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The National Coroners Information System as an information tool for injury surveillance

FLINDERS UNIVERSITY
ADELAIDE AUSTRALIA

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The National Coroners Information System as an information tool for injury surveillance

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ICD-10	10th Revision of International Classification of Diseases
ICD-10-AM	10th Revision of International Classification of Diseases, Australian Modification
MCOD	Multiple Cause of Death
MUNCCI	Monash University National Centre for Coronial Information
NCIS	National Coroners Information System
RCIS	Research Centre for Injury Studies
UCOD	Underlying Cause of Death

Executive Summary

INTRODUCTION

To date, information on injury deaths in Australia has primarily come from the Australian Bureau of Statistics (ABS) Deaths Data Collection. All injury deaths in Australia should be recorded in this data set, and the great majority should be identifiable using the assigned ICD-10 codes. Most injury deaths are referred to a Coroner. The main exception is many deaths by elderly persons due to falls. The ABS Deaths Data Collection should provide comprehensive coverage of injury deaths, but it does not contain text information, nor coded information on many aspects of the circumstances surrounding the injury event.

The National Coroners' Information System (NCIS) has the potential to provide the detailed information that the ABS Deaths Data Collection does not, while still providing comprehensive coverage of injury deaths. Although the NCIS has been established partly as a source of information to support the prevention of injury and disease, its effectiveness in this role has not yet been tested through the practical use of the data. Like any such system, teething problems can be expected early in its operation, so it is important to use the data in order to identify the strengths and limitations of the system.

The focus of the current report is injury deaths and the use of data to accurately describe the number, rate and circumstances of these deaths, in order to appropriately target, design, implement and evaluate injury prevention programs. To achieve this, the data need to be valid, to include all relevant deaths, to allow specific classes of deaths to be identified, and to provide detailed information about the circumstances surrounding the fatal incidents. Timeliness is also an important consideration. The aim of this report is to assess the strengths and weaknesses of the NCIS, particularly in terms of its coverage and data integrity, in supporting injury prevention initiatives, primarily by comparing it to the ABS Deaths Data Collection. Specific injury topic areas are considered to aid this assessment, but the focus is on illustrating the functions of the NCIS rather than providing a comprehensive description of the topic areas.

METHODS

All injury deaths that occurred on or between 1 July 2000 and 30 June 2001 (defined as in-range deaths) were included. The NCIS data did not include information on Queensland deaths, which were not available to authorised external users of NCIS data when this project was conducted. The information was in the form of coded variables, structured text variables and free text documents.

Deaths data from the Australian Bureau of Statistics (ABS) came from the mortality unit record data collection (ABS Deaths Data Collection). The inclusion criteria for the ABS Deaths Data used in this analysis were chosen to match those of the NCIS data– that is, all deaths that occurred in Australia on or between 1 July 2000 and 30 June 2001, excluding deaths that were certified in Queensland. Only deaths certified by a Coroner, and which had an Underlying Cause of Death (UCoD) in the ICD-10 range V01–Y84, Y90–Y98 (i.e. Chapter XX External causes of morbidity and mortality) or a Multiple Cause of Death (MCoD) in the ICD-10 range S00–T89 (i.e. Chapter XIX Injury, poisoning and certain other consequences of external causes), were included.

In addition to a general overview analysis of the main NCIS data fields, topic-specific analyses were conducted on ten topic areas:

- All fatal injuries
- Suicide
- Work-related deaths
- Tractor-related deaths
- Drowning
- Fatal poisoning by venomous plants and animals
- Fall-related deaths in the elderly
- Traffic-related deaths
- Fatal poisoning in children
- Fall-related deaths in children

Information for this study was obtained under an agreement between MUNCCI and the Research Centre for Injury Studies at Flinders University.

OVERVIEW OF THE NCIS

The initial files obtained from the NCIS contained 6,505 different observations. Following correction of errors and missing values, 6,380 deaths were considered in-range. Eighty-seven per cent of the in-range injury deaths (84% of all deaths) in the data set were Closed, but this percentage varied moderately across the seven States and Territories.

Eighty per cent of persons died on the day of the incident and 96% within one week of the incident. Half the cases were notified to the NCIS on the day of the death, another quarter by the day after the death, and 97% within one week of the death. The median time from NCIS notification to case Closure was 520 days, with 90% of cases Closed[1] within just under two years. The median time to Closure varied considerably across the seven States and Territories.

External Cause, as expected, was the main Case Type at Notification and at Completion for in-range cases. Considering only injury deaths, about half the deaths were classified as *Unintentional* at Completion, and another third were classified as *Intentional self-harm*. Excluding cases with a missing Intent at Completion, 93% of cases had the same Intent code at both Notification and Completion.

Up to four text documents are available for each case—the police report, autopsy report, toxicology report and Coroner's Finding. For Closed cases, the availability of text documents varied considerably between States and Territories. In addition, the quantity and quality of the information contained in the documents also varied considerably between, and sometimes within, States and Territories. The police report was present for nearly all cases, whether Open or Closed, except in New South Wales. South Australia and Western Australia had almost no autopsy reports, with the other jurisdictions varying from 50% to 95% of cases with autopsy reports. The proportion of cases with toxicology reports varied considerably, from almost zero in South Australia to 92% in Victoria. The Northern Territory, Victoria, Tasmania and the Australian

[1] Case status is defined in section 3.3.2

Capital Territory all had Findings for about 90% of Closed cases, whereas Findings were present for very few New South Wales and South Australian cases, and for less than a third of Western Australian cases.

Sex, age, Mechanism, Object or substance producing injury, Cause of Death, Incident Location and Incident Activity were recorded for about 90% or more of all cases and for 99% or more of Closed cases (only 92% for Incident Activity). A comparison of the main features of Closed and Open cases suggests that Open cases are similar to Closed cases except in the extent to which information is available. Most Open cases did not have specified Mechanisms or Objects, but most did have information on location, activity and cause of death.

RESULTS AND DISCUSSION

The NCIS as a data source

The NCIS was developed as a tool for the use of State and Territory Coroners, and as a source of information to underpin public health activity, particularly for injuries. This analysis has identified several strengths and weaknesses of the NCIS as it now exists and as it may be expected to function in the future.

This analysis suggests that the NCIS provides very good coverage of all injury deaths, except for those that occur in Western Australia and Queensland. The lack of information on Queensland deaths arose because information on Queensland deaths was not yet available for public access at the time of this analysis, although Queensland cases are now entered into the NCIS. The apparent under-reporting in Western Australia appears to arise because of a backlog of entering Western Australian data into the system.

Data quality

Apart from the problems with coverage, the specific analyses identified some data quality issues within the NCIS. Work-related cases are clearly not being adequately identified currently. The specific sub-analyses identified errors in the codes applied for most variables. Although there was no comprehensive validation or crosschecking of variables, these errors seemed relatively minor. Identification and correction of the errors require significant resources to be applied to quality control and checking of the coding, with feedback of information to coders regarding areas of concern and areas that are being coded well. This should occur on an on-going basis, looking for logical inconsistencies, and also by focussing on particular areas.

As well as having on-going and random checks of data validity, the use of the data by outside parties should be encouraged, as this is likely to highlight many important data quality problems. However, it should be emphasised that the overall assignment of the main codes appears to have been done comprehensively, with key variables such as Age, Sex, Mechanism, Object, Cause of Death, Case Type at Completion and Intent at Completion coded or recorded for over 99% of all Closed cases.

Attention also needs to be paid to the presence of text documents and the quality of the information in them. The presence of text documents, and the detail and relevance of information in them, varied considerably between, and sometimes within, States and Territories. The text documents are an extremely important component of the NCIS from the point of view of injury prevention, and the documents have the potential to significantly improve the capabilities of the NCIS as a source of information for both

Coroners and public health practitioners. It is important that efforts continue to improve the proportion of cases for which all relevant text documents are available, and that MUNCCI encourage improvements in the standard and standardisation of the text documents.

The timing of data entry in the NCIS also needs to be considered. The NCIS was designed to allow key classification data (Case Type and Intent) to be entered at the time the case was first entered into the system, and then to be modified in light of any new information that might become available during the coronial investigation and deliberation process. Separate variables to cover the classification at notification and case closure were included. This allows recording of the correct information at the time of case closure, without losing the information about how a case was viewed at the time of notification. It also should allow Open cases to be stratified by case type and intent.

The notification variables are not supposed to be re-coded on the basis of information that becomes available at a later time. However, the results of the current analysis (Intent at Notification missing for 67% of Open cases) suggest that the Intent at Notification variable is commonly not being completed until well into the coronial investigation process, and possibly not until the case is Closed. This may have arisen at least partly because of ambiguous coding instructions.

Classification of External Causes

We note that a number of items in the NCIS system of classifications are implementations of a consultative draft of the International Classification of External Causes of Injury (ICECI). These items are particularly important for injury surveillance. They include Intent, Mechanism, Object, Place and Activity. The ICECI has been revised since the consultation draft, and we recommend that the NCIS should be revised periodically (at least every two years) to be brought in line with the current version.

Time to closure

The speed with which the Coronial investigation is completed and a case is Closed in the NCIS is very important for injury researchers, because text documents are not available for use until a case is Closed, and presumably the validity of NCIS data entry performed earlier in a case is not checked until the Coronial process is completed. The data for this analysis were obtained 20 months after the end of the period of interest, by which time 13% of the cases were still Open. There is likely to be little that MUNCCI can do influence the time taken to complete the Coroner's investigation, and so it can be expected that the time taken will not diminish significantly in the short term. Therefore, it is likely that for most injury issues, the analysis should be based on deaths that have occurred at least 18 months before the data are extracted, although incomplete data may be suitable for some purposes.

Drug coding system

The analysis of suicides identified a shortcoming in the available NCIS data regarding involvement of drugs. The Object coding frame has some broad categories for drugs, and the Object text fields and Cause of Death fields often include which drugs were involved. In addition, the toxicology report, when present, often lists the drugs that

have been identified through toxicology testing. However, there is no specific coded variable that identifies any specific drugs involved. This makes it difficult to identify deaths involving particular compounds. To overcome this problem, it would be very useful if there was a comprehensive coding system for drugs, and related factors involved in the death and/or found at autopsy. Such a system is under consideration by MUNCCI at the moment.

The NCIS search facility

The NCIS has a comprehensive search facility. The main strengths, and some areas that could usefully be improved, are described in this Report.

The search facility allows searching to be based on the values of coded variables or the content of text documents. The output can be in terms of coded values or links to text documents (but not both). The output of the search can be returned quickly to the screen. Alternatively, if only coded values are requested, output to a file is possible. The text documents for all cases can be searched, but access to the text documents is only available for Closed cases. Overall, the search facility is extremely useful and allows quick identification of relevant cases and detailed information for many of them. However, current shortcomings of the search facility mean that it is often "clunky" to use.

The search facility was not reviewed in detail, but the analysis identified a number of shortcomings. All of these appear reasonably straightforward to correct. The main issues to be addressed include:

- being able to modify queries once they have been saved;
- being able to select cases on the basis of more than one selected value of a variable, or using combinations of variables that are currently not possible to be used;
- being able to search more than one type of text document at the same time; and
- improvements to the search page concerned with Mechanism.

Comparison between the NCIS and the ABS Deaths Data Collection

The NCIS is potentially very useful for prevention purposes because of the considerable detail available in the coded and brief text variables and in the free text documents. The structure of the NCIS provides considerable flexibility in the available information, because generally each variable only covers a single concept. The variables can then be combined in different ways, depending on the particular issue of interest. It also provides much more detailed information than the ABS, and has the major advantage that the text documents provides the ability to consider aspects of the circumstances that are not coded. In contrast, the ABS data are much more rigid, and the combination of concepts in the same variable limits the usefulness of the information unless the question of interest is specifically addressed by the combination of concepts included.

Therefore, for most injury issues of interest, the NCIS is now, and is likely to increasingly become, of much more use than the ABS. However, there are some areas in which the ABS will remain more useful. Chief among these is fall-related death in the elderly. However, unlike the ABS, the NCIS is still able to provide the detailed

information about the circumstances surrounding the fatal incidents that is needed to underpin the design and targeting of prevention initiatives.

Linking ABS and NCIS cases

Developing a better understanding of the relationship between injury deaths identified in the ABS and those identified in the NCIS would be greatly improved if there was a common identifier of records in the two systems. Two simple potential identifiers exist – the Death Registration Number used in the ABS Deaths Data Collection, and the Unique Case Number used in the NCIS. Since it appears that the ABS coding officers now consult the NCIS for most injury deaths, addition of the NCIS Unique Case Number to the ABS Deaths Data Collection could be easily achieved.

ICD-10-AM

For several of the analyses considered in this report, the ABS information could have been made more useful if the coding was based on ICD-10-AM rather than on the basic version of ICD-10 (World Health Organisation 1992). For example, ICD-10-AM provides more detailed coding, and more accurate identification, of deaths associated with agricultural machinery towed or powered by tractors than is possible with ICD-10. However, there is no code that is specific to even a subset of deaths directly related to tractors, though this omission could be corrected in a future edition of ICD-10-AM. More detail describing Place and Activity can also be obtained using ICD-10-AM compared with the basic version of ICD-10.

OVERALL CONCLUSIONS AND RECOMMENDATIONS

The main aim of this report was to determine the usefulness of the NCIS as a source of information in relation to injury surveillance. The main criteria by which the NCIS was assessed included the scope of the information contained within the system, the availability of this data and the quality of the data. Other issues discussed included the potential benefits of case-level linkage between the NCIS and the ABS Deaths Data Collection, search capabilities of the NCIS, the benefits of ICD-10-AM coding of ABS Deaths Data and the impact of the NCIS on the National Injury Prevention Plan.

Overall there were 23 recommendations. These are summarised below, but a more detailed list is provided in Section 5.2 .

The NCIS as a data source about injuries

The NCIS appears to contain information on most injury deaths in Australia since 1 July 2000.

Exceptions are Western Australia, where there is a backlog of Coronial deaths still to be entered into the system, and Queensland, for which information was not available when this project was done. A third exception is deaths due to falls by older persons, most of which are certified by a medical practitioner, and do not come to the attention of a Coroner.

Currently, specific information in relation to drug involvement is limited to detailed text searching. The development of a comprehensive coding system would make identification of drugs more efficient and complete.

Recommendations included the role of MUNCCI in encouraging the entry of back-logged cases in Western Australia and facilitating agreements which would make available information on Queensland deaths to authorised users. It is also recommended that options be explored for bringing data collection on medically-certified falls deaths into line with other injury deaths. A further recommendation relates to the development of a comprehensive coding system for drugs with consideration being given to an indexing method based on an existing system such as the ATC-index[2].

Data quality issues relevant to the NCIS

Despite instances of errors in the data for a minority of cases, the overall level of completion for key variables for Closed cases in the NCIS was found to be high. However, significant shortcomings were observed in relation to some coding variables for work-related and vehicle-related deaths. Also, both the availability and quality of information contained within text documents was found to vary considerably between States and Territories.

Virtually all cases are notified to the NCIS within one week of death. The time between case notification and case closure varies considerably between jurisdictions with a median time of just under 18 months. This period is likely to be primarily determined by coronial processes rather than by factors directly related to the NCIS.

A number of items in the NCIS classifications are implementations of a consultative draft of the International Classification of External Causes of Injury (ICECI).

Key recommendations in this area include:

- MUNCCI should perform ongoing data and validation checks of the NCIS and be involved in the regular training of and feedback of information to coders in the coroner's office.
- Authorised users should be encouraged to inform MUNCCI of data quality issues that they might encounter.
- MUNCCI should continue to encourage and facilitate the entry of text documents onto the NCIS and work with relevant parties to improve the level of detail of relevant information in those documents.
- MUNCCI should continue to minimise the time to closure by facilitating the entry of required data into the NCIS.
- MUNCCI should collaborate with coroners and other third party users of the NCIS for the purpose of identifying ways in which more timely reporting can be enabled.
- The NCIS coding system should be revised periodically to be brought in line with the current version of ICECI.

Linking ABS and NCIS cases

The availability of a common linking variable between the ABS Deaths Data Collection and the NCIS would be very beneficial to users of data from both systems. The NCIS Unique Case Number is likely to be the most easily adopted common linking variable.

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[2] Since 1982, the Anatomical Therapeutic Chemical (ATC) classification system has been maintained by the WHO Collaborating Centre for Drug Statistics Methodology in Oslo, Norway. The system provides a global standard for classifying medical substances and serves as a tool for drug utilisation research.

It is recommended that ABS and MUNCCI consider as a priority the feasibility of using the NCIS Unique Case Number as a common linking variable to be included in the ABS Deaths Data Collection.

Search capabilities of the NCIS

The NCIS has a comprehensive search facility that can quickly provide detailed information regarding a specific group of cases. Some specific shortcomings, described in this report, limit the utility of the search facility. These shortcomings appear to be straightforward to correct. It should also be noted that the NCIS search facility is better suited to individual cases or small data requests than to large or complicated data requests, which are better served by provision of case data in the form of Excel files.

It is recommended that MUNCCI should review the NCIS search facility with the aim of improving its utility. Suggested improvements are detailed in section 5.2.6.

ICD-10-AM coding of ABS Deaths Data Collection

Adoption of ICD-10-AM as the standard coding system for external causes in the ABS Deaths Data Collection would make the ABS information more useful for injury research and prevention purposes. The burden of using ICD-10-AM in place of ICD-10 would be much lower for the External Causes chapter than for any other part of ICD-10 because of the poor performance of the automated coding system for External Causes, requiring manual intervention for most of the cases.

It is recommended that the ABS should consider adopting supplementary external cause categories from ICD-10-AM for use in coding injury deaths.

The NCIS and the National Injury Prevention Plan

The NCIS is an important information source to support the research and surveillance strategies contained in the 2001–2003 National Injury Prevention Plan covering falls in older people, falls in children, drowning and near-drowning, and poisoning among children.

The analyses presented on these four priority areas indicate the scope of the problem and the type of relevant information that could be obtained from the NCIS.

It is recommended that the NCIS should be used as an additional information source for detailed analyses on topics identified as priority areas under National Injury Prevention Plans.

1 Introduction

To date, information on injury deaths in Australia has primarily come from the Australian Bureau of Statistics (ABS) Deaths Data Collection. This data set is based on information from the State and Territory Registries of Birth, Deaths and Marriages, with which all deaths in Australia should be registered. Information on all registered deaths is sent to the ABS on a regular (usually monthly) basis. The ABS assigns an Underlying Cause of Death (UCoD) code to each death, using the International Classification of Diseases, tenth revision (ICD-10) codes and coding rules. One or more Multiple Cause of Death (MCoD) codes can also be assigned, again using the codes and coding rules of the ICD-10 system. Certain other variables are coded, including two to cover Place of occurrence and Activity at the time of incident (both based on ICD-10), and a series of Flag variables that identify specific classes of death and some more information about them.

The Cause of Death, Activity, Place and Flag variable codes are assigned on the basis of the information on the death certificate. For many (possibly most) injury cases, there is insufficient information on the death certificate to allow the coding to be validly performed. For these deaths, further information is sought from Coroners' officers and/or Coroners' records. With the advent of the National Coronial Information System (NCIS), the ABS is increasingly obtaining this information directly from the NCIS. Once the ICD-10 and Flag codes have been added, the Registry information is combined into one large data set, which is released as the ABS Deaths Data Collection. All injury deaths in Australia should be recorded in this Data Set and in the main, be identifiable using the assigned ICD-10 codes. Most injury deaths are reported to the Coroner. The main exception is many deaths by elderly persons due to a fall (Kreisfeld and Harrison 2003).

The focus of the current report is injury deaths and the use of data to accurately describe the number, rate and circumstances of these deaths, in order to appropriately target, design, implement and evaluate injury prevention programs. To achieve this, the data need to be valid, to include all relevant deaths, to allow specific classes of deaths to be identified, and to provide detailed information about the circumstances surrounding the fatal incidents. Timeliness is also an important consideration. Since all deaths should be registered in the ABS Deaths Data Collection, and injury deaths should be separately identifiable using their assigned ICD-10 codes, the ABS Deaths Data Collection should provide comprehensive coverage of injury deaths. However, it does not contain text information, nor coded information on many aspects of the circumstances surrounding the injury event. Some information is provided by the ICD-10 codes and Flag variables. However, the information is limited, and lacks the flexibility to examine many specific questions of interest that were not anticipated at the time the coding systems were developed, or which require more detail than the current variables and codes can provide.

The National Coroners' Information System (NCIS) has the potential to provide the detailed information that the ABS Deaths Data Collection does not, while still providing comprehensive coverage of injury deaths. The NCIS[3] is a national system of information and supporting infrastructure that is designed to provide prompt access to coronial data from all coronial jurisdictions in Australia, to support the work of Coroners and others interested in the prevention of injury and disease. The NCIS has been developed for Coroners, and is managed by the Monash University Centre for Coronial Information (MUNCCI).

At the time of writing, the NCIS covered all Australian States and Territories, with Queensland data recently being entered into the system but not yet being publicly accessible. All deaths referred to a Coroner and that occurred in Australia (except Queensland) from 1 July 2000 onwards are supposed to be entered into the system.

Although the NCIS has been established partly as a source of information to support the prevention of injury and disease, its effectiveness in this role has not yet been tested through the extensive practical use of the data. Like any such system, teething problems can be expected early in its operation, so it is important to use the data in order to identify the strengths and limitations of the system.

The aim of this report is to assess the strengths and weaknesses of the NCIS, particularly in terms of its coverage and data integrity, in supporting injury prevention initiatives, primarily by comparing it to the ABS Deaths Data Collection. Specific injury topic areas are considered to aid this assessment, but the focus is on illustrating the functions of the NCIS rather than providing a comprehensive description of the topic area.

[3] Information about the NCIS is available at: http://www.vifp.monash.edu.au/ncis/

2 Methods

2.1 Data sources

2.1.1 NCIS data

All deaths notified to a State or Territory Coroner in Australia are supposed to be notified to the NCIS. This notification is probably complete, or nearly so. Queensland deaths are reported to the NCIS, but information on these deaths was not available publicly at the time of the preparation of this report.

2.1.2 Deaths data

Deaths data used in this report are from the Australian Bureau of Statistics (ABS) mortality unit record data collection. These represent the number of deaths registered by the Registrars of Births, Deaths and Marriages during each calendar year for the whole of Australia. All data were coded to the International Classification of Diseases, 10th Version (ICD-10) (World Health Organisation, 1992).

2.2 Case definitions

2.2.1 NCIS data

The intention was to identify all deaths of interest that occurred in a 12-month period. Only limited information is available on a case in the NCIS until the coronial investigation process is completed and the status of the case is formally changed from Open to Closed in the NCIS. The most important determinant of Closure is the time since the death was reported to the Coroner. The 12-month period 1 July 2000 to 30 June 2001 was chosen because this was the earliest 12-month period covered by the NCIS and so could be expected to have the largest proportion of cases completed (or Closed).

Information was requested from the NCIS regarding all deaths that met the following criteria:

- date of notification on or between 1 July 2000 and 30 June 2001; and/or
- date of death on or between 1 June 2001 and 30 June 2001; and
- Case type at notification OR case type at completion not equal to 'Natural Cause'.[4]

[4] Our intention had been to obtain all cases unless their Case Type was coded as *Natural Cause* at both Notification and Completion. In fact the data set obtained also excluded cases with a *Missing*

This meant that all deaths notified in the period of interest, or that occurred in the last month of the period of interest but that were notified later, would be included unless they were classified as 'Natural Cause' at both the time of notification and the time of completion. The Natural Cause group was excluded because it was unlikely to contain any injury deaths and to decrease the number of cases that needed to be provided by MUNCCI and initially reviewed for the analysis.

Information from the whole of Australia, including Queensland, was desired, but it was known prior to the commencement of the study that Queensland data would not be available.

All relevant fields from the various NCIS forms were requested. Information for fields that have numeric codes was provided in coded form.

The information reported on here was extracted in the week ending 14 March 2003. Cases described as 'Open' or 'Closed' refer to the Case Status at the time the data were extracted. The information was provided in two Excel worksheets—one based on date of notification and a smaller one based on date of death for June 2001 deaths. These files were cleaned, unnecessary fields deleted and some new fields created on the basis of the original information provided. Duplicates of cases that appeared in both files were deleted. Cleaning included comparing dates of incident, death and notification looking for anomalies (e.g. the incident could not occur after the death, and notification could not occur before the death). Anomalies identified were resolved where possible by inspecting the relevant NCIS file on the web site and reading any attached files or other information. Most of the anomalies appeared to be typographical errors that occurred during data entry. For apparently in-range cases (deaths that occurred on or between 1 July 2000 and 30 June 2001) where the date of death was missing or wrong, where the dates of incident and notification were the same, and the recorded date of death one year later, the date of incident was accepted as the date of death. Where the recorded date of death was one year after the date of notification (or otherwise clearly a typographical error), but the date of incident was several days before the date of notification (or was a typographical error also), the date of notification was accepted as the date of death. The files were then imported into SAS (SAS 1999) and analysed.

2.2.2 ABS Deaths data

The inclusion criteria for the ABS Deaths Data used in this analysis were chosen to match those of the NCIS data—that is, all deaths that occurred in Australia on or between 1 July 2000 and 30 June 2001, excluding deaths that were certified in Queensland. Queensland deaths were excluded from the analysed ABS data because Queensland data in the NCIS were not publicly available at the time the data were extracted. Only deaths certified by a Coroner were included. We included all deaths meeting these criteria that were in the annual files containing records of deaths registered by 31 December 2001, six months after the end of the study period.

Case Type at either Notification or Completion, unless the Case Type was coded as *External Cause* at either Notification or Completion. The affect of this is likely to have been small (see section 3.3.4).

Deaths that satisfied all of the following criteria were selected for inclusion in this report:

- Certified by a Coroner
- Certification in any State or Territory except Queensland
- An Underlying Cause of Death (UCoD) in the ICD-10 range V01–Y84, Y90–Y98 (i.e. Chapter XX External causes of morbidity and mortality) or a Multiple Cause of Death (MCoD) in the ICD-10 range S00–T89 (i.e. Chapter XIX Injury, poisoning and certain other consequences of external causes) and/or in the ICD-10 range V01–Y84, Y90–Y98
- Date of death 1 July 2000–30 June 2001
- Date of death registration 1 July 2000–31 December 2001

In addition to a general overview analysis of the main NCIS data fields, topic-specific analyses were conducted on ten topic areas:

1. All fatal injuries
2. Suicide
3. Work-related deaths
4. Tractor-related deaths
5. Drowning
6. Deaths due to invenomation
7. Fall-related deaths in the elderly
8. Road traffic-related deaths
9. Fatal poisoning in children
10. Fall-related deaths in children

These topics were chosen to illustrate areas likely to be the basis of injury surveillance, and which test a variety of aspects of the NCIS. They include all four of the topics declared as priorities for 2001–2003 under the National Injury Prevention Plan (topics 5,7,9 & 10) and the two most common categories of injury death (topics 2 & 8). The criteria and ICD-10 codes related to each of these topics are outlined at the beginning of the relevant section.

2.3 Comparisons

Comparisons in this project are at aggregate level, not at case level. That is, we applied equivalent specifications to each of the two data sources, and compared case numbers and proportions for each. Case level analysis would require either a common case identifier (e.g. death registration number) in both sources or probablistic matching of records. The former is not available in the NCIS. The latter goes beyond the planned scope of this project, and permission to do so was not sought.

3 Overview of the NCIS

3.1 Introduction

This chapter presents an overview of the NCIS data analysed for this project. A brief description is provided of each NCIS data element that is important for injury data analysis, as well as information on the degree to which each data element is completed in the NCIS. Information is presented separately for Closed and Open cases. Closed cases would be expected to have complete coverage for each data element, but Open cases can be expected to have missing information for some data elements. The analysis focuses on in-range cases (deaths that occurred on or between 1 Jul 2000 and 30 Jun 2001). Much of the information is summarised in Table 3.8, at the end of this Chapter.

The basic structure and content of the NCIS was considered in a recent report from the same research group who prepared the current report (Driscoll, Harrison et al. 2003). Much of that information is relevant to the current analysis, and aspects of the early parts of this chapter are based on the relevant parts of the previous report. However, all data presented in this chapter come from the data set prepared for the current analysis, rather than from the data set used in the previous report.

The focus of this report is deaths due to External Causes ('injury' deaths). As explained in the Methods section, the initial data set obtained from the NCIS included some deaths that were not due to injury or may not have been due to injury, because not all cases were Closed at the time the data were obtained. However, unless otherwise specified, the information presented in this section relates only to the injury deaths[5].

3.2 Structure of the NCIS

The structure of the NCIS is well described in several MUNCCI publications, one of which is quoted here. 'The NCIS has been designed to hold Core Data Items that are fields, variables or reports concerning the deceased person, the causes and circumstances of death and related matters. Depending on the data item, this information is in the form of codes (or code labels); numerical values (e.g. for age); brief passages of text (e.g. for name and address) or documents. Much of this information is recorded as an ordinary part of the practice of Coroners and their staff. Several core data items (e.g. Mechanism of injury) are designed to enable users of NCIS data to identify specific types of cases efficiently and reliably. The Coroners' findings are generally in the form of text files' (this description is taken from the NCIS Data Dictionary (MUNNCI 2001).

[5] The identification of injury deaths is described in Section 4.1.

Information is entered at various stages of the coronial process. The initial data entry involves notification of the case to the system. The final data entry should occur at the time the case is closed. Because the available information changes during the coronial investigation process, assessments of the surrounding circumstances may change over time. Therefore, for several important data concepts, relevant data items are coded separately at the time of case notification and again at the time of case closure.

Most of the categorical variables are coded and entered at individual State and Territory Coroners' offices. The NCIS classification and coding system is described in a data dictionary (MUNNCI 2001). Text documents are prepared or compiled as part of the Coroner's investigation process or at the conclusion of the case.

3.3 Obtaining data from the NCIS

Authorised users can obtain information from the NCIS by accessing the web site or by requesting information directly from MUNCCI staff. The web site provides access to individual cases and also allows data to be retrieved according to certain search criteria. The web site is preferred for access to individual cases or for small data requests. However, large or complicated data requests are better handled by the MUNCCI staff, who can provide the information in the form of one or more Excel files.

It is not currently possible to retrieve documents for more than one case through a search, whether via the web site or conducted by the MUNCCI staff, if information from other fields is also required. However, the documents and information from other fields are obtainable through a series of searches.

Authorisation for access can be obtained after submission of an application and consideration of this by MUNCCI and relevant ethics committees. Information for this study was obtained under an agreement between MUNCCI and the Research Centre for Injury Studies at Flinders University.

3.3.1 Identifying in-range cases

Deaths (or cases) were defined as in-range if the death occurred on or between 1 July 2000 and 30 June 2001. The initial files obtained from the NCIS contained 6,505 different observations. Following correction of errors and missing values, 6,380 deaths were considered in-range.

3.3.2 Closed and Open cases

One of the most important data elements from a research point of view is the Case status data element, which describes whether the case is Open or Closed. Closed cases are those for which the coronial process has been completed and for which all required information has been entered into the NCIS. Open cases are those that are either not finalised by the Coroner, or that are finalised but for which the required information has not been entered into the NCIS database. Case status remains Open until MUNCCI is satisfied that these criteria are met. Detailed and identifying information is available to third party users of the NCIS only for Closed cases. This

means that documents such as the police report, autopsy report, toxicology report and Finding are not available for Open cases. This clearly limits the usefulness of the available coded information for Open cases, because there is no way of verifying the information or properly understanding the circumstances surrounding the fatal injury. Information is sometimes added to, or amended in, NCIS records after they have been given a Closed status. We are aware of no facility within the NCIS to identify changed values, or associated values (e.g. date of change, previous value).

Eighty-seven per cent of the in-range injury deaths (84% of all deaths) in the current data set were Closed. For injury deaths, this percentage varied moderately across the seven States and Territories, from 80% in New South Wales to 95% in the Australian Capital Territory. For all deaths, the percentage varied from 76% in New South Wales and Western Australia to 96% in the Australian Capital Territory (Table 3.1).

Table 3.1: Case status for injury deaths and all deaths, by State or Territory; case counts and per cent; Australia (excluding Queensland), July 2000–June 2001

State or Territory	Injury deaths[1]	% Closed	All deaths	% Closed
New South Wales	2,131	80.0	2,622	75.8
Victoria	1,612	92.7	1,812	92.7
South Australia	583	88.3	908	90.1
Western Australia	421	91.2	542	75.8
Tasmania	217	83.4	231	80.1
Northern Territory	145	92.4	155	91.6
Australian Capital Territory	107	95.3	110	95.5
Total	**5,216**	**86.6**	**6,380**	**83.5**

1 The definition of injury deaths is outlined in section 4.1.2 of this report.

More recent cases were less likely to be Closed than earlier cases, although the difference in the proportions was small during the study period (Table 3.2).

Table 3.2: Case status by date of death for injury deaths, case counts and per cent; Australia (excluding Queensland), July 2000–June 2001

	All cases	
Time period	Case count	% Closed
1 Jul 2000–30 Sep 2000	1,295	90.6
1 Oct 2000–31 Dec 2000	1,405	90.1
1 Jan 2001–31 Mar 2001	1,231	84.8
1 April 2001–30 Jun 2001	1,183	86.1
1 Jul 2000–30 June 2001 (All)	**5,114**[1]	**86.6**

1 One hundred and two cases were excluded due to invalid date of death.

3.3.3 Time to death, notification and closure

Cases could be expected to usually be notified to the NCIS within a few days of death, so the date of death and the date of notification could be expected to be similar, but not necessarily the same, because notification could be delayed by various factors. Therefore, the period of interest is usually best defined by the date of death. However, for some cases, the date of death might not be known, or not coded in the NCIS (especially for Open cases) or incorrectly recorded in the NCIS. If only the date of death, as recorded in the NCIS, is used to identify the cases of interest, potentially relevant cases for which the date of death is not recorded, or is wrongly recorded, would not be included. Conversely, if there is a delay in notification, some deaths that did occur during the period of interest would not be included if date of notification was used as the proxy criteria for identifying deaths of interest. Since date of notification is virtually always recorded, and this date is usually very close to the date of death, it can also be used as a filter to help identify deaths that occurred in the period of interest but which do not have a recorded date of death or which have an erroneous date of death.

Eighty per cent of persons died on the day of the incident and 96% within one week of the incident. Half the cases were notified to the NCIS on the day of the death, another quarter by the day after the death and 97% within one week of the death.

The median time from NCIS notification to case Closure was 520 days, with 90% of cases Closed within just under two years. The median time to Closure varied across the seven States and Territories, from 161 days in the Northern Territory to 618 days in New South Wales (Tables 3.3 and 3.4).

Table 3.3: Time from notification to closure for all closed injury cases; case count, per cent, cumulative per cent; Australia (excluding Queensland), July 2000–June 2001

Time to closure	Number	Per cent	Cumulative %
Less than 50 days	31	0.73	0.73
50–99 days	128	3.02	3.76
100–149 days	272	6.43	10.18
150–199 days	232	5.48	15.67
200–249 days	223	5.27	20.94
250–300 days	194	4.58	25.52
300–399 days	439	10.37	35.89
400–499 days	456	10.78	46.67
500–599 days	942	22.26	68.93
600–699 days	894	21.12	90.05
700–799 days	277	6.55	96.60
800–899 days	125	2.95	99.55
900–999 days	19	0.45	100.00

Table 3.4: Time from notification to closure for all closed injury cases; days for specific percentiles; by State and Territory; Australia (excluding Queensland), July 2000–June 2001

	Days to reach certain percentile of cases closed		
State or Territory	**25%**	**50%**	**75%**
New South Wales	441	618	696
Victoria	492	574	611
South Australia	111	182	298
Western Australia	222	265	383
Tasmania	286	431	557
Northern Territory	109	161	239
Australian Capital Territory	340	361	394
Total	**293**	**520**	**625**

3.3.4 Case Type

The Case Type is classified at the time of notification (at which stage the categorisation is considered preliminary) and again when the Coronial process is completed (at which stage the categorisation is considered final). Deaths are classified as *Natural Cause* deaths (those due to 'illness'), *External Cause* deaths (those due to 'injury'), and deaths for which the case type is not known. All the deaths of interest in this study were expected to be classified as *External Cause* deaths at Closure, but some might have been classified differently at Notification.

Looking at ALL in-range cases (not just injury deaths), *External Cause*, as expected, was the main Case Type at Notification and at Completion for in-range cases. There were 5,132 cases coded as *External Cause* at notification, but of the 4,509 cases coded as *External Cause* at the time of Notification and which had a non-missing Case Type at Completion, 96% were also classified as *External Cause* at completion. Conversely, 91% of cases classified as *External Cause* at Closure had been classified as External Cause at Notification, and 2.5% had been initially classified as *Natural*. Although the intention had been to obtain all cases unless their Case Type was coded as *Natural* at both Notification and Completion, in fact the data set used also excluded cases with a *Missing* Case Type at Notification , unless the Case Type was coded as *External Cause* at Completion and cases for which Case Type was *Natural* at Notification and *Missing* at Completion. This is unlikely to have excluded significant numbers of true injury deaths. All cases with a missing Case Type at Completion were *Open* cases (Table 3.5).

Table 3.5: Case Type at Notification and Completion for all in-range cases, case count and per cent; Australia (excluding Queensland), July 2000–June 2001

	Case Type at Notification						
Case Type at Completion	**Natural**	**External cause**	**Still enquiring**	**Not known**	**Missing**	**Total**	**%**
Natural	..	161	6	574	..	741	11.6
External cause	121	4,326	4	275	2	4,728	74.1
Not known	34	22	2	64	..	122	1.9
Missing	..	623	104	62	..	789	12.4
Total	**155**	**5,132**	**116**	**975**	**2**	**6,380**	**100.0**

3.3.5 Intent

The intent of the injuries sustained for each death included in the NCIS is coded to one of seven categories (unless there is insufficient information to allow this categorisation to be made). This coding is performed twice—at the time the case is notified to the NCIS ('Intent at Notification'), at which stage the categorisation is considered preliminary; and at the end of the coronial process ('Intent at Completion'), at which stage the categorisation is considered final. The coding of Intent at the completion of the coronial process relies heavily on any specific statement made by the Coroner—coders are explicitly instructed that 'The coding should reflect the decision reached by the Coroner in the finding.'[6] Like Case Type, Intent is classified at the time of notification and the time of case completion (i.e. the time the case is Closed).

Considering only injury deaths, about half the deaths were classified as *Unintentional* at Completion, and another third were classified as *Intentional self-harm*. Excluding cases with a missing Intent at Completion, 93% of cases had the same Intent code at both Notification and Completion. All but seven cases (99%) with a missing Intent at Completion were Open cases (Table 3.6)

[6] From NCIS Data Dictionary, p33 (MUNCCI 2001).

Table 3.6: Intent at Notification and Completion for all injury cases, case count and per cent; Australia (excluding Queensland), July 2000–June 2001

	Intent at Notification							
Intent at Completion	**Unintentional**	**Violence**	**Self-harm**	**Not known**	**Missing**	**Other**	**Total**	**%**
Unintentional[1]	2,447	1	11	135	63	3	2,660	51.0
Interpersonal violence	5	125	2	1	..	..	133	2.5
Intentional self-harm[2]	2	5	1,615	48	12	2	1,684	32.3
Medical misadventure[3]	11	..	..	5	17	23	56	1.1
Not known[4]	5	..	4	106	5	1	121	2.3
Other[5]	2	2	1	1	..	5	11	0.2
Missing[6]	22	13	17	7	486	6	551	10.6
Total	**2,494**	**146**	**1,650**	**303**	**583**	**40**	**5,216**	**100.0**

1 Three Unintentional deaths had an Intent at Notification of *Other* (two) or *Still enquiring* (one).
2 Two *Intentional self-harm* deaths had an Intent at Notification of *Other* (one) or *Still enquiring* (one).
3 Twenty-three *Medical misadventure* deaths had an Intent at Notification of *Medical misadventure*.
4 One *Not known* death had an Intent at Notification of *Still Enquiring*.
5 Eleven deaths had an Intent at Completion of *Other* (three), *Legal intervention* (four), *War* (one), or had invalid codes for Intent at Completion. Of the five deaths having an Intent at Notification of *Other*, four were due to *Legal intervention* with one being classified as *Other.*
6 Six deaths with a missing Intent at Completion had an Intent at Notification of *Legal intervention* (one), *Still enquiring* (four) and invalid code (one).

3.3.6 Text documents

Up to four text documents are available for each case—the police report, autopsy report, toxicology report and Coroner's Finding. In New South Wales, the toxicology report is usually included in the autopsy report. Text documents are only accessible to authorised external users once the case is Closed. For Closed cases, the availability of text documents varies considerably between States and Territories. In addition, the quantity and quality of the information contained in the documents also varies considerably between, and sometimes within, States and Territories.

The police report was present for nearly all cases, whether Open or Closed, except in New South Wales. South Australia and Western Australia had almost no autopsy reports, with the other jurisdictions varying from 50% to 95% of cases with autopsy reports. The proportion of cases with toxicology reports varied considerably, from almost zero in South Australia to 92% in Victoria. The Northern Territory, Victoria, Tasmania and the Australian Capital Territory all had Findings for about 90% of Closed cases, whereas Findings were present for very few New South Wales' and South Australian cases, and for less than a third of Western Australian cases (Table 3.7).

Table 3.7: Presence[1] of text reports, Closed cases and All cases for all injury cases, per cent; Australia (excluding Queensland), July 2000–June 2001

	Police report		Autopsy report		Toxicology report		Coroner's Finding	
State or Territory	% Closed	% All	% Closed	% All	% Closed	% All	% Closed	% All
New South Wales	76.0	67.6	57.0	49.0	0[#]	0[+]	4.1	3.4
Victoria	100.0	100.0	73.8	75.1	91.6	91.9	93.2	87.0
South Australia	100.0	100.0	0	0	0.2	0.2	0.8	1.9
Western Australia	99.2	97.6	1.0	1.0	49.5	45.6	27.3	25.2
Tasmania	100.0	100.0	51.4	53.9	38.1	32.3	88.4	74.7
Northern Territory	100.0	100.0	95.5	95.2	77.6	77.2	95.5	88.3
Australian Capital Territory	98.0	98.1	86.3	86.9	64.7	66.4	88.2	84.1
Total	**90.8**	**86.5**	**52.9**	**50.0**	**39.8[#]**	**36.9[+]**	**43.2**	**37.8**

1 This table indicates whether the text documents are present in the NCIS system. Even if the text documents are present in the NCIS system, they are only ACCESSIBLE to authorised external users once the case is Closed.

\# In New South Wales, the toxicology report is included in the autopsy report. Taking this into account, the percentage of Closed records with a toxicology report is 57.0% in New South Wales and 61.4% overall.

\+ In New South Wales, the toxicology report is included in the autopsy report. Taking this into account, the percentage of all records with a toxicology report is 49.0% in New South Wales and 56.6% overall.

3.3.7 Sex and age

Sex and age were recorded for over 99% of all cases.

3.3.8 Mechanism

The 'Mechanism' data element is defined as 'The way in which injury was sustained. How the person was hurt[7]'. Up to three Mechanisms can be coded for any one incident, and each Mechanism has four associated data elements—three coded data elements of increasing detail, and a text field.

Ninety per cent of all injury cases (99% of Closed cases) had at least one Mechanism coded, 33% had two Mechanisms coded and 6% had three Mechanisms coded. Only 10% of cases had text included in a Mechanism text field.

3.3.9 Object or substance producing injury

Up to three objects can be coded. Each has two levels of detail of coded information and a text field. There are also other data elements completed for deaths involving motor vehicle crashes.

Eighty nine per cent of all injury cases (99% of Closed cases) had at least one Object coded, 33% had two Objects coded and 6% had three Objects coded. Thirty-one per cent of cases had text included in an Object text field.

[7] From NCIS Data Dictionary, p95 (MUNCCI 2001).

3.3.10 Activity

The 'Activity' data element has nine main categories and many sub-categories. A specified activity was coded for 89% of all injury deaths, and 92% of *Closed* injury deaths.

3.3.11 Incident location

'Incident Location' is covered by three data elements, two levels of detail of coded information and a text field. A specified location was coded for 97% of all injury deaths, and virtually all *Closed* injury deaths. Twelve per cent of deaths had information in the Incident Location text field.

3.3.12 Medical cause of death

The information on cause of death in the NCIS is currently recorded in free text form rather than being coded, although there are provisions for such coding to be recorded in the future. There are six text fields in which the cause of death can be recorded, covering 1a, 1b, 1c, 1d and 2 on the death certificate, plus another field. Particular types of death are best identified by searching the fields for certain text strings, or sorting the fields alphabetically and scanning them for particular words or phrases.

A specified Cause of Death was recorded for 99% of all injury deaths and 100% of *Closed* injury deaths.

3.4 Comparison of Closed and Open cases

A comparison of the main features of Closed and Open cases suggests that Open cases are similar to Closed cases except in the extent to which information is available. The age, sex and Case Type at Notification were all very similar in Closed and Open cases. A much higher proportion of Open cases had a missing Intent at Notification, suggesting that this is not completed until towards the end of the Coronial process, in contrast to the Case Type, which appears to be completed at an early stage of the Coronial process, since there were very few cases with a missing case Type at Notification.

Most Open cases did not have specified Mechanisms or Objects, but most did have information on location, activity and cause of death (Table 3.8).

Table 3.8: Main characteristics of injury deaths by case status, per cent; Australia (excluding Queensland), July 2000–June 2001

Data element	Closed (n = 4,515)	Open (n = 701)	Total (n = 5,216)
Case type at notification			
External	91.4	93.2	91.6
Natural	2.5	1.3	2.4
Still enquiring	0.1	3.1	0.5
Not known	6.0	2.3	5.5
Missing	0	0.1	0
Case type at completion			
External	99.7	32.4	90.6
Natural	0	0	0
Not known	0.3	0.6	0.4
Missing	0	67.1	9.0
Intent at notification			
Unintentional	52.7	16.7	47.8
Intentional self-harm	35.3	7.9	31.6
Other categories	3.3	4.3	3.4
Still enquiring	0	0.7	0.1
Not known	6.5	1.6	5.8
Missing	2.2	68.9	11.2
Intent at completion			
Unintentional	56.7	14.0	51.0
Intentional self-harm	36.5	5.3	32.3
Other categories	4.0	2.6	3.8
Not known	2.6	0.6	2.3
Missing	0.2	77.6	10.6
Sex and age			
Male	73.7	73.0	73.6
Missing	0.1	0.3	0.1
Average Age (standard deviation) years	41.5 (20.2)	39.6 (19.4)	41.3 (20.1)
Mechanism			
Three mechanisms	7.1	0.6	6.2
Two mechanisms	30.4	4.1	26.8
One mechanism	62.4	25.7	57.4
No mechanism	0.1	70.6	9.6

continued

Table 3.8 (continued): Main characteristics of injury deaths by case status, per cent; Australia (excluding Queensland), July 2000–June 2001

Data element	Closed (n = 4,515)	Open (n = 701)	Total (n = 5,216)
Object			
Three objects	7.0	0.6	6.1
Two objects	30.2	3.8	26.7
One object	61.6	23.0	56.4
No objects	1.2	72.6	10.8
Cause of death			
Specified	100.0	90.2	98.6
Activity			
Specified	92.1	70.0	89.2
Location			
Specified	99.8	81.4	97.3

4 Results

4.1 All injury

4.1.1 Rationale for selecting all injury

Routine deaths data in Australia have indicated that injury is an important cause of preventable death (Pointer, Harrison et al. 2003).

As mentioned in the Introduction, all deaths in Australia should be registered, and all registered deaths should be included in the ABS mortality data collection. Injury deaths should be separately identifiable in the ABS Deaths Data because injury deaths should normally be allocated an ICD-10 External Cause code for the Underlying Cause of Death or External Cause codes and/or ICD-10 codes for injury conditions in Multiple Cause of Death fields. Therefore, the ABS Deaths Data should be a comprehensive source of information on the number and, broadly, type of injury death each year in Australia. However, the ABS Deaths Data do not provide detailed information on injury deaths.

Also as mentioned in the Introduction, all injury deaths (with the noteworthy exception of some due to falls by elderly persons) should be reported to, and investigated by, a State or Territory Coroner. Therefore, the NCIS should also form a largely comprehensive source of information on injury deaths in Australia. In addition, the NCIS should provide detailed information that can support the design, implementation and evaluation of injury prevention programs.

Since there is good reason to expect that virtually all injury deaths are reported to, and identifiable in, the ABS Deaths Data Collection, comparison of this with the NCIS should provide a good measure of the usefulness of the NCIS in providing information on all injury deaths in Australia.

A secondary area of interest concerns which deaths in the ABS and the NCIS should be considered as injuries. The circumstances leading to death for persons NOT allocated an Underlying Cause of Death of External Cause but allocated a Multiple Cause of Death Code of Injury or Poisoning or External Cause are not yet well understood (Kreisfeld and Harrison 2003). Therefore, it is not clear whether comparison with NCIS data is most appropriately made with all ABS Deaths that have either an Underlying Cause of Death Code or Multiple Cause of Death Code suggesting injury, or only with deaths with an Underlying Cause of Death code suggesting injury. We considered data meeting both of these definitions.

4.1.2 Identifying all injury deaths

ABS information

Two definitions of injury were used for the ABS deaths. The first was any death with an Underlying Cause of Death code of any ICD-10 External Cause code (V01–Y84, Y90–Y98). The second definition was any death with an Underlying Cause of Death code of any ICD-10 External Cause code (V01–Y84, Y90–Y98), or a Multiple Cause of Death code of any ICD-10 Injury or Poisoning Code (S00–T98) or any ICD-10 External Cause code (V01–Y84, Y90–Y98). Apart from the overall and State and Territory comparisons, the first definition was used for all comparisons to the NCIS.

NCIS information

Each death included in the NCIS is identified as being due to *Natural Causes* or *External Cause* (unless there is insufficient information to allow this identification to be made). As mentioned earlier, this coding is performed twice—at the time the case is notified to the NCIS ('Case Type at Notification'), at which stage the identification is considered preliminary; and at the end of the coronial process ('Case Type at Completion'), at which stage the identification is considered final. All injury cases in the NCIS should be easily identifiable by simply selecting all cases with a Case Type at Completion of *External Cause*. Unfortunately, a significant minority (16%) of NCIS cases in the selected data set were still Open at the time the data were obtained, and most (67%) of these did not have a definitive code for Case Type at Completion.

For most cases without a definitive code for Case Type at Completion, other information can be used to identify injury deaths. Of the Closed cases with a Case Type at Notification of *External Cause*, 96% also had a Case Type at Completion of *External Cause*. Therefore, it is reasonable to assume that Open cases with a Case Type at Notification of *External Cause* but without a definitive Case Type at Completion are injury deaths. For other Open cases without a definitive Case Type at Completion, other NCIS variables can be used in an attempt to identify injury cases. Variables used for this purpose were Cause of Death, Mechanism and Object. However, there are limitations that need to be kept in mind when utilising these variables to identify injuries:

- Cause of Death is a text variable, so it is labour intensive to comprehensively search. The text may not mention the underlying injury, especially if there is a delay of several days between injury occurrence and death. Also, the Cause of Death is sometimes missing, especially for Open cases (it was missing in 1% of all cases—10% of Open cases—in the current data set).
- Mechanism of Death is useful because a code is usually only assigned for injury deaths. However, this group of variables sometimes provides no information, especially for Open cases (it was missing in 10% of all cases—71% of Open cases—in the current data set).
- Involved Objects can be useful because certain objects are likely to be associated with injury deaths (e.g. ladders). However, again, this group of variables sometimes provides no information, especially for Open cases (it was missing in 11% of all cases—73% of Open cases—in the current data set).

Therefore, for this analysis, injury cases in the NCIS were defined as cases that:

- had a Case Type at Completion = *External Cause*; OR
- had a Case Type at Completion = *Missing* or *Unknown*, and a Case Type at Notification of *External Cause;* OR
- had other information that identified them as being due to external causes.

4.1.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, 6,210 injury deaths were identified. Of these, 5,391 had an External Cause UCoD, and the remaining 819 were identified on the basis of a MCoD.

From the NCIS, 5,216 injury deaths were identified. Of these, 4,728 had a Case Type at Completion of External Cause, and the remaining 488 were identified on the basis of their Cause of Death (484) or their Mechanism (4).

State and Territory

Based on the ABS deaths where the UCoD was an External Cause, the number of injuries identified by the NCIS was very similar to that identified by the ABS in all jurisdictions apart from Western Australia, where the number of injuries in the NCIS was only 62% of the number in the ABS (Table 4.1).

When these percentages were examined on a quarterly basis (using date of death), there was no clear trend of decreasing percentage over time, although the percentage in the last quarter was lower than the percentages for the previous three quarters in all jurisdictions apart from Western Australia.

Table 4.1: Deaths with a UCoD indicating injury (ABS) or identified as being due to injury (NCIS) by State or Territory of registration (for ABS) or investigation (for NCIS); Australia, July 2000–June 2001: ABS Deaths Data and NCIS

	ABS		NCIS		NCIS / ABS[1]
State or Territory[2]	Deaths	Per cent	Deaths	Per cent	Per cent
New South Wales	2,103	39.0	2,131	40.9	101.3
Victoria	1,578	29.3	1,612	30.9	102.2
South Australia	586	10.9	583	11.2	99.5
Western Australia	681	12.6	421	8.1	61.8
Tasmania	195	3.6	217	4.2	111.3
Northern Territory	143	2.7	145	2.8	101.4
Australian Capital Territory	105	1.9	107	2.1	101.9
Total	**5,391**	**100.0**	**5,216**	**100.0**	**96.8**

1 The number of injury deaths in the NCIS divided by the number of injury deaths in the ABS.
2 Queenland not included.

Based on the ABS deaths where the UCoD or the MCoD identified injury as contributing to the death, the number of injuries identified by the NCIS was only 84% of the number identified by the ABS (Table 4.2).

Table 4.2: Deaths with a UCoD or MCoD indicating injury (ABS) or identified as being due to injury (NCIS) by State or Territory of registration (for ABS) or investigation (for NCIS); Australia, July 2000-June 2001: ABS Deaths Data and NCIS

	ABS		NCIS		NCIS / ABS
State or Territory[1]	Deaths	Per cent	Deaths	Per cent	Per cent
New South Wales	2,549	41.0	2,131	40.9	83.6
Victoria	1,793	28.9	1,612	30.9	89.9
South Australia	653	10.5	583	11.2	89.3
Western Australia	746	12.0	421	8.1	56.4
Tasmania	204	3.3	217	4.2	106.4
Northern Territory	148	2.4	145	2.8	98.0
Australian Capital Territory	117	1.9	107	2.1	91.5
Total	**6210**	**100**	**5,216**	**100.0**	**84.0**

1 Queensland not included.

Age and sex

The age and sex distribution was very similar between the ABS and NCIS data sets, although the percentages were not exactly the same in each age-sex group. In the ABS, males comprised 73.2% of the injury cases, very similar to the 73.7% in the NCIS (Table 4.3).

Table 4.3: Age group and sex for all injury deaths[1]: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)[2]
Age Group	n = 3,948	n = 3,837	n = 1,443	n = 1,366	n = 5,391	n = 5,208
0–4	1.6	1.2	3.5	2.0	2.1	1.4
5 –14	1.9	2.2	2.1	2.6	2.0	2.3
15–24	17.5	17.6	15.2	16.1	16.9	17.2
25–34	24.1	24.6	16.0	17.2	21.9	22.7
35–44	19.9	20.5	17.0	17.4	19.1	19.6
45–54	13.6	13.8	13.0	12.7	13.4	13.5
55–64	7.6	7.4	8.1	8.0	7.8	7.5
65–74	6.1	5.9	8.3	9.0	6.7	6.7
75 plus	7.7	6.8	16.8	14.7	10.1	8.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

1 The ABS cases are only those with an UCoD identifying an External Cause.
2 Eight deaths had unknown age (3), unknown sex (4) or both (1).

Place of occurrence

There is only limited useful information in the ABS regarding the place of occurrence[8] of fatal injuries. Forty seven per cent of deaths had no information on place of occurrence. In contrast, the NCIS had place of occurrence information for nearly all cases, and considerably more detail than the ABS (Tables 4.4 and 4.5).

Although comparisons between the ABS and NCIS results are difficult because of the large amount of missing information in the ABS data, it is clear that the ABS does not code the place of occurrence for nearly all incidents that occur on streets and highways, with only 1% of these in the ABS injuries, compared with 27% in the NCIS.

This reflects the statement in the ICD-10 manual that the place codes 'are for use with the categories W00–Y34 except Y06– and Y07–[9]'. This restriction on the use of place codes has been relaxed in ICD-10-AM, from the second edition, enabling collection of more meaningful data.

Table 4.4: Broad place of occurrence for all injury deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS (%)	NCIS (%)
Place of occurrence[1]	**n = 5,391**	**n = 5,216**
Home	30.4	44.6
Residential / correctional facility	1.9	2.0
School, other institution and public administrative area	2.7	0.7
*Hospital or other health service**	*n/a*	*3.7*
Sports and athletics area	0.3	0.7
Street and highway	1.0	26.9
Trade and service area	1.8	3.2
Industrial and construction area	0.9	0.5
*Mine or quarry**	*n/a*	*0.3*
Farm	0.7	1.9
Other specified places	11.1	10.2
*Recreation area**	*n/a*	*2.6*
Unspecified place	17.5	0.2
Missing	29.4	2.5
Total	**100.0**	**100.0**

1 The NCIS is able to provide an extra level of specificity for each major category.
* The ABS does not have these categories. Instead, each of these three categories is incorporated in the category immediately above it (i.e. *Hospital* is in *School, other institution and public administrative area, Mine* is in *Industrial and construction area, and Recreation area* is in *Other specified place*).
n/a not applicable.

[8] The 'place of occurrence' indicates the location at which the incident took place and does not necessarily indicate the location at which death occurred.
[9] From ICD-10 vol 1 p1,013 (World Health Organisation 1992).

Table 4.5: Detailed place of occurrence for all injury deaths; Australia (excluding Queensland), July 2000–June 2001: NCIS.

Place of occurrence	Number	Per cent
Home		
Farm-house	37	0.7
Free-standing house	1,542	29.6
Flat, apartment, terrace house	590	11.3
Boarding house, hostel, private hotel	29	0.6
Caravan, mobile home (residential)	32	0.6
Other specified home	27	0.5
Unspecified home	70	1.3
Residential / correctional facility		
Institutional home	7	0.1
Home for elderly, frail	37	0.7
Prison/Youth training or Detention Centre	16	0.3
Police cell	2	0.0
Other specified residential/correctional facility	26	0.5
Unspecified residential/correctional facility	16	0.3
School, other institution and public administrative area		
Childcare centre	1	0.0
Primary school (public/private/state)	6	0.1
Secondary school (public/private/state)	2	0.0
Tertiary and adult education institutions	1	0.0
Public administration place	5	0.1
Place for the arts	2	0.0
Other specified school, other institution, or public administrative area	9	0.2
Unspecified school, other institution, or public administrative area	8	0.2
Hospital or other health service		
Hospital	157	3.0
Community health centre	1	0.0
Medical surgery or clinic	2	0.0
Other specified hospital or other health service	34	0.7
Unspecified hospital or other health service	1	0.0

continued

Table 4.5 (continued): Detailed place of occurrence for all injury deaths; Australia (excluding Queensland), July 2000–June 2001: NCIS.

Place of occurrence	Number	Per cent
Recreation area		
Amusement park	1	0.0
Holiday resort	4	0.1
Public park	78	1.5
Aquatic recreation centre	5	0.1
Other specified recreation area (place mainly for informal recreational activity)	13	0.3
Unspecified recreation area (place mainly for informal recreational activity)	32	0.6
Sports and athletics area		
Oval, field, pitch	6	0.1
Stadium, arena	3	0.1
Race track (horse, motorcycle, car, etc)	8	0.2
Other: land-based sport	2	0.0
Other: water-based sport	5	0.1
Other: snow or ice based sport	2	0.0
Other specified sports or athletics area (place mainly for formal sports, etc)	7	0.1
Unspecified sports or athletics area (place mainly for formal sports, etc)	4	0.1
Street and highway		
Freeway	183	3.5
Urban road	726	13.9
Non-urban road	253	4.9
Other specified street or highway (public road)	107	2.1
Unspecified street or highway (public road)	136	2.6
Trade and service area		
Shop	7	0.1
Commercial eating place	8	0.2
Entertainment/drinking place	26	0.5
Airport	7	0.1
Bus or railway station	44	0.8
Service station	2	0.0
Warehouse	3	0.1
Office building	4	0.1

continued

Table 4.5 (continued): Detailed place of occurrence for all injury deaths; Australia (excluding Queensland), July 2000–June 2001: NCIS.

Place of occurrence	Number	Per cent
Trade and service area (continued)		
Other specified trade or service area	48	0.9
Unspecified trade or service area	18	0.4
Industrial or construction area		
Construction site	7	0.1
Demolition site	1	0
Factory	14	0.3
Unspecified industrial or construction area	132	2.5
Mine or quarry		
Underground mine	5	0.1
Open mine or quarry	5	0.1
Other specified mine or quarry	1	0.0
Unspecified mine or quarry	5	0.1
Farm		
Farm	91	1.7
Timber plantation	1	0.0
Other specified farm	2	0.0
Unspecified farm	4	0.1
Other specified place		
Bush, remote or undeveloped place	133	2.6
Railway (other than station)	67	1.3
Camping ground, caravan park	9	0.2
Inland body of water	103	2.0
Other body of water–beach, ocean, etc	112	2.2
Wharf, pier, jetty	3	0.1
Bridge	9	0.2
Other specified place	99	1.9
Unspecified place		
Unspecified place	4	0.1
Still enquiring	1	0.0
Unlikely to be known	6	0.1
Total	**5,216**	**100.0**

Activity at the time of the incident

Information on the general activity of the fatally injured person was available for 77% of the ABS injury deaths, and 89% of the NCIS injury deaths, although nearly half of the NCIS cases without definitive place information were Open cases and so could be expected to have definitive information once the case was Closed (Table 4.6).

Table 4.6: Activity for all injury deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

Activity[1]	ABS (%) n = 5,391	NCIS (%) n = 5,216
While engaged in sports activity	**1.3**	**2.8**
Organised sports and active recreation		0.3
Informal sports and active recreation		2.3
Sports and active recreation unspecified		0.2
While engaged in leisure activity	**3.4**	**9.9**
Hobby activities		0.2
Leisure–entertainment		0.4
Voluntary work (formal or informal)		0.1
Other specified leisure activity		1.8
Unspecified leisure activity		7.5
While working for income	**2.0**	**3.1**
Working, including travelling for work		2.2
Commuting		0.4
Working or commuting, unspecified		0.4
While engaged in other types of work	**0.8**	**2.0**
Cleaning, cooking, clothes, washing, etc		0.1
Gardening		0.2
Household maintenance		0.4
Caring for children, relatives, etc		0.1
Other specified domestic duties		0.2
Unspecified domestic duties		1.0
While resting, sleeping, eating or engaged in other vital activity	**3.5**	**12.4**
Resting, sleeping		6.1
Eating, drinking		0.8
Washing oneself, such as showering etc		0.4
Other specified personal activity		3.4
Unspecified personal activity		1.7

continued

Table 4.6 (continued): Activity for all injury deaths; Australia (excluding Queensland), July 2000-June 2001: ABS Deaths Data and NCIS.

Activity[1]	ABS (%) n = 5,391	NCIS (%) n = 5,216
While being nursed or cared for[2]	**n/a**	**4.0**
Being nursed or cared for in a formal health care setting		3.5
Informally being nursed or cared for		0.4
Unspecified whether being nursed in a formal health care setting or informally		0.2
While engaged in educational activities[2]	**n/a**	**0.1**
Informal activity during lunch or other daily break times		0
Travel to and from school		0
While engaged in other specified activities	**26.8**	**55.0**
General travel		17.6
Self inflicted harm		31.6
Other specific activity excluding travel		5.7
During unspecified activity	**62.2**	**6.0**
Missing	0.7	4.8
Total	**100.0**	**100.0**

1 The NCIS is able to provide an extra level of specificity for each major activity category, but the ABS does not.
2 The ABS source does not have these categories.
n/a not applicable.

Circumstances

For ABS injury deaths, some general information on the circumstances of the fatal injury is available from the External Cause codes. The External Cause Codes categorise the deaths on the basis of one or more of several distinct parameters, such as intent, involved object and place of occurrence. However, only one variable is available to describe all these parameters, so different codes incorporate one or more parameters, limiting the flexibility and usefulness of the information. The NCIS does not yet incorporate ICD-10 codes, although this may happen in the future. Instead, it provides potentially much more information on the circumstances of each death through coded and text variables covering the mechanisms of injury and the objects involved. There is provision for up to three mechanisms and three agencies to be coded. Even more detailed information is available through the four main text documents that are potentially available for each death—the police description, the autopsy report, the toxicology report, and the Finding.

The strengths and weaknesses of the ABS and NCIS collections as sources of information for injury surveillance are considered in each of the following sections covering specific injury types/circumstances. An overall assessment is given in Chapter 5.

4.1.4 Discussion

Fatal injury cases, for which an Underlying Cause of Death code of External Cause is appropriate, appear to be identifiable within the NCIS as injury deaths. The Case Type at Completion is the best variable to use to identify these injury deaths. Where cases are still Open and there is no Case Type at Completion, injury cases can be reasonably easily identified if there is a Cause of death recorded, as there was for nearly all deaths included in the current analysis.

The difference in the number of injury deaths identified in the two data sets is presumed to be due primarily to some of the NCIS injury cases still being Open and having insufficient information to allow them to be properly identified as injury deaths. The similarity between the number of ABS deaths with an Underlying Cause of Death code of external Cause, and the number, age and sex of the identified NCIS injury deaths, suggests that ABS deaths only identified as injuries on the basis of their Multiple Cause of Death codes are not easily identifiable as injuries in the NCIS. This in turn suggests that most of these latter deaths might be more appropriately viewed as being Natural Cause deaths to which one or more external causes made a relatively minor contribution[10]. However, this remains speculation, and requires a more in-depth consideration of the ABS Deaths Data to be answered more definitively.

The apparent under-counting in Western Australia is probably partly a function of the fact that 14% of all Western Australian cases had a missing Cause of Death and missing or unknown Case Type at Completion, compared to 4% in New South Wales, 2% in Tasmania, and less than 1% elsewhere. However, even if all the Western Australian cases with missing Cause of Death information were injury deaths, the number of injury deaths in Western Australia would be 487, which is still only 72% of the number of injuries identified by the ABS.

In contrast, Tasmania had 11% more injury deaths in the NCIS than the ABS. The reason for this is not clear. Inspection of the Cause of Death text fields for all 231 Tasmanian cases in the NCIS dataset indicated that all the deaths identified as injury deaths had been correctly coded.

[10] If so, then this might imply that, among deaths reported to a coroner, nearly all in which external causes played a significant causal role, are clearly identified as such. This is what would be expected of an effective coronial system. However, this implies nothing about the extent to which external causes play a significant role in the majority of deaths (about 86%), which are not reported to a coroner.

4.2 Suicide

4.2.1 Rationale for selecting suicide

Routine deaths data in Australia have indicated that suicide is a major cause of potentially preventable death (Steenkamp and Harrison 2000).

All recognised suicides should be identifiable in the ABS Death Data by the associated ICD-10 External Cause code[11]. Therefore, the ABS Deaths Data should be a comprehensive source of information on the number and, broadly, type of suicides each year in Australia. However, the ABS Deaths Data do not provide detailed information on these deaths.

All recognised suicides should all also be identifiable in the NCIS, since all suspected suicides should be referred to a Coroner. Therefore, the NCIS should also be a comprehensive source of information on injury deaths in Australia. In addition, the NCIS should provide detailed information that can support the design, implementation and evaluation of suicide prevention programs.

The decision that a death is due to intentional self-harm can be difficult to make. The NCIS coders are instructed to base their coding on the specific comments of the Coroner in the Finding, if it is available[12]. Presumably, the ABS coders do similarly. However, the validity of the assignment of the Intentional self-harm of an injury by NCIS coders is not known.

There are many areas of interest relating to the circumstances surrounding suicide that may be important for prevention purposes, but which are not available from the ABS Deaths Data. If information on some of these areas is available through the NCIS, this would be a major benefit to suicide prevention researchers. These areas include:

- the prior and recent history of the deceased in terms of previous suicide attempts, psychiatric conditions and psychiatric treatment;
- the means of suicide, including means which may tend to go unrecognised, such as via motor vehicle crashes;
- associations between the means of suicide and characteristics of the deceased;
- possible risk factors for suicide such as proximate life crises, confused sexuality, psychiatric conditions, socio-economic status, and consequences of indigenous status; and
- the usual residence of the deceased and location of the suicidal event.

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[11] It is likely that not all deaths by suicide are recognised as such. The intent of some deaths referred to a coroner is inherently difficult to determine (e.g. some deaths by drowning), and sometimes the deceased person or others might wish to obscure the fact of suicide. For similar reasons, some suicide deaths might not be reported to a coroner.

[12] The instructions in the Data Dictionary (page 33) for Intent at Completion are 'Coders should be discouraged from drawing conclusions about intent, except in accordance with specific guidelines'. The coding should reflect the decision reached by the Coroner in the Finding. The code *'9—Unlikely to be known'* should only be used after the Coroner has delivered a finding.

4.2.2 Identifying suicides

ABS information

Suicide deaths were identified in the ABS Deaths Data as deaths with an Underlying Cause of Death Code identifying intentional self-injury (ICD-10 External Cause codes X60–X84). A further group of codes identifies deaths where the intent is uncertain[13]. This group (Y10–Y34) can also be expected to contain some suicide deaths, but the proportion is not known. These were not included in this analysis.

NCIS information

All suicide cases in the NCIS should be easily identifiable by simply selecting all cases with an Intent at Completion of *Intentional self-harm*. Unfortunately, some cases had a *Missing* Intent at Completion. Excluding those cases coded *Natural Cause* at Completion, a significant minority (16.3%) of NCIS cases in the selected data set were still Open at the time the data were obtained, and most (84.0%) of these had a Missing code for Intent at Completion. Virtually all (99.0%) of the deaths with a Missing Intent at Completion were still Open.

Of the 1,600 Closed cases with an Intent at Notification of *Intentional self-harm*, 98.8% also had an Intent at Completion of *Intentional self-harm*. The others were coded to *Unintentional* (11 deaths), *Interpersonal violence* (1 death), *Not known* (4 deaths) and *Missing* (4 deaths).

For this analysis, suicide cases in the NCIS were defined as cases that had an Intent at Completion of *Intentional self-harm*. (Another 20 Open cases coded as *Intentional self-harm* at Notification that had a non-suicide Intent at Completion were not included.) Nearly all (97.7%) of the identified suicide cases were Closed.

4.2.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, 1,861 suicides were identified. For the same period, 1,687 suicides were identified from the NCIS, 91% of the ABS—identified deaths. The 1,687 suicides in the NCIS was 32% of all known injury deaths in the NCIS, compared with the ABS, where 35% of all injuries were coded as suicides.

State and Territory

Based on the ABS deaths, the number of suicides was about 10% less in the NCIS. However, the overall coverage varied between States and Territories, with Western Australia and New South Wales having the lowest proportions compared to the ABS numbers. Tasmania had 22% more deaths identified as suicide than did the ABS (Table 4.7).

[13] The ICD-10 description is: 'Codes from this category are designed for use when the intent is unspecified, unstated or cannot be determined. That is, the injuries are not specified as accidental (unintentional), self-inflicted with intent to self-harm, or assault.'

Table 4.7: State or Territory of registration (for ABS) or investigation (for NCIS) for suicides; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS		NCIS / ABS[1]
State /Territory	Deaths	Per cent	Deaths	Per cent	Per cent
New South Wales	715	38.4	586	34.7	82.0
Victoria	538	28.9	575	34.1	106.9
South Australia	208	11.2	197	11.7	94.7
Western Australia	261	14.0	176	10.4	67.4
Tasmania	63	3.4	77	4.6	122.2
Northern Territory	35	1.9	35	2.1	100.0
Australian Capital Territory	41	2.2	41	2.4	100.0
Total	**1,861**	**100.0**	**1,687**	**100.0**	**90.7**

1 The number of deaths in the NCIS divided by the number of deaths in the ABS.

Age and sex

The age and sex distribution was very similar between the ABS and NCIS data sets. In both the ABS and the NCIS, males comprised 78% of the suicide cases.

Table 4.8: Age group and sex for suicides: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)[1]
Age Group	n = 1,451	n = 1,314	n = 410	n = 372	n = 1,861	n = 1,687
0–14	0.4	0.3	0.2	0.3	0.3	0.3
15–24	12.8	12.3	13.6	13.4	13.0	12.6
25–34	25.4	25.4	20.3	21.8	24.3	24.7
35–44	24.6	24.4	23.2	22.9	24.3	24.0
45–54	15.6	16.2	17.8	18.0	16.1	16.6
55–64	9.4	9.6	10.0	8.3	9.5	9.3
65–74	6.2	6.1	7.5	7.8	6.5	6.5
75 plus	5.5	5.7	7.5	7.5	6.0	6.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

1 One death had unknown sex.

Place of occurrence

As noted for all injuries, there is only limited useful information in the ABS regarding the place of occurrence for all types of fatal injuries, including suicides. Eighteen per cent of deaths had no information on place of occurrence. In contrast, the NCIS had place of occurrence information for nearly all cases. Comparisons between the ABS and NCIS results are difficult because 18% of the cases had an

Unspecified Place. However, once the differences between the coding structures is taken into account, the information suggests that the coding of Place at the broad level is very similar between the two data sources, apart from suicides which occur at home, a significant proportion of which appear to be coded in the ABS as *Unspecified* (Table 4.9).

The NCIS provides much more detail on Place than the ABS. This is not described comprehensively here. Examples are that many of the deaths coded at the general level as *Other specified* occurred in bush or undeveloped areas, or involved people being hit by trains or drowning in bodies of fresh or salt water. Most deaths identified as occurring in a *Recreation area* occurred in a public park.

Table 4.9: Broad place of occurrence for suicides; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS (%)	NCIS (%)
Place of occurrence	**n = 1,861**	**n = 1,687**
Home	50.7	65.2
Residential / correctional facility	1.7	1.8
School, other institution and public administrative area	2.6	0.7
*Hospital or other health service**	*n/a*	*1.2*
Sports and athletics area	1.8	0.4
Street and highway	4.1	6.1
Trade and service area	2.2	3.6
Industrial and construction area	0.6	0.4
*Mine or quarry**	*n/a*	*0.4*
Farm	1.1	1.8
Other specified places	17.0	13.6
*Recreation area**	*n/a*	*4.6*
Unspecified place	18.1	0.2
Total	**100.0**	**100.0**

* The ABS does not have these categories. Instead, each of these three categories is incorporated in the category immediately above it (i.e. *Hospital* is in *School, other institution and public administrative area, Mine* is in *Industrial and construction area, and Recreation area* is in *Other specified place*).

n/a not applicable.

Activity at the time of the incident

Activity at the time of injury is not likely to be a useful variable for analysis of suicides in the ABS data, because all such details should be classed as Other specified activity according to the ABS coding scheme. In the NCIS, a specific activity code is provided to identify self-inflicted harm.

The activity was identified as *Other specified activity* for 58.3% of suicides in the ABS, and as *Unspecified* for nearly all the rest. In comparison, the NCIS identified the activity of 91.3% of suicide deaths as *Self-inflicted harm*.

Circumstances

As mentioned in the section on all injuries, information regarding the general circumstance of suicide deaths is available from the ABS using the External Cause code. The NCIS does not yet incorporate ICD-10 codes, although this may happen in the future. However, it provides potentially much more information on the circumstances of each death through coded and text variables covering the mechanisms of injury and the objects involved, and through the four main text documents that may be available for most deaths—the police description, the Finding, the autopsy report and the toxicology report.

Most of the NCIS deaths can be allocated to the ABS External Cause groupings using a combination of the Mechanism and Object codes allocated to each case. A comparison for the suicides shows a strong similarity in the percentage of cases in each grouping. This suggests that the coding of the relevant information for the ABS and the NCIS has a high level of agreement, at least at the broad level. It also suggests that the 'missing' NCIS cases reflect all suicide cases, and are 'missing' only because they were still Open and so did not have a definitive Case Type at Completion. The main differences appear to have arisen through different coding at the more detailed level, or different amounts of information that are coded. This appears to be the case for the differences seen in the poisoning and vehicle involvement categories.

Detail on the exact substances involved is available in the NCIS for most suicides through the toxicology and/or autopsy text documents. In addition, most of the NCIS suicides involving poisoning with drugs had the specific drugs recorded in one or more of the Object text fields. These were not summarised in detail for this analysis. However, the NCIS currently does not code drugs in detail, so the coded Mechanisms and Objects mostly only identify drugs as 'Other and unspecified'. This resulted in different percentages to the ABS within the drug poisoning sub-categories, but very similar percentages for drug poisoning overall. Secondly, the NCIS separately identifies hanging from other threats to breathing and from drowning, whereas the ABS does not separately identify hanging from other threats to breathing apart from drowning. (This distinction was lost with the change from ICD-9 to ICD-10.) A third example is deaths involving persons being struck by trains, which appear to have been coded to X81 in the ABS (lying or jumping in front of a moving object), whereas these were coded to "Vehicle crash" in the NCIS. Again, this resulted in different percentages within the vehicle involvement sub-categories, but very similar percentages overall for vehicle involvement. The only difference of note that does not have a ready explanation is the much smaller number of NCIS suicides assigned to the 'Other and unspecified firearm' category. The numbers/percentages in the specific firearm categories are very similar in the ABS and the NCIS, suggesting that most of the deaths coded to *Other and unspecified firearm* in the ABS have been coded to a non-firearm category in the NCIS. Why this would be so is not clear (Table 4.10). This could be resolved by further study, especially if the data sources are linked.

Table 4.10: Summary of general circumstance of suicides, using External Cause Code (ABS) and Mechanism Code (NCIS); Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS			NCIS	
	ICD-10	Deaths	Per cent	Deaths	Per cent
Poisoning					
Drugs					
Analgesics	X60	5	0.3	-	
Sedatives	X61	66	3.5	-	
Narcotics	X62	30	1.6	17	1.0
Other nervous system	X63	4	0.2	-	
Other and unspecified	X64	140	7.5	197	11.7
Total drug poisoning		**245**	**13.2**	**214**	**12.7**
Alcohol	X65	3	0.2	4	0.2
Gases and vapours	X67	408	21.9	362	21.5
Pesticides	X68	9	0.5	7	0.4
Other chemicals	X69	13	0.7	17	1.0
Total poisoning		**433**	**23.3**	**390**	**23.1**
Threats to breathing					
Hanging		-		617	36.6
Other threats to breathing		-		62	3.7
Hanging, strangulation suffocation	X70	752	40.4	-	
Drowning	X71	44	2.4	35	2.1
Total threats to breathing		**796**	**42.8**	**714**	**42.3**
Firearms					
Handgun	X72	27	1.5	22	1.3
Rifle or shotgun	X73	115	6.2	115	6.8
Other and unspecified firearm	X74	35	1.9	7	0.4
Total firearms		**177**	**9.5**	**144**	**8.5**
Other					
Fire/smoke	X76	26	1.4	27	1.6
Sharp object	X78	28	1.5	39	2.3
Fall/jump from height	X80	67	3.6	64	3.8
Total other		**121**	**6.5**	**130**	**8.5**

continued

Table 4.10 (continued): Summary of general circumstance of suicides, using External Cause Code (ABS) and Mechanism Code (NCIS); Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS			NCIS	
	ICD-10	Deaths	Per cent	Deaths	Per cent
Vehicle involvement					
Jumping / lying in front of	X81	64	3.4	-	
Vehicle crash	X82	11	0.6	75	4.4
Total vehicle involvement		**75**	**4.0**	**75**	**4.4**
Other specified	X83	8	0.4	18	1.1
Unspecified	X84	6	0.3	2	0.1
Total		**1,861**	**100.0**	**1,687**	**100.0**

Although a detailed summary of suicide deaths is beyond the scope of the current analysis, a sample of suicide cases identified in the NCIS were examined, to determine the type and detail of information available. Most cases had a police report, but only about one half had the other documents (autopsy report, toxicology report and Finding) available. Forty four per cent of suicide cases had both a police report and a Finding. Most cases examined had at least some information in the police report and/or the Finding regarding previous episodes of self-harm; current and previous psychiatric conditions such as depression and schizophrenia; recent life stresses such as separation from a partner, loss of a job, increasing debt and ill health; presence of a suicide note; and the immediate circumstances related to the fatal injury, such as the time, place and method. The quality and detail of the information varied considerably, appearing to be most influenced by the State or Territory in which the death was investigated. In some jurisdictions, the police report contained more detailed information in these areas than the Finding, and in other jurisdictions the Finding contained more detailed information.

4.2.4 Discussion

The ABS Deaths Data probably has comprehensive coverage of recognised suicides in Australia, with the External Cause codes providing a good summary, at a broad level, of the method of suicide. However, it provides little information on areas important to developing an understanding of the factors leading up to suicide.

Until all cases for a period of interest are Closed, the NCIS is likely to provide an underestimate of the number of recognised suicides. However, this underestimate appears to be unbiased, with the suicides that are identified appearing to be a very good reflection of all suicides (as identified by the ABS). The major advantage of the NCIS is that it provides detailed information on the circumstances surrounding the fatal event, including concerning recent life stresses and relevant aspects of the deceased person's physical and psychological well-being. As for all injury deaths, suicides were proportionately (compared with the ABS) much lower in Western Australia than in other jurisdictions.

Although the current version of the NCIS provides very useful information in a relatively easily accessible format, there are some difficulties when considering suicides that could be usefully addressed. These include :

- not being able to easily identify potential suicides that do not have a coded Intent at Notification (as is the case for most Open cases);
- the lack of a comprehensive coding system for drugs involved in the death and/or found at autopsy ; and
- the lack of text documents, a considerable proportion of cases having only one of the police report, autopsy report, toxicology report and Finding available.

4.3 Work-related deaths

4.3.1 Rationale for selecting work-related deaths

Two comprehensive studies of work-related deaths in Australia have shown that, from 1982–1992, 400–450 workers died each year as a result of work-related injury (Harrison, Frommer et al. 1989; Driscoll, Mitchell et al. 2001). An additional 100–150 workers were fatally injured whilst travelling to and from work. Other work-related fatal injury involves bystanders—non-workers who are fatally injured as a direct result of the work activity of others (such as a crane toppling onto a person walking past a construction site). The more recent study showed that there were about 80 deaths of bystanders each year in workplace incidents, and another 120 deaths of bystanders in motor vehicle incidents on public roads in which the working vehicle was primarily 'at fault'. (Removing Queensland deaths gives totals of about 340 for working deaths, 120 for commuters, 60 for workplace bystanders and 100 for road bystanders.) Note that these numbers exclude suicides, regardless of whether there may have been some relationship to work.

Unfortunately, there has been no adequate way of identifying work-related traumatic deaths in Australia on an on-going basis. No comprehensive information on Australian work-related deaths is available for the period since 1992, and the information that is available for earlier periods was obtained through large, resource-intensive studies with a long lead time between the period covered and the public availability of the data.

4.3.2 Identifying work-related deaths

ABS information

The ABS Deaths Data Collection has an Activity variable that includes a category for work: 'Working for income'. However, there are some shortcomings with this category. It includes persons travelling to or from work, but does not separately identify these two groups. In addition, a considerable number of deaths do not have an Activity code assigned, there is no provision to identify bystander deaths, and the accuracy of the coding of this category is not known. Coders use information from the Coroner's Finding or other easily available information from the Coronial

investigation, and unless the deceased person was obviously working at the time of the fatal incident, or work is specifically mentioned in the Finding, it is unlikely that a death would be coded as work-related. Some ICD-10 External Cause codes are likely to be specific for work-related injury of workers (e.g. V60.0, V60.5, V61.0, V61.5, up to V68.0, V68.5, plus V69.4: all of these cover drivers of heavy transport vehicles injured in transport accidents), but these probably cover a small minority of the total work-related injury deaths.

Deaths due to suicide were excluded from the current analysis.

For this analysis, deaths in the ABS Deaths Data Collection were accepted as work-related if they had an Activity Code of '2: Working for income', as long as they were not suicides.

NCIS information

The NCIS has a variable describing the activity of the person at the time of the fatal injury. One category identifies 'work-related' activity, with further detail regarding whether the activity was 'Working, including travelling for work (code 3.1)'; 'Travelling to or from work (commuting)' (code 3.2); or 'Working or commuting, unspecified' (code 3.9).

There is also a separate 'Work-related' variable, which identifies deaths as either work-related or not. For this variable, 'work-related' includes working persons, commuters and bystanders. Work-related deaths may also be identifiable through:

- Object variables, looking for codes and text descriptions of Objects likely to be related to work (e.g. cranes and tractors);
- Mechanism variables, looking for Mechanisms likely to be related to work (e.g. explosions); and
- Keyword or manual searches of the Police reports and Findings.

Key word searching and manual searching of text documents for deaths involving work is a significant undertaking, because of the large number of descriptions likely to contain at least one of the keywords, and was beyond the scope of the current analysis. Therefore, the coding of the Work-related and Activity variables was relied upon to identify work-related deaths. Shortcomings of this approach are considered in the discussion at the end of this section. However, text documents and coded information on the NCIS web site were used to check the 21 deaths with an activity code 3.9, in order to determine if the cases could be definitively coded as involving working or involving commuting.

Initial consideration of the Work-related variable showed that 65 of the 217 cases identified as work-related by this variable had an Activity code indicating activity other than work. The available documents for these cases were inspected, and the work-related status re-assessed on the basis of the circumstances. Thirty-seven (57%) of them were medical misadventure cases. There are arguments for and against regarding such deaths as being work-related. For the purposes of the current analysis, these deaths were excluded.

Most of the remaining deaths were found to be bystander deaths. Some of these were non-working persons killed in motor vehicle incidents involving working vehicles. Where the working vehicle is 'at fault' in such an incident, it is appropriate to consider these as work-related, and the NCIS definition for the Work-related

variable explicitly includes them. However, where the working vehicle is not at fault, the incident is probably best regarded not as a work-related incident. Again, the NCIS definitions for the Work-related variable explicitly exclude such incidents. Therefore, for the current analysis, bystander deaths involving motor vehicle incidents on public roads were only included if the working vehicle was considered primarily 'at fault' in the incident, based on the information in the police report and/or the Finding.

A small number of deaths identified as work-related had a code indicating non-work, but had text documentation clearly indicating that the deceased person was working at the time of the injury. The Activity code for these persons was changed to the appropriate Working or Commuting code.

Therefore, for this analysis, work-related deaths in the NCIS were defined as cases that, after correction, had:

- An Activity code = 3.1, 3.2 or 3.9; or
- A work-related variable code = '1: work-related' (excluding those due to medical misadventure and bystanders in motor vehicle incidents in which the working vehicle was not 'at fault'); or
- Other information identifying the death as work-related.

4.3.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, 108 non-suicide work-related deaths were identified on the basis of their activity code (which includes working and commuting).

From the NCIS, 163 working and commuting deaths were identified—134 working deaths, 24 commuting deaths, and five deaths that were either working or commuting. In addition, 22 bystander deaths (8 workplace, 14 road) were identified.

Comparisons to ABS data can only be appropriately made using the working and commuting deaths combined, as this is the basis on which the ABS identifies deaths as work-related. Therefore, the presented comparisons below are based on working and commuting deaths, unless otherwise specified.

State and Territory

The State and Territory distribution of working and commuting deaths was broadly similar for the ABS and NCIS, apart from Western Australia, which had much lower coverage in the NCIS. However, in contrast to other injury sub-categories, a much larger number of working deaths were identified in the NCIS than in the ABS (Table 4.11).

Table 4.11: Working and commuting deaths identified in the ABS and the NCIS by State or Territory of registration (for ABS) or investigation (for NCIS); Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS		NCIS / ABS[1]
State or Territory	Deaths	Per cent	Deaths	Per cent	Per cent
New South Wales	47	43.5	87	53.4	185.1
Victoria	26	24.1	36	22.1	138.5
South Australia	10	9.3	18	11.0	180.0
Western Australia	11	10.2	6	3.7	54.5
Tasmania	7	6.5	11	6.7	157.1
Northern Territory	7	6.5	5	3.1	71.4
Australian Capital Territory	0	0.0	0	-	-
Total	**108**	**100.0**	**163**	**100.0**	**150.9**

1 The number of deaths in the NCIS divided by the number of deaths in the ABS.

Age and sex

The age and sex distributions were similar between the ABS and NCIS working and commuting deaths for males and for both sexes combined, although the percentages were not exactly the same. The low number of female working deaths identified in the ABS precludes useful comparison between their age distribution and that of the larger number of female working deaths identified in the NCIS (Table 4.12).

Table 4.12: Age group and sex for working and commuting deaths: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)
Age Group	n = 103	n = 146	n = 5	n = 17	n = 108	n = 163
15–24	12.6	12.3	20.0	11.8	13.0	12.3
25–34	15.5	19.9	60.0	17.6	17.6	19.6
35–44	22.3	21.2	20.0	23.5	22.2	21.5
45–54	26.2	23.3	..	29.4	25.0	23.9
55–64	13.6	13.7	..	5.9	13.0	12.9
65–74	5.8	6.2	..	..	5.6	5.5
75 plus	3.9	3.4	..	11.8	3.7	4.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Place of occurrence

The place of occurrence was missing for 38% of the ABS-identified work-related deaths. Given the results seen for all injuries (Section 4.1), it is likely that most of the ABS deaths with a missing Place code should be allocated to the 'Street and highway' category, which would make the percentage in that category only slightly

smaller for the ABS deaths than for the NCIS deaths. There were also considerable differences between the two data sets in the percentages of deaths allocated to the Trade and Service Area, Industrial and Construction Area and Farm categories. The reasons for these discrepancies are not clear. As expected, nearly all commuting deaths occurred on public roads.

Table 4.13: Broad place of occurrence for working and commuting deaths; Australia (excluding Queensland), July 2000-June 2001: ABS Deaths Data and NCIS.

	ABS (%)	NCIS (%)			
		Working	Commuting	Uncertain	Total
Place of occurrence	**n = 108**	**n = 134**	**n = 24**	**n = 5**	**n = 163**
Home	1.9	8.2	0.0	0.0	6.7
Residential / correctional facility	0.0	0.7	0.0	0.0	0.6
School, other institution and public administrative area	6.5	3.0	0.0	0.0	2.5
*Hospital or other health service**	n/a	0.7	0.0	0.0	0.6
Sports and athletics area	0.9	0.7	0.0	0.0	0.6
Street and highway	1.9	35.1	95.8	80.0	45.4
Trade and service area	4.6	10.4	0.0	0.0	8.6
Industrial and construction area	27.8	9.7	0.0	0.0	8.0
*Mine or quarry**	n/a	3.7	0.0	0.0	3.1
Farm	6.5	17.2	4.2	0.0	14.7
Other specified places	9.3	7.5	0.0	20.0	6.7
*Recreation area**	n/a	1.5	0.0	0.0	1.2
Unspecified place	2.8	0.7	0.0	0.0	0.6
Missing	38.0	0.7	0.0	0.0	0.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

* The ABS does not have these categories. Instead, each of these three categories is incorporated in the category immediately above it (ie. *Hospital* is in *School, other institution and public administrative area, Mine* is in *Industrial and construction area, and Recreation area* is in *Other specified place*).

n/a not applicable.

Activity at the time of the incident

The ABS deaths were selected on the basis of their Activity codes, and no further information on activity is available, apart from activity information inherent to some External Cause codes (e.g. indicating a truck driver). It is not possible to separately identify commuting deaths from working deaths in the ABS Deaths Data Collection because, although commuting deaths are likely to only be assigned to a limited number of External Cause codes (in the range V01–V59, V70–V82, V87–V89), working deaths can also be allocated these codes. The NCIS Work-related and Activity variables can be combined to separately identify working, commuting and bystander deaths.

Circumstances

As mentioned in other Sections, some general information about the circumstances leading to fatal injuries is available from the External Cause codes for ABS-identified deaths. This provides an easily obtainable, succinct summary of the injury events. However, the information is of limited use for prevention activities because it lacks detail, is focussed on varying facets of the incidents as pre-determined by the ICD-10 coding structure, and lacks flexibility (Table 4.14)

Table 4.14: General circumstances, based on ICD-10 External Cause code, for ABS work-related deaths; Australia (excluding Queensland), July 2000–June 2001, number and per cent

General circumstance[1]	Number	Per cent
Pedestrian	9	8.3
Car / van	10	9.3
Heavy transport vehicle	5	4.6
Animal rider	1	0.9
Industrial vehicle	2	1.9
Agricultural vehicle	6	5.6
All-terrain vehicle	2	1.9
Unspecified vehicle incident	1	0.9
Water transport	5	4.6
Air transport	1	0.9
Falls	11	10.2
Struck by / strike against / caught between	19	17.6
Lifting devices	1	0.9
Hand tools	1	0.9
Agricultural machinery	2	1.9
Other machinery	2	1.9
Other inanimate mechanical forces	3	2.8
Threat to breathing	4	3.7
Contact with electricity	10	9.3
Fire and hot substances	2	1.9
Venomous insects	1	0.9
Accidental poisoning	2	1.9
Assault	8	7.4
Total	**108**	**100.0**

1 Based on ICD External Cause code

In comparison, the NCIS has a considerable amount of detailed information available that can be flexibly combined to suit the research question of interest. External cause codes are not yet included in the NCIS, but the Mechanism variables provide the closest approximation to the External Cause categories used in the ABS. The Mechanism variables can be combined with many other variables such as those

describing other mechanisms, objects, intent, place and cause of death, as well as with information from available text documents. The NCIS also contains information on the occupation and industry of the deceased person at the time the incident occurred, whereas the ABS only contains information on occupation, and not necessarily on the occupation relevant to the incident. Detailed description of the deaths is beyond the scope of this report but, as an example, the Primary Mechanism coded for the work-related deaths identified in the NCIS are shown in Table 4.15

Table 4.15 General circumstances, based on NCIS Primary mechanism code, for NCIS work-related deaths; Australia (excluding Queensland), July 2000–June 2001, NCIS, number and per cent

Primary mechanism	Working n = 134	Commuting n = 24	Working or commuting n = 5	Bystander–workplace n = 8	Bystander–road n = 14	Total n = 185
Contact with blunt object	11.9	0.0	0.0	25.0	0.0	9.7
Vehicle crash	41.0	58.3	20.0	37.5	100.0	47.0
Bodily force	0.0	0.0	0.0	12.5	0.0	0.5
Crushing	7.5	4.2	0.0	0.0	0.0	5.9
Fall	9.0	0.0	0.0	12.5	0.0	7.0
Contact - other	0.7	0.0	0.0	0.0	0.0	0.5
Cutting, etc	3.7	8.3	0.0	0.0	0.0	3.8
Heat or cold	0.7	0.0	0.0	0.0	0.0	0.5
Electric current	5.2	0.0	0.0	0.0	0.0	3.8
Breathing threats	2.2	4.2	0.0	0.0	0.0	2.2
Drowning	2.2	0.0	0.0	0.0	0.0	1.6
Poisoning	1.5	0.0	0.0	12.5	0.0	1.6
Chemical—other	1.5	0.0	0.0	0.0	0.0	1.1
Unspecified	11.9	25.0	80.0	0.0	0.0	14.1
Missing mechanism	0.7	0.0	0.0	0.0	0.0	0.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

4.3.4 Discussion

Reliable information has shown that in the early 1990s, each year in Australia (excluding Queensland) there were about 340 working deaths, 120 commuting deaths and 160 bystander deaths (Driscoll, Mitchell et al. 2001). On the basis of these data, even taking into account some expected decline in the rate of work-related fatal injury, it is clear that the ABS Activity variable greatly underestimates the number of working and commuting deaths. It also provides no information on bystander deaths. The precise extent of the underestimation is not clear. However, some indication is provided by considering External Cause codes that would be expected to be applied only, or mainly, to work-related deaths. Of the ABS deaths assigned one of these External Cause codes as an Underlying Cause of Death, only 31% were identified as being work-related, 15% had a different (non-work) activity code assigned, and 54% did not have an activity code assigned. In keeping with the

finding for all injuries of a very low assignment of activity for motor vehicle incidents, the ABS did not code a specific activity for most deaths of semi-trailer drivers, virtually all of which could be expected to be due to work (Table 4.16).

Table 4.16: Assigned Activity code for External Cause deaths likely to involve working persons, all ABS injury deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data.

		Activity according to ABS code (%)			
External Cause categories	**Number**	**Work**	**Non-work**	**Unspecified**	**Total**
Heavy transport vehicle driver	31	9.7	9.7	80.6	100.0
Bus driver	2	0.0	0.0	100.0	100.0
Industrial vehicle	3	66.7	33.3	0.0	100.0
Agricultural vehicle	13	46.2	15.4	38.5	100.0
Construction vehicle	3	0.0	100.0	0.0	100.0
Helicopter occupant	2	100.0	0.0	0.0	100.0
Scaffolds	1	100.0	0.0	0.0	100.0
Lifting devices	1	100.0	0.0	0.0	100.0
Agricultural machinery	4	50.0	0.0	50.0	100.0
Rupture of pressurised tyre, pipe	1	100.0	0.0	0.0	100.0
Electrical transmission lines	4	50.0	25.0	25.0	100.0
Total	**65**	**30.8**	**15.4**	**53.8**	**100.0**

For NCIS deaths, the Work-related and Activity variables also provide a considerable underestimate of the true number of work-related deaths. However, unlike the ABS, many work-related deaths should be identifiable through the text documents. This is particularly so for workplace deaths and workplace bystander deaths, as information on the basic circumstances of the deaths is likely to indicate the relatedness to work. Deaths of heavy vehicle operators should also be identifiable from the text descriptions and coded variables identifying the vehicles involved in any motor vehicle incident. It is likely that many other work-related deaths in motor vehicle incidents will not be easily identifiable from the text descriptions, because of insufficient detail in the police report and Finding regarding the purpose of the journey and the circumstances of the incident.

The reasons for the underestimation of work-related deaths by the Work-related and Activity variables is not clear. A thorough validation of the coding of these variables is beyond the scope of the current report, but some limited validation provides useful insights.

Twenty-one deaths had an Activity code of 3.9, indicating that the deceased person was either working or commuting at the time, but that there was insufficient information to determine the main reason for the journey. This is not an uncommon occurrence in motor vehicle incidents for which there is limited information. Information on the NCIS web site for the 21 cases was inspected to determine if the cases could be definitively assigned to either working or commuting groups. Of the 21, there was sufficient information to clearly determine that 14 of the persons had been working at the time of the incident and that two had been commuting. For these, most of the working incidents occurred at worksites rather than on roads, and

those that did occur on roads occurred in circumstances that clearly involved work (e.g. bus or semi-trailer drivers killed when their vehicles crashed), so it is not clear why they were not given the correct Activity code initially. The circumstances of death for five cases remained unclear. All these involved motor vehicle incidents on public roads and for which there were no text documents available. The available coded information was very suggestive that one of these persons was neither working nor commuting, and that the Activity code 3.9 might have been mistakenly assigned because the person was a passenger in a car that collided with a train.

Two examples of the application of codes for the Work-related variable are given by considering deaths involving semi-trailers and deaths involving tractors.

Thirty-one deaths of semi-trailer drivers or passengers in motor vehicle incidents were identified using the coded information in the NCIS—25 drivers, four passengers, one person outside the vehicle and one other person. It is reasonable to assume that all the drivers were working at the time of the incident. The Activity of these persons was recorded as working (18), commuting (one) or working and commuting (four) in 23 (92%) of the 25 deaths. In addition, there were 147 deaths of persons where the other vehicle involved was a semi-trailer. Many of these can be expected to have been road-bystander deaths (i.e. motor vehicle incidents in which the working vehicle was at fault), yet only eight (5%) were coded as being work-related deaths of persons who were not working (i.e. as road bystander deaths).

Seventeen deaths involving tractors and attached equipment were identified in the NCIS data (see Section 4.4). On the basis of all the information available in the NCIS, 12 of the deceased persons were deemed to be working, two were bystanders and three were probably not work-related. The NCIS work-related code showed reasonable, but not complete, agreement with this assessment, with three working deaths coded as not working (Table 4.17).

Table 4.17: Work-related status – true status and status as identified by work-related code in NCIS, tractor-related deaths; Australia (excluding Queensland), July 2000–June 2001: NCIS.

	NCIS coded work-related status		
True work-related status	**Work**	**Non-work**	**Total**
Working	9	3	12
Bystander	1	1	2
Not working	1	2	3
Total	**11**	**6**	**17**

However, when the NCIS web site was inspected for further information, which was about three months after the data were originally extracted for the project, it was noted that the cases were now identified as being work-related, even though these cases had been closed in the previous year. Subsequent discussions with MUNCCI personnel revealed that specific data quality checks had been made of potential work-related cases, and those found to be wrongly coded had had their codes corrected. This had occurred after the data extract for the current analysis. Using the new codes, there was complete agreement between the 'true' work-related status of working deaths and the work-related coding of these deaths in the NCIS. However, one bystander death was differently coded. In total, 134 working

deaths were identified in the NCIS using one or more of the Activity code, work-related code and other available information. Of these 134, ten had a Work-related code not indicating work: *Not work-related* (six), *Still enquiring* (two), *Not known* (one) or *Missing* (one). Five of these ten cases with wrong codes were Closed. Of the other cases identified as being work-related, the coding of the work-related variable seemed much better, with all but one of the commuting cases, and all the working/commuting cases and bystander deaths, identified by the work-related variable as being work-related.

These results suggest problems with the application of the Activity and Work-related codes for some work-related cases in the NCIS. The main problems seem to be:

- a significant underestimation of working and commuting deaths due to failure to identify working and commuting deaths as being work-related, partly due to lack of information in the text documents and partly due to oversight;
- a gross underestimation of bystander deaths; and
- failure to code deaths of persons who were clearly working or commuting to the appropriate category.

The recent data quality check by MUNCCI may have partially addressed some of these problems, but it is clear that problems still remain, as shown by the wrong Activity coding of 16 of the 21 cases with an Activity code of 3.9.

As with other analyses, the results suggest a significant under-reporting of injury cases in Western Australia.

4.4 Tractor-related deaths

4.4.1 Rationale for selecting tractor-related deaths

Tractors have long been recognised as the major cause of fatal injury on farms in Australia. The main circumstances that have been identified in fatal incidents arising directly from tractors are tractor rollovers, where the driver or other tractor occupant is struck by the overturning vehicle or otherwise fatally injured as the tractor overturns; and tractor run overs, where a person not on the tractor, or the tractor occupant who has fallen from the tractor, is struck by the moving tractor or attached equipment. A common circumstance indirectly related to tractors has been victims being fatally injured by mechanical equipment powered by a tractor, or by other equipment or materials being carried by a tractor (Franklin, Mitchell et al. 2000; NOHSC 2000).

In recent years, the main preventive programs targeting severe tractor-related injury have focussed on retrofitting rollover protective structures to tractors. Accurate information on tractor deaths is required in order to evaluate the effectiveness of these programs, as well as to monitor all tractor deaths. Ideally, information should be available on whether the tractor was directly or indirectly involved, and the circumstances surrounding the fatal incidents. Unfortunately, tractor-related deaths are not able to be definitively identified in the ABS deaths data, because there is no specific ICD-10 code to indicate if a death is tractor-related, nor in what way the tractor was involved.

4.4.2 Identifying all tractor-related deaths

ABS information

Tractor-related deaths were identified in the ABS Deaths Data as deaths coded to either 'Occupant of special vehicle used mainly in agriculture' (V84) or to 'Contact with agricultural machinery (W30)'. Unfortunately, neither of these categories is specific to tractor-related deaths, as they include deaths due to other agricultural vehicles and machinery. This has the advantage of including deaths related to equipment powered by tractors without the tractors being directly involved, but the disadvantage that deaths NOT related directly or indirectly to tractors may also be included. In addition, some deaths related to tractors might be excluded.

NCIS information

Tractor-related deaths in the NCIS can theoretically be identified using several coded and free text variables, as well as through a search of available text documents. For this analysis, tractor-related deaths were identified using coded variables (Primary, Secondary and Tertiary Object); text variables (Primary, Secondary and Tertiary Object Text; Cause of Death Text; Activity Text); and text documents (Police report and Finding).

The Object coding frame has a specific code to identify tractors (F09), as well as several categories for other types of agricultural equipment (F11: Harvesting machines; F13: Auger; F15: Slasher; F18: Other specified special agricultural vehicle or mobile machinery; and F20: Unspecified special agricultural vehicle or mobile machinery).

The object text variables were searched for the words 'tractor', 'auger', 'slasher', 'post hole' and 'harvest'.

Documents on the NCIS web site were searched for cases with any occurrences of the words 'tractor', 'auger', 'slasher', 'post hole' or 'harvest'. The text documents for the relevant cases were then inspected and the case included or excluded depending on the available information.

4.4.3 Comparison between ABS data and NCIS data

Overall comparison

Eighteen deaths satisfied the ICD-10 selection criteria used for the ABS Deaths Data and seventeen deaths were identified from the NCIS.

Seventeen NCIS cases were initially identified using the coded Object variable, but two (both coded as 'Other specified special agricultural vehicle') of these were excluded. The first involved a four-wheel All-Terrain Vehicle (ATV) rather than a tractor or specific agricultural equipment. All Terrain Vehicles have their own ICD-10 code (V86) and should not be included in either V84 or W30. This case had an incorrect Object code (F18: 'Other specified special agricultural vehicle or mobile machinery'), and should have been coded to 'Special all-terrain/off-road vehicle' (F49). The second case involved an articulated crane that was being used to remove a tree on a private property. It was mainly described in the Finding as a 'crane', but in one place the term 'tractor/crane', was used. However, since the Object had not been coded as a tractor, and the other available information did not suggest that the vehicle/equipment was an agricultural tractor, the case was excluded.

Another case was identified because 'tractor' was mentioned in the 'Object Text' and 'Cause of Death' fields (this case had an object code of 'Other specified transport' (E98)). The final case was identified only from a text search of the NCIS documents, with one or more of the relevant key words present in both the police report and the Finding. This case involved an irrigator towed by a tractor coming into contact with overhead powerlines and had only one Object coded— 'Electrical transmission lines' (R81).

Police descriptions were available for all but one of the deaths, and Findings were available for 11 (64.7%).

The main aspects of the data available from the ABS and the NCIS are compared below, with the term 'tractor-related' used to describe the deaths, even though limitations in the coding mean that some of the deaths identified by the ABS may not have involved tractors.

State and Territory

Compared to the ABS, the NCIS revealed more deaths in Victoria and fewer in New South Wales. A possible explanation for this is that some deaths occurred near the Victorian—New South Wales border, and were investigated in one State but registered in the other. However, this seems unlikely, because all 17 deaths identified in the NCIS were coded as the incident occurring, the person dying and the coronial investigation being carried out, in the same State or Territory. It is more likely that the ABS data included a few cases that did not involve a tractor. Although it is possible that one or two tractor-related cases were not identified in the NCIS because the cases were still Open and relevant information was not accessible, this is less likely because searches of the text documents include the text documents of Open cases, even though these documents are not available for perusal. Therefore, only cases without text documents, or those involving tractors but which do not mention tractors in the text document, would not be identified (Table 4.18).

Table 4.18: State or Territory of registration (for ABS) or investigation (for NCIS) for tractor-related deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
State or Territory[1]	**Deaths**	**Per cent**	**Deaths**	**Per cent**
New South Wales	5	27.8	4	23.5
Victoria	6	33.3	8	47.1
South Australia	2	11.1	2	11.8
Western Australia	2	11.1	..	..
Tasmania	2	11.1	2	11.8
Northern Territory	1	5.6	1	5.9
Total	**18**	**100.0**	**17**	**100.0**

1 There were no recorded deaths in the Australian Capital Territory

Age and sex

The age and sex was similar between the ABS and NCIS data sets, although the numbers were not exactly the same in each age-sex group (Table 4.19).

Table 4.19: Age group and sex for tractor-related deaths: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
Age Group	ABS	NCIS	ABS	NCIS	ABS	NCIS
0–4	..	..	..	1	..	1
5–14	..	..	1	1	1	1
15–24	2	2	..	..	2	2
25–34	2	1	..	..	2	1
35–44	..	..	1	1	1	1
45–54	3	2	..	..	3	2
55–64	2	2	..	..	2	2
65–74	5	4	..	..	5	4
75 plus	2	3	..	..	2	3
Total	**16**	**14**	**2**	**3**	**18**	**17**

Place of occurrence

There was very little information on place of occurrence in the ABS data, with only four of the 18 deaths having a specified place of occurrence, all of which occurred on a farm. In contrast, the NCIS had good information on place of occurrence, with specific coded information available for 16 of the 17 deaths. The NCIS information indicates that the vast majority of tractor and agricultural machinery deaths occurred on farms, information that is not obtainable from the ABS data unless the Place variable is comprehensively completed (Table 4.20).

Table 4.20: Place of occurrence for tractor-related deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
Place of occurrence[1]	Deaths	Per cent	Deaths	Per cent
Farm house	..	..	2	11.8
Public road	..	..	2	11.8
Farm	4	22.2	12	70.6
Other specified place	..	..	1	5.9
Unspecified place	1	5.6	..	..
Missing	13	72.2	..	..
Total	**18**	**100.0**	**17**	**100.0**

1 The NCIS is able to provide an extra level of specificity for each major category. For example, the 12 farm cases can be subdivided into 'Farm', 'Timber plantation' or 'other or unspecified'.

Activity at the time of the incident

Information on the general activity of the fatally injured person was available for 11 of the 18 ABS-identified deaths and 16 of the 17 NCIS-identified deaths. Both data

sets identified a similar proportion of incidents that occurred while the person was working for income, and the same number of incidents occurring while the person was engaged in some other form of work (Table 4.21).

Table 4.21: Activity for tractor-related deaths; Australia (excluding Queensland), July 2000-June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
Activity[1]	Deaths	Per cent	Deaths	Per cent
While engaged in leisure activity	..	..	1	5.9
While working for income	8	44.4	9	52.9
While engaged in other types of work	3	16.7	3	17.7
During other specified activity	..	..	3	17.7
During unspecified activity	7	38.9	1	5.9
Total	**18**	**100.0**	**17**	**100.0**

1: The NCIS is able to provide an extra level of specificity for each major category. For example, the nine working for income cases can be allocated to 'Working, including travelling for work', 'Commuting: travelling to or from such work' or 'Working or commuting, unspecified'. In this instance, all were coded as 'Working'.

Circumstances

Type of agricultural equipment

The ABS information does not distinguish well between the type of agricultural equipment involved. Specific equipment types can be identified in ICD-10-AM at the fourth and fifth digit level of W30, with W30.0 identifying grain augers, W30.1 identifying harvesters and W30.2 identifying equipment towed or powered by a tractor. However, there is no code that is specific to even a subset of deaths directly related to tractors, though this omission could be corrected in a future edition of ICD-10-AM. More fundamentally, as noted above, the ABS Deaths Data is coded according to ICD-10, not ICD-10-AM, which means that these specific equipment types can not be identified in that data set. Of the 18 deaths in the ABS data, 14 were coded as 'Occupant of special vehicle used mainly in agriculture' (V84), nine of which were identified as 'Driver of special agricultural vehicle injured in non-traffic accident' (V84.5). The other four were coded to 'Contact with agricultural machinery' (W30), without any information on the specific type of agricultural machinery.

The NCIS in theory provides greater detail in terms of the type of equipment, with the major advantage being that it has a category specific to tractors. However, in this instance, the NCIS also had an advantage because it specifies the type of non-tractor agricultural equipment, which the ICD-10 codes do not allow the ABS data to do, (but this could be done if coding was based on ICD-10-AM). Further information on the type of equipment is available from the text descriptions in the NCIS.

The NCIS information suggests that about two thirds of the agricultural machinery deaths were directly due to the involvement of tractors. The ABS Deaths Data coding for the similar group of deaths suggests that most deaths directly related to tractors are coded to V84, and specifically to V84.5 (Table 4.22).

Table 4.22: Type of equipment for tractor-related deaths: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
Equipment	**Deaths**	**Per cent**	**Deaths**	**Per cent**
Tractor	..	..	12	70.6
Auger (powered by tractor)	..	..	2	11.8
Slasher (powered by tractor)	..	..	1	5.9
Other specified[1]	..	..	2	11.8
Not specified	18	100.0	..	..
Total	**18**	**100.0**	**17**	**100.0**

1 The incidents involved a potato-box tipper attached to the front of a tractor, and an irrigator being towed behind a tractor.

The ABS does not provide any explicit information on the circumstances of any of the tractor-related deaths. In contrast, some contextual information was available from the NCIS for all 17 deaths, and good information for most. Although detailed consideration of the information is beyond the scope of the current analysis, an example of the information available is that the descriptions indicated that 12 of the deaths involved the deceased being struck by a tractor — 11 were operating the tractor at the time and were fatally injured due to a rollover (six); run over by the tractor after falling off the tractor (two); run over by attached equipment after falling off the tractor (one); or run over while standing near the tractor trying to get back on it (two). The twelfth person was a toddler run over by a tractor. The other five deaths involved attached equipment —caught in powered equipment (a slasher and a potato box tipper) whilst doing maintenance (two); caught in an operating auger (one); a child run over by a slasher towed by a tractor (one); and a worker electrocuted when an irrigator towed by a tractor came into contact with overhead powerlines (one). Available documentation on all of the six deaths involving tractor rollovers explicitly mentioned rollover protective devices as being present (in two) or absent (in four), although the presence or absence of seat belts was not mentioned for any of them.

4.4.4 Discussion

All (or nearly all) deaths related to tractors and equipment powered and/or attached to tractors appear to be included and identifiable in the NCIS. Given that the all-injury analysis strongly suggested an under-reporting of Western Australian cases to the NCIS, the two Western Australian cases identified in the ABS may be true tractor-related cases that have not yet been included in the NCIS. Alternatively, they may not have involved tractors or attached equipment, and only been included because of the lack of specificity of the ICD-10 codes used for the ABS deaths.

Detailed information is available on nearly all of the tractor-related deaths, and coded variables can be used to identify most, but not all, of them. The ABS Deaths Data Collection appears to identify most deaths related to tractors and attached equipment, but not to separately identify tractors or other equipment involved, nor to provide any detail regarding the circumstances of the deaths. Useful additional specification of this type of case would be provided by the ABS data if cases were

coded according to the more detailed external causes available in ICD-10-AM (i.e. the additional character provided for coding W30).

4.5 Drowning deaths

4.5.1 Rationale for selecting drowning deaths

Drowning is an important cause of injury death in Australia (Driscoll, Harrison et al. 2003). Drowning and near-drowning is one of the priority topics under the National Injury Prevention Plan 2001–2003 (Department of Health and Aged Care, 2000). Drowning deaths should be identifiable in the ABS Deaths Data Collection using ICD-10 codes and the drowning flag variable[14]. However, these variables are unlikely to provide the level of detail regarding the circumstances of death that the NCIS potentially can. For example, a recent analysis of NCIS data provided new information on the extent of involvement of alcohol in drowning. Conversely, the ease and completeness with which deaths due to drowning can be identified in the NCIS is not well known, and comparison with the ABS Deaths Data provides a way to assess of the extent of any under-recognition.

4.5.2 Identifying drowning deaths

ABS information

All deaths that satisfied at least one of the following criteria were accepted as drowning deaths in the ABS data set:

- deaths for which the UCoD field, or any MCoD field, contained any ICD-10 External Cause code which implies drowning (i.e.V90, V92, W65–W74, X71, X92, or Y21);
- deaths for which any MCOD field contained ICD-10 code T75.1 ('drowning and non-fatal submersion'); and
- deaths for which the 'Drowning' flag was set.

NCIS information

Drowning deaths were identified through any of the Mechanism, Cause of Death, Object or Location fields. The Mechanism coding frame has a specific category covering drowning (*J2: Drowning and immersion*). The Cause of Death text fields were searched for the text strings 'DROWN' (in words such as 'drowning' or 'drowned') and 'IMMERS' (primarily in the word 'immersion'). The Object, Location and Activity fields were also searched.

Therefore, for this analysis, drowning deaths in the NCIS were defined as cases that:

- had a Mechanism = '*J2: Drowning and immersion*'; and/or

[14] The 'drowning flag' is a supplementary item and classification included in the ABS Deaths Data Collection, which is used for all deaths recognised as involving drowning. Values of the item code circumstances of drowning.

- had a Cause of Death text field indicating drowning as the cause of death; and/or
- had other information that identified them as being due to drowning.

4.5.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, 303 drowning deaths were identified, compared with 287 (95% of the ABS total) identified in the NCIS.

State and Territory

The State and Territory distribution of drowning deaths was very similar for the ABS and NCIS, apart from Western Australia (Table 4.23).

Table 4.23: Drowning deaths identified in the ABS and the NCIS by State or Territory of registration (for ABS) or investigation (for NCIS); Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS		NCIS / ABS[1]
State or Territory	**Deaths**	**Per cent**	**Deaths**	**Per cent**	**Per cent**
New South Wales	154	50.8	143	49.8	92.9
Victoria	67	22.1	72	25.1	107.5
South Australia	19	6.3	21	7.3	110.5
Western Australia	37	12.2	22	7.7	59.5
Tasmania	16	5.3	18	6.3	112.5
Northern Territory	7	2.3	8	2.8	114.3
Australian Capital Territory	3	1.0	3	1.0	100.0
Total	**303**	**100.0**	**287**	**100**	**94.7**

1 The number of injury deaths in the NCIS divided by the number of injury deaths in the ABS.

Age and sex

The age and sex distribution was very similar between the ABS and NCIS drowning deaths, although the percentages were not exactly the same (Table 4.24). Seventy-six per cent of ABS drowning deaths were of males, compared with 78% of NCIS drowning deaths.

Table 4.24: Age group and sex for drowning deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)[1]
Age Group	n = 231	n = 224	n = 72	n = 62	n = 303	n = 287
0–4	7.8	7.6	11.1	9.7	8.6	8.0
5–14	3.5	3.1	1.4	1.6	3.0	2.8
15–24	12.6	11.6	13.9	12.9	12.9	11.8
25–34	16.9	18.8	8.3	8.1	14.9	16.4
35–44	15.6	17.0	11.1	9.7	14.5	15.3
45–54	16.0	17.0	19.4	21.0	16.8	17.8
55–64	12.6	8.0	15.3	14.5	13.2	9.4
65–74	8.2	8.9	5.6	9.7	7.6	9.1
75 plus	6.9	8.0	13.9	12.9	8.6	9.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

1 One death had unknown age.

Place of occurrence

Unlike most other types of injury death, the ABS had good coverage of the Place of occurrence for drowning deaths, with 90% of deaths having a specified place coded. However, two thirds of these were in the 'Other specified' category, providing little useful information on the Place.

The specific category percentages were similar for the NCIS deaths, except that most of the deaths with missing place information in the ABS appear to have been coded to the 'Other specified' category for the NCIS deaths. The NCIS provides another level of detail of coded information for Place. For example, most of the deaths in the 'Other specified' category occurred in an inland body of water (29.2% of all deaths) or at the beach or ocean (35.5% of all deaths) (Table 4.25).

Further information is available from the drowning Flag used in the ABS Deaths Data Collection, and even more detail is available from inspection of the NCIS text documents (which are only available for Closed cases). This is considered later in this Section for the NCIS.

Table 4.25: Broad place of occurrence for drowning deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

Place of occurrence	ABS (%) n = 303	NCIS (%) n = 287
Home	17.8	17.1
Residential / correctional facility	..	..
School, other institution and public administrative area	2.0	0.4
*Hospital or other health service**	*n/a*	..
Sports and athletics area	2.0	2.1
Street and highway	2.3	3.1
Trade and service area	0.3	0.4
Industrial and construction area	..	..
*Mine or quarry**	*n/a*	..
Farm	2.0	2.1
Other specified places	58.1	67.3
*Recreation area**	*n/a*	*5.9*
Unspecified place	5.9	
Missing	10.6	1.7
Total	**100.0**	**100.0**

* The ABS does not have these categories. Instead, each of these three categories is incorporated in the category immediately above it (i.e. *Hospital* is in *School, other institution and public administrative area, Mine* is in *Industrial and construction area, and Recreation area* is in *Other specified place*).

n/a not applicable.

Activity at the time of the incident

Information on the general activity of the fatally injured person was available for only 57% of the ABS drowning deaths, and 89% of the NCIS drowning deaths. The large proportion of ABS deaths with non-specific activity information makes comparison between the two data sets difficult (Table 4.26). The NCIS provides an extra level of detail on Activity, but for specific circumstances such as drowning, the coding frame is probably still too generic to be of great use. However, as for Place of occurrence, much more useful information on Activity is available from the text documents. This is described later in this Section.

Table 4.26: Activity for drowning deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

Activity[1]	ABS (%) n = 303	NCIS (%) n = 287
While engaged in sports activity	15.2	29.6
While engaged in leisure activity	16.8	23.0
While working for income	1.3	2.4
While engaged in other types of work	2.3	2.8
While resting, sleeping, eating or engaged in other vital activity	3.6	4.9
While being nursed / care for	..	1.1
While engaged in educational activities	..	..
While engaged in other specified activities	18.8	25.4
During unspecified activity	41.9	8.7
Missing	0.7	2.1
Total	**100.0**	**100.0**

1 The NCIS is able to provide an extra level of specificity for each major activity category, which the ABS does not.

Circumstances

A detailed consideration of the drowning deaths is beyond the scope of the current analysis, but an example of the level of information available from the NCIS is provided by a recent report that analyses NCIS information on all drowning deaths from the same period covered here (Driscoll, Harrison et al. 2003). This analysis was based on NCIS data extracted about six months earlier than for the current analysis, at which stage a lower proportion of cases was Closed—60% of cases were Closed, compared to the 83% Closed in the data used for the current analysis. Examples from that report include information on the general circumstances, the location and the type of recreational activity involved.

The main circumstance types involved in the drowning cases were recreational aquatic activity (45%), incidentally contacting water while undertaking a non-water activity (such as walking nearby and falling in—26%) and intentional self-injury (16%). Four of the recreational activity incidents involved the drowning death of a person attempting to rescue a family member from the water. Five of the 'incidental' incidents involved persons cleaning or doing other maintenance in or near a pool area (but not in the pool itself) who fell into the pool and drowned.

Half of the drowning deaths that occurred during recreational aquatic activity involved persons swimming. Fishing accounted for another quarter (evenly spread between rock fishing and other fishing), while surfing, boating and scuba accounted for much smaller proportions.

The drownings occurred in a variety of places: at or near a beach (26%), rocky foreshore (6%) or open water (6%); rivers and creeks (19%); and private swimming pools (11%) were the most common (Table 4.27).

Table 4.27: Specific location of incident for drowning deaths; Australia (excluding Queensland), July 2000-June 2001: NCIS. Per cent (n = 287)

Location	Per cent
Beach	26
Ocean—rocks	6
Open water	6
Jetty—salt water	4
River	19
Lake / reservoir	8
Jetty—fresh water	1
Pool—private	11
Pool—public	2
Farm dam	4
Bath	6
Spa	2
Other / not known	3
Total	**100**

As a comparison, some more detailed information is available in coded form from the ABS by using the External Cause codes and the drowning Flag. The External Cause codes combine several concepts, including two or more of the type of watercraft incident (if any), watercraft involved (if any), whether or not entry into the water followed a fall, type of body of water and intent. The drowning Flag is a semi-hierarchical variable that categorises most drowning deaths by the general circumstances of the incident. However, some of the categories appear to cover at least two concepts (place and circumstance), and sometimes a third (type of watercraft). In addition, about one third of the 303 ABS drowning deaths were classified as 'Incidental' or 'Other specified'. These factors limit the usefulness of the classification. There is significant overlap between the External Cause codes and the drowning Flag categories, with the major difference being extra detail in the Flag categories and their lack of focus on intent. The NCIS drowning cases could be categorised into either of these coding frames, but this would involve a combination of several coded variables, and sometimes the use of text variables.

4.5.4 Discussion

Both the ABS and the NCIS seem to identify all drowning deaths, with differences between the two probably due primarily to some drowning deaths in NCIS not being identifiable while they are still Open. About 16% of NCIS drowning deaths did not have a Mechanism indicating drowning (most of these were still Open and had missing Mechanisms), and were initially identified from the Cause of Death text variables (all but two) or the Object variables. This is not straightforward and relies on the appropriate words being in the description of the cause of death.

The lower coverage by the NCIS of drowning deaths for Western Australia was similar to that found in the other specific analyses.

The ABS now provides a moderate amount of information on the circumstances of drowning deaths through the use of the External Cause code and the drowning Flag. In comparison, the structure of the NCIS provides a lot more flexibility, because generally each variable only covers a single concept and much more information is available.

An improvement in the NCIS that would assist persons interested in analysing information about drowning deaths is to decrease the time taken to close cases, as it is difficult to confidently identify drowning deaths which do not have information for both Mechanism and Cause of Death, and the detailed information that is mainly from the text variables is not available for Open cases.

4.6 Deaths due to invenomation

4.6.1 Rationale for deaths due to invenomation

Injury cases are diverse, and many specific types of fatal case occur infrequently. Nevertheless, such types may be of interest for analysis for a range of reasons. Deaths due to invenomation were chosen as an example because the events following the invenomation are of particular importance, due to the potential for medical intervention to prevent the invenomation resulting in death. Other matters of interest include the nature of the invenomating organisms, the circumstances of invenomation, and characteristics of the invenomated person.

Deaths due to invenomation should be identifiable in the ABS Deaths Data Collection using the relevant External Cause codes. However, this information provides little understanding of the circumstances leading up to the invenomation and the events following it. The NCIS can potentially provide this detailed information.

4.6.2 Identifying deaths due to invenomation

ABS information

Deaths due to invenomation were identified in the ABS Deaths Data as deaths with an Underlying Cause of Death Code identifying contact with venomous animals and plants (ICD-10 External Cause codes X20–X29).

NCIS information

Several approaches can be used to identify deaths due to invenomation in the NCIS. Mechanism and Object variables have coded information that can be used. The Mechanism coding frame has a specific category (C6: Invenomation (sic)) to cover invenomation, and the Object coding frame has several specific categories identifying venomous plants or animals[15]. In addition, text documents can be searched, although these are only available for Closed cases.

For this analysis, deaths due to invenomation were defined as cases that had a:

- Mechanism code of '*C6: Invenomation*' or an Object code identifying a venomous plant or animal; and/or
- Text document indicating that invenomation was the main cause of the fatal incident.

Documents on the NCIS web site were searched for cases with any occurrences of the words 'bee', 'wasp" hornet', 'ant', 'spider', 'scorpion', 'tick', 'centipede', 'millipede', 'snake', 'jellyfish', 'jelly fish', 'coral', or 'venom'. The text documents for the relevant cases were then inspected and the case included or excluded depending on the available information.

All five of the cases that satisfied these criteria were Closed.

4.6.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, seven invenomation deaths were identified, compared to five in the NCIS for the same period.

State and Territory

The ABS deaths occurred in New South Wales (two), Victoria (two), South Australia (two) and Tasmania (one). The five NCIS deaths occurred in New South Wales (two), Victoria (two) and South Australia (one).

[15] K17: venomous plant; K30: bee; K31: wasp; K32: hornet; K33: ant; K34: spider; K35: scorpion; K36: tick; K37: centipede, millipede; K38: other specified arthropod; K53: sea snake; K56: jellyfish; K57: coral; K58: Other specified marine animal nec; K61: snake; K95: other specified venomous animal nec; K96: unspecified venomous animal nec.

Age and sex

The ABS deaths were five males (two aged 25–34 years, and three aged 35–54 years) and two females (one aged 0–4 years and one aged 65–74 years). The NCIS deaths were three males (aged 25, 26 and 54 years) and two females (aged 18 months and 70 years).

Place of occurrence

The place information was not very informative for either data source. Place was unspecified for five of the seven ABS deaths, with the other two occurring on a street or highway, and at an other specified place. For the NCIS deaths, three occurred at home, one on a road and one in an undeveloped area.

Activity at the time of the incident

The activity information was also not very informative for either data source. Activity was unspecified for six of the seven ABS deaths, with the other occurring during work activity. The NCIS deaths occurred during informal recreation activity, commuting to or from work, while resting, while being cared for, and during unknown activity.

Circumstances

The ABS External Cause codes provide information regarding the general circumstance of the invenomation deaths. These codes identified the invenomation occurrences as being due to contact with venomous snakes (two), contact with venomous spiders (two) and contact with hornets, wasps and bees (three).

Of the five NCIS-identified invenomation deaths, police reports were available for all five, Findings and toxicology reports for two, and an autopsy report for another two. As for the topics covered in other Sections, a detailed summary of invenomation deaths is beyond the scope of the current analysis. However, the small number of cases allows a brief coverage of the circumstances and issues involved.

Two deaths involved snake bites, and both had some uncertainty regarding the circumstances. One death was of a mountain cyclist on a long country ride, who appeared to have been bitten several times by snakes, but to have also had dehydration and hyperthermia, and the relative contribution of the two external causes was uncertain. The other case involved a toddler who developed a non-specific illness for several days and then became rapidly unwell, had two puncture marks on her skin suggestive of a snake bite and a test on the urine which indicated brown snake venom, but who did not respond to brown snake anti-venom, tested negative for snake bite at autopsy, and for whom a snake bite was thought unlikely by her parents.

One death involved an anaphylactic reaction to a bee sting sustained while riding a motor cycle. Another involved an anaphylactic reaction ascribed to the bite of a white-tailed spider, apparently the second such bite in a short period. The final death was due to an anaphylactic reaction to a tick, the reaction occurring immediately after the tick was removed from the skin.

4.6.4 Discussion

The differences between the ABS and the NCIS in identifying deaths from invenomation are probably due to the fact that two of the ABS-identified deaths were still Open in the NCIS, and so not identifiable as invenomation deaths because the Mechanism and Object codes were not completed, and the text documents were not available. The death resulting from a tick appears to be included in the ABS deaths (based on the age and sex), but not to have been assigned the correct External Cause code (X25 and not X23, appears to be the correct code).

The NCIS provides considerably more detail than the ABS on the circumstances leading up to and following the invenomation.

Similar to other deaths, until all cases for a period of interest are Closed, the NCIS is likely to provide an underestimate of the number of invenomation deaths. The major advantage of the NCIS is that it provides detailed information on the circumstances surrounding the fatal event. The major disadvantage is the difficulty in identifying invenomation deaths until the cases are Closed.

4.7 Fall-related deaths in the elderly

4.7.1 Rationale for selecting fall-related deaths in the elderly

Falls in the elderly is included as one of the priority areas under the National Injury Prevention Plan on the grounds of strong burden of injury evidence, and a demonstrated high cost to the health system (Department of Health and Aged Care, 2001). One of the strategies under this plan is to 'ensure that statistical systems are adequate to provide necessary epidemiology data on falls prevention in older people and that good use is made of this data'. The current ABS Deaths Data, which is based on the ICD-10 coding scheme, do not provide the level of detail necessary to support the development of intervention programs. In addition, currently the extent fractures contribute to fatal outcomes in elderly people who have experienced a fall is unclear. This is a reflection of administrative guidelines in which few queries into the external cause of death are made where the deceased person is old, particularly if the person is aged 75 years or older (Harrison and Steenkamp 2002). It has been suggested that deaths in the elderly that have been coded to external cause code X59 (Exposure to unspecified factor) in conjunction with any type of facture may predominantly be due to some kind of fall (Cripps, Steenkamp et al. 2002). However, evidence for this link can not be ascertained from the current ABS Deaths Data Collection. It is hoped that the additional information provided by the NCIS may provide some evidence on this matter.

One obvious drawback of the NCIS for this topic is that it is unable to provide any information on deaths that are certified by a medical practitioner, which account for approximately 75% of all fall-related deaths in the elderly (NCIS, In Press). Despite this, the NCIS may be able to provide more detailed information on Coroner-registered deaths and may also be useful in identifying new or emerging problems in regard to fall-related deaths in the elderly.

4.7.2 Identifying all fall-related deaths in the elderly

ABS information

Deaths that satisfied the following criteria in the ABS Deaths Data Collection were selected for inclusion within this topic area:

- Occurred in adults aged 65 and over.
- Had any of the External Cause codes listed in Table 4.28 in the Underlying Cause of Death Field or in any of the Multiple Cause of Death fields.
- Had the ICD-10 external cause code X59 (Exposure to unspecified factor) in the Underlying Cause of Death field and any Multiple Cause of Death field in conjunction with at least one of the following injury codes: SO2, S12, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, T14.2 (i.e. 'fractures').

Table 4.28: ICD-10 External cause codes and description relating to falls.

Code	Description
W00–W19	Falls
V80.0	Fall from animal or animal-drawn vehicle (non-collision)
X80	Intentional self-harm by jumping from a high place
Y01	Assault by pushing from a high place
Y30	Falling, jumping or pushed from a high place, undetermined intent

NCIS information

Fall-related deaths in the elderly in the NCIS were identified using several approaches—Mechanism code; Cause of Death text; and the police investigation, autopsy and Finding documents.

The Mechanism coding frame has a specific code to identify falls: (A4) Falling, stumbling, jumping. This coded variable has three levels (Primary, Secondary and Tertiary), allowing fatal incidents involving more than one mechanism to have up to three mechanisms identified.

The Cause of Death text was searched for any words containing 'fall' and 'fell'.

Documents (i.e. Autopsy reports, Police investigation reports and Finding reports) on the NCIS web site were searched for cases with any occurrences of words containing 'fall' or 'fell' in combination with terms such as 'head injury' or 'neck injury' or 'chest injury' or 'multiple injuries' or 'fracture'.

Deaths for which Cause of Death or text documents indicated that a fall had directly, or indirectly, led to the death were regarded as fall-related for the purposes of this analysis.

4.7.3 Comparison between ABS data and NCIS data

Overall comparison

232 deaths satisfied the ICD-10 selection criteria used for the ABS Deaths Data. Of these, 176 had an Underlying Cause of Death as outlined in Table 4.7.1, whilst the remaining 56 were allocated a X59 code in the Underlying Cause of Death field in conjunction with a fracture code in one of the Multiple Cause of Death fields.

261 deaths were identified from the NCIS. 168 (64.4%) of these deaths were drawn from the initial data extraction set on the basis of having been allocated a fall-related coded mechanism variable. A further 85 deaths were identified on the NCIS web site using a boolean search of NCIS text documents, with 36 of these having a Mechanism coded as fall, three having other Mechanism codes and 46 having no Mechanism code at all. The remaining eight deaths were identified by the appearance of the word 'fall' in one of the Cause of Death fields with one of these having a mechanism coded as fall and seven having no mechanism code at all (Table 4.29). Of the 261 deaths, only five remained Open (Table 4.30).

Of the 168 cases drawn from the initial data extraction set, 145 (86.3%) had a fall identifiable in at least one of the NCIS text documents. Also, 152 (90.5%) of these 168 cases were allocated to an *External Cause* case type at closure with the remainder allocated to a *Natural Cause* case type. In contrast only nine (10.6%) of the 85 cases identified by the NCIS text search were allocated to an *External Cause* case type with all but one of the remaining cases being allocated to a *Natural Cause* case type. Similarly, six (75%) of the cases identified by the Cause of Death search were allocated to a *Natural Cause* case type (Table 4.7.2). Of the total 261 cases identified, only 45 (17.2%) had a fall identifiable in one of the Cause of Death fields. The main aspects of the data from the two data sources are compared below.

Table 4.29: Method of identification and Case Type at Closure for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: NCIS.

	Case Type at Closure				
Identification method	**External cause**	**Natural cause**	**Unlikely to be known**	**Null**	**Total**
Initial data extraction	152	16	..	..	168
NCIS text search	9	75	1	..	85
Cause of death search	1	6	..	1	8
Total cases	**162**	**97**	**1**	**1**	**261**

Table 4.30: Status of cases by Mechanism for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: NCIS.

Mechanism	**Open**	**Closed**	**Total**	**Per Cent**
Fall	2	200	202	77.4
Other	..	3	3	1.1
None	3	53	56	21.5
Total cases	**5**	**256**	**261**	**100**

State and Territory

As described above, more cases satisfying study criteria for "fall-related deaths in the elderly" were found in the NCIS than in the ABS data. This was so whether or not we included cases from the ABS collection which have X59 as the Underlying Cause code, in conjunction with a code indicating the presence of a fracture ('X59/fracture' cases). This overall pattern was also evident for cases registered in NSW, Victoria and Tasmania (Table 4.31). However, for Western Australia , the ACT and the Northern Territory, fewer cases of this type were found in the NCIS than the ABS collection, whether or not X59/fracture cases were included. In South Australia, the number of NCIS cases was larger than the number of ABS cases, unless X59/fracture cases are included.

Table 4.31: State or Territory of registration (for ABS) or investigation (for NCIS) for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS (with X59)		ABS (w/o X59)		NCIS	
State or Territory	**Deaths**	**Per cent**	**Deaths**	**Per cent**	**Deaths**	**Per cent**
New South Wales	110	47.4	86	48.9	148	56.7
Victoria	68	29.3	56	31.8	81	31.0
South Australia	25	10.8	9	5.1	13	5.0
Western Australia	13	5.6	11	6.3	6	2.3
Tasmania	5	2.2	5	2.8	7	2.7
Northern Territory	1	0.4	1	0.6	..	..
Aust Capital Territory	10	4.3	8	4.5	6	2.3
Total	**232**	**100.0**	**176**	**100.0**	**261**	**100.0**

Table 4.32: Comparison of NCIS deaths to ABS deaths both with and without X59 cases for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001.

	NCIS/ABS (with X59)	NCIS/ABS (w/o X59)
State or Territory	**Per cent**	**Per cent**
New South Wales	134.5	172.1
Victoria	119.1	144.6
South Australia	52.0	144.4
Western Australia	46.2	54.6
Tasmania	140.0	140.0
Northern Territory	..	..
Australian Capital Territory	60.0	75.0
Total	**112.5**	**148.3**

Age and sex

The age and sex distributions were similar between the ABS and NCIS data sets, although the numbers were not exactly the same in each age-sex group. The largest absolute difference in case numbers was found in the 75+ age group, but proportionate differences did not vary substantially with age (Table 4.33).

Table 4.33: Age group and sex for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data (X59 included) and NCIS.

	Sex					
	Male		Female		Total	
Age Group	ABS	NCIS	ABS	NCIS	ABS	NCIS
65–69	16	13	5	8	21	21
70–74	20	25	9	9	29	34
75+	84	96	98	110	182	206
Total	**120**	**134**	**112**	**127**	**232**	**261**

Place of occurrence

The NCIS provided better information than the ABS on the place of occurrence. The 'place of occurrence' indicates the location at which the incident took place and does not necessarily indicate the location at which death occurred. Of the ABS deaths, 101 (43.5%) were classified as 'Unspecified' . In contrast, the NCIS had specific coded information for all but nine deaths with only one of these being coded as 'Unspecified' (Table 4.34). In addition, the NCIS is able to provide an extra level of specificity for each major category. For example, the 101 incidents that occurred at home can be subdivided into a number of sub categories (Table 4.35).

Table 4.34: Status by place of occurrence for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data (X59 included) and NCIS.

	ABS		NCIS	
Place of occurrence	**Deaths**	**Per cent**	**Deaths**	**Per cent**
Home	53	22.8	101	38.7
Residential/correctional facility	32	13.8	39	14.9
School, other institution or public admin. Area	27	11.6	52	19.9
*Hospital**	n/a	n/a	41	15.7
Sports or athletics area	2	0.9	..	..
Street and Highway	4	1.7	8	3.1
Trade or service area	4	1.7	4	1.5
Industrial and construction area	1	0.4	1	0.4
Farm	1	0.4	4	1.4
Other specified place	6	2.6	5	1.9
*Recreation area**	n/a	n/a	4	1.6
Unspecified place	101	43.5	2	0.8
Missing	1	0.4	-	-
Total	**232**	**100.0**	**261**	**100.0**

* The ABS does not have these categories. Instead, each of these categories is incorporated in the category immediately above it (i.e. *Hospital* is in *School, other institution and public administrative area, and Recreation area* is in *Other specified place*).

n/a not applicable.

Table 4.35: NCIS location code for injuries at home and subcategories for fall-related deaths in the elderly; Australia(excluding Queensland), July 2000–June 2001.

Code	Type of place	Injuries	Per cent
1	**Home**		
11	Farm-house	..	..
12	Free-standing house	71	70.3
13	Flat, apartment, terrace house	28	27.7
14	Boarding house, hostel, private hotel	..	..
15	Caravan, mobile home (residential)	1	1.0
19	Other or unspecified	1	1.0

Activity at the time of the incident

Information on the type of activity of the person at the time of injury was only available for 42 (18.1%) of the 232 ABS-identified deaths with 17 of these being classified as 'other specified activity'. In contrast, 231 (88.5%) of the NCIS-identified deaths had specific coded information, although 29 (11.1%) of these were coded as 'other specified activity' (Table 4.36). In addition, the NCIS is able to provide an extra level of specificity for each major category. For example, the 42 deaths that

occurred during resting, eating, sleeping etc. can be subdivided into a number of subcategories (Table 4.37).

Table 4.36 : Status by activity for fall-related deaths in the elderly: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data (X59 included) and NCIS.

	ABS		NCIS	
Activity	**Deaths**	**Per cent**	**Deaths**	**Per cent**
Sports and active recreation activity	..	..	2	0.8
Leisure activity	7	3.0	26	10.0
Working for income	2	0.9	2	0.8
Engaged in other types of work	10	4.3	27	10.3
Resting, sleeping, eating or other personal activity	16	6.9	42	16.1
Being nursed or cared for*	n/a	n/a	102	39.1
Engaged in formal education*	n/a	n/a	1	0.4
Other specified activity	17	7.3	29	11.1
Unspecified activity	180	77.6	29	11.1
Missing	..	..	1	0.4
Total	**232**	**100.0**	**261**	**100.0**

* These categories are only available in the NCIS

Table 4.37: NCIS activity code for injuries occurring during resting, eating, sleeping, other personal activity and subcategories

Code	Type of place	Injuries	Per cent
5	**Resting, sleeping, eating, other personal activity**		
5.1	Resting, sleeping	10	23.8
5.2	Eating, drinking	..	..
5.3	Washing oneself, such as showering etc	7	16.7
5.8	Other specified personal activity	8	19.0
5.9	Unspecified personal activity	12	40.0

Number and type of fractures

Of the 232 ABS-identified deaths, 111 (47.8%) included some form of fracture with hip fractures accounting for 55% of all fractures. This was similar to the NCIS in which 157 (59.9%) of the 262 deaths recorded some form of fracture with 48.4% of these being hip fractures (Table 4.38). Of the 121 ABS-identified deaths that did not involve a fracture, 91 (75.2%) were associated with some form of head injury compared to the NCIS in which 75 (71.4%) of the 105 deaths not involving a fracture were associated with some form of head injury.

Table 4.38: Number and type of fracture: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data (X59 included) and NCIS.

Fracture	ABS[1]	Per Cent	NCIS	Per Cent
Hip	61	55.0	76	48.4
Skull	12	10.8	34	21.7
Neck	8	6.3	7	4.5
Spine/pelvis	13	12.6	24	15.3
Ribs/sternum	11	8.1	11	7.0
Other	6	4.5	5	3.2
Total cases	**111**	**100**	**157**	**100**

1 These numbers represent the major fracture for each of these cases. In all there were 126 occurrences of fractures for the 111 cases.

Circumstances

The ABS is only able to provide a limited amount of information about the circumstances of death. Of the 232 deaths, 224 (96.6%) appeared to be accidental, with 111 (47.8%) of these deaths involving a fracture. Eight deaths were due to suicide, whilst none of the deaths were due to assault (Table 4.39). In contrast, some contextual information was available from the NCIS for nearly all of the 261 deaths, with detailed information for most. In terms of intent, 248 (95%) of the deaths appeared to be unintentional with 151 (57.8%) of all deaths involving a fracture. Twelve deaths resulted from complications of medical care, 12 deaths were due to suicide, whilst none of the deaths appeared to be due to assault (Table 4.40). Although detailed consideration of the information available is beyond the scope of the current analysis, the NCIS information may be of considerable value in relation to future epidemiological studies in this area.

For example, the NCIS can provide detailed information on the circumstances leading up to the fall e.g:

> *'At around 4.00pm the deceased walked down an internal set of stairs and slipped backwards, striking his head on the bottom step which was tiled'* or *'The deceased was carrying suitcases at the time and due to the movement of the train, fell backwards from the third step onto the ground'.*

Also, it can provide more detailed information regarding the injuries sustained due to the fall e.g:

> *'Because of this fall, the deceased suffered a displaced spiral fracture of the left femur'* or *'In the fall, this 97 year old lady had suffered bruising to the left side of her forehead and a laceration above her left ear. In addition to these injuries, the patient had also sustained a sub-dural haematoma'.*

Finally, the NCIS can provide details regarding the extent to which the fall and subsequent injury contributed to a person's death e.g:

> *'There is no evidence to suggest that this death was due to anything other than natural causes, although the natural end point in this case may well have been precipitated by the fracture and fall'* or *'This injury would have contributed to causing her death by putting an added strain on her diseased heart'.*

Table 4.39 : ICD-10 External cause codes and number of deaths for each category for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data.

Code	Description	Deaths	Per Cent
W00–W19	Falls	167	72.0
V80.0	Fall from animal or animal-drawn vehicle (non-collision)	1	0.4
X59 + Fracture	Exposure to unspecified factor + fracture	56	24.1
X80	Intentional self-harm by jumping from a high place	8	3.5
Y01	Assault by pushing from a high place	..	..
Y30	Falling, jumping or pushed from a high place, und. intent	..	..

Table 4.40: NCIS Intent Completion field and number of deaths for each category for fall-related deaths in the elderly; Australia (excluding Queensland), July 2000–June 2001.

Intent - Completion	Deaths	Per Cent
Unintentional	236	90.4
Intentional self harm	12	4.6
Adverse effects or complications of medical or surgical care	12	4.6
Unlikely to be known	1	0.4

4.7.4 Discussion

Some discrepancies exist between the ABS and the NCIS in terms of the overall number of deaths and related demographics for elderly persons fatally injured in falls. Some of these discrepancies may, in part, be attributed to the different coding systems employed by these two systems as well as to differing interpretations of individual coders. In particular, this may relate to the extent to which a fall may contribute to the death of an individual. For example, a fall may be interpreted as a major contributor to death in one system and this death consequently be coded to an external cause, whereas in another system, for the same death, the fall may be interpreted as a less significant contributor to the death and may be coded to a natural cause. Also, incorrect coding may account for some of the inconsistencies between the two systems. For example, in the NCIS, the location at which the incident occurred was, in some instances, entered as the location at which death occurred, despite the two locations being different. Disparities were also found in the Activity code, where the entered activity did not match that indicated within the attached police or autopsy reports[16].

There also appeared to be some minor discrepancies between the data requested from the NCIS and that which was received from MUNCCI. For example seven cases were identified in the falls analysis which met the selection criteria for the initial data extraction, but were not present in the extracted data. Following

[16] Since this report was not intended to be a detailed analysis of falls in the elderly, there was no systematic searching for coding inconsistencies in the 'location' or 'activity' fields. Consequently the numbers presented in tables reflect those extracted directly from the NCIS.

discussions with MUNCCI, it is not clear why they were not included in the data extracted set, and this is being further investigated by MUNCCI.

There was some support for the link between deaths in the elderly that have been coded to X59 in conjunction with a fracture being primarily due to a fall, since 38 of the 56 cases coded to X59 had sustained a fracture of the femur. However, without the ability to link these cases to individual cases in the NCIS, there was no way to verify this suspicion.

The detailed information provided by the NCIS in comparison to the ABS Deaths Data Collection would certainly be of considerable benefit in the production of future epidemiological reports relating to fall-related deaths in the elderly. The extra information contained within the NCIS is able to provide a clearer picture of the circumstances leading to death in the majority of cases and is able to detect potential cases that are not readily identifiable using the ABS data. However, the usefulness of this information is lessened to some extent by the fact that Coroner-registered deaths only account for a relatively small proportion (26% in 2000–2001) of all deaths in the elderly which are, or are likely to be, related to a fall. Consequently, the ABS will most likely continue to remain the main data source when conducting investigations into the extent of mortality associated with falls in the elderly, but the NCIS can provide additional valuable information on the circumstances involved. Finally, it would be of use to understand the basis of the inconsistencies that exist between the ABS data and the NCIS. The introduction of case-level linkage may be of assistance in this regard.

4.8 Road traffic-related deaths

4.8.1 Rationale for selecting road traffic-related deaths

Motor vehicle crashes and related incidents are a major cause of injury deaths in Australia. Their major role in injury deaths in most countries for many decades has resulted in the ICD system making them a priority in terms of the structure of the classification. Motor-vehicle-related deaths are therefore easily identifiable in data systems that use the ICD-10 system, such as the ABS Deaths Data set. The ICD-10 system provides coded information on the transport mode of the deceased person, the type of vehicle or object involved in any collision, the position of the deceased person in the vehicle (if the person was travelling in or on a vehicle), and whether the incident occurred (at least in part) on a public road (such incidents are described as 'traffic accidents') or not on a public road (such incidents are described as 'non-traffic accidents'). The main ICD-10 categories cover only non-intentional motor vehicle-related deaths. Motor vehicle-related deaths due to suicide or homicide are covered in a separate section of the classification and with less detail.

The classification system for road traffic-related deaths in the NCIS was designed to allow direct comparison with ICD-10. The NCIS classifications are based on the ICECI system, which was developed to be compatible with ICD-10. (WHO Working Group on Injury Surveillance Methods, 2002). The major difference between the NCIS and the ABS is that the NCIS has separate variables to cover each factor/concept of interest, whereas the ICD-10 has a single variable to cover many

different factors/concepts. The NCIS also provides more detail in some of the classifications.

Since both data sets use classification systems that should be compatible with each other, their results should be very similar. The comparison presented here considers only road traffic accident deaths (as defined by ICD-10). These are non-intentional incidents involving some form of motor vehicle and which occur, at least in part, on a public road.

4.8.2 Identifying road traffic-related deaths

ABS information

Road traffic-related deaths were identified by selecting all deaths that had a UCOD identifying them as having occurred as a result of a traffic accident. Deaths were included if they had any of the following UCoDs :

Pedestrian:	V02–04 (.1, .9), V09.2
Pedal cyclist:	V12–14 (.3–.9), V19(.4–.6)
Motorcycle rider:	V20–28 (.3–.9), V29(.4–.9)
Three-wheeled vehicle occupant:	V30–39 (.4–.9),
Car occupant:	V40–49 (.4–.9),
Pick-up truck or van occupant:	V50–59 (.4–.9),
Heavy transport vehicle occupant:	V60–69 (.4–.9),
Bus occupant:	V70–79 (.4–.9),
Other land transport:	V80 (.3–.5), V81.1, V82.1, V83–V86 (.0–.3), V87 (.0–.8), V89.2

NCIS information

The main method for identifying road traffic-related deaths in the NCIS is to use the Mechanism code 'A1.8 Vehicle crash: (predominantly) blunt mechanism [MVA]'. This code should be used for all, and only, deaths related to vehicle incidents. This category includes all vehicle incidents, not just those involved in road traffic incidents, so those incidents that did not involve a traffic accident need to be excluded. Most relevant incidents would be expected to have the code as the Primary Mechanism but, if another mechanism was deemed to be more directly involved in the deaths (e.g. a motor vehicle incident in which the deceased drowned), the vehicle incident code may be applied in the Second or Tertiary Mechanism variables.

The three 'Context' variables (one for each Mechanism variable) identify whether the incident should be described as a 'traffic accident' or a 'non-traffic accident', according to ICD-10 definitions.

Other relevant NCIS variables are the Mode of transport (which describes the mode of transport of the deceased), the Counterpart (which describes the vehicle or object

with which the deceased or the deceased's vehicle collided), the User (which describes the role of the person in using the means of transport), the Intent at Completion (which identifies whether or not the incidents were intentional) and the three Object variables (which can be used to cross-check against the User and Counterpart variables).

In order to maximise the consistency with the inclusion criteria used for the ABS deaths, NCIS deaths were included if they satisfied the following criteria:

- had a value of the Primary, Secondary or Tertiary Mechanism of A1.8;
- did not have a value of Mode of Transport that identified travel in a train (code 15), boat (code 21) or plane (code 22);
- did not have any other information identifying travel in a train, boat or plane;
- did not have a value of Counterpart that identified being hit by a train (code 15) if the Mode of transport identified the deceased as a pedestrian (code 1);
- had a value of Context identifying the incident as a traffic accident (code 2); and
- did not have a value of the Intent at Completion of '2: Interpersonal violence' or '3: Intentional self-harm'.

4.8.3 Comparison between ABS data and NCIS data

Overall comparison

From the ABS, 1,385 road traffic-related deaths were identified. From the NCIS, 1,137 road traffic-related deaths were identified.

State and Territory

The State and Territory distribution of road traffic-related deaths was similar in the ABS and the NCIS. The main differences were much lower relative proportions of deaths in New South Wales and Western Australia (Table 4.41).

Table 4.41: Road traffic-related deaths identified in the ABS and the NCIS by State or Territory of registration (for ABS) or investigation (for NCIS); Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS		NCIS / ABS[1]
State or Territory	Deaths	Per cent	Deaths	Per cent	Per cent
New South Wales	533	38.5	389	34.2	73.0
Victoria	393	28.4	372	32.7	94.7
South Australia	150	10.8	155	13.6	103.3
Western Australia	188	13.6	96	8.4	51.1
Tasmania	50	3.6	56	4.9	112.0
Northern Territory	52	3.8	49	4.3	94.2
Australian Capital Territory	19	1.4	20	1.8	105.3
Total	**1,385**	**100.0**	**1,137**	**100.0**	**82.1**

1 The number of injury deaths in the NCIS divided by the number of injury deaths in the ABS.

Age and sex

The age and sex distributions of road traffic-related deaths were very similar between the ABS and NCIS for males and females, and for both sexes combined, although the percentages were not exactly the same (Table 4.42).

Table 4.42: Age group and sex for road traffic-related deaths: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
	ABS(%)	NCIS(%)[1]	ABS(%)	NCIS(%)	ABS(%)	NCIS(%)
Age Group	n = 989	n = 800	n = 396	n = 337	n = 1,385	n = 1,137
0–14	4.8	4.4	6.8	6.2	5.3	4.9
15–24	30.5	29.3	24.2	24.3	28.7	27.8
25–34	19.9	20.5	12.9	13.1	17.9	18.3
35–44	14.3	14.6	13.4	12.8	14.0	14.1
45–54	11.0	10.6	11.4	8.9	11.1	10.1
55–64	6.2	6.6	8.6	8.3	6.9	7.1
65–74	6.0	5.5	8.1	11.3	6.6	7.2
75 plus	7.4	8.4	14.6	15.1	9.5	10.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

1 One male death had unknown age.

Place of occurrence

The place of occurrence was missing for all but 2% of the ABS deaths. This is consistent with the findings for all injuries combined, which identified very clearly that few deaths due to motor vehicle incidents on public roads were given a code for place of occurrence. This is consistent with the advice given in the ICD-10 data dictionary for use of Place classification. (World Health Organisation, 1992) In contrast, place was coded for virtually all NCIS traffic-related deaths, with 96% of these occurring on a street or highway (Table 4.43).

Table 4.43: Broad place of occurrence for road traffic-related deaths; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

Place of occurrence	ABS (%) n = 1,385	NCIS (%) n = 1,137
Home	0.1	0.3
School, other institution or public admin. area	..	..
*Hospital or other health service**	n/a	1.1
Sports and athletics area	-	0.3
Street and highway	0.5	96.1
Freeway	*n/a*	*12.0*
Urban road	*n/a*	*51.5*
Non-urban road	*n/a*	*15.2*
Other specified public road	*n/a*	*7.4*
Unspecified public road	*n/a*	*10.1*
Trade and service area	-	0.4
Farm	-	0.3
Other specified places	0.3	1.4
*Recreation area**	n/a	0.1
Unspecified place	1.3	-
Missing	97.8	0.1
Total	**100.0**	**100.0**

*: The ABS does not have these categories. Instead, each of these three categories is incorporated in the category immediately above it (i.e. *Hospital* is in *School, other institution and public administrative area, and Recreation area* is in *Other specified place*).

n/a: not applicable.

Activity at the time of the incident

The activity was unspecified for most of the ABS-identified deaths. In contrast, information on activity was available for nearly all NCIS-identified deaths. However, apart from indicating that about 6% of incidents occurred while the deceased was engaged in leisure activities, and 5% of incidents occurred when the deceased was driving for work-related reasons, this information was of little use, since 71% of persons were coded as being involved in 'general travel' (Table 4.44).

Table 4.44: Activity for road traffic-related deaths; Australia (excluding Queensland), July 2000–June 2001.

Activity	ABS (%) n = 1,385	NCIS (%) n = 1,137
While engaged in sports activity	0.2	0.9
While engaged in leisure activity	3.0	6.2
While working for income	1.4	4.5
While engaged in other types of work	0.1	0.3
While resting, sleeping, eating or engaged in other vital activity	0.9	2.6
While being nursed / care for*	n/a	1.1
While engaged in other specified activities	10.8	78.4
General travel	*n/a*	*71.9*
Self-inflicted harm	*n/a*	*0.2*
Other specific activity excluding travel	*n/a*	*6.3*
During unspecified activity	83.5	5.2
Missing		0.8
Total	**100.0**	**100.0**

* This category is only available in the NCIS.

n/a not applicable.

Circumstances

As mentioned in other Sections, some general information about the circumstances leading to fatal injuries is available from the External Cause codes for ABS-identified deaths. This provides an easily obtainable, succinct summary of the injury events. For motor vehicle-related deaths, relatively detailed information is available. Direct comparison with NCIS information should be possible, because the NCIS classification structures were designed to be compatible with ICD-10. Comparisons can be made on the basis of the mode of transport of the deceased person, the vehicle or object with which the deceased or the deceased's vehicle collided, the position of the deceased in or on the vehicle, or the type of vehicle. Both the ABS and the NCIS code these factors, but they are easier to identify and cross-tabulate in the NCIS, because only one variable is used for each concept. Detailed comparison and description of the deaths is beyond the scope of the current report, but a sample comparison is shown in Table 4.45, which summarises information on the mode of transport of the deceased person. The proportions of deaths in each of the categories is very similar in the two data sets, suggesting that they identify essentially the same deaths, and that the coding classifications used in the two systems are compatible.

Table 4.45: Mode of transport of deceased person, based on ICD-10 External Cause code (for ABS deaths) and NCIS category (for NCIS deaths) for road traffic-related deaths; Australia (excluding Queensland), July 2000–June 2001. Per cent

ICD-10 category	ICD-10 range	ABS n = 1,385	NCIS n = 1,137
Pedestrian	V01–09	15.9	16.1
Pedal cyclist	V10–19	1.3	1.2
Motorcycle rider	V20–29	12.0	12.0
Three-wheeled vehicle occupant	V30–39	-	0.1
Car occupant	V40–49	61.6	59.3
Pick-up truck or van occupant	V50–59	2.1	2.8
Heavy transport vehicle occupant	V60–69	2.7	2.6
Bus occupant	V70–79	0.6	0.2
Other land transport	V80–89	3.8	3.9
Missing		-	1.8
Total		**100.0**	**100.0**

4.8.4 Discussion

Both the ABS and the NCIS appear to provide good coverage of unintentional road traffic-related deaths that occur on public roads. Detailed coded information is available from both systems, but the NCIS information allows different factors of interest to be cross-tabulated more easily. In addition, the NCIS has, or has the potential to have, information on a wide range of other areas of interest to traffic safety investigators that is not available in the ABS. For example, information on the time of the incident (available as a separate variable), the mechanism (e.g. head-on, rollover) and place (e.g. t-intersection, bend in a road) of the incident, and the involvement of alcohol (available from the toxicology report, autopsy report, police description, Finding and/or object variables), and the speed are all potentially available in the NCIS, subject to the level of detail recorded in the text documents.

Although the NCIS is capable of providing much more detail on deaths related to road traffic accidents than the ABS, there are some areas that could be usefully improved. The NCIS underestimated the number of deaths identified by the ABS by about 18%. This is likely to be primarily due to lack of information for Open cases, and to a general under-reporting of cases Western Australia. The low proportion of cases in New South Wales is probably the result of a higher proportion of cases being Open, with many Open cases not having a Mechanism coded. This means that most road traffic-related deaths that are still Open cannot be identified using the Mechanism variable. For example, 16% of New South Wales injury cases had no coded Mechanism, compared with 7% in Victoria, 5% in the Northern Territory and less than 3% elsewhere. The particularly low number of NCIS cases seen in Western Australia, compared to the ABS number, was seen in all the analyses in this report.

Identifying motor vehicle traffic deaths in the NCIS required several steps and the use of several variables. The Mechanism for deaths related to motor vehicles should be coded to A1.8. The Data Dictionary entry implies that ONLY motor vehicle-related deaths should be assigned this code, as '[MVA]' is at the end of the

description of the category (the full entry is 'A1.8 Vehicle crash: (predominantly) blunt mechanism [MVA]'). However, the coding frame for the Mode of Transport variable, which is supposed to be completed for all deaths with a Mechanism of A1.8, includes categories for non-motor vehicles such as trains, watercraft, and aircraft. The analysis here confirmed that deaths that did not involve motor vehicles, but did involve other vehicles, were coded to this category. This caused difficulties, because two deaths (one involving a boat and one a plane) had a Mode of Transport identifying a pedestrian death (one person was in the water and was struck by a boat, and one person's parachute didn't open properly when they jumped from a plane), and so were not easily identified for exclusion by using the Mode of Transport variable. Adding to these difficulties are the fact that coders are instructed to code the Context variable for all deaths with a Mechanism value of A1.8. This includes incidents where the deceased was on, or hit by, a train, boat or plane. These are circumstances for which the concept of 'Context' has little relevance, since it is primarily aimed at land transport incidents involving vehicles of some sort, excluding trains. In addition, the Data Dictionary does not include an explicit definition of a non-traffic death and a traffic death.

In addition, a number of errors were found in the coding of the main variables relevant to motor vehicle traffic accident deaths, even though 94% of the cases were Closed. For example:

- nine of the 76 deaths coded as *Non-traffic* deaths clearly met the definition for *Traffic* deaths;
- one of the *Traffic* deaths was not related to a vehicle incident (the deceased shot himself whilst sitting in a vehicle);
- all eight of the deaths coded as *Vehicle is site of injury* were *Traffic* deaths;
- the five deaths coded as *Other specified context* were *Traffic* deaths (one), *Non-Traffic* deaths (one), related to boats (one) or planes (one), or were not vehicle related (this involved a man in a wheel chair falling into his swimming pool);
- two of the three deaths coded as *Unlikely to be known* were *Traffic deaths*; and
- all 20 deaths with a *Missing* Context (all were Open cases) were *Traffic* deaths.

Most of these errors were identified through checking of basic apparent inconsistencies. Examples of such apparent anomalies are:

- deaths with a value of Context not equal to *Traffic* but a value of the place of occurrence identifying a public road;
- deaths with a Context equal to *Traffic* but a value of the place of occurrence not identifying a public road; and
- deaths with a Mechanism code identifying a motor vehicle incident but which were *Natural Cause* according to the Case Type at Completion).

The 1,137 *Traffic* deaths were identified using the following approach. There were initially 1,351 vehicle-related deaths (Mechanism code = A.1.8), 105 of which were excluded because they had the Mode of Transport identified as a plane, boat or train. Two more were found in which the Mode of Transport had been identified as a *Pedestrian* but where the deceased was struck by a boat or had jumped from a

plane. This left 1,244 deaths that appeared to have involved motor vehicle incidents. Of these, eight deaths were excluded because the person actually died of natural causes (in these cases, the motor vehicle incident had occurred because the person was already dead or dying as a result of the natural cause), two were excluded because they did not involve any sort of vehicle, and 69 were excluded because they were not *Traffic* deaths, leaving 1,165 deaths. Another 28 were excluded because the Intent at Completion identified them as suicide (16) or homicide 12), leaving 1,137 deaths due to unintentional traffic incidents that occurred on public roads (Table 4.46).

Table 4.46: Initial and final categorisation of Context for deaths coded in the NCIS as vehicle-related deaths; Australia (excluding Queensland), July 2000–June 2001. Per cent

	Context—initial category							
Context—actual	**Non-traffic**	**Traffic[1]**	**Vehicle is site of injury**	**Other specified[2]**	**Not known**	**Missing**	**Train, boat or plane**	**Total**
Non-traffic	67	..	..	1		..	..	**68**
Traffic	9	1,125	8	1	2	20	..	**1,165**
Not known	..	..	..	..	1	..	..	**1**
Train, boat or plane	..	..	..	2	..	..	105	**107**
Not applicable	..	9	..	1	..	..	..	**10**
Total	**76**	**1,134**	**8**	**5**	**3**	**20**	**105**	**1,351**

1 Nine deaths with the Context coded as *Traffic accident* did not involve a vehicle incident at all (eight were *Natural Cause* deaths, and in the other the deceased had shot himself whilst sitting in a vehicle).

2 Three deaths with the Context coded as *Other specified* were not motor vehicle incidents (one involved a person in the water being hit by a boat; one involved a parachutist whose parachutes did not open properly; one involved a man in a wheel chair falling into his swimming pool). The other two were clearly a Non-traffic death and a Traffic death.

Because of the difficulties currently experienced when identifying in the NCIS motor vehicle deaths in general, and road traffic-related deaths in particular, it would be useful if the relevant variables in the NCIS could be reviewed. This review is also appropriate because these variables were based on the 1999 draft of the ICECI, which has been updated since the NCIS Data Dictionary was developed. The main issues to be addressed by the review are:

- allowing simple identification of road vehicle and off-road vehicle land transport deaths from other forms of transport (such as trains, boats and planes); and
- providing a clear definition for the different categories of the Context variable.

4.9 Poisoning in children

4.9.1 Rationale for poisoning deaths

Poisoning of children is one of the priority areas under the National Injury Prevention Plan (Department of Health and Aged Care, 2001). One of the strategies under this plan is to 'ensure that statistical systems are adequate to provide necessary epidemiology data on prevention of poisoning among young children and that good use is made of this data'.

Over the period 1979–1997, 60 (1.3%) of all poisoning deaths occurred in children aged 0–4 years. (O'Connor 2001). Of these, 33 (55%) were due to medicinal substances. During the same period, poisoning accounted for approximately 1.3% of all injury-related deaths in children aged 0–4 years. Hospital separations due to poisoning are numerous, but rarely of long duration. During 1996–1997, 94% of admissions involving children aged 0–4 years had a stay of one day or less with almost half of these being same-day admissions (O'Connor 2001).

Detailed data on deaths due to poisoning might enable further reduction of this uncommon cause of death, by providing insights into substances and formulations, and circumstances under which children are exposed to them.

4.9.2 Identifying all poisoning deaths

ABS information

Deaths that satisfied the following criteria were selected for inclusion within this topic area:

- occurred in children aged 0–4 years; and
- had an ICD-10 code in the range T36–T50 (Poisoning by drugs, medicaments and biological substances) in any Multiple Cause of Death field; and/or
- had any of the External Cause codes listed in Table 4.47 in the Underlying Cause of Death field or in any of the Multiple Cause of Death fields .

Table 4.47: ICD-10 External cause codes and description relating to poisoning events

Code	Description
X40–X49	Accidental poisoning by and exposure to noxious substances
X85	Assault by drugs, medicaments and biological substances
X89	Assault by other specified chemicals and noxious substances
X90	Assault by unspecified chemical or noxious substance
Y1–Y19	Poisoning by and exposure to harmful substances, undetermined intent

NCIS information

Poisoning deaths of children aged less than five years in the NCIS were identified using several approaches—Mechanism code; Cause of death text; and searching the Police investigation, Autopsy, Toxicity and Finding documents.

The Mechanism coding frame has a specific code at the top level of the hierarchy of codes, to identify poisoning deaths: (N) Poisoning by or exposure to chemical substances. Any death with a poisoning code in any of the three possible Mechanisms was included.

The Cause of Death field was searched for any words containing 'poison' or 'toxic'.

Documents (i.e. Autopsy reports, Police investigation reports, Finding reports, Toxicity Reports) on the NCIS web site were searched for cases with any occurrences of words containing 'poison' or 'toxic'.

In summary, deaths were included if they:

- were of children aged 0–4 years; and
- had a Mechanism code indicating poisoning (code N); and/or
- had a Cause of Death field containing the words 'poison' or 'toxic'; and/or
- had a text document containing the words 'poison' or 'toxic'.

The available information regarding cases which met these criteria was checked to confirm the case actually did involve poisoning.

4.9.3 Comparison between ABS data and NCIS data

Overall comparison

Six deaths satisfied the ICD-10 selection criteria used for the ABS Deaths Data compared to four for the selection criteria used for the NCIS. Only one of the NCIS cases was identified using the coded Mechanism variable. A further two deaths were identified using a boolean search of the NCIS documents whilst one death was identified by the appearance of the word 'toxic' in the Cause of Death field.

State and Territory

The ABS deaths occurred in New South Wales (three), Victoria (two) and Western Australia (one). Three of the NCIS deaths also occurred in New South Wales with one death in Victoria.

Age and sex

The ABS deaths were two males and four females compared to the NCIS which had one male death and three female deaths.

Place of occurrence

The small number of cases made it difficult to compare information on Place from the ABS and the NCIS. Place was unspecified for two of the six ABS deaths, with two occurring at home, one at a residential institution and one at a school, other institution or public administrative area. The NCIS had specific coded information for all four cases, with two occurring in hospital, one at home and one at school.

Activity at the time of the incident

Information on the general activity of the fatally injured person was only available for one of the six ABS-identified deaths with this death being classified as 'other specified activity'. All four of the NCIS-identified deaths had specific coded information, with two of the deaths occurring during personal activities, one during a leisure activity and one while being nursed or cared for. However, information on activity is unlikely to be of much use in children aged less than five years, because of the limited number of types of activity in which they could be engaged.

Circumstances

The ABS collection was only able to provide a limited amount of information about the circumstances of each death. All six deaths appeared to be accidental (i.e. They were allocated a code between X40 and X49: Accidental poisoning by and exposure to noxious substances). Detailed information was available from the NCIS for only two of the four deaths. One death involved a 10-month-old child ingesting a small amount of a petroleum-based cleaning fluid. The fluid was in use by an adult at the time, but the question as to whether the bottle containing the fluid was left open or was opened by the child was not indicated in the Coroner's report. The other death indicated chlorphenimarine as a possible contributory factor, although the actual cause of death was not determined. The other two deaths were still classified as Open and therefore no information was available regarding the circumstances leading to death. These deaths involved methadone toxicity in one case and morphine toxicity in the other.

4.9.4 Discussion

Only four of the six ABS-identified poisoning-related deaths in children appeared to be included and identifiable in the NCIS. Presuming the other two cases are in the NCIS, they may well have still been Open, and not identifiable as poisoning deaths because of the limited amount of information currently available on them. It is concerning that only one death could be identified in the NCIS by use of the appropriate Mechanism code, with three of the four NCIS-identified deaths having no Mechanism code at all. However, two of these three cases were still Open, and so the Mechanism could be expected to be included at a later date. The introduction of case-level linkage may provide some assistance in describing and assessing the differences between the two sources.

Current data items available in the ABS Deaths Data and the coding scheme used, i.e. ICD-10, do not provide the type of in-depth qualitative data needed for

understanding how cases occurred or for designing intervention measures. The NCIS may be able to provide more detailed information and may also be useful in identifying new or emerging problems in regard to poisoning-related deaths in young children, although the small case numbers and delay in closing cases are important issues.

4.10 Fall-related deaths in children

4.10.1 Rationale for selecting fall-related deaths in children

Falls by children is one of the priority areas under the National Injury Prevention Plan (Department of Health and Aged Care, 2001). One of the strategies under this plan is to 'ensure that statistical systems are adequate to provide necessary epidemiology data on falls in children and that good use is made of this data'.

Between 1979 and 1998, there were about eleven childhood deaths due to falls annually (Steenkamp and Cripps 2001). Fall-related deaths accounted for 2.3% of all deaths due to injury and poisoning in children aged 0–14 years during this period.

4.10.2 Identifying all fall-related deaths in children

ABS information

Deaths that satisfied the following criteria were selected for inclusion within this topic area:

- occurred in children aged 0–14 years; and
- had any of the External Cause codes listed in Table 4.48 in the Underlying Cause of Death Field or in any of the Multiple Cause of Death fields; and/or
- had the ICD-10 external cause code X59 (Exposure to unspecified factor) in the Underlying Cause of Death field and/or any Multiple Cause of Death field in conjunction with at least one of the following injury codes: SO2, S12, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, T14.2 (i.e. 'fractures'.

Table 4.48: ICD-10 External cause codes and description relating to falls

Code	Description
W00–W19	Falls
V80.0	Fall from animal or animal-drawn vehicle (non-collision)
X80	Intentional self-harm by jumping from a high place
Y01	Assault by pushing from a high place
Y30	Falling, jumping or pushed from a high place, undetermined intent

NCIS information

Fall–related deaths in children aged less than five years in the NCIS were identified using several approaches—Mechanism code; Cause of death text; and the police investigation, autopsy and Finding documents.

The Mechanism coding frame has a specific code that identifies falls (*A4: Falling, stumbling, jumping*). Any death with a code identifying falling in any of the three possible Mechanism variables was included.

The Cause of Death field was searched for the words 'fall' and 'fell'.

Documents (i.e. Autopsy reports, Police investigation reports and Finding reports) on the NCIS web site were searched for cases with any occurrences of the words 'fall' or 'fell' in combination with terms such as 'head injury' or 'neck injury' or 'chest injury' or 'multiple injuries' or 'fracture'.

In summary, deaths were included if they:

- were of children aged 0–4 years; and
- had a mechanism code indicating a fall (code A4); and/or
- had a Cause of Death field containing the words 'fall' or 'fell'; and/or
- had a text document containing the words 'fall' or 'fell' in combination with terms such as 'head injury' or 'neck injury' or 'Chest injury' or 'multiple injuries' or 'Fracture'.

The available information regarding cases which met these criteria was checked to confirm the case actually did involve a fall.

4.10.3 Comparison between ABS data and NCIS data

Overall comparison

Twelve deaths satisfied the ICD-10 selection criteria used for the ABS Deaths Data compared to 13 for the selection criteria used for the NCIS. Twelve of the NCIS cases were identified using the coded Mechanism variable, with one further death being identified by the presence of the word 'fell' in the Cause of Death field.

State and Territory

Compared to the ABS, the number of deaths of this type found in the NCIS was fewer in Victoria and larger in Western Australia. There were an identical number of deaths in New South Wales, South Australia and the Australian Capital Territory (Table 4.49).

Table 4.49: State or Territory of registration (for ABS) or investigation (for NCIS) for fall-related deaths in children; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
State or Territory	Deaths	Per cent	Deaths	Per cent
New South Wales	4	33.3	4	30.7
Victoria	5	41.7	3	23.1
South Australia	1	8.3	1	7.7
Western Australia	1	8.3	4	30.7
Australian Capital Territory	1	8.3	1	7.7
Total	**12**	**100.0**	**13**	**100.0**

Age and sex

The age and sex distributions were similar between the ABS and NCIS data sets, although the numbers were not exactly the same in each age-sex group (Table 4.50).

Table 4.50: Age group and sex for fall-related deaths in children: Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	Sex					
	Male		Female		Total	
Age Group	ABS	NCIS	ABS	NCIS	ABS	NCIS
0–4	1	1	1	0	2	1
5–9	2	2	4	5	6	7
10–14	3	4	1	1	4	5
Total	**6**	**7**	**6**	**6**	**12**	**13**

Place of occurrence

The NCIS provided better information than the ABS on the place of occurrence. Three of the 12 ABS cases were classified as '*Unspecified*' or '*Missing*', with another three simply classified as '*Other specified place*'. In contrast, the NCIS had specific coded information for all 13 cases although one was coded as '*Other specified place*' (Table 4.51).

Table 4.51: Status by place of occurrence for fall-related deaths in children; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
Place of occurrence	**Deaths**	**Per cent**	**Deaths**	**Per cent**
Home	3	25.0	5	41.7
School, other institution or public admin. Area	1	8.3	1	8.3
Street or highway	..	..	1	8.3
Industrial and construction area	2	16.7	2	16.7
Farm	..	..	1	8.3
Other specified place	3	25.0	1	8.3
*Recreation area**	n/a	n/a	2	16.7
Unspecified place	2	16.7	..	..
Missing	1	8.3	..	..
Total	**12**	**100.0**	**13**	**100.0**

* The ABS does not have this category. Instead, this category is incorporated in the category immediately above it (ie. *Recreation area* is in *Other specified place)*.

n/a not applicable.

Activity at the time of the incident

Information on the general activity of the fatally injured person was only available for five of the 12 ABS-identified deaths with three of these being classified as 'other specified activity'. In contrast, all but one of the NCIS-identified deaths had specific coded information, although four of these were coded as 'other specified activity' (Table 4.52). As previously mentioned, the NCIS is able to provide an extra level of specificity for each major category. For example, that occur during a leisure activity can be allocated to a number of subcategories (Table 4.53).

Table 4.52: Activity for fall-related deaths in children; Australia (excluding Queensland), July 2000–June 2001: ABS Deaths Data and NCIS.

	ABS		NCIS	
Activity	**Deaths**	**Per cent**	**Deaths**	**Per cent**
Sports and active recreation activity	..	..	2	15.4
Leisure activity	1	8.3	5	38.5
While engaged in other types of work	1	8.3	..	..
Engaged in formal education*	..	..	1	7.7
During other specified activity	3	25.0	4	30.8
During unspecified activity	7	58.3	1	7.7
Total	**12**	**100.0**	**13**	**100.0**

* This category only available in the NCIS

Table 4.53: NCIS activity code for injuries occurring during a leisure activity and subcategories

Code	Type of place	Injuries
2	**Leisure Activity**	
2.1	Hobby activities	..
2.2	Leisure activities with an entertainment element	1
2.3	Voluntary work (formal of informal)	..
2.8	Other specified leisure activity	1
2.9	Unspecified leisure activity	3

Circumstances

The ABS is only able to provide a limited amount of information about the circumstances of each death. Of the 12 deaths, 11 appeared to be unintentional and one due to suicide. In contrast, some contextual information was available from the NCIS for 11 of the 13 deaths, and detailed information for most. Nine of the 13 deaths were recorded as unintentional, one as intentional self harm with the other three cases still being Open and yet to have a code entered in relation to intent. Although detailed consideration of the information is beyond the scope of the current analysis, an overview of the circumstances surrounding the nature of fall-related deaths in children can be quickly ascertained. For example, seven of the 13 deaths involved a fall from a height of greater than one metre. These deaths involved falling through a skylight (2); falling from the edge of a cliff (2); falling from a factory roof (1); falling from a third floor balcony (1); and falling from the edge of a quarry (1), this last death being due to suicide. Four of the remaining six deaths involved a fall from a horse (1); a fall from an inflatable castle being blown into the air (1); a fall from a trailer being towed by a car (1), and a fall whilst swinging from a broken tree branch (1). There was no contextual information provided for the remaining two deaths, these cases still being classified as Open.

4.10.4 Discussion

Most of the ABS-identified fall-related deaths in children appear to be included and identifiable in the NCIS. Detailed information is available on nearly all these deaths. All but one of these deaths was identified using the appropriate coded variables. Also, it appears that there are a small number of deaths included within each data source that are not common to both. The reason for this discrepancy is not clear, but most likely relates to inconsistencies between the two systems as to how data are coded. Case-level linkage would assist in describing and assessing these differences.

Current data items available in the ABS deaths data and the coding scheme used (ICD-10) do not provide the type of in-depth qualitative data needed for evaluating causes and designing intervention measures. The NCIS may be able to provide more detailed information and may also be useful in identifying new or emerging problems in regard to fall-related deaths in children, although this is limited by small case numbers and the typically long period between the date of death and closure of cases within the NCIS.

5 Summary and conclusions

5.1 NCIS as a data source

The NCIS was developed as a tool for the use of State and Territory Coroners, and as a source of information to underpin public health activity, particularly for injuries.

This analysis has identified several strengths and weaknesses of the NCIS as it now exists and as it may be expected to function in the future. These have been addressed in the discussion sections of each part of Chapter 4, but some recurring themes and related issues are considered here.

The following sections describe some limitations of the NCIS. These should be read in the context of an appreciation of its strengths. Before NCIS data became available, it was known that coroner's records contained much information of value for injury surveillance and similar purposes. However, access to this information was laborious, slow and costly. In the absence of the NCIS, the work described in this report would have occupied several person-years of time, travel to and searches through numerous repositories of paper records, and development and use of methods for data extraction, coding and storage. The cost of such a study would have been at least several hundreds of thousands of dollars. The fact that we were able to undertake this project much more quickly and cheaply because of the NCIS is a sign of the great progress that has been achieved. It is also a sign of progress that we are in a position to point out specific areas in which refinement or enhancement is desirable rather than to be restating old arguments in favour of creating something like the NCIS.

5.1.1 Coverage

This analysis suggests that the NCIS provides very good coverage of all injury deaths, except for those that occur in Western Australia and Queensland. The lack of information on Queensland deaths arose because information on Queensland deaths was not available for public access at the time of this analysis, although Queensland cases are now entered into the NCIS. However, public access is expected before the end of 2003, and information on all Queensland deaths from 1 January 2001 should be available.

The apparent under-reporting in Western Australia was unexpected. It is probably partly a function of the fact that 14% of all Western Australian cases had a missing Cause of Death and missing or *Unknown* Case Type at Completion, compared to 4% in New South Wales, 2% in Tasmania, and less than 1% elsewhere. However, even if all the Western Australian cases with missing Cause of Death information were injury deaths, the number of injury deaths in Western Australia would be 487, which is still only 72% of the number of injuries identified by the ABS. Following discussion with officers at MUNCCI, it appears that this under-reporting arises because of a backlog of entering Western Australian data into the NCIS. This seems

to be worst for early cases, with the NCIS having only 46% of expected deaths (based on ABS-identified injury deaths) in the three months July to September 2000, but there was no clear trend of increasing coverage for more recent deaths in the 12 months covered by this analysis. Presumably the delay in entering cases into the NCIS arises from a lack of resources in the Western Australian coronial system. Whatever the cause, it should be corrected as soon as possible.

5.1.2 Data quality

Apart from the problems with coverage, the specific analyses identified some data quality issues within the NCIS. Work-related cases are clearly not currently being adequately identified. This appears to be partly because of errors in the application of the codes when there is sufficient information and partly because of insufficient information in the available documents.

The specific sub-analyses identified some errors in the codes applied for most variables. Although there was no comprehensive validation or crosschecking of variables, these errors seemed relatively minor. Such errors are to be expected in any large data set involving multiple coders, especially early in its operation. Identification and correction of the errors require significant resources to be applied to quality control and checking of the coding, with feedback of information to coders regarding areas of concern and areas that are being coded well. This should occur on an on-going basis, looking for logical inconsistencies, and also by focussing on particular areas.

As an example, a concerted effort to check the coding of work-relatedness has been undertaken in recent months (MUNCCI, personal correspondence). This appears to have improved the identification of working and commuting deaths, but not to have resulted in many bystander deaths being identified. In addition, the assignment of the *Working or Commuting Unspecified* category for Activity (code 3.9) for deaths with sufficient information to be assigned to the specific *Working* (code 3.1) or *Commuting* (code 3.2) categories does not appear to have been corrected. It is not known to us if the reasons for the initial coding errors have been identified and discussed with the relevant coders. Presumably there are similar problems with other variables, and similar potential for correction.

Another example is given by the key dates entered into the system for each case. These were considered in the initial data checking, when in-range cases were being identified for this analysis. The fact that there was a considerable minority of cases with obvious errors in the dates of incident, death or notification (identified because of inconsistencies in the dates—e.g. date of death before date of incident) suggests that there is no in-built system or regular checking to identify and correct logical inconsistencies in the entered data.

As well as having on-going and random checks of data validity, the use of the data by outside parties should be encouraged, as this is likely to highlight many important data quality problems. However, it should be emphasised that the overall assignment of the main codes appears to have been done comprehensively, with key variables such as Age, Sex, Mechanism, Object, Cause of Death, Case Type at Completion and Intent at Completion coded or recorded for over 99% of all Closed cases.

Attention also needs to be paid to the presence of text documents and the quality of the information in them. Police reports were present for virtually all Closed cases in all States and Territories except New South Wales, in which they were missing for 25%. Coronial Findings were present for about 90% of cases in Victoria, Tasmania, the Northern Territory and the Australian Capital Territory, but for only 25% of Western Australian cases and for very few cases in New South Wales and South Australia. The text documents are an extremely important component of the NCIS from the point of view of injury prevention. Therefore, it is important that efforts continue to improve the proportion of cases for which all relevant text documents are available.

The detail and relevance of information in the text documents also varied considerably between, and sometimes within, States and Territories. Although this aspect of data quality is not directly under the control of MUNCCI, it is important that MUNCCI encourage improvements in the standard and standardisation of these documents, as the documents have the potential to significantly improve the capabilities of the NCIS as a source of information for both Coroners and public health practitioners.

A final issue to consider is the timing of data entry in the NCIS. The NCIS was designed to allow key classification data (Case Type and Intent) to be entered at the time the case was first entered into the system, and then to be modified in light of any new information that might become available during the coronial investigation and deliberation process. Separate variables to cover the classification at notification and case closure were included. This allows recording of the correct information at the time of case closure, without losing the information about how a case was viewed at the time of notification. It should also allow Open cases to be stratified by case type and intent.

The notification variables are not supposed to be re-coded on the basis of information that becomes available at a later time. However, the results of the current analysis (Intent at Notification missing for 67% of Open cases) suggest that the Intent at Notification variable is commonly not being completed until well into the coronial investigation process, and possibly not until the case is Closed. Although this was not the aim of the coding system, it is perhaps understandable given the instructions in the NCIS Data Dictionary for Intent at Notification, which state, among other things, that 'The coding should reflect the decision reached by the Coroner in the finding. Before a finding has been made, the decision about intent should be made based on evidence in case folders. The quality of this evidence often varies and the final decision may remain problematic, especially in regard to suicides.' The instructions are the same for the Intent at Notification and Intent at Completion, whereas it might be more appropriate for the reference to the Coroner's Finding to be removed from the coding instructions for the Intent at Notification. In addition, if the intent at the time of case notification really is not known, then the coding instructions are for the category '*8: Still enquiring*' to be used, rather than the variable being left blank, as appears to happen at the moment. Revision of coding instructions should be considered.

5.1.3 Classification of External Causes

We note that a number of items in the NCIS system of classifications are implementations of a consultative draft of the International Classification of External causes of Injury (ICECI). These items are particularly important for injury surveillance. They include intent, mechanism, object, place and activity. The ICECI has been revised since the consultation draft, and we recommend that the NCIS should be revised periodically (at least every two years) to be brought in line with the current version.

5.1.4 Time to closure

The primary determinant of whether a case is Open or Closed is likely to be the time since the death and the length of the Coronial investigation process, (rather than the time to enter all relevant data into the NCIS). There is likely to be little that MUNCCI can do to influence the length of the Coronial investigation process, and so it can be expected that the time taken to close a case will not diminish significantly in the short term.

The speed with which the Coronial investigation is completed and a case is Closed in the NCIS is very important for injury researchers, because text documents are not available for use until a case is Closed, and presumably the validity of NCIS data entry performed earlier in a case is not checked until the Coronial process is completed. The data for this analysis were obtained 20 months after the end of the period of interest, by which time 13% of the cases were still Open. The median time to closure was 520 days, and it took almost 700 days for 90% of the cases to be closed. Time to closure also varied significantly between jurisdictions. In contrast, the time from death to notification was very short, with most cases notified to the NCIS on the day of the death, and 97% within one week.

Open cases are probably similar to Closed cases, except for the fact that they are still Open. Some circumstances of death may be more likely to be associated with longer Coronial investigation or decision periods (e.g. those leading to criminal charges), but this is probably not the case for most cases of interest to injury researchers. In this analysis, the characteristics of deceased persons, and the circumstances of their death, were similar, based on those Open cases with information on the cause of death and the mechanisms and objects involved. This suggests that Closed injury cases are a relatively unbiased sample of all injury cases. However, depending on the injury issue, analyses will need to focus on Closed cases because the required level of information is not available for Open cases.

For example, Case Type at Notification was completed for 99% of Open cases, and 93% of Closed cases with a known Case Type at Notification had the same Case Type at Completion. This suggests that a consideration of all injury deaths can be based on a combination of Open and Closed cases, using the Case Type at Notification as proxy for Case Type at Completion. Information on age and sex was present for virtually all cases, whether Open or Closed. Also, the Cause of Death variables were completed for 90% of Open cases, allowing a consideration of causes of death to be reasonably based on Open as well as Closed cases. In contrast, the Intent at Notification (missing in 69%) and Intent at Completion (missing in 78%) were uncommonly completed for Open cases, so investigation of suicides needs to be based on Closed cases. Similarly, Mechanism (missing in 71%) and Object

(missing in 73%) information was missing in almost three quarters of Open cases. Also, no text documents are available for Open cases. Therefore, it is likely that for most injury issues, the analysis should be based on deaths that have occurred at least 18 months before the data are extracted. This should ensure that the vast majority of cases used for any analysis are Closed. For surveillance of all injuries combined, and when focussing on the recorded causes of death, Open cases could reasonably be included, so it is not necessary to wait as long before conducting the analysis.

Timeliness is an important characteristic of injury surveillance, and we recommend that MUNCCI should collaborate with users of the NCIS for this purpose to identify ways in which more timely reporting can be enabled.

5.1.5 Drug coding system

The analysis of suicides identified a shortcoming in the available NCIS data regarding involvement of drugs. The Object coding frame has some broad categories for drugs, and the Object text fields and Cause of Death fields often include statements of which drugs were involved. In addition, the toxicology report, when present, often lists the drugs that have been identified through toxicology testing. However, there is no specific coded variable that identifies any specific drugs, or specific types of drugs involved. This makes it difficult to identify deaths involving particular compounds.

Text searches of the Object text field and the Cause of Death field are possible and should identify many of the relevant deaths and the drugs involved, but such searching is more time-consuming and more prone to error than using coded data (provided the data are properly coded). Text searching of the toxicology reports is generally unhelpful, because the reports often list all the drugs for which assays have been done, rather than just the drugs that are identified. This is useful when investigating whether particular drugs would have been identified if present, but not useful when trying to identify which drugs were present, because the text search will identify any case where the drug was assayed for, not just those where it was found.

To overcome this problem, it would be very useful if there was a comprehensive coding system for drugs involved in the death and/or found at autopsy. Such a system is under consideration by MUNCCI at the moment.

5.1.6 The NCIS search facility

The NCIS has a comprehensive search facility. This was used for some of the specific analyses in this report, and aspects of the system are described in Chapter 4. Detailed information on the search facility is available from publications on the NCIS web site (MUNNCI 2002a). However, the main strengths, and some areas that could usefully be improved, are described here.

The search facility allows searching to be based on the values of coded variables or the content of text documents. The output can be in terms of coded values or links to text documents (but not both). The output of the search can be returned quickly to the screen. Alternatively, if only coded values are requested, output to a file is possible. The text documents for all cases can be searched, but access to the text

documents is only available for Closed cases. Overall, the search facility is extremely useful and allows quick identification of relevant cases and detailed information for many of them (see box). However, current shortcomings of the search facility mean that it is often 'clunky' to use.

The search facility was not reviewed in detail, but the analysis identified a number of shortcomings. All of these appear reasonably straightforward to correct.

Modifying queries

Once a query has been saved, it cannot be modified, and a query cannot be run until it has been saved. This means that, even if a query only needs minor modification, it still needs to be re-designed from the beginning.

Cases selection

Currently it is not possible to select cases on the basis of more than one value of a variable, unless all values are selected. For example, using the Case Type at Notification, it is possible to select all cases, or all cases coded to *External Cause*, but not possible to select all cases other than those coded to *Natural Cause*.

It is also not possible to select cases on the basis of certain combinations of variables. For example, Case Type at Notification and Case Type at Closure cannot be used as the basis for case selection in the same query. This is because the relevant part of the selection screen (Screen 1) can cover Case Type at Notification or Case Type at Closure, but not both. Similarly, Mechanism and Object cannot be used in the same query because the relevant part of the selection screen (Screen 4) can cover Object or Mechanism, but not both.

Searching text documents

It is currently not possible to search more than one text document at a time. This is because the relevant part of the selection screen (Screen 1) allows the choice of only one document type at a time, rather than combinations of two, three or four document types. This means that to search all four document types for a given word, the search must be run four times. In addition, since a saved query cannot be modified (see above), and a different relevant document type needs to be selected for each query, the query must be designed from scratch four times.

The Mechanism search page

The search page for Mechanism (Page 4) is misleading. There are three Mechanisms that can be coded for an incident, and up to three levels of detail in the coding for each Mechanism. The page allows specification of which of the three Mechanisms (Primary, Secondary or Tertiary) are to be searched, or for all three Mechanisms to be included. It also allows specification of the Mechanism at Level 1, 2 or 3. However, the wording used on the search page is 'Level' to describe the level of detail for a particular Mechanism AND to describe the three Mechanisms (Primary, Secondary or Tertiary). If Level 3 is chosen in one part of the page, the search only includes values of the Tertiary Mechanism, rather than values of all Mechanisms but only at the most detailed level (also described as 'Level 3' on the page). Therefore, by selecting Level 3 at the top of the page, and also specifying a detailed (Level 3)

value for the Mechanism category, it is easy for the user to believe they are searching for all cases with a certain detailed value of either the Primary, Secondary or Tertiary Mechanisms. However, in fact they would have specified a search only for cases with that detailed value in the Tertiary Mechanism.

5.1.7 Comparison between the NCIS and the ABS Deaths Data Collection

The NCIS is potentially very useful for prevention purposes because of the considerable detail available in the coded and brief text variables and in the free text documents. The structure of the NCIS provides considerable flexibility in the available information, because generally each variable only covers a single concept. The variables can then be combined in different ways, depending on the particular issue of interest. It also provides much more detailed information than the ABS, and has the major advantage that the text documents provide the ability to consider aspects of the circumstances that are not coded.

In contrast, the ABS data are much more rigid, and the combination of concepts in the same variable limits the usefulness of the information unless the question of interest is specifically addressed by the combination of concepts included. This reflects the primary purpose of the system, which is to code Underlying Cause of Death according to ICD-10, and to do this in a reliable manner for all deaths registered in Australia.

Therefore, for many injury issues of interest, the NCIS is now of much more use than the ABS and is likely to become more so, although generally the ABS currently provides more timely information on the number of deaths. However, there are some areas in which the ABS will remain more useful than the NCIS for injury surveillance. Chief among these is fall-related death in the elderly. In many circumstances, these deaths can be certified by a medical practitioner rather than having to be reported to a Coroner. Therefore, many of the deaths (75% in the period of interest in this analysis) are not recorded in the NCIS, and the ABS is the appropriate data source to use for surveillance purposes. However, unlike the ABS, the NCIS is able to provide the detailed information about the circumstances surrounding the fatal incidents that is needed to underpin the design and targeting of prevention initiatives.

5.1.8 Linking ABS and NCIS cases

Developing a better understanding of the relationship between injury deaths identified in the ABS and those identified in the NCIS would be greatly improved if there were a common identifier of records in the two systems. This would allow access to the strengths of both systems. Two potential identifiers exist. One is the Death Registration Number originating from State and Territory Registries of Births, Deaths and Marriages, and used in the ABS Deaths Data Collection. The other is the Unique Case Number used in the NCIS. Since it appears that the ABS coding officers now consult the NCIS for most injury deaths, addition of the NCIS Unique Case Number to the ABS Deaths Data Collection could be easily achieved. This could then be used to link information on individual ABS deaths to the more detailed information on that death that should be available in the NCIS. This would

help take advantage of the comprehensive coverage of deaths by the ABS, which is not subject to the restrictions arising from cases still being Open in the NCIS, and the ICD-10 coding of deaths, which can be used to more easily identify specific injury sub-groups within the NCIS. The more detailed information available in the NCIS for these deaths can then be used to better understand the circumstances surrounding the fatal incidents.

Case-level linkage between the ABS and the NCIS would also greatly assist in understanding the current coding practices in the ABS. In particular, it would aid in better characterising the deaths identified as arising from injuries only because they are assigned a Multiple Cause of Death Code identifying an ICD-10 injury code or External Cause code.

Privacy, confidentiality and related administrative considerations are more likely to impede linkage than are technical considerations. Such factors might constrain or even prevent linkage. However, the potential of properly authorised use of linked data to enhance the value of NCIS and ABS data for injury surveillance is great. We recommend that MUNCCI should undertake or enable an investigation of options and issues for linkage as a matter of importance.

5.1.9 ICD-10-AM

For several of the analyses considered in this report, the ABS information could have been made more useful if the coding was based on ICD-10-AM rather than on the basic version of ICD-10. For example, ICD-10-AM provides more detailed coding, and more accurate identification, of deaths associated with agricultural machinery towed or powered by tractors than is possible with ICD-10. However, there is no code that is specific to even a subset of deaths directly related to tractors, though this omission could be corrected in a future edition of ICD-10-AM. More detail describing Place and Activity can also be obtained using ICD-10-AM compared with the basic version of ICD-10.

We are aware that ABS coding of causes of death is based on an automated coding system, which is written for ICD-10. However, this system does not code external causes adequately, and requires manual intervention for most cases. Hence, there is less impediment than for other parts of ICD-10 to enhancing coding of external causes by use of some or all of the additional categories provided by the ICD-10-AM. ICD-10 codes, needed for international reporting, can be derived from ICD-10-AM codes, or recorded separately.

5.1.10 Practical example using the NCIS

The following example (see box) relates to deaths of infants due to strangulation by blind-cords and represents a practical situation that highlights some of the strengths and limitations of the NCIS when compared to the ABS Deaths Collection.

Deaths of infants and young children due to strangulation by blind-cords.

An urgent request was made for the RCIS to supply information regarding deaths of infants and young children due to strangulation of infants by blind-cords.

Routine data on deaths and hospital admissions

Routine deaths data (the ABS Deaths Data Collection) were not useful because ICD-10 (World Health Organization 1992), the version currently used to code deaths, does not include categories that can be used to identify cases of this type specifically. ICD-10 categories W76 'Other accidental hanging and strangulation' and W75 'Accidental suffocation and strangulation in bed' are the most likely categories to contain the deaths of interest, but they are not specific for the objects that produce strangulation.

National Coroners Information System (NCIS)

The data specificity and detail necessary to provide useful information for this request is provided by the classifications in the NCIS. In addition to the coded data, documents attached to many records in the NCIS can be examined for additional information.

Two project members independently conducted searches of the NCIS independently, and each found the same three cases of interest. Considerable detail was available on two of the cases, but the third case was Open, and so little information was accessible. The NCIS commenced full operation from July 2000, so earlier cases would not be expected in this source. Data submission from Queensland began a year after this, but NCIS users are not yet permitted to access the Queensland data in the NCIS.

The two cases for which detailed information is available have similarities: both children were about one and a half years old, and both died in their cot after having become entangled in the cord of a window furnishing during a period in which they had been left alone for a day-time sleep. The furnishing is described as a concertina blind in one case and a curtain in the other. Entanglement appears to have been with an internal cord of the concertina blind (i.e. one of the cords that run through holes in the segments of the blind). Both children were reported to have been unconscious or dead by the time they were discovered.

An additional case was found among the Coronial inquest Findings in South Australia published on the Coroner's web-site.[17] This case, which dated from 1999, was similar to the two cases described above. The child had been put into his cot for a day-time sleep, and was found a short time later with the cord of a nearby curtain around his neck. The Coroner, Mr Chivell, included a public warning in his Finding regarding the danger of toddlers sleeping near blinds and curtains, and recommended that parents consult a relevant KidSafe brochure released as part of the Safe Sleeping Campaign.

Published scientific literature

A literature search identified several relevant research articles (Moore and Byard 1993; Byard, Beal et al. 1994; Rauchschwalbe and Mann 1997). In addition, the US CPSC has worked with industry to develop safer designs for new blinds, and methods to improve the safety of existing ones (Window Covering Manufacturers Association Inc. 1996), whilst since 1989, Health Canada has received reports of 19 deaths and 17 near-miss incidents of child strangulation by window-blind and curtain cords. The agency has issued a Health Advisory notice on the subject.

[17] see: (www.courts.sa.gov.au/courts/coroner/findings/findings_2000/alsford.finding.htm)

Summary and conclusion

The risk of strangulation of young children in cords of blinds and other window coverings has been recognised for about a decade, in Australia and elsewhere. By the mid-1990s the problem had been characterised in sufficient detail to enable the development of preventive responses and to prompt their implementation, initially in the United States. Preventive responses initially focused on risks associated with loops in pull-cords. More recently, this has been supplemented by preventive responses focusing on risks associated with the internal cords that run through the slats of venetian blinds. Preventive responses exist for new products (by safer design) and to enable existing products to be modified.

Available data indicate that this cause has led to at least four deaths of one to two year old children in Australia since 1999. (The total number of deaths in Australia from all causes at ages one or two years in 2001 was 171.)

The hazard was considered a continuing preventable cause of child mortality that warranted further preventive attention. In accordance with a condition under which data users have access to data in the NCIS, the issue was brought to the attention of Australian coroners in July 2003, as an 'Issue of Concern to Public Health and Safety'.

One the major advantages of the NCIS as highlighted by the above example is having the capacity to identify deaths occurring due to relatively uncommon situations together with the ability to access detailed information in relation to the circumstances leading to death. Additionally, this information can promptly be brought to the attention of Australian coroners.

Unfortunately, since the NCIS was not implemented until July 2000, cases occurring before this date were unable to be identified. There is currently no public access to Queensland cases in the NCIS and consequently any cases in that state meeting the criteria as outlined above were also unable to be identified. Another limitation relating to this example is the time between case notification and case closure. One of the identified cases was still Open over 10 months after the date of death and consequently there was little detailed information about this case.

Searching for these cases proved to be relatively straightforward by selecting the appropriate categories within the Mechanism and Object fields. However, if information in one or both of these fields is incorrect or missing, searching for cases through the attached text documents is somewhat less efficient and more time consuming.

5.2 Overall conclusions and recommendations

5.2.1 The NCIS as a data source about injuries

The NCIS has added substantially to the extent of information relevant to injury surveillance which is accessible in Australia and appears to contain information on most injury deaths in Australia since 1 July 2000.

Exceptions are Western Australia, where there is a backlog of Coronial deaths still to be entered into the system, and Queensland, for which information was not available when this project was done[18]. A third exception is deaths due to falls by older persons, most of which are certified by a medical practitioner, and do not come to the attention of a Coroner.

The coded and text data in the NCIS provide a detailed and flexible information resource for injury research.

Recommendations

1. NCIS should be used routinely as a source of data on injury deaths, though with care concerning some aspects of completeness and quality of data.
2. MUNCCI should encourage the backlog of cases in Western Australia to be entered as soon as possible.
3. MUNCCI should facilitate the agreements necessary to allow information on Queensland deaths entered into the NCIS to be made available to authorised users as soon as possible.
4. Explore options for bringing data collection on medically-certified falls deaths into line with other injury deaths.

5.2.2 Data quality issues relevant to the NCIS

The overall level of completion for key variables for Closed cases in the NCIS is high.

Preliminary validation of a selection of variables suggests that there are errors in the data for a minority of cases.

Consideration of work-related cases suggest that there are significant short-comings in the coding of the Activity variable for working and commuting cases, and in the identification of work-related bystander cases.

Consideration of road traffic-related deaths suggests that there are problems with the coding of variables relevant to vehicle-related deaths. These are likely to be partly related to shortcomings in the relevant coding instructions in the NCIS Data Dictionary.

[18] According to MUNCCI, data on deaths in Queensland from 1 January 2001 is expected to be accessible to authorised users of the NCIS by the end of 2003.

A police report is available for nearly all Closed cases. A Finding is available for nearly all cases in some States and Territories, but for very few cases in others. The availability of autopsy reports and toxicology reports varies considerably between States and Territories.

The quality of information in the police report and Coroner's Finding varies considerably.

Most cases do not seem to have the Intent at Notification variable completed at, or soon after, the time of case notification.

Recommendations

5. MUNCCI should continue to give high priority to data quality issues.
6. MUNCCI should maximise the validity of data within the NCIS through on-going checks for logical inconsistencies, random checks of individual data items, detailed validation of individual or related data items, and regular training of and feedback of information to coders in the Coroners' offices.
7. Authorised users should be encouraged to use the data for detailed analyses of specific areas, and to inform MUNCCI of data quality issues that they encounter during their analyses.
8. MUNCCI should continue to encourage and facilitate the entry of text documents onto the NCIS for all reported deaths.
9. MUNCCI should work with relevant parties to improve the level of detail of relevant information included in the police reports and Coroner's Findings.
10. MUNCCI should modify the coding instructions for the Intent at Notification variable to remove the reference to the Coroner's Finding.
11. MUNCCI should continue to encourage the coding of Intent at Notification at, or soon after, the time of case notification.
12. MUNCCI should review the variables relevant to identifying motor vehicle deaths in general, and road traffic-related deaths in particular. The main issues to be addressed by the review are:
    - allowing simple identification of road vehicle and off-road vehicle land transport deaths from other forms of transport (such as trains, boats and planes); and
    - providing a clear definition for the different categories of the Context variable.

5.2.3 Classification of External Causes

A number of items in the NCIS system of classifications are implementations of a consultative draft of the International Classification of External causes of Injury (ICECI). These items are particularly important for injury surveillance.

Revision of the ICECI has taken place since the consultation draft.

Recommendations

13. The NCIS should be revised periodically (at least every two years) to be brought in line with the current version of ICECI.

5.2.4 Timeliness

Virtually all cases are notified to the NCIS within one week of death.

Time to closure is likely to be primarily determined by Coronial processes rather than by factors directly related to the NCIS.

The median time to closure varies considerably between jurisdictions, but is nearly 18 months overall.

The importance to data users of the time to closure varies, depending on the issue being considered.

For most injury issues, Closed cases are required in order to have sufficient information available for each case.

Recommendations

14. MUNCCI should continue to minimise the time to case closure by facilitating the entry of required data into the NCIS.
15. Injury researchers should take into account the issue being considered before deciding on the importance of relying on information only from Closed cases for their data analysis.
16. For surveillance of all injuries, and stratification by age or sex, Open cases can usefully be included in analyses.
17. For specific injury issues, analysis is most appropriately focused on Closed cases.
18. MUNCCI should collaborate with users of the NCIS for the purpose of identifying ways in which more timely reporting can be enabled.

5.2.5 Comprehensive drug coding system in the NCIS

The current method for recording drug involvement in the NCIS probably allows identification of specific drugs in most cases, but only through use of text fields and detailed text searching. The development of a comprehensive coding system for drugs involved in the death and/or found at autopsy would make identification of cases involving drugs much more efficient and complete.

Recommendations

19. MUNCCI should continue to support the development of a comprehensive coding system for drugs involved in the death and/or found at autopsy.

5.2.6 The NCIS search facility

The NCIS has a comprehensive search facility that can quickly provide detailed information regarding a specific group of cases. Current shortcomings limit the utility of the search facility. These shortcomings appear to be straightforward to correct.

Recommendations

20. MUNCCI should review the NCIS search facility with the aim of improving its utility. Specific improvements identified in the project that should be considered are:
    - allow queries to be modified once they have been saved;
    - allow a query to exclude specific values of a variable;
    - allow selection of cases in the same query based on both the Case Type at Notification and the Case Type at Completion;
    - allow selection of cases in the same query based on both the Mechanism and the Object;
    - allow searching of multiple document types in the same query; and
    - alter the wording and/or structure of the Mechanism search page (Page 4).

5.2.7 The NCIS and the National Injury Prevention Plan

The NCIS is an important information source to support the research and surveillance strategies contained in the 2001–2003 National Injury Prevention Plan covering falls in older people, falls in children, drowning and near-drowning, and poisoning among children.

The analyses presented on these four priority areas indicate the scope of the problem and the type of relevant information that could be obtained from the NCIS. However, these analyses were preliminary, and there is scope for much more detailed analysis to take place on all four of these topics, and on other injury topics[19].

Recommendations

21. The NCIS should be used as an additional information source for detailed analyses on topics identified as priority areas under National Injury Prevention Plans.

5.2.8 Linking ABS and NCIS cases

The availability of a common linking variable between the ABS Deaths Data Collection and the NCIS would be very beneficial to users of data from both systems. The NCIS Unique Case Number is likely to be the most easily adopted common linking variable.

[19] The value of these analyses will be enhanced by linkage of NCIS and ABS data. Refer to section 5.2.7.

Recommendations

22. MUNCCI, the Australian Bureau of Statistics and other interested organisations should consider as a priority the feasibility of using the NCIS Unique Case Number as a common linking variable to be included in the ABS Deaths Data Collection. If linkage is found to be feasible, the Australian Bureau of Statistics and MUNCCI should implement it promptly.

5.2.9 ICD-10-AM

Adoption of ICD-10-AM as the standard coding system for External Causes in the ABS Deaths Data Collection would make the ABS information more useful for injury research and prevention purposes. This classification can easily be mapped back to ICD-10 if required by the ABS for official reporting. The burden of using ICD-10-AM in place of ICD-10 would be much lower for the External Causes chapter than for any other part of ICD-10 because of the poor performance of the automated coding system for External Causes, requiring manual intervention for most of the cases.

Recommendations

23. The Australian Bureau of Statistics should consider adopting supplementary external cause code categories from ICD-10-AM for coding injury deaths.

6 References

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INJURY RESEARCH & STATISTICS

This report assesses the strengths and weaknesses of the National Coroners Information System (NCIS), particularly in terms of its coverage and data integrity and in supporting injury prevention initiatives, primarily by comparing it to the ABS Deaths Data Collection. Specific injury topic areas are considered to aid this assessment, but the focus is on illustrating the functions of the NCIS rather than providing a comprehensive description of the topic area.

The NCIS was found to be potentially very useful for injury prevention purposes because of the considerable detail available in the coded and text variables and in the attached text documents. However, there are still a number of limitations that need to be addressed.