1 Introduction

Every year, the Australian Bureau of Statistics (ABS), compiles data on all deaths registered in Australia. Since 1992, the National Injury Surveillance Unit (NISU) has used these data as the basis for reports on injury deaths. These reports have the aim of describing and monitoring the pattern of injury mortality in Australia.

As in the previous report in the series (2003–04), we have implemented a method of reporting injury mortality in which:

1. Deaths for inclusion in the report were selected according to a published *Operational definition of injury* (Kreisfeld & Harrison 2006).
2. Deaths are reported according to when they occurred rather than when they were registered.
3. Financial year (i.e. July to June), rather than calendar years are used as the reporting period.

A detailed explanation of this approach is included in the report *Injury deaths, Australia 2003–04* (Henley et al. 2007).

This report, more than previous ones in the series, makes use of data from sources additional to the ABS mortality collection. In the main, these sources have been used to compare case counts with those based on the ABS mortality collection (see Section 1.2). Three sources have been used: the National Coroners Information System (NCIS), road death data from the road safety statistics section of the Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) and homicide statistics from the Australian Institute of Criminology (AIC).

1.1 Major causes of injury

For most chapters in this report, ICD-10 external cause codes continue to be used for the purpose of assigning deaths according to major cause groups, which are the same as those used in previous reports. However, whereas reports before 2002–03 focused only on the external cause code that appears as the UCoD, this report classifies cases on the basis of ICD-10 Chapter XX codes anywhere in the record. In some cases, this results in individual deaths appearing in more than one section of the report because they have been assigned more than one external cause code. However, each death is only counted once in overall counts (e.g. Section 2.1)

This report differs from the approach used for the 2003–04 report for chapters where misclassification of ICD-10 external cause codes is a major concern (see Section 1.2). Hence, for chapters describing transport deaths (Section 2.2), suicide deaths (Section 2.8) and homicide deaths (Section 2.9), assignment of cases to a particular external cause group is based primarily upon data contained within selected variables in NCIS, rather than upon ICD-10 codes within the ABS mortality data. ABS data are provided for comparative purposes.

1.2 Reliability of injury death case numbers

Explanatory notes in the ABS Cause of Death publication for deaths registered in 2004 and 2005 caution that care should be taken in interpreting results in recent years for External causes of morbidity and mortality (ABS 2006; ABS 2007a). Information from the ABS and our own investigations indicate that case counts for injury deaths in the ABS mortality data in recent years are subject to noteworthy misclassification (ABS 2007b; De Leo 2007; Henley et al. 2007; Walker et al. 2008; Elnour & Harrison 2009).

A separate investigation, focusing on suicide statistics, provides insights into the nature and magnitude of this data problem (Harrison et al. 2009). In summary, some injury deaths in the period covered by this report were assigned an Underlying Cause of Death code in the ABS mortality data which, when reviewed in the light of data that became available at a later date, is not correct. This occurred due to an interaction of three main factors.

1. Slow completion and documentation of some coroner cases. In recent years, including the period covered by this report, the ABS has relied upon the NCIS as the main source for information on the external causes of deaths. While most coroner cases are completed within months of the date of death, some remain open for years. In addition, in some cases there has been a delay between case completion by the coroner and entry of case data by coroners' staff into the NCIS.

2. A deadline for coding each death. For deaths registered before 2007, the ABS operated according to an annual processing cycle which required that every death registered in a given calendar year should be processed before publication of the annual cause of death report and data file for that year. In recent years, including the period covered by this report, publication by the ABS occurred about 15 months after the end of a calendar year. Due to the slow closure of some deaths as described in point 1, information in the NCIS about some deaths was lacking or incomplete by this deadline. Hence, ABS coders had to code some deaths on the basis of incomplete information.

3. Coding rules for cases with incomplete information. The ABS codes causes of death according to the International Classification of Diseases, 10th revision (ICD-10). This classification provides rules that apply to the coding of cases with incomplete information. If no information about cause is available to the coder (as might occur for an injury death not added to the NCIS until after the ABS deadline) then the case will be assigned a residual code (usually R99), and will not be reported as an injury death. If information is available about the mechanism of injury (e.g. hanging, shooting) but definitive information is not available about the role of human intent (i.e. suicide, homicide or unintentional), then the death will be coded as unintentional.

The net effect of this is misclassification of the cause of some injury deaths in the period. Note that misclassification does not imply error on the part of ABS coders. In other work we found that the quality of the coding appears to have been good (Harrison et al. 2009). Rather, the misclassification resulted from an interaction of the three factors described above.

The main effects of the misclassification are that:

1. Some injury deaths were not assigned an external cause code, but were instead assigned 'residual' codes (R98 and R99).
2. Some deaths due to suicide and homicide were assigned an external cause code for 'unintentional' injury. These were generally assigned to the unintentional category corresponding to the correct mechanism of injury (e.g. suicide by hanging assigned to unintentional suffocation or hanging). This has the effect of undercounting the intentional category and over-counting the corresponding unintentional category.

Where possible, we examined alternative data sources as a way to validate case counts according to the ABS mortality collection. Separate sources were available for road deaths and homicides. In addition, we used data from the NCIS for comparisons with many categories of deaths. While the NCIS is the same source that was used by the ABS as the main basis for external cause coding, we used NCIS data as they were in 2008, long after the ABS had coded the data reported here. Hence, we had the benefit of additional and finalised data for many NCIS cases that had been incomplete when the deaths were coded by ABS officers. We examined the NCIS data, including ABS-originated cause of death codes that were available for most NCIS cases, and produced estimates of case numbers for many of the types of cases covered in this report. These estimates based on NCIS in 2008 are compared with logically equivalent data from the ABS mortality data in a section near the start of most chapters. We found numerous injury deaths which, if coded on the basis of data available in NCIS at the time we did the assessment, would be assigned different ICD codes to those that had been assigned by the ABS at an earlier date, and generally on the basis of less information. Note that these are comparisons of summary data, and were not based on record linkage. The method is described further in Appendix 1 and in the separate report on suicide statistics (Harrison et al. 2009).

We have also:

1. Examined trends in numbers of many types of deaths during the period 1997–05, looking for rises and falls in case numbers that might be due to data issues rather than changes in occurrence. We looked particularly closely at codes which, if ICD-10 coding rules are followed, are likely to be assigned to injury cases if no information or incomplete information was available to the coder. Findings supported the suspicion that such assignments had occurred in 2004 and 2005.
2. Compared data from the ABS with data from other sources, for the types of injury death for which other sources exist. The main relevant sources are data on motor vehicle traffic injury deaths from the from the road safety statistics section of the Department of Infrastructure, Transport, Regional Development and Local Government (see Sections 2.2.1 and 2.2.9) and data on homicides from the Australian Institute of Criminology (see Section 2.9.1). These confirmed under-estimation of these two types of external cause of injury.
3. Compared trends in ABS deaths data with data for hospitalised injury. In particular, we compared ABS deaths data with numbers of cases of hospitalised injury where the person died in hospital. The downward inflection in rates for several types of injury death, when calculated using the ABS data, was not seen in rates based on deaths in hospital due to the same types of cause.

The information available to us has enabled us to confirm the concern announced by the ABS and others. The following points provide an overview assessment of the effect of this and more detailed information is provided in later chapters. Based on our assessment we conclude that the main effects of this data problem for deaths that occurred in 2004–05 are as follows:

Underestimates

- total 'external causes' deaths appear to be underestimated by a small proportion
- motor vehicle traffic accidents, especially in New South Wales, were underestimated
- suicide
- homicide

Overestimates

- unintentional injury by mechanisms that are common among suicides and homicides (e.g. hanging and shooting)

We are not sure when misclassification commenced, nor how it has varied over time. However, there are reasons to think that it emerged, or has worsened, since 2002. Evidence for this is:

- This is the period during which the ABS has relied heavily upon data in the NCIS when coding the causes of injury deaths
- Divergence between the ABS estimates and estimates for homicides and road deaths from other sources have emerged since about then
- Indications of mechanism-specific coding shifting from suicide or homicide to unintentional in this period

Precise measurement of the extent of misclassification and the provision of revised estimates would require recoding of cases using NCIS, with permission to record-link data from the two sources. The work done for this report and for the separate project on suicide statistics indicates that it is technically feasible, but would be time-consuming.

In the absence of the findings of such a project, we conclude that trends based on ABS injury mortality data for the period commencing about 2002 until the introduction by the ABS of new procedures (for deaths registered in 2007) must be interpreted with great caution. This warning applies especially to trends for suicide and homicide.

Commencing with deaths registered in 2007, the ABS has begun to apply a revised cause of death reporting process. The most important change, for present purposes, is that cause of death information for a case can be reviewed and changed for at least two years longer than was allowed under the previous system. Hence, there is now a much longer window of time for a coroner case to be closed, and for information about it to be entered into the NCIS, and for this information to be available to guide cause of death coding. Expected consequences of this change are that 'final' cause of death data for injury deaths in Australia will be more complete and reliable than in recent years, but final data for a particular year will not be available for several years after a reference year.