from NSW, WA, SA, Tasmania and NT. Includes injury and disease cases resulting in death, permanent incapacity or 5 or more days work absence

Source: Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92[6]

10.2.2 Some specific groups of work-related injury

Farming, forestry, fishing and hunting injuries

Farmers, and persons in other occupations who are often grouped with farmers for statistical purposes (forestry, fishing and hunting workers), have high rates of work-related compensated injury and disease (Table 10.2 and Figure 10.4), and of work-related fatalities.[7,8,13] (See also Chapter 4.)

During the period 1982–84, 223 work-related agricultural fatalities occurred in the employed labour force in Australia, at a rate of 19.4 per 100 000 persons per year. This rate was 2.4 times higher than that for all work-related fatalities, and was similar to comparable rates in New Zealand and the United States. Agricultural fatalities included high proportions of cases involving very young (see below) or old persons. Rates rose with age, were much higher for males than females (27.4 and 4.6 per 100 000 persons per year, respectively), and were twice as high for persons other than farm managers as for managers (28 and 15 per

100 000 persons per year, respectively). Estimated rates varied between types of agricultural occupation, though this information is difficult to interpret. Tractors were involved in 40 per cent of deaths (rolling over in two-thirds of these cases). Other mobile machines (including motor vehicles) were involved in another 30 per cent of the deaths (rolling over in three-fifths of the cases). Of the tractor roll-over deaths, 97 per cent involved tractors that were not, or probably were not, fitted with a roll-over protection system.[8]

Another 34 deaths involved children (age <15 years). Twenty-one of the children were injured as by-standers to agricultural work (often while playing; 14 were aged < 4 years) and the remainder were injured while engaged in farm work. The lack of clear boundaries between home and workplace on many farms places children at risk in this industry to an extent not seen in most industries.[8]

Professional fishing is the occupation of a small proportion of the Australian labour force (around 10 000 during the 1980s), but the rate of work-related death is high in this group.[13] In the period 1982–84, the observed rate was 143/100 000 employees per year, a rate 18 times higher than the fatality rate for the entire workforce, and twice as high as the rate for miners and quarry-workers. Two-thirds of the 47 deaths were by drowning. Factors noted to be involved frequently were rough weather, non-seaworthy vessels, inadequate use of personal flotation devices, and inexperience.[13]

Road injuries

Road injuries account for a small proportion of non-fatal work-related injuries, but for a large proportion of work-related fatalities. Of compensated employment injuries in New South Wales in 1988–89, 1.4 per cent were road injuries.[24] Of 98 fatal injuries recorded, however, 20 (20%) were road injuries. The proportion of the road cases that were fatal (1.3%) was greater than the proportion for non-road cases (0.2%), indicating the potential for severity of road trauma.

During the period 1982–84, 600 of 1544 work-related fatalities (39%) resulted from incidents involving vehicles on public roads.[10] Of the 600 work-related road deaths, 366 occurred in the course of work, the remaining 243 occurring while commuting between home and work. These case counts are likely to be underestimates, because the data source (coroner records) often did not specify the work-relatedness of road deaths.

For all ages 17 years and above, road deaths while working accounted for 24 per cent of all work-related deaths, and for 4 per cent of all road deaths. These proportions were higher during the middle part of adult life. For example, at ages 40 to 49, road deaths while working accounted for 28 per cent of all work-related deaths, and for 12 per cent of all road deaths. While work-related road deaths were most frequent during working hours, they accounted for the greatest proportion of cases in the early hours of the morning. Trucks were the predominant type of vehicle involved in road deaths while working (58%) and most of the trucks were articulated (71%). Cars, station wagons, vans and utilities accounted for 33 per cent of road deaths while working. For several occupation groups (Table 10.3) and industry sectors, road deaths accounted for the bulk of all work-related fatalities.[10]

Table 10.3: Work-related road deaths: case counts and proportions of all work-related fatalities, by occupation group, Australia 1982–84

Occupation group	Work-related road deaths		
	While working (cases)	While commuting (cases)	As per cent of all work-related deaths in the occupation group
Professional, technical	12	28	59%
Administrative	10	8	69%
Clerical	*	7	>54%
Sales	19	16	73%
Farmers, etc	30	19	16%
Miners and quarrymen	*	4	>5%
Transport, communication	223	23	64%
Tradesmen, labourers	54	88	29%
Services	11	31	41%
All occupations	**366**	**234**	**39%**

* Fewer than 4 cases

Electrical injury

Contact with electricity accounted for 95 work-related deaths in Australia in the period 1982–84.[9] Electrical injury thus accounted for 10 per cent of work-place deaths (i.e. work-related deaths other than road traffic or commuting cases). All of the cases were men, and the crude death rate was 0.75 per 100 000 employed males per year. Thirty-four of the men had electrical occupations, and another four were engaged in electrical work at the time of injury. Common types of place at which the injury cases occurred were: farms and other places of primary production (22%); domestic residences (16%); construction sites (15%); factories and warehouses (11%); and other industrial sites (20%). In 40 cases, aerial power lines were the source of current, and most of these occurred when a conductive object, such as a crane boom, truck, irrigation pipe or drilling rig came into contact with the line. Thirteen of the 40 occurred on a farm. Other common types of cases involved contact with fixed wiring (27 cases), and welding machines and accessories (11 cases). Significantly more cases (both indoor and outdoor) occurred during the hotter half of the year (October to March). Moisture and lack of adequate clothing were common contributory factors. Review of circuitry involved suggested that 65 per cent of the 55 cases not involving contact with an aerial powerline could have been prevented by use of a residual current device. Comparable findings were reported in a study of all electrocutions in Western Australia, 1976–1990.[24]

Electrical injury is much less common among non-fatal work-related injuries. For example, in New South Wales in 1988–89, 'contact with electric current' was recorded for 283 of 93 717 compensated workplace injuries (0.3 %).[25]

Fixed plant and machinery

High among the concerns which prompted the introduction of early occupational health and safety legislation (factories acts, in the second half of the nineteenth century) was injury by fixed machinery. Guards to protect workers from dangerous parts of such machinery have long been required. During the period 1982–84, 51 work-related deaths involving fixed plant and machinery occurred in Australia.[26] All were males, and most cases (69 per cent) occurred in the manufacturing industry sector. The author found that failure to guard the

machine properly was a factor in at least 37 per cent of the cases and that, in nearly one-half of these, a guard had been removed or rendered inoperative.

Alcohol

Alcohol is well recognised as a major factor in the occurrence of road injuries. The role of alcohol in other categories of injuries, including occupational injuries, is less well defined and literature is very limited. The Work Related Fatalities Study (WRFS) sought data on blood alcohol concentration (BAC) for work-related fatalities in Australia during the period 1982–84, and recorded information on which it was, in many cases, possible to base an assessment of the likelihood that intoxication had contributed to the fatal event. An analysis of these data has been reported.[11] Of cases for which BAC data were available (60 per cent of 1737 work-related fatalities considered), values above zero were found in 16 per cent, with a median value of 0.104 g/dL. Of cases in which alcohol was detected, the level was greater than 0.05 g/dL in 65 per cent. In a comparison between the cases for which BAC was zero and those for which it was above zero, cases in the latter group were found to be more likely to be single, separated or divorced, and to have an occupation as a manager, executive or administrator, and to have occurred while commuting. These findings may underestimate the involvement of alcohol in work-related fatalities. BAC data were not available for 40 per cent of cases. Records indicated that alcohol had been considered as a factor in 69 cases in which BAC was not tested. Furthermore, the nature of the study restricted its scope to the BAC of the fatally injured person and cases in which the elevated BAC of another person contributed to the occurrence of an occupational fatality could not be identified.

10.2.3 Work-related injury in relation to all injury

It has been difficult to assess the proportion of all injury which is work related because the main collections of data on injury do not distinguish work-related cases at all (e.g. routine mortality data), or do so in a way that may not correspond with data conventions for occupational health and safety (e.g. hospital inpatient morbidity data).

The WRFS provided an opportunity to compare patterns of work-related and non-work-related injury in a well-defined class of Australian mortality data.[27] The study began with a list, derived from routine collections of mortality data, of all injury deaths which had occurred during the three calendar years 1982, 1983 and 1984 and which had been registered by a coroner by the end of 1985. Two categories of injury deaths were excluded: suicides (E950–E959); and deaths attributed to medical and surgical causes (E870–E879 and E930–E949). For most purposes, the study restricted its attention to deaths at ages 15 years and older. Deaths on the list were assessed for 'work-relatedness' using other sources of information (principally coroner records). The following section outlines and compares the distribution by 'external cause' of the WRFS cases (i.e. deaths on the list which were found to be work-related), and non-cases (other deaths on the list).

Overall, work-related cases accounted for 11 per cent of deaths in the set defined as above. Proportions contributed by the three major categories of work-related deaths distinguished in the WRFS were: commuting (2%); road traffic deaths while working (3%); and deaths while working which did not occur in road traffic (6%).

As may be expected, nearly all (97%) of the WRFS cases classified as work-related commuting cases had been given ICD-9 external cause codes (E-codes) for transport. Eighty-eight per cent of the 'transport' commuting cases were recorded as motor vehicle traffic accidents.

Likewise, 96 per cent of the cases regarded as work-related traffic deaths in the WRFS had E-codes with this meaning. The few exceptions reflected different assessments of whether cases had occurred on public roads, and whether some cases involving mobile machinery should be coded as such, or to 'traffic'.

Most (89 per cent) of the non-traffic workplace fatalities fell into three broad E-code groups: transportation (25%); falls (11%); and a miscellaneous category referred to as 'other unintentional' (53%) (Table 10.4)

Table 10.4: Injury deaths by E-code group: case numbers and proportions which were work-related, Australia 1982–84*

External cause code group	Work-related deaths† (cases)	Total deaths (cases)	Percentage of work-related deaths in each category
All (E800–869, E880–929, E960–999)	901	14542	6.2
Transport (E800—848)	223	9025	2.5
non-rail land**(E810–829)	95	8386	1.1
rail (E800–807)	33	198	16.7
water (E830–838)	46	264	17.4
air (E840–845)	43	169	25.4
other transport (E846–848)	6	8	75.0
Falls (E880–888)	100	1519	6.6
from ladder or scaffold (E881)	32	52	61.5
from building or other structure (E882)	42	119	35.3
other falls (E800, E883–888)	26	1348	0.7
Falling object (E917)	115	159	72.3
Machinery (E919)	184	210	87.6
Electricity (E925)	93	199	46.7

* Date of death 1982–84; registered by a coroner by end of 1985; ages 15+; excludes suicide and medically-related deaths

** Mainly motor vehicle crashes (e.g. on farms); also cases involving persons riding or being drawn by animals

† Non road-traffic work-related cases from Work Related Fatalities Study[7]

Another source of estimates of work-related injury as a proportion of all injury is the Injury Surveillance Information System, which has obtained records of a large number of attendances at hospital Emergency departments due to injury. The number of hospitals choosing to participate has varied since the system commenced in 1986, peaking at about 50. While the overall relationship between cases collected by the system and all injury attendances is not well defined, where comparative studies have been done they have indicated that the included cases are fairly representative (though child injury cases are over-represented). The system includes indicative data on the injury sustained (provided by hospital staff) and information about the person injured and the circumstances of injury,

including whether it occurred while working. This information is volunteered by the injured person, or an accompanying adult. For present purposes, two sets of cases have been selected and compared. Both are derived from the set of all cases held at NISU on 1 February 1994 which had occurred in 1992 or 1993, and aged 15 to 64 years. This group was split into the subset where the injury was stated to have occurred while the person was working (n=21 997), and the subset not stated to have occurred while working (n=87 564).

Twenty per cent of the attendances of persons aged 15–64 were work related. The proportion of work-related cases was higher for males (24%) than for females (11%). The work-related attendances were less likely to be admitted (8 per cent admitted) than were the other attendances in this age group (14 per cent admitted).

Proportions of major categories of reported injuries are shown for the work-related and non-work-related cases in Table 10.5 (Note that the proportions are of recorded injuries, not presenting cases. An average 1.16 injuries per case was recorded in the set considered here.) Of injuries recorded for the work-related attendances, 45 per cent involved the upper limb (mostly the hand) and 22 per cent were head injuries. Injury of the upper limb accounted for 51 per cent of the injuries recorded for the admitted work-related cases. Two particularly frequent categories of work-related injury were cuts, lacerations and puncture wounds of the hand (18 per cent of reported injuries), and foreign bodies in, and superficial abrasions of, the eye (10%).

Table 10.5: Common types of injury at ages 15–64 years recorded at presentation of work-related and non-work-related cases to Emergency departments: all attendances and admitted cases, 1992 and 1993

All injuries	Attendances		Admissions	
	Non-work n=102503 column %	Work n=24663 column %	Non-work n=16846 column %	Work n=2537 column %
Nature of injury				
Cut, laceration	19.8	26.3	17.0	23.3
Burn	2.4	4.9	2.7	4.8
Fracture, dislocation	17.3	9.1	1.7	26.7
Sprain, strain	15.7	12.7	2.3	2.6
Body part injured				
Head	21.9	22.4	19.9	11.2
Upper limb	32.5	44.8	22.8	50.8

Source: National Injury Surveillance Unit, from hospitals participating in the Injury Surveillance Information System

10.3 Discussion

Work-related injury accounts for an important, though relatively small proportion of all injury. This chapter is intended to provide a survey of available data at the national level. Responsibility for control of work-related injury lies principally with employers, though employees and certain other groups also have defined duties. Occupational health and safety organisations, laws and professional groups have developed to address this aspect of injury occurrence. Particularly since the mid-1980s, occupational health and safety activities in

Australia have tended to become associated with the processes of industrial relations, and the key sectors engaged in industrial relations (employers, unions and government) have increased the attention given to it.

Work-related injury is of interest to the health sector, and to those interested in injury control generally, from a number of perspectives. Many work-related injuries, particularly the more severe ones, are treated by health sector personnel and in health sector facilities. In particular, work-related injuries account for an important proportion of injuries attending hospital Emergency departments. Also, some categories of work-related injuries have characteristics which include them in the area of interest of injury control workers who do not focus exclusively on occupational injury (e.g. road injuries, drownings, injury in rural and remote Australia, injury associated with fishing, involvement of alcohol in injury occurrence).

Publications which have appeared during the past five years have added substantially to the previously scanty information available on the burden of work-related injury at the national level in Australia. The sources now available are still limited in important respects. Nationally-compiled workers' compensation data suffer from the important limitations, some inherent in the information source. Moves towards full compliance with the Worksafe Australia Minimum Data Set for Compensation Based Statistics will improve the situation. It will be some time, however, before time-series are available. Most of the work-related fatalities data described in this chapter were derived from a large survey conducted in the mid-1980s and dealing with the period 1982–84. Replication of the study (being undertaken by Worksafe) will provide comparable data for a more recent period. Annual summary data could be provided if the routine collections of mortality and hospital separations cases flagged work-related cases in a suitable way (the 'type of activity' classification of the newly released ICD10 has been proposed by NISU).[20]

10.4 References

1. Castles I. Social Indicators Australia, number 5 (1992). ABS Cat 4101.0. Canberra: Australian Bureau of Statistics, 1992.
2. Brooks A. Guidebook to occupational health and safety laws. 3rd edition. CCH Australia 1988.
3. Commonwealth and States of Australia Conference on Industrial Hygiene. Report. Melbourne: Commonwealth and States of Australia, 1922.
4. National Occupational Health and Safety Commission. National Data Set for Compensation-based Statistics. Canberra: Australian Government Publishing Service, 1987.
5. Worksafe Australia. Industry Occupational Health and Safety Performance, Australia: a statistical summary 1986–87. Sydney: Worksafe Australia, 1993.
6. Worksafe Australia. Estimates of national occupational health and safety statistics 1991–92. Canberra: Australian Government Publishing Service, 1993.
7. Harrison JE, Frommer MS, Ruck EA, Blyth FM. Deaths as a result of work-related injury in Australia, 1982–1984. Med. J. Aust. 1989; 150: 118–125.
8. Erlich SM, Driscoll TR, Harrison JE, Frommer MS, Leigh J. Work-related agricultural fatalities in Australia, 1982–1984. Scand J Work Environ Health 1993:19;162–167

9. Harvey-Sutton PL, Driscoll TR, Frommer MS, Harrison JE. Work-related electrical fatalities in Australia, 1982–1984. Scand. J. Work Environ. Health 1992; 18:293–297

10. Harrison JE, Mandryk JA, Frommer MS. Work-related road fatalities in Australia, 1982–84. Accid. Analysis Prevention 1993;25:443–451.

11. Hollo CD, Leigh J, Nurminen M. The role of alcohol in work-related fatal accidents in Australia 1982–1984. Occup. Med. 1993; 43:13–17

12. Corvalán C, Driscoll TR, Harrison J. The role of birth and period of residence of migrants in work-related fatalities in Australia. Scand. J. Work Environ. Health 1994. In press.

13. Driscoll TR, Ansari G, Harrison JE, Frommer S, Ruck EA. Traumatic work-related fatalities in commercial fishing in Australia. Submitted manuscript.

14. Stout N, Frommer MS, Harrison J. Comparison of work-related fatality surveillance in the USA and Australia. Journal of Occupational Accidents 1990; 13:195–211.

15. Paine V. A comparison of occupational fatalities as a result of work-related injury, New Zealand and Australia 1982–84. Treatise. University of Sydney, 1993.

16. Wigglesworth EC. Serious occupational injuries in Australia: some deficiencies of the existing data collections. Community Health Studies 1990;14:279–287.

17. Worksafe/Standards Australia. Workplace injury and disease recording standard. 1990. (AS1885.1).

18. Division of Industrial Hygiene. Reliable records in industrial ambulance rooms. Melbourne: Commonwealth of Australia, Department of Health, c. 1930. Service publication no. 23.

19. Standards Association of Australia. Revised Australian code for recording industrial accidents. 1966, (ASCZ6).

20. National Injury Surveillance Unit. National Minimum Data Set for Injury Surveillance. Canberra: Australian Institute of Health and Welfare, 1994.

21. Work Health Authority. Workplace injuries – statistical supplement for 1991–92. Darwin: Work Health Authority (undated).

22. Worksafe Australia. Occupational health and safety performance, Australia — best estimates. Sydney: Worksafe Australia, 1993.

23. National Occupational Health and Safety Commission. Type of occurrence classification system. Canberra: Australian Government Publishing Service, 1990.

24. Workcover Authority of NSW. Workers Compensation Statistics 1987–88 and 1988–89. Workcover Authority, Rosebery, NSW, 1990.

25. Fatovich DM. Electrocution in Western Australia 1976–1990. Med. J. Aust. 1992;157:762–764.

26. Heathershaw J. Work related fatalities due to fixed plant and machinery. Treatise, University of Sydney, 1992.

27. Harrison JE. Studying traumatic work-related fatalities in Australia. Treatise, University of Sydney, 1989.

Appendix: Reference tables

This appendix contains three sets of tables to which reference is made in some sections of the report. The tables are also intended as a convenient source for reference.

Tables	Table numbers		
	Mortality† 1979–81	Mortality† 1989–91	NSW‡ 1991–92
Age group by sex	1	14	27
Injury diagnosis			28
Major E-code groups, by age and sex	2	15	29
Accidental transportation cases, by age and sex	3	16	30
Accidental land transportation cases (non-rail), by age and sex	4	17	31
Accidental drowning, by age and sex	5	18	32
Accidental poisoning (drugs etc), by age and sex	6	19	33
Accidental poisoning (other substances), by age and sex	7	20	34
Accidental falls, by age and sex	8	21	35
Accidental burns, scalds etc, by age and sex	9	22	36
Other unintentional injuries, by age and sex	10	23	37
Intentional self-inflicted injuries, by age and sex	11	24	38
Intentional injury, inflicted by other person, by age and sex	12	25	39
All cases by E-code 'intent' groups, age and sex	13	26	40

† Mean annual rate per 100 000 population
Cases for three calendar years have been aggregated to increase the reliability of estimates
‡ Annual rate per 100 000 population

Injury mortality cases selected for tabulation were all those which had been attributed a "cause of death" code in the range 800.0 to 999.9. Values in this range in Australian routine mortality data represent 'external causes' codes as defined in the International Classification of Diseases (ICD). Beginning with deaths registered in 1979, version 9 of the ICD has been used for this purpose (ICD9). In order to help reveal changes in injury mortality, data for two periods have been presented. Each period covers three calendar years, and the rates presented are annual averages (i.e. three-year sum of cases divided by three-year sum of relevant populations). Years refer to the date of death registration, not to the date of occurrence. Multiple year periods were used in preference to reporting a single year in order to reduce uninformative variation due to small numbers of cases. At the time of table preparation, 1991 data were the most recent available. Data are based on information provided by coroners (and, in a small proportion of these cases, medical practitioners) and informants (usually a relative of the deceased person) which is passed to the Australian Bureau of Statistics (ABS), via State and Territory registrars of death. Coding, including ICD coding, was done by ABS officers.

Differences in scope, definitions and data availability between hospital inpatient morbidity data collections for States and Territories at the time of preparation of this report made it impracticable to present national data for injury admissions. Data have been presented for the State having the largest population, New South Wales (34 per cent of the national population in 1991). The New South Wales hospital inpatient data presented are all cases for which the 'external causes' data field contained a value in the range 800.0 to 999.9, and where the person left a hospital ('separated') during the year July 1991 to June 1992 (Table 28 is, in

addition, limited to cases for which the primary diagnosis was an ICD9-CM code in the range 800 to 999). The 'clinical modification' of the ICD (ICD9-CM) had been used to classify these data. Note that hospital separation rates are not equivalent to the incidence of hospitalised injury, as the former includes cases of multiple admission due to the same injury.

The population estimates used to calculate rates in these tables can be found in the ABS publication *Estimated Resident Population by Age and Sex, States and Territories of Australia, June 1987 to June 1992* [ABS catalogue number 3201.0, Canberra, 1993]. All rates presented are per 100 000 resident population.

Table 1: Injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Age group (years)	Male	Female	Persons
0–4	31.9	22.7	27.4
5–9	17.8	9.6	13.8
10–14	19.5	8.7	14.2
15–24	119.4	31.0	76.0
25–34	85.2	22.8	54.4
35–54	79.1	28.2	54.3
55–64	84.2	35.8	59.5
65–74	99.9	47.9	71.6
75+	239.1	190.3	207.8
All ages	78.2	33.3	55.7

† All cases for which an ICD9 external cause code (E-code) was recorded.

Table 2: Deaths by major E-code group†, age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Transportation	10.6	11.6	11.8	82.3	42.6	30.8	31.8	39.1	68.0	38.4
Drowning	9.4	2.5	1.1	3.3	3.1	3.6	3.6	3.1	3.9	3.6
Poisoning, pharmaceuticals	0.2	0.0	*	1.7	1.3	0.9	1.0	0.6	0.7	0.9
Poisoning, other substances	0.0	0.0	0.2	0.7	0.5	0.8	0.8	1.0	2.6	0.6
Falls	0.8	0.3	0.5	1.6	2.0	4.2	7.5	15.1	107.6	5.8
Fires/burns/scalds	1.3	0.5	0.5	0.7	1.0	1.3	1.8	4.9	6.3	1.4
Other unintentional	6.9	2.3	4.0	7.1	7.3	8.5	7.9	7.4	9.7	6.9
Intentional, self inflicted	0.0	0.0	0.5	17.8	22.4	24.1	24.0	23.8	27.7	16.6
Intentional, inflicted by another	2.2	0.5	0.3	2.5	3.4	3.2	2.8	2.0	4.3	2.5
Other/unspecified	0.3	*	0.4	1.5	1.6	1.9	2.9	3.0	8.2	1.7
Total	**31.9**	**17.8**	**19.5**	**119.4**	**85.2**	**79.1**	**84.2**	**99.9**	**239.1**	**78.2**
Female										
Transportation	8.8	7.1	6.3	21.1	10.5	10.5	14.5	18.8	27.9	13.2
Drowning	6.4	0.6	0.6	0.4	0.3	0.6	0.6	1.0	1.5	1.0
Poisoning, pharmaceuticals	*	0.0	0.2	0.8	0.9	1.4	2.1	0.9	0.7	0.9
Poisoning, other substances	*	*	0.0	0.2	*	0.2	0.4	0.5	2.5	0.3
Falls	0.6	0.3	*	0.2	0.3	0.7	3.1	11.3	138.3	7.4
Fires/burns/scalds	1.0	0.2	*	0.3	0.3	0.6	1.2	2.3	5.4	0.8
Other unintentional	4.1	1.0	0.6	0.7	0.8	1.0	1.8	1.7	4.3	1.4
Intentional, self inflicted	0.0	0.0	0.2	4.8	6.7	10.1	9.7	8.6	6.7	5.9
Intentional, inflicted by another	1.1	0.3	0.3	1.9	1.9	1.7	1.0	0.9	0.7	1.3
Other/unspecified	0.5	*	*	0.7	0.9	1.3	1.5	1.7	2.3	1.0
Total	**22.7**	**9.6**	**8.7**	**31.0**	**22.8**	**28.2**	**35.8**	**47.9**	**190.3**	**33.3**
Persons										
Transportation	9.8	9.4	9.1	52.3	26.8	20.9	23.0	28.0	42.3	25.8
Drowning	7.9	1.5	0.9	1.9	1.7	2.1	2.1	2.0	2.3	2.3
Poisoning, pharmaceuticals	0.1	0.0	0.1	1.3	1.1	1.1	1.6	0.8	0.7	0.9
Poisoning, other substances	*	*	0.1	0.5	0.3	0.5	0.6	0.7	2.5	0.4
Falls	0.7	0.3	0.3	0.9	1.2	2.5	5.3	13.0	127.3	6.6
Fires/burns/scalds	1.1	0.3	0.3	0.5	0.7	1.0	1.5	3.5	5.7	1.1
Other unintentional	5.5	1.7	2.3	4.0	4.1	4.8	4.8	4.3	6.2	4.1
Intentional, self inflicted	0.0	0.0	0.4	11.4	14.7	17.2	16.7	15.6	14.3	11.2
Intentional, inflicted by another	1.7	0.4	0.3	2.2	2.7	2.5	1.9	1.4	2.0	1.9
Other/unspecified	0.4	0.1	0.3	1.1	1.3	1.6	2.2	2.3	4.4	1.3
Total	**27.4**	**13.8**	**14.2**	**76.0**	**54.4**	**54.3**	**59.5**	**71.6**	**207.8**	**55.7**

† All cases for which an ICD9 external cause code (E-code) was recorded.

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 3: Transport injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle traffic	9.5	10.3	10.0	77.7	37.2	25.4	27.3	35.7	65.6	34.4
Motor vehicle non-traffic	0.7	0.4	0.6	1.5	1.0	0.8	1.1	0.6	*	0.9
Non-motor road vehicle	*	0.3	0.5	0.5	0.4	0.4	0.4	0.4	1.1	0.4
Railway transport	*	*	0.4	1.0	0.7	0.7	1.2	0.9	*	0.7
Water transport	*	0.6	0.3	1.2	1.7	2.1	1.6	1.3	*	1.3
Air transport	*	0.0	*	0.3	1.5	1.3	0.3	*	0.0	0.7
Vehicles nec	0.0	*	0.0	*	*	0.1	0.0	0.0	0.0	0.0
Total transport	**10.6**	**11.6**	**11.8**	**82.3**	**42.6**	**30.8**	**31.8**	**39.1**	**68.0**	**38.4**
Female										
Motor vehicle traffic	7.8	6.4	5.3	20.0	9.8	10.0	13.8	18.2	27.1	12.5
Motor vehicle non-traffic	0.7	*	*	0.2	*	*	0.3	*	*	0.2
Non-motor road vehicle	*	0.4	0.7	0.5	0.1	*	*	*	*	0.2
Railway transport	*	0.0	*	0.2	*	*	0.2	0.5	0.6	0.1
Water transport	*	*	*	0.2	0.0	0.2	*	0.0	0.0	0.1
Air transport	0.0	0.0	*	0.1	0.4	0.2	0.0	0.0	0.0	0.1
Vehicles nec	0.0	0.0	0.0	*	0.0	0.0	0.0	0.0	0.0	*
Total transport	**8.8**	**7.1**	**6.3**	**21.1**	**10.5**	**10.5**	**14.5**	**18.8**	**27.9**	**13.2**
Persons										
Motor vehicle traffic	8.7	8.4	7.7	49.3	23.7	17.9	20.4	26.1	40.9	23.4
Motor vehicle non-traffic	0.7	0.3	0.4	0.8	0.5	0.5	0.7	0.4	*	0.5
Non-motor road vehicle	*	0.3	0.6	0.5	0.3	0.2	0.2	0.2	0.5	0.3
Railway transport	0.1	*	0.2	0.6	0.4	0.4	0.7	0.7	0.6	0.4
Water transport	0.1	0.3	0.2	0.7	0.8	1.2	0.9	0.6	*	0.7
Air transport	*	0.0	0.1	0.2	1.0	0.8	0.1	*	0.0	0.4
Vehicles nec	0.0	*	0.0	*	*	0.1	0.0	0.0	0.0	0.0
Total transport	**9.8**	**9.4**	**9.1**	**52.3**	**26.8**	**20.9**	**23.0**	**28.0**	**42.3**	**25.8**

† Cases with external cause codes (E-codes) in the range E800–E848

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 4: Land transport (non-rail) injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle occupant	4.2	3.1	4.1	49.5	26.9	18.9	16.5	19.2	24.2	21.7
Motorcyclist	0.0	0.0	0.8	23.1	6.9	1.3	0.5	0.5	*	5.7
Bicyclist	*	2.2	3.0	1.5	0.4	0.4	0.7	0.9	1.5	1.1
Pedestrian	5.8	5.4	2.7	4.7	3.4	5.2	10.4	15.6	40.4	6.6
Riding/drawn by animal	0.0	*	0.3	0.3	0.3	0.3	0.2	*	0.0	0.2
Other/unspecified	*	*	*	0.8	0.7	0.4	0.4	0.6	*	0.4
Total non-rail land transport	**10.3**	**10.9**	**11.0**	**79.7**	**38.6**	**26.6**	**28.7**	**36.8**	**67.0**	**35.7**
Female										
Motor vehicle occupant	5.2	2.4	3.1	17.0	8.3	8.1	9.6	11.1	11.1	9.0
Motorcyclist	0.0	*	*	1.7	0.4	0.1	0.0	0.0	0.0	0.4
Bicyclist	*	0.6	0.9	0.2	*	0.1	*	0.0	0.0	0.2
Pedestrian	3.2	3.8	1.4	1.2	1.0	1.7	4.3	7.1	16.0	3.0
Riding/drawn by animal	0.0	*	0.4	0.4	0.1	*	0.0	*	0.0	0.1
Other/unspecified	*	0.0	*	0.1	0.2	*	0.3	*	*	0.1
Total non-rail land transport	**8.6**	**7.0**	**6.1**	**20.6**	**10.0**	**10.1**	**14.2**	**18.4**	**27.3**	**12.9**
Persons										
Motor vehicle occupant	4.7	2.7	3.6	33.5	17.7	13.7	13.0	14.8	15.8	15.4
Motorcyclist	0.0	*	0.5	12.6	3.7	0.7	0.3	0.2	*	3.0
Bicyclist	0.1	1.4	2.0	0.9	0.2	0.3	0.4	0.4	0.5	0.6
Pedestrian	4.5	4.6	2.1	2.9	2.3	3.5	7.3	11.0	24.7	4.8
Riding/drawn by animal	0.0	0.1	0.3	0.3	0.2	0.2	0.1	*	0.0	0.2
Other/unspecified	*	*	0.1	0.4	0.4	0.2	0.4	0.3	0.3	0.3
Total non-rail land transport	**9.5**	**9.0**	**8.6**	**50.7**	**24.5**	**18.5**	**21.3**	**26.7**	**41.5**	**24.3**

† Cases with external cause codes (E-codes) in the range E810–E829

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 5: Drowning or near-drowning deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Swimming pool or quenching tank	7.1	0.9	0.3	0.6	0.8	1.0	1.2	1.2	2.2	1.4
Other/unspecified	2.3	1.6	0.9	2.7	2.3	2.6	2.4	1.9	1.7	2.2
Total drowning	**9.4**	**2.5**	**1.1**	**3.3**	**3.1**	**3.6**	**3.6**	**3.1**	**3.9**	**3.6**
Female										
Swimming pool or quenching tank	4.4	*	0.2	0.1	0.1	0.2	0.3	0.5	0.6	0.5
Other/unspecified	2.0	0.5	0.4	0.3	0.2	0.4	0.3	0.5	0.8	0.5
Total drowning	**6.4**	**0.6**	**0.6**	**0.4**	**0.3**	**0.6**	**0.6**	**1.0**	**1.5**	**1.0**
Persons										
Swimming pool or quenching tank	5.8	0.5	0.2	0.4	0.5	0.6	0.8	0.8	1.2	0.9
Other/unspecified	2.2	1.0	0.6	1.5	1.3	1.5	1.3	1.2	1.1	1.4
Total drowning	**7.9**	**1.5**	**0.9**	**1.9**	**1.7**	**2.1**	**2.1**	**2.0**	**2.3**	**2.3**

† Cases with an external cause code (E-code) of E910

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 6: Accidental poisoning deaths by drugs etc.† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Opiates & related drugs	0.0	0.0	0.0	0.7	0.4	*	*	0.0	0.0	0.2
Other specified analgesics	0.0	0.0	0.0	0.2	0.1	*	*	0.0	0.0	0.1
Barbiturates	0.0	0.0	0.0	0.4	0.3	0.3	0.6	*	*	0.3
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	*	*	0.1	0.0	0.0	0.0	0.1
Tranquillisers	*	0.0	0.0	*	0.1	0.1	*	*	0.0	0.1
Anti-infectives	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0	0.0	*
Other/unspecified	*	0.0	*	0.3	0.2	0.1	*	*	*	0.2
Total poisoning - pharmaceuticals	**0.2**	**0.0**	*	**1.7**	**1.3**	**0.9**	**1.0**	**0.6**	**0.7**	**0.9**
Female										
Opiates & related	*	0.0	0.0	*	0.1	0.1	*	0.0	*	0.1
Other specified analgesics	0.0	0.0	*	*	0.1	0.1	*	*	0.0	0.1
Barbiturates	0.0	0.0	*	0.3	0.3	0.5	1.3	0.5	*	0.4
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	*	0.2	0.4	*	0.0	0.0	0.1
Tranquillisers	0.0	0.0	0.0	0.1	*	0.2	*	*	0.0	0.1
Anti-infectives	0.0	0.0	0.0	0.0	0.0	*	*	0.0	0.0	*
Other/unspecified	0.0	0.0	*	0.2	0.1	0.2	0.2	0.3	*	0.1
Total poisoning - pharmaceuticals	*	**0.0**	**0.2**	**0.8**	**0.9**	**1.4**	**2.1**	**0.9**	**0.7**	**0.9**
Persons										
Opiates & related	*	0.0	0.0	0.4	0.3	0.1	0.1	0.0	*	0.1
Other specified analgesics	0.0	0.0	*	0.1	0.1	0.1	*	*	0.0	0.1
Barbiturates	0.0	0.0	*	0.3	0.3	0.4	1.0	0.4	0.3	0.3
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	0.1	0.1	0.2	*	0.0	0.0	0.1
Tranquillisers	*	0.0	0.0	0.1	0.1	0.2	0.2	*	0.0	0.1
Anti-infectives	0.0	0.0	0.0	0.0	0.0	*	*	0.0	0.0	*
Other/unspecified	*	0.0	*	0.2	0.2	0.2	0.2	0.3	0.3	0.2
Total poisoning - pharmaceuticals	**0.1**	**0.0**	**0.1**	**1.3**	**1.1**	**1.1**	**1.6**	**0.8**	**0.7**	**0.9**

† Cases with external cause codes (E-codes) in the range E850–E858

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 7: Accidental poisoning deaths by other substances† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Alcoholic beverages, ethanol	0.0	0.0	0.0	*	0.1	*	*	*	*	0.1
Petroleum products, solvents	0.0	0.0	*	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Agricultural & horticultural chemicals	0.0	0.0	0.0	0.0	0.0	*	*	*	0.0	0.0
Foodstuffs; poisonous plants	0.0	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Motor vehicle exhaust gas	0.0	0.0	0.0	*	0.1	0.2	0.0	*	*	0.1
Other/unspecified	0.0	0.0	*	0.5	0.2	0.4	0.6	0.6	2.2	0.4
Total poisoning - other substances	**0.0**	**0.0**	**0.2**	**0.7**	**0.5**	**0.8**	**0.8**	**1.0**	**2.6**	**0.6**
Female										
Alcoholic beverages, ethanol	0.0	0.0	0.0	0.0	*	*	*	*	0.0	0.0
Petroleum products, solvents	0.0	0.0	0.0	*	0.0	*	0.0	0.0	0.0	
Agricultural & horticultural chemicals	*	0.0	0.0	0.0	0.0	*	0.0	0.0	*	0.0
Foodstuffs; poisonous plants	*	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0	*
Motor vehicle exhaust gas	0.0	0.0	0.0	*	0.0	0.0	0.0	*	0.0	*
Other/unspecified	0.0	*	0.0	0.1	*	0.1	0.2	0.3	2.4	0.2
Total poisoning - other substances	*	*	**0.0**	**0.2**	*	**0.2**	**0.4**	**0.5**	**2.5**	**0.3**
Persons										
Alcoholic beverages, ethanol	0.0	0.0	0.0	*	0.1	0.1	0.1	*	*	0.0
Petroleum products, solvents	0.0	0.0	*	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Agricultural & horticultural chemicals	*	0.0	0.0	0.0	0.0	*	*	*	*	0.0
Foodstuffs; poisonous plants	*	0.0	0.0	*	*	0.0	*	0.0	0.0	0.0
Motor vehicle exhaust gas	0.0	0.0	0.0	*	0.1	0.1	0.0	*	*	0.0
Other/unspecified	0.0	*	*	0.3	0.1	0.3	0.4	0.5	2.3	0.3
Total poisoning - other substances	*	*	**0.1**	**0.5**	**0.3**	**0.5**	**0.6**	**0.7**	**2.5**	**0.4**

† Cases with external cause codes (E-codes) in the range E860–E869

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 8: Falls deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Stairs	*	0.0	0.0	*	0.2	0.5	1.2	1.1	2.8	0.4
Ladder/scaffold	0.0	0.0	0.0	0.1	*	0.4	0.3	1.0	1.7	0.2
Building/structure	0.2	*	*	0.5	0.7	0.9	1.0	0.7	1.3	0.6
Playground equipment	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Different level	0.2	0.3	0.3	0.6	0.5	0.4	1.2	1.4	8.0	0.7
Same level: slip, trip, stumble	*	0.0	0.0	*	*	0.5	0.5	1.3	7.4	0.4
Same level: collision in sport	0.0	0.0	*	0.1	*	0.0	0.0	0.0	0.0	0.0
Fracture - cause unspec.	*	0.0	0.0	0.0	*	0.3	0.9	4.2	61.3	1.9
Other/unspecified	*	0.0	*	0.2	0.4	1.3	2.4	5.4	25.1	1.5
Total falls	**0.8**	**0.3**	**0.5**	**1.6**	**2.0**	**4.2**	**7.5**	**15.1**	**107.6**	**5.8**
Female										
Stairs	*	0.0	0.0	0.0	*	0.1	0.4	1.1	3.0	0.3
Ladder/scaffold	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0	0.0	*
Building/structure	0.2	*	0.0	*	*	*	*	0.3	*	0.1
Playground equipment	0.0	0.0	*	0.0	0.0	0.0	0.0	0.0	0.0	*
Different level	0.2	*	0.0	0.0	*	0.1	0.3	0.9	11.1	0.6
Same level: slip, trip, stumble	0.0	0.0	*	*	*	*	0.3	1.0	9.3	0.5
Same level: collision in sport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fracture - cause unspec.	0.0	0.0	0.0	0.0	0.0	0.1	0.5	4.2	89.1	4.2
Other/unspecified	0.0	0.0	*	*	0.1	0.3	1.4	4.0	25.4	1.6
Total falls	**0.6**	**0.3**	*	**0.2**	**0.3**	**0.7**	**3.1**	**11.3**	**138.3**	**7.4**
Persons										
Stairs	*	0.0	0.0	*	0.1	0.3	0.8	1.1	2.9	0.3
Ladder/scaffold	0.0	0.0	0.0	0.1	*	0.2	0.1	0.4	0.6	0.1
Building/structure	0.2	*	*	0.3	0.4	0.5	0.6	0.5	0.7	0.3
Playground equipment	*	0.0	*	0.0	0.0	0.0	0.0	0.0	0.0	*
Different level	0.2	0.2	0.2	0.3	0.3	0.3	0.8	1.1	10.0	0.7
Same level: slip, trip, stumble	*	0.0	*	0.1	*	0.3	0.4	1.1	8.7	0.5
Same level: collision in sport	0.0	0.0	*	0.1	*	0.0	0.0	0.0	0.0	0.0
Fracture - cause unspec.	*	0.0	0.0	0.0	*	0.2	0.7	4.2	79.1	3.1
Other/unspecified	*	0.0	*	0.1	0.3	0.8	1.9	4.6	25.3	1.6
Total falls	**0.7**	**0.3**	**0.3**	**0.9**	**1.2**	**2.5**	**5.3**	**13.0**	**127.3**	**6.6**

† Cases with external cause codes (E-codes) in the range E880–E888

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 9: Deaths by fires, burns or scalds† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Housefires	0.6	0.2	*	0.3	0.6	0.7	0.6	2.3	1.9	0.6
Clothing ignition	0.0	0.0	*	0.0	*	0.1	*	0.5	*	0.1
Hot substance or object, steam	*	0.0	0.0	*	0.0	0.1	0.3	0.5	1.7	0.1
Other/unspecified	0.6	0.3	0.4	0.4	0.4	0.4	0.8	1.6	2.4	0.6
Total fires/burns/scalds	**1.3**	**0.5**	**0.5**	**0.7**	**1.0**	**1.3**	**1.8**	**4.9**	**6.3**	**1.4**
Female										
Housefires	0.3	*	0.0	0.2	0.1	0.3	0.5	0.8	1.6	0.3
Clothing ignition	*	0.0	0.0	0.0	*	*	0.3	0.7	1.3	0.2
Hot substance or object, steam	0.3	0.0	0.0	0.0	0.0	*	0.2	0.3	1.8	0.1
Other/unspecified	0.3	*	*	*	*	0.2	*	0.5	0.7	0.2
Total fires/burns/scalds	**1.0**	**0.2**	*	**0.3**	**0.3**	**0.6**	**1.2**	**2.3**	**5.4**	**0.8**
Persons										
Housefires	0.5	0.2	*	0.3	0.4	0.5	0.5	1.5	1.7	0.5
Clothing ignition	*	0.0	*	0.0	0.1	0.1	0.2	0.6	1.0	0.1
Hot substance or object, steam	0.2	0.0	0.0	*	0.0	0.1	0.3	0.4	1.7	0.1
Other/unspecified	0.4	0.2	0.3	0.2	0.2	0.3	0.5	1.0	1.3	0.4
Total fires/burns/scalds	**1.1**	**0.3**	**0.3**	**0.5**	**0.7**	**1.0**	**1.5**	**3.5**	**5.7**	**1.1**

† Cases with external cause codes (E-codes) in the range E890–E899 and E924

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 10: Other unintentional injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Firearm	*	0.5	1.0	1.3	0.7	0.5	0.2	0.4	0.7	0.6
Excessive heat	*	0.0	0.0	*	0.1	0.1	0.0	0.0	*	0.1
Excessive cold	0.0	0.0	0.0	*	*	0.1	0.0	*	0.0	0.0
Exposure/neglect	*	0.0	*	*	*	0.1	0.4	0.5	*	0.1
Aspiration - food	2.2	*	0.4	0.6	0.7	1.4	1.9	2.3	3.5	1.1
Aspiration, non-food	0.5	*	*	*	*	0.1	*	0.0	*	0.1
Suffocation	1.8	0.3	0.8	0.4	0.3	0.2	0.3	0.0	0.0	0.4
Foreign body	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0
Struck by falling object	0.4	0.3	0.2	0.7	1.3	1.5	1.4	0.4	*	0.9
Dog bite	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Collision in sport	0.0	0.0	*	0.3	*	0.0	0.0	0.0	0.0	0.1
Other collision	*	*	*	0.2	0.2	0.2	0.4	0.3	0.0	0.2
Caught/crushed	*	*	0.0	0.0	*	0.1	*	0.0	0.0	0.1
Machinery	0.5	0.3	0.2	1.0	1.0	1.7	1.4	1.3	0.9	1.1
Cutting/piercing	0.0	0.0	*	0.2	*	0.3	0.4	*	*	0.1
Explosion	0.0	0.0	*	0.3	0.3	0.2	*	0.0	*	0.2
Electric current	0.3	0.2	0.9	1.5	1.8	1.3	0.6	0.7	*	1.1
Other/unspecified	0.6	0.6	*	0.6	0.5	0.7	0.7	1.2	1.7	0.6
Total other unintentional	**6.9**	**2.3**	**4.0**	**7.1**	**7.3**	**8.5**	**7.9**	**7.4**	**9.7**	**6.9**
Female										
Firearm	*	0.2	*	0.2	*	*	0.0	0.0	0.0	0.1
Excessive heat	*	0.0	0.0	0.0	*	0.0	*	*	0.4	0.0
Excessive cold	0.0	0.0	0.0	0.0	0.0	*	0.0	*	*	*
Exposure/neglect	0.0	0.0	0.0	0.0	*	*	*	0.0	*	0.0
Aspiration - food	1.6	0.0	0.0	0.1	0.3	0.5	1.0	1.1	2.3	0.6
Aspiration, non-food	*	0.0	0.0	*	0.0	*	*	*	*	0.0
Suffocation	0.8	*	0.0	*	0.0	0.0	*	*	*	0.1
Foreign body	*	0.0	*	0.0	0.0	*	0.0	0.0	0.0	*
Struck by falling object	*	*	*	0.0	*	*	*	*	0.0	0.1
Dog bite	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Collision in sport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other collision	0.3	*	*	0.0	0.0	0.0	0.0	0.0	0.4	0.1
Caught/crushed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	0.0	*
Machinery	0.3	*	*	*	*	0.0	0.2	0.0	0.0	0.1
Cutting/piercing	*	0.0	0.0	0.0	*	*	0.0	0.0	*	0.0
Explosion	0.0	0.0	0.0	*	0.0	0.0	0.0	0.0	0.0	*
Electric current	*	*	*	*	*	0.1	*	0.0	*	0.1
Other/unspecified	0.2	0.3	*	0.1	0.2	0.2	*	*	0.4	0.2
Total other unintentional	**4.1**	**1.0**	**0.6**	**0.7**	**0.8**	**1.0**	**1.8**	**1.7**	**4.3**	**1.4**

continued

Table 10 (continued)

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Persons										
Firearm	0.1	0.3	0.6	0.7	0.4	0.3	0.1	0.2	0.3	0.4
Excessive heat	*	0.0	0.0	*	0.1	0.0	*	*	0.5	0.0
Excessive cold	0.0	0.0	0.0	*	*	0.1	0.0	*	*	0.0
Exposure/neglect	*	0.0	*	*	*	0.1	0.2	0.2	0.3	0.1
Aspiration - food	1.9	*	0.2	0.3	0.5	1.0	1.5	1.6	2.7	0.8
Aspiration, non-food	0.3	*	*	*	*	0.1	*	*	*	0.1
Suffocation	1.3	0.2	0.4	0.2	0.2	0.1	0.2	*	*	0.3
Foreign body	*	0.0	*	*	*	*	0.0	*	*	0.0
Struck by falling object	0.3	0.2	0.1	0.3	0.7	0.8	0.8	0.2	*	0.5
Dog bite	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Collision in sport	0.0	0.0	*	0.2	*	0.0	0.0	0.0	0.0	0.0
Other collision	0.2	*	*	0.1	0.1	0.1	0.2	0.1	0.3	0.1
Caught/crushed	*	*	0.0	0.0	*	0.0	*	*	0.0	0.0
Machinery	0.4	0.2	0.1	0.6	0.6	0.9	0.8	0.6	0.3	0.6
Cutting/piercing	*	0.0	*	0.1	*	0.1	0.2	*	*	0.1
Explosion	0.0	0.0	*	0.1	0.2	0.1	*	0.0	*	0.1
Electric current	0.2	0.1	0.5	0.8	1.0	0.7	0.3	0.3	*	0.6
Other/unspecified	0.4	0.5	0.1	0.4	0.3	0.4	0.4	0.7	0.9	0.4
Total other unintentional	**5.5**	**1.7**	**2.3**	**4.0**	**4.1**	**4.8**	**4.8**	**4.3**	**6.2**	**4.1**

† Cases with external cause codes (E-codes) E900–E909, E911–E923 and E925–E928

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 11: Self-inflicted injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle exhaust	0.0	0.0	0.0	1.9	3.7	4.0	2.5	2.1	0.7	2.2
Hanging	0.0	0.0	0.3	2.4	2.8	3.3	4.1	3.6	5.6	2.4
Firearm	0.0	0.0	0.3	8.6	8.3	8.8	8.4	9.4	9.3	6.4
Poison, solids/liquids	0.0	0.0	0.0	2.9	4.0	4.6	4.6	4.0	4.3	2.9
Cutting/piercing	0.0	0.0	0.0	0.1	0.3	0.5	0.6	0.8	1.7	0.3
Unspec./other	0.0	0.0	0.0	2.0	3.4	2.9	3.8	3.9	6.1	2.3
Total intentional - self inflicted	**0.0**	**0.0**	**0.5**	**17.8**	**22.4**	**24.1**	**24.0**	**23.8**	**27.7**	**16.6**
Female										
Motor vehicle exhaust	0.0	0.0	0.0	0.2	0.5	0.6	0.4	0.3	0.0	0.3
Hanging	0.0	0.0	*	0.5	0.5	1.1	0.9	0.9	1.0	0.6
Firearm	0.0	0.0	0.0	0.6	0.9	1.0	0.4	0.5	*	0.5
Poison, solids/liquids	0.0	0.0	*	2.4	3.4	4.9	4.8	3.9	3.3	2.9
Cutting/piercing	0.0	0.0	0.0	*	0.1	0.2	0.3	0.3	*	0.1
Unspec./other	0.0	0.0	0.0	1.1	1.3	2.3	2.8	2.8	2.0	1.4
Total intentional - self inflicted	**0.0**	**0.0**	**0.2**	**4.8**	**6.7**	**10.1**	**9.7**	**8.6**	**6.7**	**5.9**
Persons										
Motor vehicle exhaust	0.0	0.0	0.0	1.0	2.1	2.3	1.4	1.1	0.3	1.3
Hanging	0.0	0.0	0.2	1.4	1.7	2.2	2.5	2.2	2.7	1.5
Firearm	0.0	0.0	0.1	4.7	4.6	5.0	4.3	4.5	3.5	3.5
Poison, solids/liquids	0.0	0.0	*	2.7	3.7	4.7	4.7	3.9	3.7	2.9
Cutting/piercing	0.0	0.0	0.0	0.1	0.2	0.4	0.5	0.5	0.7	0.2
Unspec./other	0.0	0.0	0.0	1.5	2.3	2.6	3.3	3.3	3.5	1.9
Total intentional - self inflicted	**0.0**	**0.0**	**0.4**	**11.4**	**14.7**	**17.2**	**16.7**	**15.6**	**14.3**	**11.2**

† Cases with external cause codes (E-codes) in the range E950–E959

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 12: Injury deaths inflicted by others† by age group and sex: mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Unarmed fight/brawl	*	0.0	0.0	0.4	0.4	0.4	0.4	0.3	*	0.3
Firearm	0.3	0.2	0.3	0.9	1.5	1.2	0.9	0.3	0.0	0.9
Cutting/stabbing	*	*	*	0.8	1.0	0.8	0.7	0.3	*	0.6
Child battering/maltreatment	0.6	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Other/unspecified	1.1	*	0.0	0.5	0.5	0.9	0.8	1.0	3.4	0.7
Total intentional - inflicted by other	**2.2**	**0.5**	**0.3**	**2.5**	**3.4**	**3.2**	**2.8**	**2.0**	**4.3**	**2.5**
Female										
Unarmed fight/brawl	0.0	0.0	0.0	*	*	0.1	*	0.0	0.0	0.1
Firearm	0.2	*	*	0.7	0.7	0.9	0.2	*	*	0.5
Cutting/stabbing	*	*	*	0.5	0.3	0.4	*	0.3	*	0.3
Child battering/maltreatment	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Other/unspecified	0.7	*	*	0.7	0.8	0.4	0.6	0.5	0.5	0.5
Total intentional - inflicted by other	**1.1**	**0.3**	**0.3**	**1.9**	**1.9**	**1.7**	**1.0**	**0.9**	**0.7**	**1.3**
Persons										
Unarmed fight/brawl	*	0.0	0.0	0.2	0.2	0.3	0.2	0.1	*	0.2
Firearm	0.3	0.2	0.2	0.8	1.1	1.1	0.6	0.3	*	0.7
Cutting/stabbing	*	*	*	0.6	0.7	0.6	0.4	0.3	*	0.4
Child battering/maltreatment	0.4	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other/unspecified	0.9	0.1	*	0.6	0.7	0.6	0.7	0.7	1.5	0.6
Total intentional - inflicted by other	**1.7**	**0.4**	**0.3**	**2.2**	**2.7**	**2.5**	**1.9**	**1.4**	**2.0**	**1.9**

† Cases with external cause codes (E-codes) in the range E960–E978 and E990–E999

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 13: All cases of injury death by age group and sex and role of human intent:† mean annual rate per 100 000 population, Australia 1979–81

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Non-intentional	29.4	17.2	18.3	97.8	58.1	50.7	55.5	72.4	200.6	58.0
Intentional, self-inflicted	0.0	0.0	0.5	17.8	22.4	24.1	24.0	23.8	27.7	16.6
Intentional, by another	2.2	0.5	0.3	2.5	3.4	3.2	2.8	2.0	4.3	2.5
Medical misadventure, complications	*	*	*	0.2	0.2	0.3	0.8	0.6	3.9	0.4
Undetermined intent	*	*	0.3	1.0	1.1	0.9	1.1	1.0	2.6	0.8
Total	**31.9**	**17.8**	**19.5**	**119.4**	**85.2**	**79.1**	**84.2**	**99.9**	**239.1**	**78.2**
Female										
Non-intentional	21.1	9.2	8.1	23.7	13.3	15.2	23.7	37.1	181.6	25.2
Intentional, self-inflicted	0.0	0.0	0.2	4.8	6.7	10.1	9.7	8.6	6.7	5.9
Intentional, by another	1.1	0.3	0.3	1.9	1.9	1.7	1.0	0.9	0.7	1.3
Medical misadventure, complications	0.4	*	0.0	0.2	0.3	0.4	0.3	0.8	1.0	0.3
Undetermined intent	*	0.0	*	0.4	0.5	0.9	1.1	0.5	*	0.5
Total	**22.7**	**9.6**	**8.7**	**31.0**	**22.8**	**28.2**	**35.8**	**47.9**	**190.3**	**33.3**
Persons										
Non-intentional	25.4	13.3	13.3	61.4	36.0	33.3	39.2	53.1	188.4	41.6
Intentional, self-inflicted	0.0	0.0	0.4	11.4	14.7	17.2	16.7	15.6	14.3	11.2
Intentional, by another	1.7	0.4	0.3	2.2	2.7	2.5	1.9	1.4	2.0	1.9
Medical misadventure, complications	0.3	*	*	0.2	0.3	0.3	0.6	0.7	2.1	0.3
Undetermined intent	*	*	0.2	0.7	0.8	0.9	1.1	0.7	1.1	0.7
Total	**27.4**	**13.8**	**14.2**	**76.0**	**54.4**	**54.3**	**59.5**	**71.6**	**207.8**	**55.7**

† All cases for which an ICD9 external cause code (E-code) was recorded

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 14: Injury deaths,† males and females by age group: mean annual rate per 100 000 population, Australia 1989–91

Age group (years)	Male	Female	Persons
0–4	19.6	15.4	17.6
5–9	11.3	6.9	9.1
10–14	13.5	5.9	9.8
15–24	90.4	25.2	58.4
25–34	83.8	21.7	52.9
35–54	61.2	19.2	40.5
55–64	65.0	26.7	45.9
65–74	81.3	41.9	60.1
75+	200.8	147.2	167.2
All ages	65.4	27.7	46.5

† All cases for which an ICD9 external cause code (E-code) was recorded.

Table 15: Deaths by major E-code group,† age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Transportation	5.7	7.0	8.1	47.0	32.1	18.4	19.2	24.1	44.1	24.0
Drowning	7.6	1.5	1.3	2.6	2.7	2.0	2.5	2.4	3.6	2.7
Poisoning, pharmaceuticals	0.2	0.0	0.0	1.6	3.0	1.2	0.6	0.3	0.7	1.2
Poisoning, other substances	0.2	*	*	1.0	0.7	0.4	*	0.4	0.6	0.5
Falls	0.4	*	0.5	1.3	1.5	2.5	5.6	13.8	91.4	5.5
Fires/burns/scalds	1.1	0.3	0.3	0.6	1.1	0.7	1.3	1.8	6.1	1.0
Other unintentional	2.8	1.6	1.6	4.7	5.5	5.2	7.1	5.9	9.5	4.8
Intentional, self inflicted	0.0	0.0	1.0	25.9	29.7	25.2	23.0	25.3	35.0	20.5
Intentional, inflicted by another	1.1	0.5	0.4	3.4	4.4	3.3	2.1	1.6	1.7	2.6
Other/unspecified	0.4	0.2	0.3	2.3	3.2	2.3	3.4	5.6	7.9	2.5
Total	**19.6**	**11.3**	**13.5**	**90.4**	**83.8**	**61.2**	**65.0**	**81.3**	**200.8**	**65.4**
Female										
Transportation	4.5	4.7	3.5	15.8	8.4	6.8	9.5	13.6	19.8	9.4
Drowning	4.3	0.4	0.3	0.5	0.5	0.3	0.7	0.9	1.6	0.8
Poisoning, pharmaceuticals	0.2	0.0	*	0.5	1.1	0.7	0.8	0.5	0.4	0.6
Poisoning, other substances	*	0.0	*	0.2	*	0.1	0.0	0.5	0.6	0.1
Falls	0.3	*	*	0.3	0.2	0.5	2.0	9.5	98.9	6.5
Fires/burns/scalds	1.1	0.3	*	0.2	0.3	0.2	0.7	1.4	3.6	0.6
Other unintentional	2.7	0.6	0.6	0.6	0.5	0.8	1.7	2.7	7.7	1.4
Intentional, self inflicted	0.0	0.0	*	4.7	7.1	6.9	8.2	8.0	7.9	5.4
Intentional, inflicted by another	1.7	0.7	0.6	1.8	2.5	1.7	0.7	1.1	1.5	1.6
Other/unspecified	0.5	*	*	0.7	1.2	1.3	2.3	3.8	5.2	1.4
Total	**15.4**	**6.9**	**5.9**	**25.2**	**21.7**	**19.2**	**26.7**	**41.9**	**147.2**	**27.7**
Persons										
Transportation	5.1	5.9	5.8	31.7	20.3	12.7	14.3	18.5	28.9	16.7
Drowning	6.0	1.0	0.8	1.5	1.6	1.1	1.6	1.6	2.3	1.7
Poisoning, pharmaceuticals	0.2	0.0	*	1.1	2.1	1.0	0.7	0.4	0.5	0.9
Poisoning, other substances	0.1	*	0.1	0.6	0.4	0.3	*	0.4	0.6	0.3
Falls	0.3	0.1	0.3	0.8	0.9	1.5	3.8	11.5	96.1	6.0
Fires/burns/scalds	1.1	0.3	0.2	0.4	0.7	0.5	1.0	1.6	4.5	0.8
Other unintentional	2.8	1.1	1.1	2.7	3.0	3.0	4.4	4.2	8.3	3.1
Intentional, self inflicted	0.0	0.0	0.6	15.5	18.4	16.2	15.6	16.0	18.0	12.9
Intentional, inflicted by another	1.4	0.6	0.5	2.6	3.5	2.5	1.4	1.4	1.6	2.1
Other/unspecified	0.5	0.1	0.2	1.5	2.2	1.8	2.8	4.6	6.2	2.0
Total	**17.6**	**9.1**	**9.8**	**58.4**	**52.9**	**40.5**	**45.9**	**60.1**	**167.2**	**46.5**

† All cases for which an ICD9 external cause code (E-code) was recorded

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 16: Transport injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle traffic	4.8	6.1	6.8	43.0	28.0	14.7	15.1	21.3	40.3	20.9
Motor vehicle non-traffic	0.8	0.4	0.5	1.1	0.7	0.5	0.6	0.4	1.2	0.7
Non-motor road vehicle	0.0	*	0.2	0.1	0.3	0.3	0.5	0.3	0.8	0.3
Railway transport	*	*	0.4	1.3	0.7	0.4	0.6	0.6	1.2	0.6
Water transport	*	0.3	0.2	0.7	1.0	1.2	1.4	0.9	0.6	0.8
Air transport	*	0.0	0.0	0.8	1.4	1.2	0.9	0.7	0.0	0.8
Vehicles nec	0.0	0.0	0.0	*	0.1	0.1	0.0	*	0.0	0.0
Total transport	**5.7**	**7.0**	**8.1**	**47.0**	**32.1**	**18.4**	**19.2**	**24.1**	**44.1**	**24.0**
Female										
Motor vehicle traffic	3.3	4.4	3.0	14.8	7.7	6.2	8.9	12.9	18.8	8.6
Motor vehicle non-traffic	0.9	*	*	0.3	*	0.1	0.3	0.4	0.4	0.2
Non-motor road vehicle	0.0	0.0	0.3	0.2	0.1	0.1	*	*	*	0.1
Railway transport	*	*	*	0.2	0.1	0.1	0.2	*	0.4	0.1
Water transport	0.2	*	0.0	0.1	0.2	0.1	0.0	0.0	*	0.1
Air transport	0.0	*	0.0	0.2	0.3	0.2	*	*	0.0	0.1
Vehicles nec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total transport	**4.5**	**4.7**	**3.5**	**15.8**	**8.4**	**6.8**	**9.5**	**13.6**	**19.8**	**9.4**
Persons										
Motor vehicle traffic	4.1	5.3	5.0	29.2	17.9	10.5	12.0	16.8	26.8	14.7
Motor vehicle non-traffic	0.8	0.2	0.3	0.7	0.3	0.3	0.4	0.4	0.7	0.4
Non-motor road vehicle	0.0	*	0.3	0.2	0.2	0.2	0.3	0.1	0.4	0.2
Railway transport	*	0.1	0.2	0.7	0.4	0.3	0.4	0.3	0.7	0.4
Water transport	0.1	0.2	0.1	0.4	0.6	0.7	0.7	0.4	0.3	0.5
Air transport	*	*	0.0	0.5	0.8	0.7	0.5	0.3	0.0	0.5
Vehicles nec	0.0	0.0	0.0	*	0.0	0.0	0.0	*	0.0	0.0
Total transport	**5.1**	**5.9**	**5.8**	**31.7**	**20.3**	**12.7**	**14.3**	**18.5**	**28.9**	**16.7**

† Cases with external cause codes (E-codes) in the range E800–E848

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 17: Land transport (non-rail) injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle occupant	3.0	1.9	2.8	27.9	17.7	10.1	10.4	14.2	20.6	13.2
Motorcyclist	0.0	0.3	0.8	10.2	6.0	1.5	0.4	*	0.5	3.2
Bicyclist	0.4	0.9	2.0	1.4	0.7	0.5	0.5	0.8	0.6	0.8
Pedestrian	2.2	3.4	1.5	4.0	3.7	2.7	4.5	6.1	19.6	3.9
Riding/drawn by animal	0.0	0.0	*	*	0.1	0.2	0.2	0.0	*	0.1
Other/unspecified	0.0	*	0.2	0.7	0.8	0.4	0.3	0.7	1.0	0.5
Total non-rail land transport	**5.6**	**6.6**	**7.5**	**44.2**	**28.9**	**15.5**	**16.2**	**21.9**	**42.3**	**21.8**
Female										
Motor vehicle occupant	2.4	2.4	1.7	12.6	6.3	5.3	6.8	9.1	11.1	6.7
Motorcyclist	0.0	0.0	*	0.8	0.3	0.1	*	0.0	0.0	0.2
Bicyclist	0.0	*	0.4	0.2	0.2	0.1	0.0	*	0.0	0.1
Pedestrian	1.6	1.8	0.8	1.3	0.8	0.7	2.0	3.7	8.1	1.7
Riding/drawn by animal	0.0	0.0	0.3	0.2	0.1	0.1	*	0.0	0.0	0.1
Other/unspecified	*	*	0.0	0.2	0.2	0.1	0.3	0.5	*	0.2
Total non-rail land transport	**4.2**	**4.5**	**3.4**	**15.3**	**7.8**	**6.4**	**9.2**	**13.4**	**19.4**	**9.0**
Persons										
Motor vehicle occupant	2.8	2.2	2.3	20.4	12.0	7.8	8.6	11.5	14.6	9.9
Motorcyclist	0.0	0.2	0.5	5.6	3.2	0.8	0.2	*	0.2	1.7
Bicyclist	0.2	0.5	1.2	0.8	0.5	0.3	0.2	0.4	0.2	0.5
Pedestrian	1.9	2.6	1.2	2.6	2.2	1.7	3.3	4.8	12.4	2.8
Riding/drawn by animal	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.0	*	0.1
Other/unspecified	*	*	0.1	0.5	0.5	0.3	0.3	0.6	0.5	0.3
Total non-rail land transport	**4.9**	**5.5**	**5.5**	**30.0**	**18.4**	**11.0**	**12.7**	**17.3**	**27.9**	**15.4**

† Cases with external cause codes (E-codes) in the range E810–E829

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 18: Drowning or near-drowning deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Swimming pool or quenching tank	6.4	0.7	0.3	0.6	0.7	0.7	0.9	0.8	2.6	1.2
Other/unspecified	1.2	0.9	1.0	1.9	2.0	1.3	1.6	1.6	1.0	1.5
Total drowning	**7.6**	**1.5**	**1.3**	**2.6**	**2.7**	**2.0**	**2.5**	**2.4**	**3.6**	**2.7**
Female										
Swimming pool or quenching tank	3.4	*	*	0.1	0.3	0.1	0.3	*	0.4	0.4
Other/unspecified	0.9	0.2	0.3	0.4	0.2	0.2	0.4	0.7	1.2	0.4
Total drowning	**4.3**	**0.4**	**0.3**	**0.5**	**0.5**	**0.3**	**0.7**	**0.9**	**1.6**	**0.8**
Persons										
Swimming pool or quenching tank	5.0	0.6	0.2	0.4	0.5	0.4	0.6	0.5	1.2	0.8
Other/unspecified	1.0		0.6	1.2	1.1	0.7	1.0	1.1	1.1	0.9
Total drowning	**6.0**	**1.0**	**0.8**	**1.5**	**1.6**	**1.1**	**1.6**	**1.6**	**2.3**	**1.7**

† Cases with an external cause code (E-code) of E910

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 19: Accidental poisoning deaths by drugs etc.† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Opiates & related drugs	0.0	0.0	0.0	0.9	1.9	0.6	*	*	0.0	0.6
Other specified analgesics	0.0	0.0	0.0	*	0.2	0.0	0.0	0.0	0.0	0.1
Barbiturates	0.0	0.0	0.0	0.0	*	0.0	0.0	0.0	0.0	*
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	0.0	0.1	*	0.0	*	0.0	0.0
Tranquillisers	0.0	0.0	0.0	*	0.2	0.1	*	*	*	0.1
Anti-infectives	*	0.0	0.0	0.0	0.0	*	0.0	*	0.0	0.0
Other/unspecified	*	0.0	0.0	0.6	0.6	0.5	0.4	*	0.6	0.4
Total poisoning - pharmaceuticals	**0.2**	**0.0**	**0.0**	**1.6**	**3.0**	**1.2**	**0.6**	**0.3**	**0.7**	**1.2**
Female										
Opiates & related	0.0	0.0	*	0.2	0.2	0.1	0.0	*	0.0	0.1
Other specified analgesics	0.0	0.0	0.0	*	*	0.1	*	0.0	0.0	0.0
Barbiturates	0.0	0.0	0.0	0.0	0.0	*	0.0	0.0	*	0.0
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	0.0	*	*	*	0.0	0.0	0.0
Tranquillisers	0.0	0.0	0.0	0.0	*	0.1	*	0.0	*	0.0
Anti-infectives	*	0.0	*	0.0	0.0	0.0	0.0	0.0	0.0	*
Other/unspecified	*	0.0	*	0.2	0.7	0.4	0.6	0.4	*	0.4
Total poisoning - pharmaceuticals	**0.2**	**0.0**	*	**0.5**	**1.1**	**0.7**	**0.8**	**0.5**	**0.4**	**0.6**
Persons										
Opiates & related	0.0	0.0	*	0.5	1.0	0.3	*	*	0.0	0.3
Other specified analgesics	0.0	0.0	0.0	0.1	0.1	0.0	*	0.0	0.0	0.0
Barbiturates	0.0	0.0	0.0	0.0	*	*	0.0	0.0	*	0.0
Non barbiturate sedatives/hypnotics	0.0	0.0	0.0	0.0	0.1	0.0	*	*	0.0	0.0
Tranquillisers	0.0	0.0	0.0	*	0.1	0.1	0.1	*	*	0.1
Anti-infectives	*	0.0	*	0.0	0.0	*	0.0	*	0.0	0.0
Other/unspecified	0.2	0.0	*	0.4	0.7	0.4	0.5	0.3	0.3	0.4
Total poisoning - pharmaceuticals	**0.2**	**0.0**	*	**1.1**	**2.1**	**1.0**	**0.7**	**0.4**	**0.5**	**0.9**

† Cases with external cause codes (E-codes) in the range E850–E858

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 20: Accidental poisoning deaths by other substances† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Alcoholic beverages, ethanol	0.0	0.0	0.0	0.1	0.1	0.1	*	*	0.0	0.1
Petroleum products, solvents	*	0.0	*	0.3	*	0.0	0.0	*	0.0	0.1
Agricultural & horticultural chemicals	*	0.0	0.0	*	*	0.0	*	0.0	*	0.0
Foodstuffs; poisonous plants	*	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Motor vehicle exhaust gas	0.0	0.0	0.0	0.1	*	*	0.0	*	*	0.0
Other/unspecified	0.0	*	*	0.4	0.4	0.3	*	*	*	0.2
Total poisoning - other substances	**0.2**	*	*	**1.0**	**0.7**	**0.4**	*	**0.4**	**0.6**	**0.5**
Female										
Alcoholic beverages, ethanol	0.0	0.0	0.0	0.0	0.0	*	0.0	*	0.0	*
Petroleum products, solvents	0.0	0.0	0.0	*	0.0	*	0.0	0.0	*	0.0
Agricultural & horticultural chemicals	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Foodstuffs; poisonous plants	0.0	0.0	0.0	*	0.0	0.0	0.0	0.0	0.0	*
Motor vehicle exhaust gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
Other/unspecified	0.0	0.0	*	*	*	*	0.0	0.4	0.5	0.1
Total poisoning - other substances	*	**0.0**	*	**0.2**	*	**0.1**	**0.0**	**0.5**	**0.6**	**0.1**
Persons										
Alcoholic beverages, ethanol	0.0	0.0	0.0	0.0	0.1	0.0	*	*	0.0	0.0
Petroleum products, solvents	*	0.0	*	0.2	*	*	0.0	*	*	0.0
Agricultural & horticultural chemicals	*	0.0	0.0	*	*	0.0	*	0.0	*	0.0
Foodstuffs; poisonous plants	*	0.0	0.0	*	*	0.0	0.0	0.0	0.0	0.0
Motor vehicle exhaust gas	0.0	0.0	0.0	0.0	*	*	0.0	*	*	0.0
Other/unspecified	0.0	*	*	0.2	0.2	0.2	*	0.3	0.4	0.2
Total poisoning - other substances	**0.1**	*	**0.1**	**0.6**	**0.4**	**0.3**	*	**0.4**	**0.6**	**0.3**

† Cases with external cause codes (E-codes) in the range E860–E869

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 21: Falls deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Stairs	0.0	0.0	*	*	*	0.4	0.6	1.4	2.8	0.4
Ladder/scaffold	0.0	0.0	0.0	*	0.1	0.3	0.4	1.0	1.1	0.2
Building/structure	*	*	0.3	0.5	0.5	0.4	0.7	0.7	0.8	0.4
Playground equipment	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Different level	*	*	*	0.3	0.6	0.5	0.8	1.7	5.4	0.6
Same level: slip, trip, stumble	*	0.0	0.0	0.2	*	0.3	0.6	1.7	7.8	0.5
Same level: collision in sport	0.0	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Fracture - cause unspec.	0.0	0.0	0.0	0.0	*	0.1	0.5	4.3	60.1	2.3
Other/unspecified	*	0.0	*	0.1	0.2	0.5	2.0	3.0	13.4	1.0
Total falls	**0.4**	*	**0.5**	**1.3**	**1.5**	**2.5**	**5.6**	**13.8**	**91.4**	**5.5**
Female										
Stairs	0.0	0.0	*	0.0	0.0	0.1	0.2	0.5	1.7	0.2
Ladder/scaffold	0.0	0.0	0.0	0.0	0.0	*	*	*	0.0	0.0
Building/structure	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0
Playground equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Different level	*	*	0.0	0.1	*	*	0.3	0.4	3.6	0.3
Same level: slip, trip, stumble	*	0.0	*	*	0.0	0.1	0.5	1.0	7.9	0.6
Same level: collision in sport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fracture - cause unspec.	0.0	0.0	0.0	0.0	*	*	0.5	4.8	72.8	4.4
Other/unspecified	*	*	*	*	*	0.2	0.5	2.5	12.8	1.0
Total falls	**0.3**	*	*	**0.3**	**0.2**	**0.5**	**2.0**	**9.5**	**98.9**	**6.5**
Persons										
Stairs	0.0	0.0	*	*	*	0.2	0.4	1.0	2.1	0.3
Ladder/scaffold	0.0	0.0	0.0	*	0.1	0.2	0.2	0.5	0.4	0.1
Building/structure	0.1	*	0.1	0.3	0.3	0.2	0.4	0.3	0.4	0.2
Playground equipment	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Different level	*	*	*	0.2	0.3	0.3	0.5	1.0	4.3	0.5
Same level: slip, trip, stumble	*	0.0	*	0.1	*	0.2	0.5	1.3	7.9	0.6
Same level: collision in sport	0.0	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Fracture - cause unspec.	0.0	0.0	0.0	0.0	*	0.1	0.5	4.6	68.1	3.3
Other/unspecified	*	*	*	0.1	0.1	0.4	1.2	2.7	13.0	1.0
Total falls	**0.3**	**0.1**	**0.3**	**0.8**	**0.9**	**1.5**	**3.8**	**11.5**	**96.1**	**6.0**

† Cases with external cause codes (E-codes) in the range E880–E888

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 22: Deaths by fires, burns, or scalds† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Housefires	0.7	0.3	0.2	0.4	0.6	0.4	0.7	0.8	2.4	0.6
Clothing ignition	0.0	0.0	0.0	0.0	*	*	*	0.3	0.7	0.1
Hot substance or object, steam	*	0.0	0.0	0.0	*	0.0	*	*	1.2	0.1
Other/unspecified	0.3	0.0	*	0.2	0.4	0.2	0.4	0.6	1.8	0.3
Total fires/burns/scalds	**1.1**	**0.3**	**0.3**	**0.6**	**1.1**	**0.7**	**1.3**	**1.8**	**6.1**	**1.0**
Female										
Housefires	0.9	0.3	*	0.2	0.2	0.2	0.3	0.6	1.2	0.3
Clothing ignition	0.0	0.0	0.0	0.0	0.0	0.0	*	*	1.4	0.1
Hot substance or object, steam	*	0.0	0.0	0.0	0.0	*	*	*	0.6	0.1
Other/unspecified	*	0.0	0.0	*	*	0.1	0.3	0.5	0.4	0.1
Total fires/burns/scalds	**1.1**	**0.3**	*	**0.2**	**0.3**	**0.2**	**0.7**	**1.4**	**3.6**	**0.6**
Persons										
Housefires	0.8	0.3	0.2	0.3	0.4	0.3	0.5	0.7	1.7	0.4
Clothing ignition	0.0	0.0	0.0	0.0	*	*	0.1	0.2	1.1	0.1
Hot substance or object, steam	0.1	0.0	0.0	0.0	*	*	*	0.1	0.9	0.1
Other/unspecified	0.2	0.0	*	0.1	0.2	0.1	0.3	0.5	0.9	0.2
Total fires/burns/scalds	**1.1**	**0.3**	**0.2**	**0.4**	**0.7**	**0.5**	**1.0**	**1.6**	**4.5**	**0.8**

† Cases with external cause codes (E-codes) in the range E890–E899 and E924

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 23: Other unintentional injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Firearm	0.0	*	*	0.5	0.5	0.3	0.4	0.0	0.0	0.3
Excessive heat	*	0.0	0.0	0.1	0.1	*	*	*	*	0.1
Excessive cold	0.0	0.0	0.0	0.0	*	0.1	0.3	0.5	1.0	0.1
Exposure/neglect	*	0.0	0.0	0.0	*	*	0.0	*	0.6	0.0
Aspiration - food	0.3	*	*	0.4	0.6	0.6	1.4	1.9	4.6	0.8
Aspiration, non-food	0.3	*	0.0	*	0.1	*	*	*	*	0.1
Suffocation	1.0	*	0.7	0.4	0.3	0.3	0.2	0.3	*	0.4
Foreign body	0.0	0.0	0.0	0.0	0.0	*	*	0.0	*	0.0
Struck by falling object	0.4	0.3	*	0.4	0.6	0.9	0.8	0.4	0.6	0.6
Dog bite	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Collision in sport	0.0	*	0.0	0.2	0.1	0.0	*	*	0.0	0.1
Other collision	*	*	0.0	0.1	0.2	*	*	*	*	0.1
Caught/crushed	*	0.0	*	*	*	*	*	*	0.0	0.0
Machinery	0.3	0.3	0.2	0.7	1.1	1.5	1.6	0.8	0.5	0.9
Cutting/piercing	*	*	*	0.0	0.1	0.1	*	*	0.0	0.1
Explosion	0.0	0.0	0.0	0.1	0.2	*	*	0.0	0.0	0.1
Electric current	0.0	*	0.2	1.0	1.0	0.6	0.5	*	0.7	0.6
Other/unspecified	*	*	*	0.7	0.4	0.7	1.3	1.1	0.8	0.6
Total other unintentional	**2.8**	**1.6**	**1.6**	**4.7**	**5.5**	**5.2**	**7.1**	**5.9**	**9.5**	**4.8**
Female										
Firearm	0.0	0.0	*	*	0.0	*	0.0	0.0	0.0	0.0
Excessive heat	*	*	0.0	0.0	0.0	*	*	*	0.3	0.0
Excessive cold	0.0	0.0	0.0	*	0.0	*	*	*	1.1	0.1
Exposure/neglect	0.2	*	0.0	0.0	0.0	*	*	*	0.9	0.1
Aspiration - food	0.4	*	*	0.2	*	0.4	0.6	1.6	3.6	0.5
Aspiration, non-food	*	0.0	0.0	0.0	*	*	0.0	*	0.4	0.1
Suffocation	0.9	*	*	*	*	*	*	*	*	0.1
Foreign body	0.0	0.0	0.0	0.0	0.0	0.0	*	*	0.0	*
Struck by falling object	0.3	*	0.2	*	*	*	*	0.0	0.0	0.1
Dog bite	0.0	0.0	0.0	0.0	0.0	0.0	*	*	0.0	*
Collision in sport	0.0	0.0	0.0	0.0	*	0.0	0.0	0.0	0.0	*
Other collision	0.0	*	0.0	0.0	*	*	*	0.0	*	0.0
Caught/crushed	*	*	0.0	0.0	*	0.0	0.0	0.0	0.0	0.0
Machinery	0.4	*	0.0	0.0	*	*	*	0.0	0.0	0.0
Cutting/piercing	0.0	*	0.0	*	*	0.0	0.0	*	*	0.0
Explosion	0.0	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Electric current	*	0.0	*	*	*	*	*	*	0.0	0.0
Other/unspecified	*	0.0	*	0.1	0.1	0.1	0.6	0.3	0.9	0.2
Total other unintentional	**2.7**	**0.6**	**0.6**	**0.6**	**0.5**	**0.8**	**1.7**	**2.7**	**7.7**	**1.4**

continued

Table 23 (continued)

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Persons										
Firearm	0.0	*	*	0.3	0.3	0.1	0.2	0.0	0.0	0.2
Excessive heat	*	*	0.0	0.0	0.1	0.0	*	0.1	0.2	0.1
Excessive cold	0.0	0.0	0.0	*	*	0.0	0.2	0.3	1.1	0.1
Exposure/neglect	0.1	*	0.0	0.0	*	*	*	0.1	0.8	0.1
Aspiration - food	0.3	0.1	*	0.3	0.3	0.5	1.0	1.7	3.9	0.6
Aspiration, non-food	0.2	*	0.0	*	0.1	0.0	*	*	0.3	0.1
Suffocation	1.0	0.1	0.4	0.2	0.2	0.2	0.1	0.2	0.2	0.3
Foreign body	0.0	0.0	0.0	0.0	0.0	*	*	*	*	0.0
Struck by falling object	0.4	0.2	0.2	0.2	0.3	0.4	0.4	0.2	0.2	0.3
Dog bite	*	0.0	0.0	0.0	0.0	0.0	*	*	0.0	*
Collision in sport	0.0	*	0.0	0.1	0.1	0.0	*	*	0.0	0.0
Other collision	*	*	0.0	0.1	0.1	0.0	*	*	0.2	0.1
Caught/crushed	0.1	*	*	*	*	*	*	*	0.0	0.0
Machinery	0.3	0.2	0.1	0.4	0.6	0.7	0.8	0.4	0.2	0.5
Cutting/piercing	*	*	*	*	0.1	0.0	*	*	*	0.0
Explosion	0.0	0.0	0.0	0.1	0.1	*	*	0.0	0.0	0.0
Electric current	*	*	0.1	0.5	0.5	0.3	0.3	0.1	0.3	0.3
Other/unspecified	0.1	*	0.1	0.4	0.3	0.4	0.9	0.7	0.9	0.4
Total other unintentional	**2.8**	**1.1**	**1.1**	**2.7**	**3.0**	**3.0**	**4.4**	**4.2**	**8.3**	**3.1**

† Cases with external cause codes (E-codes) E900–E909, E911–E923 and E925–E928

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 24: Self-inflicted injury deaths† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle exhaust	0.0	0.0	0.0	4.3	7.3	6.7	4.5	3.3	5.2	4.4
Hanging	0.0	0.0	0.7	8.2	7.5	5.5	5.6	7.0	8.9	5.3
Firearm	0.0	0.0	0.4	8.0	6.7	6.0	6.6	7.2	9.0	5.3
Poison, solids/liquids	0.0	0.0	0.0	2.0	4.1	3.8	2.9	3.0	3.0	2.5
Cutting/piercing	0.0	0.0	0.0	0.2	0.4	0.6	0.7	0.6	0.7	0.4
Unspec./other	0.0	0.0	0.0	3.1	3.6	2.7	2.6	4.3	8.2	2.6
Total intentional - self inflicted	**0.0**	**0.0**	**1.0**	**25.9**	**29.7**	**25.2**	**23.0**	**25.3**	**35.0**	**20.5**
Female										
Motor vehicle exhaust	0.0	0.0	0.0	0.5	1.1	1.1	0.7	0.6	0.4	0.6
Hanging	0.0	0.0	*	1.1	1.3	1.0	1.6	1.2	1.7	1.0
Firearm	0.0	0.0	0.0	0.6	0.6	0.3	0.3	0.2	0.0	0.3
Poison, solids/liquids	0.0	0.0	0.0	1.4	2.7	2.9	3.1	2.9	2.8	2.0
Cutting/piercing	0.0	0.0	0.0	*	0.1	0.1	0.3	0.3	*	0.1
Unspec./other	0.0	0.0	*	1.0	1.2	1.4	2.2	2.7	2.9	1.3
Total intentional - self inflicted	**0.0**	**0.0**	*	**4.7**	**7.1**	**6.9**	**8.2**	**8.0**	**7.9**	**5.4**
Persons										
Motor vehicle exhaust	0.0	0.0	0.0	2.5	4.2	3.9	2.6	1.8	2.2	2.5
Hanging	0.0	0.0	0.4	4.7	4.4	3.3	3.6	3.9	4.4	3.1
Firearm	0.0	0.0	0.2	4.4	3.7	3.2	3.5	3.4	3.4	2.8
Poison, solids/liquids	0.0	0.0	0.0	1.7	3.4	3.3	3.0	2.9	2.9	2.3
Cutting/piercing	0.0	0.0	0.0	0.2	0.3	0.4	0.5	0.4	0.4	0.3
Unspec./other	0.0	0.0	*	2.1	2.4	2.1	2.4	3.4	4.9	1.9
Total intentional - self inflicted	**0.0**	**0.0**	**0.6**	**15.5**	**18.4**	**16.2**	**15.6**	**16.0**	**18.0**	**12.9**

† Cases with external cause codes (E-codes) in the range E950–E959

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 25: Injury deaths inflicted by others† by age group and sex: mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Unarmed fight/brawl	0.0	0.0	0.0	0.4	0.6	0.4	0.4	0.6	*	0.4
Firearm	*	*	*	0.9	1.0	0.8	0.4	*	*	0.6
Cutting/stabbing	*	*	*	1.2	1.7	1.0	0.5	0.4	*	0.9
Child battering/ maltreatment	0.5	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other/unspecified	0.4	0.2	*	0.9	1.1	1.1	0.9	0.5	1.0	0.8
Total intentional - inflicted by other	**1.1**	**0.5**	**0.4**	**3.4**	**4.4**	**3.3**	**2.1**	**1.6**	**1.7**	**2.6**
Female										
Unarmed fight/brawl	*	0.0	0.0	0.2	0.2	*	0.0	*	*	0.1
Firearm	0.3	*	*	0.3	0.6	0.5	0.2	0.3	*	0.4
Cutting/stabbing	*	0.3	0.0	0.5	0.7	0.5	0.3	*	0.3	0.4
Child battering/ maltreatment	0.7	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Other/unspecified	0.5	0.3	0.4	0.8	1.0	0.7	0.3	0.5	0.9	0.7
Total intentional - inflicted by other	**1.7**	**0.7**	**0.6**	**1.8**	**2.5**	**1.7**	**0.7**	**1.1**	**1.5**	**1.6**
Persons										
Unarmed fight/brawl	*	0.0	0.0	0.3	0.4	0.2	0.2	0.3	*	0.2
Firearm	0.2	*	0.1	0.6	0.8	0.6	0.3	0.2	0.2	0.5
Cutting/stabbing	0.1	0.2	*	0.9	1.2	0.8	0.4	0.3	0.3	0.6
Child battering/ maltreatment	0.6	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other/unspecified	0.5	0.2	0.3	0.8	1.0	0.9	0.6	0.5	0.9	0.7
Total intentional - inflicted by other	**1.4**	**0.6**	**0.5**	**2.6**	**3.5**	**2.5**	**1.4**	**1.4**	**1.6**	**2.1**

† Cases with external cause codes (E-codes) in the range E960–E978 and E990–E999

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 26: All cases of injury death by age group, sex and role of human intent:† mean annual rate per 100 000 population, Australia 1989–91

Mode of injury death	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Non-intentional	18.4	10.6	11.9	59.4	47.0	30.9	37.8	50.3	159.0	40.3
Intentional, self-inflicted	0.0	0.0	1.0	25.9	29.7	25.2	23.0	25.3	35.0	20.5
Intentional, by another	1.1	0.5	0.4	3.4	4.4	3.3	2.1	1.6	1.7	2.6
Medical misadventure, complications	*	*	*	0.3	0.2	0.4	0.8	2.6	4.0	0.6
Undetermined intent	*	0.0	*	1.6	2.5	1.3	1.3	1.5	1.1	1.3
Total	**19.6**	**11.3**	**13.5**	**90.4**	**83.8**	**61.2**	**65.0**	**81.3**	**200.8**	**65.4**
Female										
Non-intentional	13.3	6.1	5.0	18.0	11.1	9.4	15.7	29.6	134.1	19.6
Intentional, self-inflicted	0.0	0.0	*	4.7	7.1	6.9	8.2	8.0	7.9	5.4
Intentional, by another	1.7	0.7	0.6	1.8	2.5	1.7	0.7	1.1	1.5	1.6
Medical misadventure, complications	*	0.0	*	0.2	0.2	0.4	1.0	2.1	3.0	0.6
Undetermined intent	0.2	0.0	0.0	0.5	0.9	0.8	1.1	1.1	0.6	0.6
Total	**15.4**	**6.9**	**5.9**	**25.2**	**21.7**	**19.2**	**26.7**	**41.9**	**147.2**	**27.7**
Persons										
Non-intentional	15.9	8.4	8.5	39.1	29.1	20.3	26.8	39.2	143.4	29.9
Intentional, self-inflicted	0.0	0.0	0.6	15.5	18.4	16.2	15.6	16.0	18.0	12.9
Intentional, by another	1.4	0.6	0.5	2.6	3.5	2.5	1.4	1.4	1.6	2.1
Medical misadventure, complications	0.2	*	0.1	0.2	0.2	0.4	0.9	2.3	3.4	0.6
Undetermined intent	0.1	0.0	*	1.0	1.7	1.1	1.2	1.3	0.8	1.0
Total	**17.6**	**9.1**	**9.8**	**58.4**	**52.9**	**40.5**	**45.9**	**60.1**	**167.2**	**46.5**

† All cases for which an ICD9 external cause code (E-code) was recorded

Note: Cells whose three year case count sums are 1–3 inclusive are indicated by *

Table 27: Injury† inpatient separations, males and females by age group: annual rate per 100 000 population, NSW 1991–92

Age group (years)	Male	Female	Persons
0–4	2040.2	1520.2	1786.5
5–9	1723.0	1159.1	1448.2
10–14	2346.0	1204.8	1790.6
15–24	3660.3	1532.0	2617.8
25–34	2866.5	1379.6	2128.1
35–54	2141.0	1524.0	1836.9
55–64	2712.7	2135.3	2423.7
65–74	3630.2	3372.6	3491.4
75+	6068.8	7711.1	7106.3
All ages	2762.9	2011.2	2385.4

† All cases for which an ICD9 external cause code (E-code) was recorded.

Table 28: Inpatient separations by injury diagnosis† and age group: annual rate per 100 000 population, NSW 1991–92

Mode of injury–males	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Fracture, dislocation										
– skull (inc. face)	80.6	50.5	115.1	316.6	218.8	94.7	44.3	29.4	71.7	137.9
– neck & trunk	8.1	5.5	21.6	80.6	79.5	79.1	112.6	138.1	363.7	81.1
– upper limb	228.1	689.0	883.4	592.9	380.8	247.2	190.8	172.1	277.0	392.6
– lower limb	97.8	102.3	199.6	287.2	212.0	174.4	185.8	293.4	886.8	222.5
Total fractures & dislocations	**415**	**847**	**1220**	**1277**	**891**	**596**	**533**	**632**	**1598**	**834**
Sprain, strain										
– upper limb	*	*	7.0	28.1	22.9	32.0	42.4	37.1	10.0	23.9
– lower limb	*	5.0	22.5	126.3	102.3	48.9	27.0	21.8	51.8	57.6
– neck and trunk	*	2.8	6.6	21.0	23.8	22.0	18.5	10.7	19.9	16.8
– other	*	*	*	3.2	3.1	2.2	2.7	2.5	5.0	2.3
Total sprains & strains	**4**	**9**	**36**	**179**	**152**	**105**	**91**	**72**	**87**	**101**
Intracranial injury (without skull fracture)	240.3	212.9	311.4	337.2	169.4	88.5	69.4	83.8	170.4	179.0
Internal injury of chest, abdomen, pelvis	5.9	8.7	26.3	60.9	37.4	26.8	22.4	19.8	37.9	30.5
Open wound										
– head	169.7	78.4	44.1	116.0	85.5	56.4	52.0	51.3	119.6	81.4
– neck & trunk	12.7	18.3	16.0	32.6	26.4	14.3	8.9	11.2	15.9	18.9
– upper limb	71.5	64.7	85.5	330.1	251.9	168.0	142.7	94.4	79.7	176.5
– lower limb	29.4	68.4	96.8	89.6	65.7	44.0	40.9	40.6	51.8	59.1
– other	0.0	*	1.9	2.1	2.5	*	0.0	0.0	0.0	1.1
Total open wounds	**283**	**231**	**245**	**570**	**432**	**283**	**244**	**197**	**268**	**337**
Superficial injury or contusion	68.8	62.8	106.1	145.8	105.2	69.4	56.7	74.1	188.3	92.8
Crushing injury	5.9	6.9	3.8	19.1	16.3	14.8	10.0	3.6	*	12.1
Foreign body (through body orifice)	129.0	59.6	21.6	16.9	19.4	22.1	38.6	28.9	53.8	34.7
Burn										
– face, head & neck	31.2	3.2	9.4	15.4	9.9	7.6	3.9	2.5	*	10.0
– trunk	40.7	5.0	8.0	6.9	3.1	3.7	*	4.1	*	7.0
– upper limb	45.3	6.9	3.8	18.6	13.8	7.8	5.4	*	*	12.1
– lower limb	21.7	7.8	11.3	10.5	6.8	7.5	9.3	8.6	10.0	9.5
– other	16.3	2.3	2.8	5.4	2.9	3.5	2.3	3.6	5.0	4.5
Total burns	**155**	**25**	**35**	**57**	**37**	**30**	**22**	**19**	**22**	**43**
Injuries to nerve (or spinal cord)	2.7	*	7.0	29.2	20.7	15.3	10.0	2.5	8.0	14.2
Other injury; early com- plication; late effect	80.1	35.3	66.2	157.5	146.1	106.5	102.9	112.7	210.2	114.6
Poisoning										
– drug, medication	204.1	11.5	24.4	172.1	178.3	96.0	55.5	65.0	104.6	113.0
– other substance	77.4	28.0	32.4	56.2	45.0	41.6	31.6	29.9	24.9	43.3
Complication of surgical/medical procedure	129.0	76.2	67.6	141.9	143.6	193.1	567.5	953.2	1236.5	273.9
Total	**1800**	**1616**	**2203**	**3220**	**2393**	**1688**	**1855**	**2295**	**4012**	**2223**

continued

Table 28 (continued)

Mode of injury–females	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Fracture, dislocation										
–skull (inc. face)	59.4	24.6	43.6	59.6	38.3	26.9	15.0	24.3	57.5	37.5
–neck & trunk	*	3.9	16.8	45.8	39.4	45.3	84.3	180.0	634.7	84.7
–upper limb	180.5	509.2	387.9	122.6	103.9	134.0	294.3	462.9	854.8	255.9
–lower limb	62.2	54.4	91.6	65.4	67.9	106.5	264.3	550.7	2184.2	255.3
Total fractures & dislocations	**304**	**592**	**540**	**293**	**249**	**313**	**658**	**1218**	**3731**	**633**
Sprain, strain										
– upper limb	*	0.0	2.0	6.9	4.6	11.1	19.2	26.9	18.0	9.6
– lower limb	1.9	*	10.9	47.3	31.8	21.5	18.5	13.5	54.0	24.5
– neck and trunk	1.9	*	3.5	12.7	14.0	18.5	14.2	10.9	22.6	12.8
– other	0.0	0.0	2.0	2.2	1.9	2.3	1.5	*	5.2	1.9
Total sprains & strains	**4**	**2**	**18**	**69**	**52**	**53**	**53**	**52**	**100**	**49**
Intracranial injury (without skull fracture)	169.6	123.3	110.0	113.7	64.3	40.5	38.5	47.4	149.8	81.9
Internal injury of chest, abdomen, pelvis	7.1	5.8	12.4	14.3	12.1	10.2	8.5	13.9	14.5	11.1
Open wound										
– head	114.0	40.9	22.3	32.2	22.2	19.3	15.8	34.8	145.2	38.4
– neck & trunk	10.9	22.6	4.5	8.0	6.7	3.8	4.2	3.9	5.8	7.0
– upper limb	41.3	24.6	26.8	65.2	56.3	50.1	31.2	29.6	45.3	45.8
– lower limb	29.5	41.9	47.6	37.5	30.4	21.7	31.2	68.2	174.2	42.5
– other	*	*	0.0	*	*	0.5	0.0	*	*	0.6
Total open wounds	**197**	**132**	**101**	**144**	**116**	**95**	**82**	**137**	**372**	**134**
Superficial injury or contusion	51.8	42.4	62.4	68.8	48.8	48.6	44.2	66.5	280.5	66.9
Crushing injury	5.7	3.4	3.0	1.8	2.7	2.0	0.0	1.7	2.9	2.4
Foreign body (through body orifice)	116.4	43.8	16.8	8.0	13.8	18.5	23.5	31.3	36.6	27.3
Burn										
– face, head & neck	24.7	*	2.0	2.9	1.9	1.7	*	*	4.6	3.5
– trunk	27.1	6.3	*	1.1	1.9	1.2	3.1	4.3	4.6	4.1
– upper limb	23.8	2.9	2.0	4.0	2.3	2.0	3.8	7.0	3.5	4.6
– lower limb	23.8	6.3	3.5	6.7	4.4	3.8	3.1	3.5	10.5	6.2
– other	12.8	1.9	0.0	1.3	3.4	0.5	1.5	*	4.6	2.4
Total burns	**112**	**18**	**9**	**16**	**14**	**9**	**12**	**16**	**28**	**21**
Injuries to nerve (or spinal cord)	*	*	4.0	5.6	8.8	6.5	3.8	2.6	4.6	5.1
Other injury; early complication; late effect	54.2	33.7	39.1	86.9	71.4	74.8	84.6	94.8	272.9	83.2
Poisoning										
– drug, medication	178.1	9.6	87.7	318.2	193.6	148.1	77.3	78.2	130.1	156.7
– other substance	54.6	18.3	37.2	25.5	22.0	21.6	12.7	16.1	19.2	24.1
Complication of surgical/medical procedure	79.3	55.9	54.5	117.4	200.3	292.5	432.4	600.7	735.2	265.2
Total	**1334**	**1081**	**1096**	**1282**	**1070**	**1134**	**1532**	**2377**	**5879**	**1561**

continued

Table 28 (continued):

Mode of injury–persons	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Fracture, dislocation										
– skull (inc. face)	70.2	37.6	80.3	190.6	129.1	61.3	29.7	26.7	62.7	87.5
– neck & trunk	4.9	4.7	19.3	63.5	59.6	62.5	98.4	160.9	534.9	82.9
– upper limb	204.9	601.3	642.0	362.5	243.4	191.4	242.6	328.7	641.7	323.9
– lower limb	80.4	79.0	147.1	178.6	140.3	140.8	225.1	432.0	1706.4	239.0
Total fractures & dislocations	**360**	**723**	**889**	**795**	**573**	**456**	**596**	**948**	**2946**	**733**
Sprain, strain										
– upper limb	0.9	*	4.6	17.6	13.8	21.7	30.8	31.4	15.0	16.7
– lower limb	1.4	3.1	16.9	87.6	67.3	35.3	22.7	17.3	53.2	41.0
– neck and trunk	1.4	1.9	5.1	17.0	18.9	20.2	16.4	10.8	21.6	14.8
– other	*	*	1.2	2.7	2.5	2.3	2.1	1.4	5.1	2.1
Total sprains & strains	**4**	**6**	**27**	**125**	**103**	**80**	**72**	**61**	**95**	**74**
Intracranial injury (without skull fracture)	205.8	169.2	213.1	227.7	117.2	64.9	53.9	64.2	157.4	130.2
Internal injury of chest, abdomen, pelvis	6.5	7.3	19.5	38.1	24.9	18.6	15.4	16.6	23.1	20.8
Open wound										
– head	142.5	60.2	33.8	74.9	54.1	38.1	33.9	42.6	135.7	59.8
– neck & trunk	11.8	20.4	10.4	20.6	16.6	9.1	6.5	7.3	9.9	12.9
– upper limb	56.8	45.4	56.9	200.4	154.8	109.9	86.9	59.2	58.0	110.9
– lower limb	29.4	55.7	72.8	64.2	48.2	33.0	36.0	55.5	129.1	50.8
– other	*	1.2	1.0	1.3	1.6	0.5	0.0	*	*	0.8
Total open wounds	**241**	**183**	**175**	**361**	**275**	**191**	**163**	**165**	**334**	**235**
Superficial injury or contusion	60.5	52.9	84.9	108.1	77.2	59.1	50.5	70.0	246.6	79.8
Crushing injury	5.8	5.2	3.4	10.6	9.6	8.5	5.0	2.6	2.6	7.2
Foreign body (through body orifice)	122.8	51.9	19.3	12.6	16.6	20.4	31.0	30.4	42.9	31.0
Burn										
– face, head & neck	28.0	2.1	5.8	9.3	5.9	4.7	2.1	1.6	4.0	6.7
– trunk	34.1	5.6	4.8	4.0	2.5	2.5	2.1	4.2	3.3	5.6
– upper limb	34.8	4.9	2.9	11.5	8.1	5.0	4.6	4.0	3.3	8.4
– lower limb	22.7	7.0	7.5	8.6	5.6	5.7	6.2	5.9	10.3	7.9
– other	14.6	2.1	1.4	3.4	3.1	2.0	1.9	2.1	4.8	3.4
Total burns	**134**	**22**	**22**	**37**	**25**	**20**	**17**	**18**	**26**	**32**
Injuries to nerve (or spinal cord)	1.9	1.2	5.5	17.6	14.7	10.9	6.9	2.6	6.2	9.6
Other injury; early complication; late effect	67.4	34.5	53.0	122.8	109.0	90.9	93.8	103.0	249.9	98.8
Poisoning										
– drug, medication	191.4	10.6	55.2	243.7	185.9	121.6	66.4	72.1	120.7	135.0
– other substance	66.3	23.3	34.7	41.1	33.6	31.7	22.1	22.5	21.3	33.6
Complication of surgical/medical procedure	104.8	66.3	61.2	129.9	171.7	242.1	499.9	763.1	919.8	269.5
Total	**1573**	**1355**	**1664**	**2271**	**1736**	**1415**	**1693**	**2339**	**5192**	**1891**

† All cases for which an external cause code (E-code) was recorded and the 'primary diagnosis' field contained a nature of injury code (N-code, as defined in ICD9-CM, chapter 17)

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 29: Inpatient separations by major E-code group,† age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Transportation	155.7	297.7	606.8	755.6	449.8	274.6	222.1	204.6	331.8	389.3
Drowning	33.0	3.7	2.3	6.0	3.5	2.4	1.5	5.6	*	5.7
Poisoning, pharmaceuticals	198.7	10.6	19.3	115.3	121.7	57.3	31.6	38.1	48.8	77.7
Poisoning, other substances	69.7	7.3	16.9	32.2	20.7	23.5	18.9	15.2	23.9	25.3
Falls	598.3	742.7	620.0	393.8	353.1	348.8	460.3	734.0	2360.4	528.8
Fires/burns/scalds	152.1	22.0	31.0	43.5	30.6	22.8	22.0	20.8	35.9	37.8
Other unintentional	488.3	484.4	843.5	1524.9	1151.3	721.7	565.2	414.2	435.4	849.5
Intentional, self inflicted	0.0	0.0	7.5	104.6	97.9	56.5	26.2	17.3	33.9	52.9
Intentional, inflicted by another	20.4	11.0	41.8	343.8	271.5	125.6	54.7	32.0	36.9	146.3
Other/unspecified	324.5	144.0	156.9	340.8	366.3	507.8	1310.1	2148.6	2758.9	649.6
Total	**2040**	**1723**	**2346**	**3660**	**2866**	**2141**	**2713**	**3630**	**6069**	**2763**
Female										
Transportation	99.3	190.8	311.6	333.8	203.4	166.3	166.2	187.8	221.3	209.4
Drowning	15.7	2.9	2.5	*	1.5	1.1	*	*	*	2.3
Poisoning, pharmaceuticals	176.7	7.7	60.4	200.3	123.8	91.6	38.5	42.6	73.2	101.7
Poisoning, other substances	44.7	8.7	26.8	20.3	15.5	13.6	10.8	13.5	12.8	17.4
Falls	443.2	538.6	302.7	154.1	150.6	250.3	646.0	1369.6	5056.5	658.1
Fires/burns/scalds	113.5	16.9	9.4	13.2	11.9	8.5	13.1	12.6	35.4	20.2
Other unintentional	382.9	263.0	321.0	338.3	305.2	282.7	243.9	282.1	429.2	308.2
Intentional, self inflicted	0.0	*	29.2	140.7	88.0	67.4	28.5	23.9	26.7	60.6
Intentional, inflicted by another	9.0	7.7	10.9	81.1	79.2	33.8	11.5	9.1	7.5	37.7
Other/unspecified	235.2	122.4	129.8	249.9	400.5	608.8	975.7	1430.5	1846.8	595.7
Total	**1520**	**1159**	**1205**	**1532**	**1380**	**1524**	**2135**	**3373**	**7711**	**2011**
Persons										
Transportation	128.2	245.6	463.1	549.0	327.5	221.2	193.9	195.5	262.0	298.9
Drowning	24.6	3.3	2.4	3.4	2.5	1.8	1.3	2.8	2.2	4.0
Poisoning, pharmaceuticals	188.0	9.2	39.3	156.9	122.7	74.2	35.0	40.5		
Poisoning, other substances	57.5	8.0	21.7	26.4	18.1	18.6	14.8	14.3	16.9	21.3
Falls	522.6	642.9	465.6	276.4	252.5	300.3	553.3	1076.4	4063.3	593.7
Fires/burns/scalds	133.3	19.5	20.5	28.5	21.3	15.7	17.5	16.4	35.6	29.0
Other unintentional	436.9	376.4	589.2	943.6	731.1	505.4	404.4	343.0	431.5	577.6
Intentional, self inflicted	0.0	*	18.1	122.3	93.0	61.9	27.3	20.8	29.4	56.7
Intentional, inflicted by another	14.8	9.4	26.8	215.1	176.1	80.3	33.1	19.7	18.3	91.8
Other/unspecified	280.9	133.5	143.7	296.3	383.3	557.5	1142.7	1761.8	2182.6	622.5
Total	**1786**	**1448**	**1791**	**2618**	**2128**	**1837**	**2424**	**3491**	**7106**	**2385**

† All cases for which an ICD9 external cause code (E-code) was recorded

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 30: Inpatient separations for transport injury† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle traffic	67.9	117.0	161.6	500.1	293.6	181.4	154.6	155.8	267.0	234.6
Motor vehicle non-traffic	16.3	28.4	80.3	84.5	41.1	22.4	21.2	19.8	30.9	39.6
Non-motor road vehicle	49.3	117.0	208.1	75.9	47.5	33.3	27.4	16.8	11.0	60.1
Railway transport	*	0.0	*	5.6	3.5	2.7	3.9	3.0	6.0	3.1
Water transport	*	*	2.8	16.3	17.1	10.4	5.0	5.1	*	9.3
Air transport	0.0	*	*	7.1	11.4	4.1	2.7	2.5	*	4.7
Vehicles, other	19.9	33.9	152.2	66.0	35.5	20.2	7.3	*	13.9	37.9
Total transport	**155.7**	**297.7**	**606.8**	**755.6**	**449.8**	**274.6**	**222.1**	**204.6**	**331.8**	**389.3**
Female										
Motor vehicle traffic	46.1	56.4	68.9	215.5	138.9	122.9	137.4	160.4	186.4	133.5
Motor vehicle non-traffic	12.8	12.0	11.9	11.6	5.7	5.7	6.5	7.8	17.4	8.9
Non-motor road vehicle	26.1	89.6	169.4	66.8	31.2	19.1	10.8	7.4	2.3	41.3
Railway transport	0.0	*	*	*	*	0.7	1.5	3.9	5.8	1.2
Water transport	0.0	*	*	6.5	2.7	1.6	3.8	2.6	*	2.5
Air transport	0.0	0.0	0.0	1.6	2.5	0.5	1.5	0.0	2.3	1.0
Vehicles, other	14.3	31.8	59.9	31.3	22.0	16.0	4.6	6.1	5.8	20.9
Total transport	**99.3**	**190.8**	**311.6**	**333.8**	**203.4**	**166.3**	**166.2**	**187.8**	**221.3**	**209.4**
Persons										
Motor vehicle traffic	57.2	87.4	116.4	360.7	216.8	152.6	146.0	158.3	216.1	183.8
Motor vehicle non-traffic	14.6	20.4	47.0	48.9	23.5	14.2	13.9	13.3	22.4	24.2
Non-motor road vehicle	38.0	103.6	189.3	71.4	39.4	26.3	19.1	11.7	5.5	50.6
Railway transport	*	*	1.2	3.2	2.1	1.7	2.7	3.5	5.9	2.2
Water transport	*	*	1.7	11.5	10.0	6.1	4.4	3.7	*	5.9
Air transport	0.0	*	*	4.4	7.0	2.3	2.1	1.2	2.2	2.8
Vehicles, other	17.2	32.9	107.3	49.0	28.8	18.1	6.0	4.0	8.8	29.4
Total transport	**128.2**	**245.6**	**463.1**	**549.0**	**327.5**	**221.2**	**193.9**	**195.5**	**262.0**	**298.9**

† Cases with external cause codes (E-codes) in the range E800–E848

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 31: Inpatient separations for land transport (non-rail) injury† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle occupant	31.2	39.9	47.9	265.2	148.4	106.2	106.0	101.5	160.4	125.1
Motorcyclist	3.6	23.4	105.2	214.6	111.4	38.0	12.3	10.7	8.0	74.2
Bicyclist	34.8	103.2	183.6	54.0	25.0	14.9	8.9	5.1	8.0	41.7
Pedestrian	45.7	60.1	49.8	42.9	31.2	25.1	37.8	47.2	96.6	39.9
Riding/drawn by animal	8.1	22.0	36.2	30.9	26.9	20.7	17.0	11.2	4.0	22.1
Other/unspecified	10.0	13.8	27.2	52.9	39.3	32.3	21.2	16.8	30.9	31.3
Total non-rail land transport	**133.5**	**262.4**	**449.9**	**660.4**	**382.3**	**237.1**	**203.2**	**192.4**	**308.9**	**334.2**
Female										
Motor vehicle occupant	28.5	24.6	27.7	160.5	100.1	95.5	105.0	109.1	122.5	95.2
Motorcyclist	*	7.2	12.9	24.3	13.0	4.5	1.9	1.7	*	8.8
Bicyclist	13.8	50.1	45.1	11.2	6.5	4.0	2.3	*	*	11.6
Pedestrian	24.7	32.8	31.2	20.5	14.0	15.1	20.8	40.9	55.2	23.6
Riding/drawn by animal	7.6	37.1	119.9	56.5	25.3	14.6	8.1	4.8	*	28.8
Other/unspecified	9.0	6.3	13.4	20.5	16.8	13.8	16.2	17.8	26.1	15.7
Total non-rail land transport	**85.0**	**158.0**	**250.2**	**293.8**	**175.8**	**147.5**	**154.3**	**175.2**	**206.2**	**183.7**
Persons										
Motor vehicle occupant	29.9	32.4	38.1	213.9	124.5	100.9	105.5	105.4	136.5	110.1
Motorcyclist	2.5	15.5	60.3	121.4	62.5	21.5	7.1	5.9	3.7	41.3
Bicyclist	24.6	77.3	116.2	33.0	15.8	9.5	5.6	3.0	3.3	26.6
Pedestrian	35.5	46.8	40.7	31.9	22.6	20.2	29.3	43.8	70.4	31.7
Riding/drawn by animal	7.9	29.4	76.9	43.4	26.1	17.7	12.5	7.7	1.8	25.4
Other/unspecified	9.5	10.1	20.5	37.2	28.0	23.2	18.9	17.3	27.9	23.4
Total non-rail land transport	**109.9**	**211.5**	**352.7**	**480.9**	**279.6**	**193.0**	**178.7**	**183.1**	**244.0**	**258.6**

† Cases with external cause codes (E-codes) in the range E810–E829

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 32: Inpatient separations for drowning or near-drowning† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Swimming pool or quenching tank	21.3	1.8	*	*	*	*	0.0	*	*	2.1
Other/unspecified	11.8	1.8	1.9	5.4	2.9	2.3	1.5	5.1	*	3.6
Total drowning	**33.0**	**3.7**	**2.3**	**6.0**	**3.5**	**2.4**	**1.5**	**5.6**	*	**5.7**
Female										
Swimming pool or quenching tank	7.1	1.9	*	0.0	*	0.0	*	0.0	0.0	0.8
Other/unspecified	8.6	*	*	*	1.0	1.1	*	*	*	1.5
Total drowning	**15.7**	**2.9**	**2.5**	*	**1.5**	**1.1**	*	*	*	**2.3**
Persons										
Swimming pool or quenching tank	14.4	1.9	*	*	0.5	*	*	*	*	1.4
Other/unspecified	10.2	1.4	1.7	3.1	2.0	1.7	1.2	2.6	1.8	2.6
Total drowning	**24.6**	**3.3**	**2.4**	**3.4**	**2.5**	**1.8**	**1.3**	**2.8**	**2.2**	**4.0**

† Cases with an external cause code (E-code) of E910

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 33: Inpatient separations for accidental poisoning by drugs etc.† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Opiates & related drugs	6.8	0.0	*	7.9	14.3	4.9	*	*	4.0	5.7
Other specified analgesics	33.9	1.8	3.8	21.2	12.2	4.5	*	*	*	9.8
Barbiturates	*	0.0	0.0	1.1	1.7	1.2	0.0	*	0.0	0.9
Non barbiturate sedatives/hypnotics	7.2	*	*	7.1	7.9	4.4	*	3.0	*	4.5
Tranquillisers	19.5	*	4.7	23.4	37.8	20.7	9.6	10.7	11.0	19.3
Anti-infectives	6.3	0.0	0.0	1.9	2.1	0.6	*	*	*	1.5
Other/unspecified	124.5	6.9	9.4	52.7	45.9	21.0	19.3	20.3	27.9	36.1
Total poisoning - pharmaceuticals	**198.7**	**10.6**	**19.3**	**115.3**	**121.7**	**57.3**	**31.6**	**38.1**	**48.8**	**77.7**
Female										
Opiates & related drugs	4.3	0.0	*	8.3	7.3	2.0	*	*	2.9	3.6
Other specified analgesics	31.8	1.9	20.3	61.9	20.1	8.7	1.5	2.6	3.5	19.1
Barbiturates	*	0.0	*	1.8	0.8	0.9	*	*	2.3	1.0
Non barbiturate sedatives/hypnotics	6.7	*	*	11.6	8.0	7.8	3.1	*	2.9	6.1
Tranquillisers	17.1	*	8.4	35.5	43.6	36.8	13.1	11.7	18.0	26.7
Anti-infectives	4.3	0.0	*	5.1	1.0	0.5	*	*	2.9	1.8
Other/unspecified	111.2	4.3	28.2	76.1	42.9	34.7	18.9	25.2	40.7	43.4
Total poisoning - pharmaceuticals	**176.7**	**7.7**	**60.4**	**200.3**	**123.8**	**91.6**	**38.5**	**42.6**	**73.2**	**101.7**
Persons										
Opiates & related drugs	5.6	0.0	*	8.1	10.8	3.5	0.8	*	3.3	4.6
Other specified analgesics	32.9	1.9	11.8	41.1	16.1	6.6	1.3	2.1	2.9	14.5
Barbiturates	0.9	0.0	*	1.4	1.2	1.0	*	*	1.5	0.9
Non barbiturate sedatives/hypnotics	7.0	*	1.0	9.3	7.9	6.1	1.7	1.9	2.6	5.3
Tranquillisers	18.3	0.9	6.5	29.3	40.7	28.7	11.4	11.2	15.4	23.0
Anti-infectives	5.3	0.0	*	3.5	1.6	0.6	*	0.9	2.6	1.6
Other/unspecified	118.0	5.6	18.6	64.2	44.4	27.7	19.1	22.9	36.0	39.7
Total poisoning - pharmaceuticals	**188.0**	**9.2**	**39.3**	**156.9**	**122.7**	**74.2**	**35.0**	**40.5**	**64.2**	**89.8**

† Cases with external cause codes (E-codes) in the range E850–E858

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 34: Inpatient separations for accidental poisoning by other substances† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Alcoholic beverages, ethanol	0.0	*	3.3	5.4	2.1	3.1	0.0	*	*	2.5
Petroleum products, solvents	16.7	0.0	0.0	2.6	*	1.2	*	0.0	0.0	2.1
Agricultural & horticultural chemicals	12.2	*	0.0	2.4	1.7	2.2	*	4.6	*	2.6
Foodstuffs; poisonous plants	4.5	2.3	2.8	7.3	4.3	3.3	3.5	2.0	*	4.0
Motor vehicle exhaust gas	0.0	0.0	0.0	1.1	*	0.6	*	*	0.0	0.5
Other/unspecified	36.2	3.2	10.8	13.5	11.4	13.1	14.3	7.1	17.9	13.6
Total poisoning - other substances	**69.7**	**7.3**	**16.9**	**32.2**	**20.7**	**23.5**	**18.9**	**15.2**	**23.9**	**25.3**
Female										
Alcoholic beverages, ethanol	0.0	*	5.9	6.3	1.5	2.1	*	*	0.0	2.3
Petroleum products, solvents	10.5	0.0	0.0	*	*	*	0.0	*	0.0	0.9
Agricultural & horticultural chemicals	8.1	*	*	*	1.0	0.5	*	0.0	*	1.2
Foodstuffs; poisonous plants	4.3	4.3	2.5	4.9	3.4	2.5	2.7	2.2	2.3	3.2
Motor vehicle exhaust gas	0.0	0.0	0.0	0.0	*	*	0.0	*	0.0	*
Other/unspecified	21.9	3.4	17.3	8.3	9.0	8.1	6.5	10.0	8.7	9.6
Total poisoning - other substances	**44.7**	**8.7**	**26.8**	**20.3**	**15.5**	**13.6**	**10.8**	**13.5**	**12.8**	**17.4**
Persons										
Alcoholic beverages, ethanol	0.0	*	4.6	5.8	1.8	2.6	*	*	*	2.4
Petroleum products, solvents	13.7	0.0	0.0	1.4	0.5	0.7	*	*	0.0	1.5
Agricultural & horticultural chemicals	10.2	*	*	1.5	1.4	1.4	*	2.1	1.5	1.9
Foodstuffs; poisonous plants	4.4	3.3	2.7	6.1	3.8	2.9	3.1	2.1	2.6	3.6
Motor vehicle exhaust gas	0.0	0.0	0.0	0.5	0.4	0.4	*	*	0.0	0.3
Other/unspecified	29.2	3.3	14.0	10.9	10.2	10.6	10.4	8.7	12.1	11.6
Total poisoning - other substances	**57.5**	**8.0**	**21.7**	**26.4**	**18.1**	**18.6**	**14.8**	**14.3**	**16.9**	**21.3**

† Cases with external cause codes (E-codes) in the range E860–E869

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 35: Inpatient separations for falls† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Stairs	47.5	23.4	14.1	15.9	22.7	24.8	37.8	50.3	121.6	30.0
Ladder/scaffold	6.3	4.1	4.7	12.0	30.2	46.5	58.2	58.9	55.8	31.3
Building/structure	50.2	33.0	30.5	32.2	33.1	27.2	18.5	13.7	15.9	29.3
Playground equipment	69.2	163.8	56.8	3.9	*	0.9	*	*	*	22.6
Different level, other	205.0	159.2	98.6	47.2	47.1	48.5	52.8	75.1	275.0	81.6
Same level: slip, trip, stumble	81.5	106.9	119.3	65.4	53.3	72.2	116.1	230.4	782.1	113.4
Fracture - cause unspec.	24.0	50.0	114.1	131.2	82.6	43.2	38.9	48.7	145.5	71.4
Other/unspecified	114.5	202.3	181.8	86.2	83.7	85.7	136.9	256.3	962.5	149.1
Total falls	**598.3**	**742.7**	**620.0**	**393.8**	**353.1**	**348.8**	**460.3**	**734.0**	**2360.4**	**528.8**
Female										
Stairs	39.9	10.1	10.9	17.0	12.4	29.0	68.1	117.8	292.7	48.4
Ladder/scaffold	2.9	2.4	*	2.0	2.7	7.0	10.8	17.4	7.5	5.7
Building/structure	28.5	18.3	8.4	6.7	2.9	4.0	5.8	4.3	10.5	7.8
Playground equipment	47.0	130.6	28.2	1.1	0.8	*	1.5	0.0	*	15.0
Different level, other	156.3	99.2	37.2	13.4	13.0	17.5	41.9	83.9	447.8	65.4
Same level: slip, trip, stumble	51.8	87.2	55.5	37.3	40.0	89.8	258.2	522.5	1856.0	219.6
Fracture - cause unspec.	19.0	49.1	66.4	31.7	25.3	35.5	67.7	133.0	380.4	65.7
Other/unspecified	97.9	141.6	95.1	44.9	53.2	67.3	191.6	490.3	2059.9	230.5
Total falls	**443.2**	**538.6**	**302.7**	**154.1**	**150.6**	**250.3**	**646.0**	**1369.6**	**5056.5**	**658.1**
Person										
Stairs	43.8	16.9	12.5	16.4	17.5	26.8	53.1	86.6	229.7	39.2
Ladder/scaffold	4.6	3.3	2.9	7.1	16.5	27.0	34.5	36.5	25.3	18.4
Building/structure	39.6	25.8	19.8	19.7	18.1	15.7	12.1	8.7	12.5	18.5
Playground equipment	58.4	147.6	42.9	2.5	0.7	0.6	1.2	*	1.5	18.8
Different level, other	181.2	129.9	68.7	30.6	30.2	33.2	47.4	79.8	384.5	73.5
Same level: slip, trip, stumble	67.0	97.3	88.2	51.6	46.7	80.9	187.4	387.8	1460.6	166.8
Fracture - cause unspec.	21.8	49.6	90.9	82.5	54.2	39.4	53.3	94.4	293.5	68.5
Other/unspecified	106.4	172.7	139.6	65.9	68.5	76.6	164.3	382.4	1655.8	190.0
Total falls	**522.6**	**642.9**	**465.6**	**276.4**	**252.5**	**300.3**	**553.3**	**1076.4**	**4063.3**	**593.7**

† Cases with external cause codes (E-codes) in the range E880–E888

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 36: Inpatient separations for fires, burns or scalds† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Housefires	2.3	*	*	0.9	2.9	1.5	3.1	*	8.0	1.9
Clothing ignition	3.6	0.0	*	1.5	1.0	0.8	*	*	*	1.1
Hot substance or object, steam	127.6	12.8	7.5	15.2	11.2	8.9	9.3	9.6	13.9	19.7
Other/unspecified	18.6	7.8	22.5	25.9	15.5	11.6	8.9	9.6	13.0	15.2
Total fires/burns/scalds	**152.1**	**22.0**	**31.0**	**43.5**	**30.6**	**22.8**	**22.0**	**20.8**	**35.9**	**37.8**
Female										
Housefires	6.7	*	*	0.9	0.8	*	*	0.0	4.1	1.2
Clothing ignition	2.9	*	*	*	0.0	*	*	*	0.0	0.5
Hot substance or object, steam	97.4	13.0	5.0	9.2	6.7	4.5	9.2	10.0	22.6	14.7
Other/unspecified	6.7	2.4	2.5	2.7	4.4	3.4	3.1	2.2	8.7	3.8
Total fires/burns/scalds	**113.5**	**16.9**	**9.4**	**13.2**	**11.9**	**8.5**	**13.1**	**12.6**	**35.4**	**20.2**
Persons										
Housefires	4.4	0.9	*	0.9	1.9	1.0	1.7	*	5.5	1.5
Clothing ignition	3.2	*	1.0	1.0	0.5	0.5	*	*	*	0.8
Hot substance or object, steam	112.9	12.9	6.3	12.2	8.9	6.7	9.2	9.8	19.4	17.2
Other/unspecified	12.7	5.2	12.8	14.5	10.0	7.6	6.0	5.6	10.3	9.5
Total fires/burns/scalds	**133.3**	**19.5**	**20.5**	**28.5**	**21.3**	**15.7**	**17.5**	**16.4**	**35.6**	**29.0**

† Cases with external cause codes (E-codes) in the range E890–E899 and E924

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 37: Inpatient separations for other unintentional injury† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Firearm	0.0	3.2	4.7	10.5	3.5	3.1	2.3	2.0	0.0	4.0
Excessive heat	*	*	0.0	3.2	0.8	0.9	1.9	2.5	4.0	1.4
Excessive cold	0.0	0.0	*	0.9	*	0.6	*	2.5	4.0	0.7
Exposure/neglect	1.8	0.0	*	*	*	*	0.0	*	6.0	0.7
Aspiration - food	25.3	1.8	*	2.1	1.9	3.9	9.3	8.1	11.0	5.6
Aspiration, non-food	32.1	6.0	1.9	*	2.1	0.8	*	*	0.0	3.8
Suffocation	*	0.0	0.0	0.9	0.8	0.0	0.0	0.0	0.0	0.3
Foreign body	73.3	55.0	20.7	16.3	20.5	22.0	33.9	24.4	47.8	29.2
Struck by falling object	15.8	11.5	8.5	26.8	26.9	27.9	22.0	6.6	8.0	21.4
Dog bite	24.0	17.4	8.9	4.3	6.8	5.4	5.8	3.6	8.0	8.0
Other collision	60.6	69.7	99.6	74.2	53.7	40.1	32.0	26.9	33.9	54.0
Caught/crushed	48.9	24.8	20.7	29.6	33.5	31.7	20.4	9.1	8.0	28.3
Machinery	9.1	7.3	10.8	85.7	94.0	84.7	84.1	44.2	16.9	64.5
Cutting/piercing	81.5	98.2	116.0	267.5	206.4	128.4	107.2	79.2	47.8	148.8
Explosion	*	*	5.2	7.7	6.4	3.6	2.3	*	0.0	3.9
Electric current	5.4	6.9	5.2	13.1	13.2	7.7	3.9	*	*	8.1
Other/unspecified	109.1	181.2	538.7	980.7	680.8	360.4	237.9	201.0	238.1	466.8
Total other unintentional	**488.3**	**484.4**	**843.5**	**1524.9**	**1151.3**	**721.7**	**565.2**	**414.2**	**435.4**	**849.5**
Female										
Firearm	*	0.0	0.0	1.6	*	*	*	0.0	0.0	0.4
Excessive heat	*	*	0.0	2.2	0.0	0.5	*	1.7	5.2	1.0
Excessive cold	*	0.0	0.0	*	*	0.0	*	*	6.4	0.6
Exposure/neglect	*	0.0	0.0	*	0.0	*	*	0.0	*	0.4
Aspiration - food	19.5	*	*	0.9	2.1	2.9	5.0	6.1	11.6	4.4
Aspiration, non-food	29.5	4.8	*	0.0	0.8	0.8	2.7	*	*	3.2
Suffocation	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Foreign body	73.2	40.0	15.9	8.3	12.1	17.1	19.2	26.9	30.2	22.2
Struck by falling object	11.9	4.8	3.0	4.0	4.4	3.2	1.9	5.7	4.1	4.4
Dog bite	19.5	8.2	5.4	3.6	3.8	6.9	5.4	7.4	7.0	6.7
Other collision	35.6	43.4	33.2	22.8	17.2	13.1	14.2	30.9	56.9	24.4
Caught/crushed	38.0	21.7	7.9	4.2	6.1	4.8	5.8	4.3	10.5	9.0
Machinery	1.9	*	*	4.2	9.0	8.2	5.4	1.7	*	5.2
Cutting/piercing	67.9	51.1	55.5	64.8	67.7	53.0	35.0	35.2	47.0	55.0
Explosion	0.0	0.0	0.0	*	1.0	0.7	0.0	*	*	0.6
Electric current	2.9	2.4	3.0	4.0	2.9	1.3	2.7	*	*	2.3
Other/unspecified	78.9	83.8	193.7	215.9	177.4	169.8	143.9	158.2	244.5	168.3
Total other unintentional	**382.9**	**263.0**	**321.0**	**338.3**	**305.2**	**282.7**	**243.9**	**282.1**	**429.2**	**308.2**

continued

Table 37 (continued)

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Persons										
Firearm	*	1.6	2.4	6.1	1.9	1.6	1.3	0.9	0.0	2.2
Excessive heat	*	*	0.0	2.7	0.4	0.7	1.2	2.1	4.8	1.2
Excessive cold	*	0.0	*	0.7	*	0.3	1.0	1.4	5.5	0.7
Exposure/neglect	1.4	0.0	*	0.7	*	0.3	*	*	3.3	0.5
Aspiration - food	22.5	1.4	1.4	1.5	2.0	3.4	7.1	7.0	11.4	5.0
Aspiration, non-food	30.8	5.4	1.2	*	1.5	0.8	1.9	0.9	*	3.5
Suffocation	1.4	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.2
Foreign body	73.2	47.7	18.6	12.4	16.2	19.6	26.6	26.0	36.7	25.7
Struck by falling object	13.9	8.2	5.8	15.6	15.6	15.7	11.9	6.1	5.5	12.8
Dog bite	21.8	12.9	7.2	3.9	5.3	6.1	5.6	5.6	7.3	7.3
Other collision	48.4	56.9	67.3	49.0	35.6	26.9	23.1	29.3	48.4	39.1
Caught/crushed	43.6	23.3	14.5	17.2	19.8	18.4	13.1	6.6	9.5	18.6
Machinery	5.6	4.5	6.3	45.8	51.8	47.0	44.9	21.3	6.6	34.7
Cutting/piercing	74.6	75.4	86.6	168.3	137.5	91.2	71.3	55.7	47.3	101.7
Explosion	*	*	2.7	4.2	3.7	2.2	1.2	*	*	2.2
Electric current	4.2	4.7	4.1	8.6	8.1	4.6	3.3	0.9	*	5.2
Other/unspecified	94.3	133.7	370.8	606.1	430.9	266.5	191.0	178.0	242.1	316.9
Total other unintentional	**436.9**	**376.4**	**589.2**	**943.6**	**731.1**	**505.4**	**404.4**	**343.0**	**431.5**	**577.6**

† Cases with external cause codes (E-codes) E900–E909, E911–E923 and E925–E928

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 38: Inpatient separations for self-inflicted injury† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Motor vehicle exhaust	0.0	0.0	0.0	4.1	4.3	3.1	1.5	*	0.0	2.3
Hanging	0.0	0.0	*	2.6	1.9	0.5	*	*	0.0	1.0
Firearm	0.0	0.0	0.0	2.1	*	0.6	*	*	0.0	0.7
Poison, solids/liquids	0.0	0.0	6.1	67.3	67.8	41.2	17.7	10.2	24.9	36.3
Cutting/piercing	0.0	0.0	*	20.4	17.1	6.4	3.9	3.6	7.0	8.6
Unspec./other	0.0	0.0	*	8.1	6.4	4.6	1.5	*	*	3.9
Total intentional - self inflicted	**0.0**	**0.0**	**7.5**	**104.6**	**97.9**	**56.5**	**26.2**	**17.3**	**33.9**	**52.9**
Female										
Motor vehicle exhaust	0.0	0.0	0.0	*	0.0	0.9	0.0	1.7	0.0	0.4
Hanging	0.0	0.0	0.0	*	*	0.5	0.0	0.0	0.0	0.3
Firearm	0.0	0.0	0.0	*	*	0.0	0.0	0.0	0.0	*
Poison, solids/liquids	0.0	*	28.2	123.9	76.5	60.0	25.4	20.0	25.0	53.5
Cutting/piercing	0.0	0.0	*	11.6	8.0	3.2	2.3	1.7	0.0	4.3
Unspec./other	0.0	0.0	0.0	4.0	2.7	2.8	*	*	*	2.0
Total intentional - self inflicted	**0.0**	*	**29.2**	**140.7**	**88.0**	**67.4**	**28.5**	**23.9**	**26.7**	**60.6**
Persons										
Motor vehicle exhaust	0.0	0.0	0.0	2.2	2.2	2.0	0.8	1.2	0.0	1.4
Hanging	0.0	0.0	*	1.5	1.2	0.5	*	*	0.0	0.6
Firearm	0.0	0.0	0.0	1.3	*	0.3	*	*	0.0	0.4
Poison, solids/liquids	0.0	*	16.9	95.0	72.1	50.4	21.6	15.5	24.9	45.0
Cutting/piercing	0.0	0.0	*	16.1	12.6	4.8	3.1	2.6	2.6	6.4
Unspec./other	0.0	0.0	*	6.1	4.6	3.7	1.2	0.9	1.8	2.9
Total intentional - self inflicted	**0.0**	*	**18.1**	**122.3**	**93.0**	**61.9**	**27.3**	**20.8**	**29.4**	**56.7**

† Cases with external cause codes (E-codes) in the range E950–E959

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 39: Inpatient separations for injury inflicted by others† by age group and sex: annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Unarmed fight/brawl	*	6.4	33.3	251.6	188.4	82.5	30.8	15.2	19.9	100.3
Firearm	0.0	0.0	*	1.5	1.4	1.5	*	0.0	0.0	1.0
Cutting/stabbing	0.0	*	*	31.7	24.2	9.0	5.8	*	*	12.2
Child battering/ maltreatment	16.3	*	*	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Other/unspecified	2.7	3.2	5.6	58.9	57.4	32.6	17.7	15.7	14.9	31.5
Total intentional - inflicted by other	**20.4**	**11.0**	**41.8**	**343.8**	**271.5**	**25.6**	**54.7**	**32.0**	**36.9**	**146.3**
Female										
Unarmed fight/brawl	*	*	6.4	57.6	51.1	22.0	5.0	3.5	4.1	24.1
Firearm	0.0	0.0	0.0	*	*	*	*	0.0	0.0	0.1
Cutting/stabbing	0.0	0.0	0.0	4.2	5.2	2.9	*	*	*	2.3
Child battering/ maltreatment	7.6	2.9	*	*	0.0	0.0	0.0	0.0	0.0	0.9
Other/unspecified	*	3.4	3.0	18.5	22.6	8.7	5.8	5.2	2.9	10.3
Total intentional - inflicted by other	**9.0**	**7.7**	**10.9**	**81.1**	**79.2**	**33.8**	**11.5**	**9.1**	**7.5**	**37.7**
Persons										
Unarmed fight/brawl	0.9	4.0	20.3	156.6	120.2	52.7	17.9	8.9	9.9	62.0
Firearm	0.0	0.0	*	0.9	0.8	0.8	*	0.0	0.0	0.5
Cutting/stabbing	0.0	*	*	18.3	14.8	6.0	3.1	*	*	7.2
Child battering/ maltreatment	12.1	1.9	1.4	*	0.0	0.0	0.0	0.0	0.0	1.2
Other/unspecified	1.9	3.3	4.3	39.2	40.2	20.8	11.7	10.1	7.3	20.8
Total intentional - inflicted by other	**14.8**	**9.4**	**26.8**	**215.1**	**176.1**	**80.3**	**33.1**	**19.7**	**18.3**	**91.8**

† Cases with external cause codes (E-codes) in the range E960–E978 and E990–E999

Note: Cells whose case count equals 1–3 inclusive are indicated by *

Table 40: Inpatient separations for all cases of injury by age group and sex and role of human intent:† annual rate per 100 000 population, NSW 1991–92

Mode of injury	Age group (years)									All ages
	0–4	5–9	10–14	15–24	25–34	35–54	55–64	65–74	75+	
Male										
Non-intentional	1707.1	1583.6	2167.5	2962.3	2241.6	1560.6	1409.6	1463.4	3286.0	1991.4
Intentional, self-inflicted	0.0	0.0	7.5	104.6	97.9	56.5	26.2	17.3	33.9	52.9
Intentional, by another	20.4	11.0	41.8	343.8	271.5	125.6	54.7	32.0	36.9	146.3
Medical misadventure, complications	305.9	128.4	126.8	233.0	244.6	392.6	1219.5	2115.1	2707.1	565.1
Undetermined intent	6.8	*	2.3	16.5	10.7	5.8	2.7	3.0	5.0	7.3
Total	**2040.2**	**1723.0**	**2346.0**	**3660.3**	**2866.5**	**2141.0**	**2712.7**	**3630.2**	**6068.8**	**2762.9**
Female										
Non-intentional	1290.7	1041.6	1052.2	1097.2	857.6	877.1	1157.3	1933.8	5867.8	1356.8
Intentional, self-inflicted	0.0	*	29.2	140.7	88.0	67.4	28.5	23.9	26.7	60.6
Intentional, by another	9.0	7.7	10.9	81.1	79.2	33.8	11.5	9.1	7.5	37.7
Medical misadventure, complications	219.5	108.9	111.0	207.2	351.9	543.3	936.8	1403.1	1806.7	553.5
Undetermined intent	*	*	*	5.8	2.9	2.4	*	2.2	2.3	2.5
Total	**1520.2**	**1159.1**	**1204.8**	**1532.0**	**1379.6**	**1524.0**	**2135.3**	**3372.6**	**7711.1**	**2011.2**
Persons										
Non-intentional	1504.0	1319.2	1624.7	2048.8	1554.4	1223.7	1283.3	1716.8	4917.1	1672.7
Intentional, self-inflicted	0.0	*	18.1	122.3	93.0	61.9	27.3	20.8	29.4	56.7
Intentional, by another	14.8	9.4	26.8	215.1	176.1	80.3	33.1	19.7	18.3	91.8
Medical misadventure, complications	263.8	118.9	119.1	220.4	297.8	466.9	1078.2	1731.6	2138.2	559.3
Undetermined intent	3.9	*	1.9	11.3	6.9	4.1	1.7	2.6	3.3	4.9
Total	**1786.5**	**1448.2**	**1790.6**	**2617.8**	**2128.1**	**1836.9**	**2423.7**	**3491.4**	**7106.3**	**2385.4**

† All cases for which an ICD9 external cause code (E-code) was recorded

Note: Cells whose case count equals 1–3 inclusive are indicated by *