

Appendix 1: Data issues

Data sources

The data on hospital separations were provided by the Australian Institute of Health and Welfare (AIHW), from the National Hospital Morbidity Database (NHMD).

Crude and age-specific rates were calculated using as population data the final estimate of the estimated resident population as at 31 December 2003, obtained from the AIHW.

Selection criteria

This report is intended to describe the population incidence of injuries newly occurring in Australia and resulting in admission to a hospital. This section describes the criteria that were used to select cases to achieve this purpose.

Period

This report is restricted to inpatient episodes that ended in the period 1 July 2005 to 30 June 2006.

For purposes of injury prevention, it would be preferable to specify cases in terms of date of injury occurrence. Date of injury occurrence is not available in the NHMD (though it is available in equivalent data in New Zealand).

Most hospital episodes due to injury are brief (mean duration of 4.0 days for *Community injury*) and hospital admission (if it occurs at all) usually follows soon after occurrence of an injury. Hence injury data reported – as here – in terms of date of separation should not, overall, differ greatly from reporting in terms of date of occurrence, though caution should be taken in making this assumption for some types of case (e.g. spinal cord injuries, for which mean length of stay is several months (Helps et al. 2002)).

Scope

We included data from all hospitals that contributed to the NHMD in 2005–06. This includes nearly all public and private hospitals in Australia that provide acute care services. Further information on inclusion scope can be found in Australian Hospital Statistics 2005–06 (AIHW 2007).

Injury

The operational definition of injury used in this report is NHMD records that were assigned, as the Principal Diagnosis, an ICD-10-AM code in particular ranges. The code range S00–T75 and T79 has been used to designate *Community injury* and the range T80–T88 designates *Complications of surgical and medical care*.

About 99% of all NHMD records in the period of interest that have any code from ICD-10-AM Chapter XIX (*Injury, poisoning and certain other consequences of external causes S00–T98*) as their Principal Diagnosis fall into one of these two groups (Table A1).

Table A1: Selection criteria for cases due to injury and poisoning, Australia, 2005–06

Selection criteria	Males	Females	Persons
<i>Community injury</i> (ICD-10-AM Principal Diagnosis range S00–T75, T79), and			
• lack any external cause code	285	160	445
• have a first reported external cause code of <i>Complications of surgical and medical care</i> **	823	727	1,550
• have a first reported external cause code in the range V01–Y36, Y85–Y87, Y89	215,050	154,246	369,302 ^(a)
Total case numbers for Community injury	216,158	155,133	371,297^(a)
Do not have a Principal Diagnosis of <i>Community injury</i> , but Additional Diagnosis codes are in range (ICD-10-AM range S00–T75, T79)	36,661	41,758	78,419 ^(b)
Total case numbers where there is a code for Community injury in the Principal or Additional Diagnosis fields	252,819	196,891	449,716^(a)
<i>Complications of surgical and medical care</i> (ICD-10-AM Principal Diagnosis range T80–T88), and			
• lack any external cause code	64	44	108
• have a first reported external cause code of <i>Community injury</i> ***	151	131	282
• have a first reported external cause in the range Y40–T84, Y88	36,870	35,785	72,655
Total case numbers for Complications of surgical and medical care	37,085	35,960	73,045
Do not have a Principal Diagnosis of <i>Complications of surgical and medical care</i> , but Additional Diagnosis codes are in range (ICD-10-AM range T80–T88)	41,168	38,020	79,190 ^(b)
Total case numbers where there is a code for Complications of surgical and medical care in the Principal or Additional Diagnosis fields	78,253	73,980	152,235^(b)
Case numbers where Principal Diagnosis is in ICD-10-AM Chapter XIX Injury and poisoning but is not classified as Community injury or Complications of surgical and medical care	2,545	2,775	5,320
• Adverse effects, not elsewhere classified (ICD-10-AM Principal Diagnosis T78)—includes adverse food reactions e.g. anaphylactic shock.	2,424	2,731	5,155
• Other complications of trauma not elsewhere classified (ICD-10-AM Principal Diagnosis T89)	111	43	154
• Sequelae of injuries, of poisoning and of other consequences of external causes (ICD-10-AM Principal Diagnosis T90–T98)	10	1	11
All cases with Principal Diagnosis in the ICD-10-AM range S00–T98	255,788	193,868	449,662^(a)

Includes (a) 6, and (b) 2 separations for which sex was not reported.

* To correct for double-counting, 34,474 separations were omitted from the estimate of incident cases as they were in ward transfers from another acute care hospital. Without this exclusion, the separations from hospital according to Principal Diagnosis were 400,019 for Community injury, 78,684 for Complications of surgical and medical care and 5,433 for the remainder of separations in the Chapter XIX Injury and poisoning chapter.

** 34 (2.8%) of these cases have one or more external cause codes of Community injury (external cause of morbidity and mortality fields in the range V01–Y36).

*** 38 (13.5%) of these cases have one or more external cause codes of Complications of surgical and medical care (external cause of morbidity and mortality fields in the range Y40–Y84).

The distinction between these two groups reflects contemporary injury prevention practice. For example, the current National Injury Prevention and Safety Promotion Plan, in common with previous Australian injury prevention policies and plans, has a scope corresponding to *Community injury* (SIPP 2005).

Community injury generally occurs outside the context of medical care, but (if serious) prompts one or more episodes of care, sometimes including admission to a hospital. A *Complication of surgical and medical care* always occurs within the context of medical care and often arises in a hospital, although the concept can include complications of surgical and medical care in other settings.

There is some potential overlap between these types of injury. For example, an injurious fall sustained by a hospital inpatient can be seen as part of the *Community injury* issue of falls, and also as a *Complication of surgical and medical care*. In this document, such cases have been assigned on the basis of Principal Diagnosis.

A small proportion of records were ambiguous as to whether they should be treated as *Community injury* or *Complications of surgical and medical care*. These records have a Principal Diagnosis in the *Community injury* range and a first reported external cause code meaning *Complications of surgical and medical care* ($n = 1,550$) or a Principal Diagnosis in the *Complications of surgical and medical care* range and a first reported external cause code indicating *Community injury* ($n = 282$). These records, shown in Table A1, were included in the analysis according to their Principal Diagnosis.

Consideration was given to amending the selection criteria for community injury in this report to include cases with the ICD-10-AM code T89 *Other complications of trauma not elsewhere classified* as the principal diagnosis. This category encompasses *Complications of open wounds, unspecified*; *Open wound with foreign body (with or without infection)*; *Open wound with infection*; *Other complications of open wounds* (e.g. delayed healing or delayed treatment). T89 is likely to include incident cases where a person sustained an injury but was not admitted to hospital until after complications of the injury had occurred. The inclusion of such cases within community injury would contribute to arriving at the best estimate of the population incidence of hospitalised injury. However, the inclusion criteria for T89 are somewhat ambiguous in that the category may also contain cases where an initial injury was treated in hospital, apparently successfully, and infection or other complication occurred after discharge requiring a second admission. Ambiguity concerning these cases would be reduced by person-based linkage of the hospital separations data and, further, by the presence in records of the date of injury. This information was not available to us. The number of cases with a principal diagnosis of T89 in 2005–06 was small ($n = 154$). On this basis, and because of the unresolved ambiguity, it was decided not to add cases with principal diagnosis = T89 to community injury. However, this category should be kept in mind, especially when investigating types of injury in which infection of wounds or complications of retained foreign bodies might be important (e.g. dog bites).

Injury solely as Additional Diagnosis (excluded)

Records in the NHMD for 2005–06 can report up to 50 Additional Diagnosis codes as well as a Principal Diagnosis code. Hence, records can occur that have a Principal Diagnosis code outside the range designating *Community injury*, but have one or more Additional Diagnosis codes within that range. The same is true for *Complications of surgical and medical care*. The numbers of records of these types are shown in Table A1.

Records in which injury codes appear only as Additional Diagnoses have not been used in the analysis presented in this report, mainly because injury was not recorded as being the main reason for these episodes in hospital. Principal Diagnosis means 'The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care...' (AIHW 2005). Hence, while many or all of the people represented by these records will, at some time, have sustained an injury as defined above, that injury was not recorded as being the main reason for their current episode in hospital.

Many of these records with an Additional Diagnosis of injury will have been counted in incidence estimates on the basis of a previous episode in hospital for acute care, the current episode being for rehabilitation. In some other instances, the Additional Diagnosis injury referred to in the record may have been incidental to the reason for admission and would not, on its own, have prompted admission. Availability of person-linked hospital morbidity data would do much to enable appropriate assignment of this group of records.

External cause codes

According to Australian Coding Standards (NCCH 2002), all records in the NHMD that meet either of the injury definitions stated above should include one or more ICD-10-AM external cause codes. In practice, only 0.1% of NHMD records that met all other selection criteria had no external cause code. Since the main focus of this report is to describe injury cases in terms of the external causes that brought them about, injury cases without an external cause code are only included in the *Community injury* and *Complications of surgical and medical care* chapters.

Records that have a Principal Diagnosis within a specified injury range, but no accompanying external cause code, numbered 445 (0.1%) of the *Community injury* subset, and 108 (0.1%) of the *Complications of surgical and medical care* subset (see Table A1).

Estimating incident cases

Each record in the NHMD refers to a single episode of care in a hospital. Some injuries result in more than one episode in hospital and, hence, more than one NHMD record. This can occur in two main ways:

- a person is admitted to one hospital, then transferred to another; and
- a person has an episode of care in hospital, is discharged home (or to another place of residence) and is then admitted for further treatment due to the same injury, to the same hospital or another one.

The NHMD does not include information designed to enable the set of records belonging to an injury case to be recognised as such. Hence, there is potential for some incident injury cases to be counted more than once. This potential exists when a single incident injury case results in two or more NHMD records, all of which satisfy the selection criteria being used.

Information in the NHMD enables this problem to be reduced, though not eliminated. The approach used for this report makes use of the Mode of Admission variable, which indicates whether the current episode commenced with inward transfer from another acute care hospital. Episodes of this type with injury as the Principal Diagnosis are likely to have been preceded by another episode, also meeting the case selection criteria for injury. Hence, these records ($n = 34,474$) were omitted from the estimates of incident cases that are shown in Table A1 and elsewhere in this report.

This procedure should correct for over-estimation of cases that is due to transfers, but will not correct for over-estimation that is due to readmissions.

The patient days reported during the episodes omitted to reduce overestimation of incident cases are part of the burden of acute hospital care provided to the incident cases. Hence, these patient days were retained when calculating mean and total length of stay. Note that this method does not include all patient days potentially attributable to injury. In particular, it does not include days for most aspects of injury rehabilitation, which are difficult to assign correctly without information enabling identification of all inpatient episodes associated with an injury case.

Confidence intervals

Nearly all injury/poisoning cases are thought to be included in the data reported, representing minimal risk of sampling error. Data are based on the financial year of separation, but choice of this time period is arbitrary. Use of calendar year would result in different rates, particularly where case numbers are small. Confidence intervals (95%; based on a Poisson distribution) were calculated using a method elsewhere described (Anderson & Rosenberg 1998). Asymmetrical confidence intervals were calculated for case numbers up to 100. Symmetrical intervals, based on a normal approximation, were calculated where case numbers exceed 100.

Age adjustment

Most all-ages rates have been adjusted for age to allow comparison of injury risk free from the distortion introduced by one population having a different age distribution to another. Direct standardisation was employed, using the Australian population in 2001 as the standard (ABS 2003) (Table A2). Where crude rates or age-specific rates are reported, this is noted.

Suppression of small cell counts in data tables

Cell counts in tables that are fewer than 4 cases have been suppressed as have rates derived from them, to protect confidentiality and because values based on very small numbers are sometimes difficult to interpret. In the instances where only one cell in a row or column has a count of less than 4, counts of one or more other cells in the same row or column have generally also been suppressed.

State and territory information

The NHMD contains information on state or territory in two senses: jurisdiction of usual residence and the jurisdiction in which the treating hospital is located. There are reasons to prefer each of these for statistical reporting of injury, in certain circumstances. The population data used for rates are framed in terms of place of usual residence, which has good conceptual fit with case data framed in the same way. Hence, it is usually preferable to calculate injury incidence rates in terms of usual residence. Analysis of some injury issues benefits from use of jurisdiction of hospital, despite its poorer correspondence to usual

population data. For example, truck drivers and holiday makers may be injured far from home, and analysis in terms of location of hospital sometimes gives insight into where injuries occurred. (Unfortunately the NHMD lacks data on geographic place of occurrence, which would be a better basis for analysing such topics.) In this report, analysis is solely in terms of state or territory of usual residence.

Errors, inconsistencies and uncertainties

Due to rounding, the sum of the percentages in tables may not equal 100 per cent.

NHMD data are generally abstracted from records, entered and coded in hospitals, passed to state and territory health departments, then to the AIHW before being provided to NISU. Processing occurs at each of these steps. Errors and inconsistencies can arise due to the large number of people and processes involved in providing the data. Some variations occur in reporting and coding although Coding Standards, National Minimum Data Sets and other mechanisms have reduced this.

Appendix 2: Population data table

The estimated resident population of persons in 2001 (ABS 2003) was used for direct age-standardisation.

Table A2: Estimated resident population by age and sex, Australia, 2001

Age group	Male	Female	Persons
0–4	657,499	624,858	1,282,357
5–9	693,790	657,874	1,351,664
10–14	693,083	660,094	1,353,177
15–19	690,668	662,077	1,352,745
20–24	660,776	641,636	1,302,412
25–29	700,910	706,171	1,407,081
30–34	726,919	739,696	1,466,615
35–39	741,434	750,770	1,492,204
40–44	734,436	744,821	1,479,257
45–49	675,055	683,539	1,358,594
50–54	652,540	648,237	1,300,777
55–59	512,888	495,911	1,008,799
60–64	413,982	408,042	822,024
65–69	335,590	346,923	682,513
70–74	303,554	334,826	638,380
75–79	227,356	292,000	519,356
80–84	128,250	201,800	330,050
85+	81,922	183,313	265,235
All ages	9,630,652	9,782,588	19,413,240

Table A3.1: Age-specific rates and age-standardised rates of separations due to external causes in males, Australia, 2005-06

ICD-10-AM E-code	Age group (years)																		All ages (crude)																		
	0-4		5-9		10-14		15-19		20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69		70-74		75-79		80-84		85+		
	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std			
Major groups	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std	Rate	Std			
Unintentional																																					
Falls	633.0	741.0	736.9	461.2	387.7	322.6	288.0	266.3	281.8	305.1	350.9	394.8	489.1	609.3	911.4	1,523.7	2,844.1	5,951.4	570.8	597.9																	
Transportation	94.6	218.9	492.2	711.7	653.0	490.7	451.0	371.7	320.5	279.7	234.6	200.3	184.3	171.5	164.3	194.3	235.2	293.6	350.2	350.0																	
Poisoning, pharmaceuticals	100.7	11.1	4.0	18.8	41.0	39.6	32.3	30.0	22.1	19.0	14.3	14.4	14.6	16.3	27.5	36.7	51.1	69.7	28.5	29.0																	
Poisoning, other substances	37.7	5.2	6.1	15.6	18.3	16.4	14.5	13.2	13.1	12.4	12.5	11.3	8.9	11.3	8.6	11.2	11.7	13.9	13.9	13.9																	
Fires, burns and scalds	121.4	23.6	29.3	44.7	44.9	37.7	34.0	24.1	27.9	21.2	21.8	22.2	15.5	21.0	23.2	22.3	23.4	28.9	34.7	34.8																	
Drowning and near-drowning	20.5	3.4	1.7	3.9	3.4	2.4	1.6	1.9	1.8	1.2	1.6	1.4	1.9	1.3	1.3	0.4	1.8	1.0	3.3	3.3																	
Other unintentional injuries	588.2	473.0	757.2	1,447.2	1,458.5	1,189.4	1,033.0	888.8	808.6	730.3	634.8	623.9	556.3	501.9	442.1	450.8	493.7	634.0	830.2	828.4																	
Intentional																																					
Intentional self-harm	0.6	0.7	14.6	125.3	163.0	160.4	170.9	154.3	126.2	101.6	87.5	57.6	45.1	37.0	30.2	31.5	43.7	55.7	89.1	89.3																	
Assault	21.0	7.9	39.9	354.2	463.4	353.4	294.2	222.7	184.7	131.3	91.9	52.8	43.3	25.2	18.9	11.6	19.7	14.9	162.2	161.8																	
Undetermined intent	5.7	2.8	6.1	32.3	45.7	41.9	40.3	29.5	20.6	20.3	13.7	10.8	8.2	7.6	5.0	9.2	5.5	14.9	20.4	20.4																	
Community injury	1,625.9	1,489.2	2,092.4	3,223.8	3,289.1	2,661.2	2,367.4	2,008.8	1,816.1	1,631.2	1,471.6	1,403.2	1,398.2	1,422.1	1,665.7	2,354.7	3,790.3	7,126.7	2,115.5	2,141.2																	
Complications of surgical and medical care	132.0	85.4	94.8	145.5	177.9	180.2	204.9	211.2	227.8	265.9	362.3	509.1	685.9	901.6	1,202.1	1,489.4	1,730.5	1,906.8	362.9	370.4																	

Note: Rates per 100,000 population.

Table A3.3: Age-specific rates and age-standardised rates of separations due to external causes in persons, Australia, 2005-06

ICD-10-AM E-code	Age group																		All ages (crude)																					
	0-4		5-9		10-14		15-19		20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69		70-74		75-79		80-84		85+					
	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate					
Unintentional																																								
Falls	568.4	671.8	539.7	305.0	268.3	235.1	221.8	217.4	237.9	276.3	357.9	444.2	578.0	768.1	1,198.0	2,116.9	4,027.3	8,207.9	644.8	624.4	76.2	176.2	346.5	517.8	459.0	337.1	301.6	257.8	223.6	206.7	179.7	160.6	147.8	147.4	158.4	179.6	211.8	211.1	254.2	255.2
Poisoning, pharmaceuticals	101.5	9.0	6.9	33.7	43.9	37.8	32.5	28.2	24.3	23.5	17.0	16.1	14.9	17.5	26.2	38.5	55.6	76.2	30.9	31.1	33.6	3.9	4.6	15.1	14.7	13.8	12.0	9.9	10.1	9.7	9.4	8.7	8.3	9.0	8.0	10.2	14.8	14.7	11.7	11.7
Poisoning, other substances	110.1	22.9	21.6	29.8	29.8	26.3	24.1	17.4	19.8	15.2	16.5	16.8	13.9	15.6	15.0	19.3	20.0	24.3	26.5	26.9	17.8	2.3	1.7	2.7	1.9	1.4	1.0	1.2	1.0	0.9	1.3	0.9	1.0	1.2	0.8	0.5	1.0	0.3	2.4	2.5
Fires, burns and scalds	528.1	406.4	533.9	908.9	900.4	750.0	653.5	586.4	548.2	507.1	461.2	459.1	423.3	402.4	388.8	440.7	544.5	742.1	580.0	581.0	528.1	406.4	533.9	908.9	900.4	750.0	653.5	586.4	548.2	507.1	461.2	459.1	423.3	402.4	388.8	440.7	544.5	742.1	580.0	581.0
Drowning and near-drowning																																								
Other unintentional injuries																																								
Intentional																																								
Intentional self-harm	0.5	0.4	43.9	259.2	211.9	186.6	190.4	183.9	157.7	136.6	108.2	74.5	44.7	39.3	31.7	29.1	35.0	36.5	115.7	116.3	19.7	5.7	27.7	221.0	292.7	236.8	205.5	160.3	129.5	89.0	60.4	34.8	29.1	16.0	13.2	9.8	15.3	11.2	107.4	108.5
Assault	5.4	2.3	6.5	44.9	46.0	38.7	37.3	30.0	25.0	21.5	14.3	13.4	9.3	8.7	6.9	9.6	7.8	12.2	21.5	21.7	5.4	2.3	6.5	44.9	46.0	38.7	37.3	30.0	25.0	21.5	14.3	13.4	9.3	8.7	6.9	9.6	7.8	12.2	21.5	21.7
Undetermined intent																																								
Community injury	1,464.2	1,303.0	1,536.2	2,344.5	2,275.6	1,868.7	1,685.4	1,499.2	1,384.9	1,300.8	1,234.6	1,239.5	1,291.8	1,442.1	1,872.7	2,903.6	4,977.9	9,385.6	1806.0	1789.8	1,464.2	1,303.0	1,536.2	2,344.5	2,275.6	1,868.7	1,685.4	1,499.2	1,384.9	1,300.8	1,234.6	1,239.5	1,291.8	1,442.1	1,872.7	2,903.6	4,977.9	9,385.6	1806.0	1789.8
Complications of surgical and medical care	117.3	76.2	80.1	135.8	169.5	175.8	218.9	247.3	276.1	316.9	410.9	513.8	663.2	825.0	1,006.6	1,209.6	1,294.3	1,176.7	355.3	345.8	117.3	76.2	80.1	135.8	169.5	175.8	218.9	247.3	276.1	316.9	410.9	513.8	663.2	825.0	1,006.6	1,209.6	1,294.3	1,176.7	355.3	345.8

Note: Rates per 100,000 population.

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List of tables

Table 1.1:	Injury hospitalisations overview: males, females and persons, Australia 2005–06	3
Table 2.1.1:	Key indicators for all community injury cases, Australia, 2005–06.....	5
Table 2.1.2:	Case counts by age group for all major causes of community injury, Australia, 2005–06	7
Table 2.1.3:	Age-standardised rates of community injury, states and territories, 2005–06.....	8
Table 2.1.4:	Principal diagnosis groups for community injury cases: males, females and persons, Australia 2005–06.....	11
Table 2.1.5:	Principal diagnosis groups for community injury cases by age, Australia 2005–06.....	12
Table 2.1.6:	Length of stay for all community injury: case counts, length of stay, percentage of total patient days for acute care of injury and mean length of stay, Australia, 2005–06	13
Table 2.1.7:	Activity when injury occurred for all Community injury, case counts, Australia, 2005–06	15
Table 2.1.8:	Place of occurrence for all Community injury, case counts, Australia, 2005–06	16
Table 2.2.1:	Key indicators for unintentional fall cases, Australia, 2005–06	17
Table 2.2.2:	Fall cases by age group, Australia, 2005–06.....	18
Table 2.2.3:	Age-standardised rates of fall injury, states and territories, 2005–06	19
Table 2.2.4:	Principal Diagnosis by body region for fall injury, Australia, 2005–06	20
Table 2.2.5:	Top 7 specific injuries for unintentional falls, Australia, 2005–06	21
Table 2.2.6:	External causes of unintentional fall injury by sex, Australia, 2005–06.....	23
Table 2.2.7:	Place of occurrence of fall injury cases by age and sex, Australia, 2005–06	29
Table 2.3.1:	Key indicators for transport cases, Australia, 2005–06	30
Table 2.3.2:	Transportation cases by age group, Australia, 2005–06.....	31
Table 2.3.3:	Injured person’s vehicle by age group, Australia, 2005–06	33
Table 2.3.4:	Age-standardised rates of transport injury, states and territories, 2005–06.....	34
Table 2.3.5:	Principal Diagnosis by body region and sex for transport injury, Australia, 2005–06	35
Table 2.3.6:	Mode of transport for land transport injury cases, Australia, 2005–06.....	38
Table 2.3.6:	Mode of transport for land transport injury cases, Australia, 2005–06.....	38
Table 2.3.7:	Mechanism of injury for land transport injury cases, Australia, 2005–06	41
Table 2.3.8:	Mode of transport for traffic land transport injury cases, Australia, 2005–06	43
Table 2.3.9:	Mode of transport for non-traffic land transport injury cases, Australia, 2005–06	43
Table 2.3.10:	Mode of transport for land transport injury cases unspecified as to whether traffic or non-traffic, Australia, 2005–06.....	44
Table 2.4.1:	Key indicators for poisoning by pharmaceutical cases, Australia, 2005–06.....	49
Table 2.4.2:	Cases of poisoning by pharmaceuticals by age group, Australia, 2005–06.....	50
Table 2.4.3:	Age-standardised rates of poisoning by pharmaceuticals, states and territories, 2005–06	51
Table 2.4.4:	Mechanism of pharmaceutical poisoning by age and sex, Australia, 2005–06.....	53

Table 2.4.5:	Mechanism of poisoning by pharmaceuticals in children 0–4 years, Australia, 2005–06	54
Table 2.4.6:	Place of occurrence for cases of poisoning by pharmaceuticals, Australia, 2005–06	57
Table 2.5.1:	Key indicators for poisoning by other substances cases, Australia, 2005–06.....	58
Table 2.5.2:	Cases of poisoning by other substances by age group, Australia, 2005–06	59
Table 2.5.3:	Age-standardised rates of poisoning by other substances, states and territories, 2005–06	60
Table 2.5.4:	External causes of poisoning by other substances by age and sex, Australia, 2005–06....	62
Table 2.5.5:	Mechanism of poisoning by other substances in children 0–4 years, Australia, 2005–06	63
Table 2.5.6:	Place of occurrence for cases of poisoning by other substances, Australia, 2005–06.....	66
Table 2.6.1:	Key indicators for fires burns and scalds cases, Australia, 2005–06.....	67
Table 2.6.2:	Fires, burns and scalds cases by age group, Australia, 2005–06.....	68
Table 2.6.3:	Age-standardised rates of fires, burns and scalds, states and territories, 2005–06	69
Table 2.6.4:	Top 6 specific injuries for fires, burns and scalds, Australia, 2005–06.....	70
Table 2.6.5:	External causes of fire, burns and scalds injury by sex, Australia, 2005–06.....	71
Table 2.6.6:	Top 5 mechanisms of fires, burns and scalds for young children aged 0–4 years, Australia, 2005–06	72
Table 2.6.7:	Place of occurrence for cases of fires, burns and scalds, Australia, 2005–06.....	74
Table 2.7.1:	Key indicators for drowning and near-drowning cases, Australia, 2005–06	75
Table 2.7.2:	All identifiable drowning and near-drowning cases, Australia, 2005–06	76
Table 2.7.3:	Circumstances of accidental drowning and near-drowning cases by age, Australia, 2005–06	77
Table 2.7.4:	Drowning and near-drowning cases by age group, Australia, 2005–06.....	79
Table 2.7.5:	Age-standardised rates of drowning and near-drowning, states and territories, 2005–06	79
Table 2.7.6:	Circumstances of drowning and near-drowning by age group, Australia, 2005–06	80
Table 2.7.7:	Place of occurrence for cases of drowning and near-drowning, Australia, 2005–06	83
Table 2.8.1:	Key indicators for other unintentional injury cases, Australia, 2005–06	84
Table 2.8.2:	Summary of key components of other unintentional injury cases, Australia, 2005–06....	84
Table 2.8.3:	Other unintentional injury cases by age group, Australia, 2005–06.....	85
Table 2.8.4:	Age-standardised rates of other unintentional injury, states and territories, 2005–06	86
Table 2.8.5:	Principal Diagnosis by body region for other unintentional injury, Australia, 2005–06	87
Table 2.8.6:	External causes of other unintentional injury cases, Australia, 2005–06	89
Table 2.9.1:	Case counts and proportions by sex for work-related injury cases, Australia, 2005–06	92
Table 2.10.1:	Case counts and proportions by sex for sports injury cases, Australia, 2005–06	94
Table 2.11.1:	Key indicators for intentional self-harm cases, Australia, 2005–06.....	95
Table 2.11.2:	Intentional self-harm cases by age group, Australia, 2005–06	96
Table 2.11.3:	Age-standardised rates of intentional self-harm, states and territories, 2005–06.....	97

Table 2.11.4:	Principal Diagnosis by body region and sex for intentional self-harm cases, Australia, 2005–06	98
Table 2.11.5:	External cause of intentional self-harm injury cases, Australia, 2005–06	99
Table 2.11.6:	Place of occurrence for cases of intentional self-harm, Australia, 2005–06	101
Table 2.12.1:	Key indicators for assault cases, Australia, 2005–06.....	103
Table 2.12.2:	Assault cases by age group, Australia, 2005–06.....	104
Table 2.12.3:	Age-standardised rates of assault, states and territories, 2005–06	105
Table 2.12.4:	Principal Diagnosis by body region for assault cases, Australia, 2005–06	106
Table 2.12.5:	External cause of assault cases, Australia, 2005–06	107
Table 2.12.6:	Relationship of the perpetrator to the victim of assault, Australia, 2005–06	108
Table 2.12.7:	Place of occurrence for assault cases by age and sex, Australia, 2005–06	111
Table 2.13.1:	Key indicators for undetermined intent cases, Australia, 2005–06	112
Table 2.13.2:	Injuries of undetermined intent by age group, Australia, 2005–06.....	113
Table 2.13.3:	Age-standardised rates of injuries of undetermined intent, states and territories, 2005–06	114
Table 2.13.4:	Principal Diagnosis by body region for injuries of undetermined intent, Australia, 2005–06	117
Table 2.13.5:	External cause of injuries of undetermined intent, Australia, 2005–06	118
Table 2.13.6:	Place of occurrence for injury cases of undetermined intent, Australia, 2005–06	119
Table 3.1:	Key indicators for cases due to Complications of surgical and medical care, Australia, 2005–06	120
Table 3.2:	Major types of injury for Complications of surgical and medical care, Australia, 2005–06	121
Table 4.1:	Case counts for ICD-10-AM Principal Diagnosis T78, Adverse effects, not elsewhere classified, Australia, 2005–06	125
Table A1:	Selection criteria for cases due to injury and poisoning, Australia, 2005–06	127
Table A2:	Estimated resident population by age and sex, Australia, 2001	132
Table A3.1:	Age-specific rates and age-standardised rates of separations due to external causes in males, Australia, 2005–06	133
Table A3.2:	Age-specific rates and age-standardised rates of separations due to external causes in females, Australia, 2005–06	134
Table A3.3:	Age-specific rates and age-standardised rates of separations due to external causes in persons, Australia, 2005–06.....	135

List of figures

Figure 2.1.1: Age-specific hospital separation rates for community injury by sex, Australia, 2005–06	6
Figure 2.1.2: Age-standardised rates of community injury, states and territories, 2005–06.....	8
Figure 2.1.3: Age distribution of cases for selected major causes of injury, Australia, 2005–06	9
Figure 2.1.4: Major causes of injury by gender, Australia, 2005–06.....	10
Figure 2.1.5: Length of stay per episode for all community injury by age and sex, Australia, 2005–06	14
Figure 2.1.6: Age-standardised rates for Community injury, Australia, 1999–00 to 2005–06	14
Figure 2.2.1: Age-specific hospital separation rates for unintentional falls by sex, Australia, 2005–06	18
Figure 2.2.2: Age-standardised rates of fall injury, states and territories, 2005–06	19
Figure 2.2.3: Age-specific hospital separation rates for fall injury by sex, Australia, 2005–06	25
Figure 2.2.4: Length of stay per episode for fall injury by age and sex, Australia, 2005–06.....	26
Figure 2.2.5: Age-standardised rates for fall injury, Australia, 1999–00 to 2005–06.....	27
Figure 2.2.6: Age-standardised rates for fall injury in older people aged 65+ years, Australia, 1999–00 to 2005–06	27
Figure 2.3.1: Age-specific hospital separation rates for transport injury by sex, Australia, 2005–06....	31
Figure 2.3.2: Age-standardised rates of transport injury, states and territories, 2005–06.....	34
Figure 2.3.3: Length of stay per episode for transport injury by age and sex, Australia, 2005–06	35
Figure 2.3.4: Age-standardised rates for transport injury, Australia, 1999–00 to 2005–06	36
Figure 2.3.5: Mode of transport for land transport injury cases, Australia, 2005–06.....	39
Figure 2.3.6: Traffic accidents – age-specific hospital separation rates by sex, Australia, 2005–06	45
Figure 2.3.7: Non-traffic accidents – age-specific hospital separation rates by sex, Australia, 2005–06	47
Figure 2.3.8: Age-standardised rates by road user group, Australia, 1999–00 to 2005–06	48
Figure 2.4.1: Age-specific hospital separation rates for poisoning by pharmaceuticals by sex, Australia, 2005–06	50
Figure 2.4.2: Age-standardised rates of poisoning by pharmaceuticals, states and territories, 2005–06	51
Figure 2.4.3: Length of stay per episode for poisoning by pharmaceuticals by age and sex, Australia, 2005–06	55
Figure 2.4.4: Age-standardised rates for poisoning by pharmaceuticals by sex, Australia, 1999–00 to 2005–06	56
Figure 2.4.5: Age-standardised rates for poisoning by pharmaceuticals by age group, Australia, 1999–00 to 2005–06.....	56
Figure 2.5.1: Age-specific hospital separation rates for poisoning by other substances by sex, Australia, 2005–06	59
Figure 2.5.2: Age-standardised rates of poisoning by other substances, states and territories, 2005–06	61

Figure 2.5.3: Length of stay per episode for poisoning by other substances by age and sex, Australia, 2005–06	64
Figure 2.5.4: Age-standardised rates for poisoning by other substances, Australia, 1999–00 to 2005–06	65
Figure 2.6.1: Age-specific hospital separation rates for fire, burns and scalds injury by sex, Australia, 2005–06	68
Figure 2.6.2: Age-standardised rates of fire, burns and scalds injury, states and territories, 2005–06	69
Figure 2.6.3: Length of stay per episode for fire, burns and scalds injury by age and sex, Australia, 2005–06	73
Figure 2.6.4: Age-standardised rates for fire, burns and scalds injury, Australia, 1999–00 to 2005–06	74
Figure 2.7.1: Age-specific hospital separation rates for drowning and near-drowning by sex, Australia, 2005–06	78
Figure 2.7.2: Age-standardised rates of drowning and near-drowning, states and territories, 2005–06	80
Figure 2.7.3: Length of stay per episode for drowning and near-drowning by age and sex, Australia, 2005–06	81
Figure 2.7.4: Age-standardised rates for drowning and near-drowning, Australia, 1999–00 to 2005–06	82
Figure 2.8.1: Age-specific hospital separation rates for other unintentional injury by sex, Australia, 2005–06	85
Figure 2.8.2: Age-standardised rates of other unintentional injury, states and territories, 2005–06	86
Figure 2.8.3: Length of stay per episode for other unintentional injury by age and sex, Australia, 2005–06	87
Figure 2.8.4: Age-standardised rates for other unintentional injury, Australia, 1999–00 to 2005–06	88
Figure 2.11.1: Age-specific hospital separation rates for intentional self-harm by sex, Australia, 2005–06	96
Figure 2.11.2: Age-standardised rates of intentional self-harm, states and territories, 2005–06	97
Figure 2.11.3: Length of stay per episode for intentional self-harm by age and sex, Australia, 2005–06	100
Figure 2.11.4: Age-standardised rates for intentional self-harm, Australia, 1999–00 to 2005–06	101
Figure 2.12.1: Age-specific hospital separation rates for assault by sex, Australia, 2005–06	104
Figure 2.12.2: Age-standardised rates of assault, states and territories, 2005–06	105
Figure 2.12.3: Length of stay per episode for assault by age and sex, Australia, 2005–06	109
Figure 2.12.4: Age-standardised rates for assault, Australia, 1999–00 to 2005–06	110
Figure 2.13.1: Age-specific hospital separation rates for injuries of undetermined intent by sex, Australia, 2005–06	113
Figure 2.13.2: Age-standardised rates for injuries of undetermined intent, states and territories, 2005–06	114
Figure 2.13.3: Length of stay per episode for injuries of undetermined intent by age and sex, Australia, 2005–06	115
Figure 2.13.4: Age-standardised rates for injuries of undetermined intent, Australia, 1999–00 to 2005–06	116

Figure 3.1:	Age-specific hospital separation rates for Complications of surgical and medical care by sex, Australia, 2005-06	122
Figure 3.2:	Length of stay per episode for Complications of surgical and medical care by age and sex, Australia, 2005-06.....	123
Figure 3.3:	Age-standardised rates of Complications of surgical and medical care, Australia, 1999-00 to 2005-06	124