

# ESTIMATING THE NUMBER OF WORK-RELATED TRAUMATIC INJURY FATALITIES IN AUSTRALIA 2003-04

AUGUST 2006



Australian Government

Australian Safety and Compensation Council

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The role of the ASCC is to lead and coordinate national efforts to improve occupational health and safety (OHS) and workers' compensation arrangements, declare national standards and codes of practice for OHS and provide policy advice to the Workplace Relations Ministers' Council on OHS and workers' compensation arrangements.

The ASCC is not a regulatory authority and does not make or enforce laws. OHS in Australia is state-based and all OHS regulations and legislation is the responsibility of state/territory OHS authorities. All ASCC standards and codes of practice are guidance and advisory documents only and their implementation is set in the regulations created by state/territory OHS authorities.

The ASCC, made up of representatives from each Australian state and territory, the ACTU and ACCI, coordinates research and provides policy advice to the Workplace Relations Ministers' Council (WRMC) on OHS and workers' compensation arrangements.

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## ABBREVIATIONS

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ANZSIC	Australian and New Zealand Standard Industry Classification
ASCC	Australian Safety and Compensation Council
ASCO	Australian Standard Classification of Occupations
ATSB	Australian Transport Safety Bureau
DAAS	Data and Analysis Section
ICD-10 AM	The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
NCIS	National Coroners Information System
NDS	National Dataset for Compensation-based Statistics
NF	Notified Fatalities
NOHSC	National Occupational Health and Safety Commission
OHS	Occupational Health and Safety
TOOCS	Type of Occurrence Classification System
VIFM	Victorian Institute of Forensic Medicine
WC	Workers' compensation

## SUMMARY OF FINDINGS

1. This report presents the results of a study undertaken by the Australian Safety and Compensation Council (ASCC) to develop an estimate of the number of work-related fatalities that occurred in Australia during 2003–04.
2. The aim of this study was to provide:
  - a reliable estimate of the total number of persons who died in Australia during 2003–04 from work-related injuries
  - a better understanding of the coverage of work-related fatalities by the different datasets
  - some insights into how the coverage of the various datasets might be improved
  - a consolidated dataset with more information than is currently available regarding individual fatality cases
  - better identification of industries with a high risk of work-related fatalities, and
  - better evidence than is currently available for establishing work-related injury prevention strategies.
3. Work-related fatalities for the purposes of this project include all work-related injuries resulting in a fatality in Australia, Australian territories or territorial waters that occurred on or between 1 July 2003 and 30 June 2004. The scope of the project comprises all work-related traumatic fatalities. That is, all persons fatally injured as a result of their own or others' work activity or work factors. More specifically this includes all employees, self-employed workers/contractors, bystanders, volunteer workers, fatalities that occurred at a private residence where work activity was involved, fatal work-related traffic accidents, commuting/journey claims, compensated and non-compensated cases, and work-related criminal activity such as homicides. The scope does not include suicides; deaths from natural causes of fatalities such as heart attacks, strokes and diseases; and deaths due to complications of surgical and medical care, also termed 'adverse events or deaths from iatrogenic injury'.
4. The methodology for this study involved combining all fatal injury cases for 2003–04 from the National Dataset for Compensation-based Statistics (NDS), the Notified Fatalities (NF) and the National Coroners Information System (NCIS) and then identifying and removing duplicate cases. The NDS is the primary dataset used in this study as it is currently the most comprehensive occupational health and safety (OHS) dataset. It only, however, covers compensated fatalities. The other two datasets, the NF and the NCIS, both contain a work-relatedness data item and include fatalities that fall outside the scope of the NDS.
5. The study concluded that there were 332 persons who died in Australia during 2003–04 from work-related injuries. This equates to a rate of 3.5 per 100 000 people in the employed civilian labour force. An additional 24 cases of uncertain scope status are not included in the total. These cases were assigned the uncertain status due to insufficient data and textual description needed to enable a sound determination about whether the circumstances of the incident fell within the project's scope.
6. About two of every three deaths (226 of 332) resulted from injuries sustained while working for income, 74 of which involved a road crash. Another 89 deaths were commuting workers, 10 deaths were bystanders and five deaths involved other work activity such as voluntary work.
7. The highest number of work-related deaths was recorded for the Agriculture, forestry and fishing industry (72), closely followed by the Transport and storage industry (62) and the Construction industry (52). Agriculture, forestry and fishing and Transport and storage also had the highest and second-highest fatality

rates (19.2 and 14.3 work-related fatalities per 100 000 people in the employed civilian labour force respectively). The next highest fatality rates were for Mining (8.3), Electricity, gas and water supply (6.7) and Construction (6.7).

8. Each of the three datasets made a significant contribution to the final estimate. The NDS provided 164 in-scope records, a contribution of 49% of the estimated number of deaths. The NF provided 134 in-scope records, a contribution of 40% of the estimated number of deaths. The NCIS provided 201 in-scope records, two of which pertained to the same death. The 200 records about separate deaths contributed 60% of the estimated number of deaths.
9. Overall, the NDS best captured work-related fatalities in six out of the 17 industries—Wholesale trade, Retail trade, Property and business services, Government administration and defence, Education, and Health and community services.
10. However, the NDS was not the best data source for those industries which recorded the highest number of deaths or had the highest fatality rates, namely Agriculture, forestry and fishing, Manufacturing, Electricity, gas and water supply, Construction, and Transport and storage.
11. Whereas the NF contributed 40% of cases across all industry groups, it captured all of the Mining cases and 65% of cases in Agriculture, forestry and fishing. Overall, the NF best captured three out of the 17 industries—Mining, Construction, and Personal and other services.
12. The NCIS best captured five out of the 17 industries—Agriculture, forestry and fishing, Accommodation, cafes and restaurants, Transport and storage, Communication services, and Cultural and recreational services. For most of these industries the estimated numbers of fatalities would have been substantially lower had the NCIS data source not been included in the project.
13. A number of issues relating to the methodology and the individual datasets were raised during this study. These include timing the study to best capture complete datasets, coding issues in the datasets, and the utility of using names in the identification of duplicates across the datasets.
14. The report provides information on the fatalities by type of work activity, industry and jurisdiction. Information on the occupation, mechanisms and other circumstances of the work-related fatal incidents will be the focus of further analysis of the data.

## 1. INTRODUCTION

### 1.1 Aims of project

The role of the Australian Safety and Compensation Council (ASCC) is to promote national consistency of occupational health and safety (OHS) and workers' compensation (WC) arrangements in Australia through: the development of policies and strategic directions, OHS standards and the National OHS Strategy 2002–2012; the coordination of research and data analysis; and the promotion of best practice in workplace safety and return to work.

This report presents the results of a study undertaken by the ASCC to develop an estimate of the number of persons who died in Australia during 2003–04 from work-related injuries.

To date, the exact number of people who die as a result of work-related activities in Australia has not been accurately established. This is because there is no single national data collection system that includes all types of work-related fatalities. The NDS is currently the key source of information used to monitor work-related fatalities in Australia, but this dataset only includes those work-related deaths for which compensation has been paid. This project aims to obtain a reliable estimate of the number of persons who died in Australia during 2003–04 from work-related injuries by supplementing the NDS with other datasets.

This project aims to increase awareness of work-related fatalities and the need to improve the safety within Australian workplaces. Specifically, it aims to provide:

- > a reliable estimate of the total number of persons who died in Australia during 2003–04 from work-related injuries
- > a better understanding of the coverage of work-related fatalities by the different datasets
- > some insights into how the coverage of the various datasets might be improved
- > a consolidated dataset with more information than is currently available regarding individual fatality cases
- > better identification of industries with a high risk of work-related fatalities, and
- > better evidence than is currently available for establishing work-related injury prevention strategies.

### 1.2 Context

#### **National OHS Strategy 2002–2012**

The National Occupational Health and Safety Commission (NOHSC) developed the *National OHS Strategy 2002–2012* (the National Strategy) in 2001 to, in part, reduce the number of work-related fatalities in Australia (it also covers non-fatal injury and disease). Prior to the implementation of the National Strategy, it was agreed by NOHSC (now ASCC) that NDS data would be used for setting and measuring fatality reduction targets in the Strategy. It was, however, agreed at that time that the data source used for these purposes would eventually be extended to cover areas not adequately covered by the NDS.

The provision of an estimate of all work-related fatalities will identify the full extent of the loss of life through work-related injury. Since the scope of the NDS is limited to employees, the estimate of all work-related fatalities may prove to be of particular value in assessing OHS performance in industries with a high proportion of self-employed workers.

## Previous studies

Two previous studies on work-related traumatic fatalities in Australia have been undertaken. The first covered the three-year period 1982–1984<sup>1</sup> and the second covered a four-year period from 1989–1992<sup>2</sup>. Both were based on coronial records. The first study recorded deaths of 581, 491 and 470 for the calendar years 1982 to 1984 respectively. The second study recorded deaths of 673, 590, 528 and 507 for the calendar years 1989 to 1992 respectively. The average fatality rates for the periods 1982–1984 and 1989–1992 were 6.7 and 5.5 respectively. This current study is based on one year of data for the period 1 July 2003 to 30 June 2004. The case definitions for each of the studies are similar. However, the previous two studies included persons killed while performing home duties (in the home), whereas the current study excluded this group. Overall, for the period 1989–1992, 307 people died from traumatic injuries while performing home duties. The current study did, however, include tradespeople working for income in a residential dwelling.

## 1.3 Review

The methodology used in deriving the estimate used in this report was peer reviewed by Flinders Consulting, comprising the Research Centre for Injury Studies, Flinders University and Elmatom Pty Ltd. The principal personnel for Flinders Consulting are Associate Professor James Harrison and Dr Tim Driscoll. Amendments were made to this report and the methodology based on their re-analysis of the data and their recommendations concerning issues of terminology, scope and data.

## 1.4 Structure of the report

Chapter 2 provides information about the three datasets used in this project, namely the NDS, the NF and the NCIS datasets. This includes a description of the strengths and weaknesses of each of the datasets and a summary of the key features of the datasets that are relevant to the project.

The definition of work-related fatalities and the scope of the project are provided in Chapter 3. A detailed definition is given, including specific inclusions and exclusions.

Chapter 4 describes the methodology used in this study. It includes details of the data elements used from each of the datasets and a description of how the datasets were combined and compared. The project employed a structured process to identify duplicates across the datasets, and this process is outlined in this Chapter. Also included are details about the use of names to verify duplicate cases.

The results of the study are presented in Chapter 5. The estimated number of work-related traumatic fatalities during 2003–04 and the overall national rate are provided. Information is also presented on the contribution of each data source to the estimate. The estimate is then examined by type of work activity, industry and jurisdiction.

Chapter 6 provides a discussion about the results presented in Chapter 5 and gives the conclusions that were drawn from the project. Specifically, it discusses the implications of the incomplete overlap of cases between the three datasets and examines the reasons for this incomplete overlap. Also discussed are other factors relating to the estimate such as the quality of the coding of work-relatedness in the NCIS, the availability of dates, the utility of names in the matching process, and the coding of industry in the three datasets.

<sup>1</sup> Cited in National Occupational Health and Safety Commission (1988) *Work-related traumatic fatalities in Australia, 1989 to 1992*. Commonwealth of Australia, Canberra.

<sup>2</sup> National Occupational Health and Safety Commission (1998) *Work-related traumatic fatalities in Australia, 1989 to 1992*. Commonwealth of Australia, Canberra.

## 2. DATASETS USED IN THIS PROJECT

### 2.1 The National Dataset for Compensation-based Statistics (NDS)

The NDS is currently the most comprehensive source of compensation-related OHS data in Australia. The scope of the NDS is all new accepted workers' compensation claims made by or for an employee (other than an employee of the defence forces) and which involved a death, a permanent incapacity, or a temporary incapacity for which payments were made.

The information provided in the NDS for individual claims includes: details of the claimant—including gender, date of birth, postcode of residence, occupation and industry of employer; details of the occurrence—including date, industry of workplace, postcode of workplace and the nature, bodily location, mechanism, agency and breakdown agency of the injury/disease; and details of the occurrence outcome, claim processing and compensation payments.

The first edition of the NDS (NDS1) was published in April 1987, and the first data produced under this system were for the 1991–92 reference period. The NDS is compiled annually by the Office of the ASCC based on accepted claims made under the state, territory and Australian Government workers' compensation Acts by or for an employee. The data about these accepted claims are supplied annually to the Office of the ASCC by the jurisdictions, comprising data for the latest reference year together with revised data for the previous five reference years.

The strengths of the NDS are that it:

- > is Australia's most comprehensive source of compensation-based OHS data
- > is supported by several classification systems, including the Australian and New Zealand Standard Industrial Classification (ANZSIC), the Australian Standard Classification of Occupations (ASCO) and the NOHSC Type of Occurrence Classification System (TOOCS)
- > has an independent assessment of work-relatedness
- > has a validation system in place and
- > has a system to review and update the data on a regular basis.

### 2.2 Limitations of the NDS data for an estimate of work-related fatalities

As noted, not all work-related fatalities are covered by the NDS data. A fatality is only recorded in the NDS where a compensation claim has been submitted and accepted by the relevant OHS authority. The following types of fatalities are therefore not included:

- > most self-employed workers and contractors—because they are generally not covered for WC
- > bystanders
- > fatalities for which the OHS authority's assessment of the claim is pending at the time the relevant NDS data set is compiled, and
- > fatalities for which a claim was not submitted for some other reason—for example, because the person lacked dependants to do so.

It has previously been reported that 34% of work-related deaths in Australia were not covered by OHS and WC agencies<sup>3</sup>. That study, published in 2003, examined the coverage of work-related fatalities by WC and OHS agencies in Australia for the period 1989–1992. It found that WC captured 56.6% of deaths and OHS agencies captured 35.4% of deaths during this period. When duplicates in the data were eliminated, the combined coverage when compared to coronial records was 66.3%. An aim of the current project is to compare the coverage of each of the datasets used for the 2003–04 estimate with the coverage found in such studies.

### 2.3 NDS coverage of industries having a high proportion of self-employed workers

As noted, the NDS does not capture information on injury or disease among self-employed workers. Therefore, NDS data for industries in which a high proportion of workers are self-employed are likely to understate the actual number of work-related fatalities.

Table 1 presents Australian Bureau of Statistics (ABS) data on the proportions of employed and self-employed workers in major industry groupings.

**Table 1: The proportion of employed and self-employed workers by industry, Australia, 2003–04**

Industry	Employed	Self-employed
Agriculture, forestry and fishing	52%	48%
Mining	97%	3%
Manufacturing	93%	7%
Electricity, gas and water supply	99%	1%
Construction	67%	33%
Wholesale trade	92%	8%
Retail trade	88%	12%
Accommodation, cafes and restaurants	91%	9%
Transport and storage	86%	14%
Communication services	90%	10%
Finance and insurance	95%	5%
Property and business services	84%	16%
Government administration and defence	100%	0%
Education	96%	4%
Health and community services	94%	6%
Cultural and recreational services	82%	18%
Personal and other services	81%	19%

Source: ABS 6291.0.55.001 Labour Force, Australia, Detailed - Electronic Delivery, Quarterly.

<sup>3</sup> T Driscoll et al. Coverage of work related fatalities in Australia by compensation and occupational health and safety agencies. *Occupational and Environmental Medicine* 2003, 60:195-200

Nearly half (48%) of the workers in Agriculture, forestry and fishing and one-third of workers in Construction were self-employed. The NDS is likely to be an incomplete data source for work-related fatalities in those industries. Relatively high numbers of compensated fatalities are reported by the NDS for these two industries—they had the third-highest and second-highest counts respectively in 2003–04—and there may be similarly high numbers of fatalities among the self-employed workers. These will not be recorded in the NDS.

Conversely, the NDS should be a reliable data source for work-related fatalities in those industries in which there is a high proportion of employees. There were ten industries in which 90% or more of the workers were employees in 2003–04.

## 2.4 Other datasets used in this project

A number of datasets were assessed for their appropriateness to supplement the NDS to estimate the number of persons who died in Australia during 2003–04 from work-related injuries. Datasets chosen to supplement the NDS had to either include the presence of a work-relatedness data item or have other data items that could be used to identify work-relatedness. Other important criteria included the ability to gain access to the data and the availability of data for 2003–04 and subsequent years.

Two data sources were chosen to supplement the NDS—the NF and the NCIS. These are established datasets and are known to cover different aspects of fatality incidents both to each other and to the NDS. The following sections describe the additional datasets and outline their strengths and the limitations of their scope and coverage.

Three other data sources were investigated to identify their appropriateness to supplement the NDS. These were the National Mortality Dataset (NMD), held by the Australian Institute of Health and Welfare (AIHW), the Fatal Road Crash Database, held by the Australian Transport and Safety Bureau (ATSB), and mining industry data from the Minerals Council of Australia (MCA). These data sources were not used in this project because the quality was not consistent or because they did not contain a work-relatedness data item and there appeared to be no way to identify work-relatedness using the available data.

## 2.5 Notified Fatalities (NF)

The NF dataset is maintained by the Office of the ASCC and provides information on work-related deaths notified to OHS authorities under their relevant OHS legislation. The collection of NF data began on 1 July 2003. These data are collected from OHS authorities throughout Australia and cover employees, self-employed workers and bystanders who suffered a fatal injury at work or as a result of a work activity.

Information regarding a fatality should be notified to the Office of the ASCC within 48 hours of being received by the jurisdiction. The information may be provided to the Office as text but should cover certain data items including gender, age, industry of workplace, industry of employer, occupation, narrative, whether commuting, and type of work activity. Where multiple fatalities occurred as a result of the same incident a separate notification is required for each fatality.

The strengths of the NF are that:

- > it captures fatalities not covered by NDS such as self-employed contract workers and bystanders
- > it includes information about where the fatality occurred—for example, at the workplace, at a private residence or at a hospital (excluding, however, fatalities resulting from medical treatment or medical malpractice)—that is useful to case matching across datasets
- > data are coded to maximise comparability with the NDS, and

- > bystander fatalities are included in the collection.

The weaknesses of the NF are that:

- > it has only been collected nationally for two years
- > it has limited coverage of transport-related deaths due to the difficulty in identifying work-related road fatalities and the lack of established protocols in most jurisdictions for notifying work-related road crashes to the OHS authority,
- > it tends to only capture deaths which occur shortly after the injury event in question, and
- > many data items—for example, mechanism of injury—are missing for transport and farming-related deaths.

## **2.6 National Coroners Information System (NCIS)**

The NCIS was officially launched in July 2000 and is a national internet-based data storage and retrieval system about coronial cases in Australia. The NCIS holds information on all fatalities referred to a coroner in Australia. The coroner's findings, police reports, autopsy reports and toxicology reports may also be made available. The NCIS contains a work-relatedness data item, with fatalities being identified as work-related or not work-related by the staff of the individual state and territory coroners' offices.

Each state and territory in Australia has a licence agreement with the Victorian Institute of Forensic Medicine (VIFM) permitting the transfer of coronial information for storage and dissemination via the NCIS. Coronial clerks enter the data into local case management systems and these data are uploaded to the NCIS on a regular basis.

The strengths of the NCIS are that:

- > the scope of the collection includes all deaths reported to an Australian coroner regardless of compensation status or work arrangements
- > text details about the causes and circumstances surrounding a fatal incident are generally provided, including details such as police narratives, autopsy and toxicology reports
- > there is a work-relatedness assessment against standard criteria, and
- > relevant data items are coded to International Classification of Diseases version 10 (ICD-10-AM).

The weaknesses of the NCIS include:

- > difficulties with the identification of bystander deaths, due to lack of information in the accompanying text documents especially for road-related fatalities,
- > under-identification of work-related fatalities in Western Australia due to a lack of access to Open cases (i.e. where the coroner's findings are pending) for that jurisdiction, and
- > limitations in the coding of work-relatedness stemming from lack of information available to coroners' and
- > the current coding of iatrogenic cases as being work related.

## 2.7 Summary of selected datasets

Table 2 summarises the major characteristics of the selected datasets (NDS, NF and NCIS) that are pertinent to the use of these datasets for estimating the number of persons fatally injured in work-related incidents in Australia.

**Table 2: The major relevant characteristics of the NDS, NF and NCIS datasets**

Characteristic	NDS	NF	NCIS
Type of dataset	Administrative	Administrative	Administrative
Work-relatedness	Yes	Yes	Yes
Industry coding	ANZSIC (coded by jurisdictions)	ANZSIC (coded by the Office of ASCC and checked by jurisdictions)	ANZSIC (coded by the Office of ASCC)
Occupation coding	ASCO (coded by jurisdictions)	ASCO (coded by the Office of ASCC)	ASCO (coded by the Office of ASCC)
TOOCS coding	Yes	Yes	No, but has 'Cause of death 1–6' data items plus 'Activity'; 'Primary, Secondary and Tertiary mechanism', and 'Primary, Secondary and Tertiary Agencies'
Scope	Compensated work-related fatalities only	All notifiable fatalities	All deaths reported to an Australian coroner
Availability of data	1991 to current	2003–04 to current	July 2000 to current (January 2001 for Queensland)
Inclusion of bystanders	No	Yes	Yes
Coding of general demographic information	Yes	Yes	Yes
Timeliness	Data available 18 months after period	Data available 6 months after period	Data available 6 to 18 months after period
Other	No text description of the incident circumstances	A limited text description of the incident circumstances	Police narrative, autopsy report, toxicology report and coroner's finding available to authorised users

## 3. DEFINITION OF WORK-RELATED FATALITIES AND SCOPE OF PROJECT

### 3.1 Definition of work-related fatalities

Work-related fatalities for the purposes of this project include all fatalities resulting from a work-related injury in Australia, Australian territories or territorial waters that occurred on or between 1 July 2003 and 30 June 2004.

Injury is defined in this study as those conditions covered by the External Cause coding rationale of ICD-10-AM<sup>4</sup>.

Only work-related injuries resulting in a fatality are included in the scope of this report. The scope includes:

- > all persons receiving payment for work
- > volunteer workers, unpaid family workers and persons undertaking work experience, and
- > persons who were not working but were killed directly as a result of someone else's work activity (bystanders).

The circumstances of work-related fatalities included within the scope of this report are those that could have occurred:

- > at a workplace
- > at a private residence where work activity was involved
- > in a traffic accident when commuting, whether or not covered by WC (see 3.2), and
- > when work-related criminal activity such as homicides takes place (see 3.2).

A case is defined as a person:

- > who was fatally injured
- > whose injuries were as a direct result of work-related exposures
- > whose injuries occurred in an incident that took place in Australia, and
- > whose death occurred on or between 1 July 2003 and 30 June 2004.

The scope of work-related fatalities for this project does not include:

- > iatrogenic injuries (see 3.3)
- > natural causes of fatalities such as heart attacks and strokes (see 3.3)
- > fatalities as a result of diseases (such as cancers)
- > suicides (see 3.3), and
- > fatalities that result from personal home duties that are in no way related to a person's occupation.

### 3.2 Specific inclusions

#### Bystander deaths

The case definition for work-related fatalities included deaths of persons that resulted from the work activity of another person such as bystanders.

<sup>4</sup> ICD-10-AM (4th Ed.) - 1 July 2004. Tabular list of diseases. National Centre for Classification in Health, Australia.

Bystanders are persons such as visitors to a workplace, or persons, including children, who received fatal injuries as a result of someone else's work activity or work factors (including work factors that persist outside working hours).

Included are bystanders who received fatal injuries away from a recognisable workplace, such as fatal injuries connected with the travel of a 'working' vehicle (for example, a truck, commuting vehicle or police vehicle), where identified in the data.

### **Commuting deaths**

The case definition for work-related fatalities includes deaths from injury sustained when commuting to or from work, irrespective of whether or not the worker was covered by WC.

Some jurisdictions compensate for commuting claims while others do not. The NDS only captures fatal commuting claims from jurisdictions that provide compensation. Supplementing the NDS with other datasets provides a possible avenue for the identification of fatal commuting incidents from other jurisdictions. These would, however, only be included in the fatalities estimate where reported and positively identified.

The jurisdictions that compensated for commuting claims for the 2003–04 period were New South Wales (with some restrictions), Queensland (with some restrictions), the Northern Territory (unless it involved a motor vehicle which would be covered by Motor Accident Compensation Act), the Australian Capital Territory (if transport was provided by the employer for the purpose of transporting employees and was driven by or at the direction of the employer, or travelling between a workplace and a place of treatment for a work-related injury), Comcare and Seacare. Jurisdictions that did not cover commuting claims for the 2003–04 period were Victoria, South Australia (unless there was a real and substantial connection between the employment and the accident), Western Australia and Tasmania.

### **Deaths resulting from criminal activity**

Fatality cases that occurred as a result of work-related criminal activity were included within the scope of this project. Work-related criminal activity includes instances where a worker is killed due to the criminal actions of others. Instances where a person is killed whilst under-taking criminal activity are not, however, included in the scope of this project.

## **3.3 Specific exclusions**

### **Deaths due to natural causes**

Natural causes include heart attacks, strokes and diseases. These are not within the scope of work-related fatalities.

### **Deaths due to complications of surgical and medical care**

The case definition for work-related fatalities excluded deaths due to complications of surgical and medical care, also termed *adverse events* or *deaths from iatrogenic injury*. These cases involve unintended and preventable harm resulting from health care rather than from the underlying condition of the person.

### **Suicide**

The scope of this project excluded deaths that had been assessed to have been the result of suicide.

Assessing the extent of any connection between work and a decision to take one's own life is extraordinarily difficult, even when detailed information is available. This makes it unlikely that a clear cut assessment of work-relatedness can be made in many suicide cases.

Suicides are included within the scope of the NDS whenever assessed as work-related by the WC authority, and these can be identified by reference to the WC authority's assessment of intent as recorded in the 'Mechanism' data item. For this project, however, all suicide cases were removed from the set of NDS records by reference to the 'Mechanism' data item and removed from the set of NCIS records by reference to the coroner's assessment of intent recorded in the 'Intent' data item. (Suicides are excluded from the scope of work-related deaths recorded in the NF.)

### **Deaths of persons undertaking criminal activity**

As noted, the case definition for work-related fatalities excluded deaths of persons fatally injured while undertaking criminal activities.

## 4. METHODOLOGY

### 4.1 Introduction

Broadly summarised, the methodology for estimating the number of persons who died in Australia during 2003–2004 from work-related injuries was based on the construction of three separate lists of in-scope deaths during that time period—one each from the NDS, the NF and the NCIS. The case definition described above was applied as needed during the construction and refinement of these lists.

This process was followed by restructuring the data on each list to enable comparison across the three lists. Details of the deaths on each of the lists were then compared in order to identify and remove duplicate and triplicate records, and a count of the remaining unique cases was obtained.

### 4.2 Selection of reference year

The 2003–04 reference period was chosen for the estimate to be derived in this project as it is the first year of overlap between all three of the datasets. As noted, the collection of NF data commenced from 1 July 2003.

The 2003–04 NDS data are preliminary and are expected to change with future annual revisions.

### 4.3 Collection of data and case identification

As noted, the three datasets chosen for the estimate of fatalities during 2003–04 were the NDS, the NF and the NCIS. The data elements used from each of the datasets are detailed below.

#### **NDS**

A subset of NDS records was extracted from the full NDS data set based on the case definition described above. For example, work-related injury deaths were obtained after excluding non-fatal cases and deaths that were the result of work-related disease by means of filtering the full data set across the data items 'Fatal' (=1) and 'Nature' (=0)<sup>5</sup>.

The following data items were extracted from the full set of NDS data items:

- Sex
- Jurisdiction
- Age
- Severity
- Year
- Date of Accident
- Month of Accident
- Year of Accident
- ANSZIC1
- ASCO1
- Nature
- Mechanism
- Breakdown Agency

<sup>5</sup> The NDS data item 'Fatal' is coded as 0 (= non-fatal) or 1 (= fatal) and the NDS data item 'Nature' is coded as 0 (= injury) or 1 (= disease).

Agency

Body Location

The selection of cases that pertained to the reference year was based on values of the data item 'Date of occurrence' (made up of day, month and year of accident) between 1 July 2003 and 30 June 2004. The date of death is not included in the NDS dataset.

In addition, 14 Victorian records identified submitted WC claims rather than accepted WC cases. The status of these cases was yet to be determined by the Victorian WC authority, although it was thought likely that most would be accepted for compensation. These uncertain cases were retained but were separately identified in order that the estimation could be done with and without them.

The finalised NDS list comprised 164 records.

### **NF**

The full NF dataset was used in this project, based on the case definition as outlined above. The NF dataset includes a short text description of each case (the 'Original narrative' data item) and this was employed as an aid in identifying matching cases across the three datasets.

The NF dataset used the following data items:

Identification number

Date of occurrence

Date of notification

Date of death

Gender

Age

Jurisdiction

Industry of employer

Occupation

Mechanism

Nature

Agency

Breakdown agency

Bodily location

Narrative

The finalised NF list comprised 134 records.

### **NCIS**

A subset of NCIS records was extracted from the full set of NCIS records having a date of death within 2003–04, according to the case definition listed above. Work-relatedness was determined by reference to the 'Work-relatedness' data item. This data item is coded by staff in the individual state and territory coroners' offices. For each closed case, confirmation of work-relatedness was sought from available text descriptions of the circumstances of the injury event. The large number of cases precluded global examination of NCIS records to establish the validity of the work-relatedness identifier.

The NCIS dataset used the following data items:

- NCIS identification number
- Age
- Sex
- Date of notification
- Date of death
- Case status
- Occupation code
- Usual occupation
- Employment status
- Case type completion
- Intent completion
- Cause of death 1
- Cause of death 2
- Work-related
- Activity
- Incident occupation
- Rank to work-relatedness
- ANZSIC1
- ANZSIC codes to 4 digits
- Incident industry text

In addition, each closed case on the NCIS contained one or more documents giving a narrative of the circumstances of the case. These are the police report, the coroner's findings, the autopsy report and the toxicology report. These documents were extracted, where available, for each closed case of interest, both as an aid in determining whether a death complied with the case definition and as an aid in identifying matching cases across the three datasets.

The finalised NCIS list comprised 201 records, representing the coronial records for 199 separate deaths plus two coronial records for another death that had been the subject of coronial investigations in two jurisdictions.

#### **4.4 Data restructuring**

The data on each list was restructured to enable comparison across the three lists. This entailed assigning common data item names, formats and coding to like data items.

Each of the three datasets were designed for different purposes and therefore had in some cases, data items that were coded in different formats. The NCIS dataset produced by VIFM for example, was coded at the individual coroners' offices. All NDS cases were coded by the relevant jurisdictions' workers' compensation authorities, whereas the NF dataset cases were coded by the Office of the ASCC. As a result it is possible that slightly different codes may have been allocated to the same fatality case. Recoding included translation of

the NF single-digit industry codes to the single alphabetic ANZSIC codes and conversion of the NF jurisdiction identifier 'JurisSource' to a data item designed to indicate state/territory of occurrence.

## 4.5 Identification of matching cases and interpretation of uncertain matches

### Identification of matching cases

Details of the deaths on each of the three lists were compared in order to identify and eliminate duplicates and triplicates in the data.

In order to simplify this process, the three lists were combined into a single EXCEL worksheet. In general, matching was then achieved by sorting this file by date variables and reviewing groups of records that had the same or similar values and were therefore adjacent, or nearby, in the sorted file.

Pairs or triplets that looked plausible on the basis of dates were scrutinised carefully, using other data items to confirm or refute the match. The other data items used most often were names, text descriptions (for NF and NCIS cases), occupation, nature, agency and mechanism of injury, age, sex, jurisdiction and industry (roughly in that order of priority).

There was considerable variation between cases in the quantity and quality of available information. In addition, for any pair or triplet of cases, there were many combinations of variables that could have the same value. This meant that there was some subjectivity to the assessment of when a suspected pair or triplet covered the same case. Therefore, each assessment was allocated a rating that indicated the confidence with which the assessment was made. This was done according to the five point rating shown in Table 3.

**Table 3: Rating scale used in assessing the likelihood of case matching**

Rating	Label	Definition
1	Definite match	It is nearly certain that the two or three records refer to the same death.
2	Likely match	It is likely to very likely that the two or three records refer to the same death.
3	Probable match	Can't be decided with confidence (for example, some not very specific variables are the same and no strong evidence of difference).
4	Unlikely match	It is likely to very likely that the two records refer to different deaths
5	Non-match	It is nearly certain that the two records refer to different deaths.

The rating was done independently by two investigators and the results were compared. Differences of 1 vs 2, and of 4 vs 5, were not regarded as substantial, but all other differences were regarded as substantial. The substantial differences were discussed between the two investigators in order to reach a final, agreed rating.

### Interpretation of uncertain matches

For the purposes of this project, cases were taken to be duplicates or triplicates if they had been given a matching rating of 1 (a 'definite' match) or 2 (a 'likely' match). Those that were ranked as 3 (a 'probable' match) were investigated further. A conservative approach was taken in order to avoid the possibility of overstating the estimated number of work-related fatalities.

## 4.6 Verification of duplicates and triplicates by use of names

Whereas the name of each deceased individual is included within the data record made available to authorised users of the NCIS, it is not part of the agreed minimum datasets of the NDS and NF data that is routinely sent to the Office of the ASCC by state and territory OHS authorities. In view of this, it was decided at the outset of this project to rely on other data items for the identification of duplicate and triplicate records across the three data sources — in particular, dates (date of birth, date of injury event and date of death, where available) plus data items such as gender, jurisdiction, industry, occupation and text descriptions, where available.

An interim report on the project was presented to the ASCC's OHS Working Group in February 2006, and the representatives of the states and territories agreed to assist with the matching of names within the bounds of the data privacy provisions that applied to their jurisdiction. It was therefore decided to include names, where available, in the identification of duplicate and triplicate records, and this was accomplished in one the following ways for each jurisdiction except the Northern Territory which was not able to assist at this time.

### **Method 1**

The OHS authorities in Victoria, South Australia and Tasmania together with Comcare supplied the ASCC with NDS and NF data that was augmented with the name of each deceased individual. Together with the available name-identified NCIS data, these data were used to confirm or refute duplicate and triplicate records and to identify new matches.

### **Method 2**

The ASCC provided details of all in-scope NDS and NF records and name-identified in-scope NCIS records to a nominated representative of the OHS authority in New South Wales, Queensland, Western Australia (for NF only) and the Australian Capital Territory who each then compared these data with their jurisdiction's name-identified NDS and NF data to identify duplicate and triplicate records. De-identified results were then provided to the ASCC.

The form of the information provided to these four jurisdictions was:

- > non-name-identified NDS and NF information and name-identified NCIS information on suspected pairs and triplets, with a request for the jurisdiction to confirm or refute the suspected match, and
- > information on single cases with names identified from the NCIS, with a request for the jurisdiction as to whether the name appeared in either the NDS or the NF.

The ASCC provided the NCIS data to these four jurisdictions with the knowledge and approval of the data custodian (the VIFM). This was conditional upon data confidentiality agreements being signed by the nominated representatives and the data being destroyed at the completion of the process.

The use of names resulted in a small improvement in the identification of duplicate and triplicate records, and in a minor decrease in the fatalities estimate, as described in Chapter 5.

## 4.7 Classification of cases by type of work activity

Having identified matching cases and excluded duplicates, information on the individual cases was used to categorise the cases into one of seven categories of type of work activity. This categorisation was done on the basis of the text description, and could therefore not be done for cases that were only NDS cases and/or only Open NCIS cases.

The seven categories were:

- Unknown - no text
- Unknown – insufficient text
- Working – not a road crash
- Working – road crash
- Commuting
- Bystander
- Other – volunteer

The scope of the fatalities estimate included commuting cases, but the limitations of the source information meant that these will not have been included comprehensively. The same applied to bystanders (persons who were not working but were fatally injured as a result of the work activity of others) and persons working other than for income (volunteers).

## 5. RESULTS

This Chapter presents the key results of the project which includes the fatalities estimate for 2003–04, the individual contributions to this estimate from each of the data sources, and the impact on the estimate resulting from the inclusion of names in the data matching process.

A breakdown of the estimate is also provided for three important data items. These are ‘Type of work activity undertaken at time of injury event’, ‘Industry of employer’ and ‘Jurisdiction of injury event’. The opportunity was also taken to examine the data sources contributing to the individual categories of these data items. This was done in order to gauge the extent to which counts for the individual categories were reliant on an individual data source or were more broadly based on contributions from two or three data sources.

### 5.1 Fatalities estimate 2003–04

The outcome of the record collection and matching is summarised in Table 4.

**Table 4: Number of records and cases by scope status and data source, Australia, 2003–04**

Data source	Records			Cases		
	In scope	Uncertain scope status	Total	In scope	Uncertain scope status	Total
NDS	164	14	178	70	12	82
NF	134	2	136	42	1	43
NCIS	201 <sup>(a)</sup>	11	212	79	8	87
NDS & NF				20	0	20
NDS & NCIS				49	2	51
NCIS & NF				47	1	48
All three data sources				25	0	25
<b>Total</b>	<b>499</b>	<b>27</b>	<b>526</b>	<b>332</b>	<b>24</b>	<b>356</b>

(a) This count pertains to 200 separate deaths. It comprises the coronial records for 199 separate deaths plus two coronial records for another death that had been the subject of coronial investigations in two jurisdictions.

In aggregate, the three data sources provided 499 in-scope records plus 27 records of uncertain scope status. Nearly all of the uncertain cases were in either the NDS or NCIS. These cases were assigned the uncertain status due to insufficient data and textual description needed to enable a sound determination about whether the circumstances of the incident fell within the project’s scope. Some of the NCIS cases had insufficient information because they were still listed as Open. Ten of the uncertain NDS records had a date of injury prior to 1 July 2003 and it is not known whether the date of death occurred during the period 1 July 2003 to 30 June 2004.

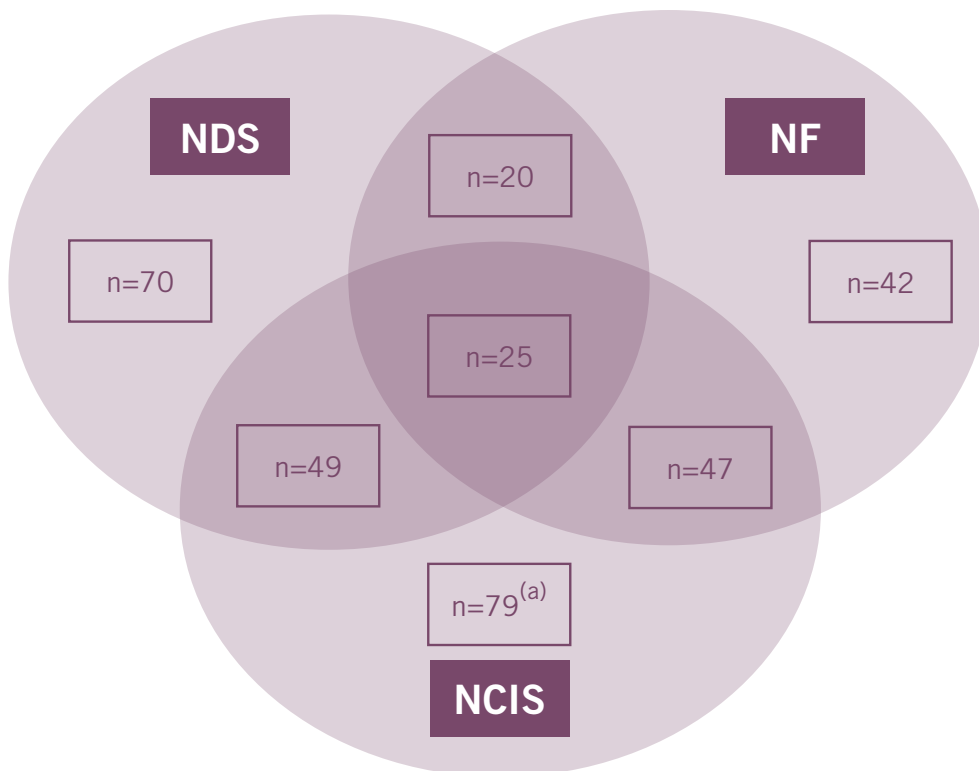
After removing the records found to be duplicates or triplicates from the count of 449, there were 332 persons who died in Australia during 2003–04 from work-related injuries (24 persons of uncertain scope status were not included in this estimate). The fatality rate for 2003–04 was 3.5 per 100 000 in the employed civilian labour force.

As noted in Section 4.5, a conservative view was taken of the identification of duplicate and triplicate records across the three datasets. This was done in order to avoid the possibility of overstating the estimated count of work-related fatalities.

## 5.2 The contribution of each data source to the fatality estimate

As noted, in aggregate the three data sources provided 499 in-scope records about 332 separate cases (persons). Figure 1 provides a schematic representation of the individual contributions of each of the data sources to these counts.

**Figure 1: The contribution of each data source to the fatality estimate**



(a) Comprises coronial records for 78 deaths plus two coronial records for another death that was the subject of coronial investigations by two jurisdictions.

Overall, of the 332 deaths found by the three data sources, 191 (58%) were counted from a single data source and 141 (42%) were counted from a total of 307 records that overlapped in various ways between the data sources. Only 25 cases were in all three datasets.

Each of the three data sources made a significant contribution to the overall fatality estimate, as follows:

- > The NDS provided 164 in-scope records, a contribution of 49% of the estimated number of deaths.
  - Of these records, 70 were unique to the NDS, representing 21% of the estimated number of deaths.
- > The NF provided 134 in-scope records, a contribution of 40% of the estimated number of deaths.
  - Of these records, 42 were unique to the NF, representing 13% of the estimated number of deaths.

- > The NCIS provided 201 in-scope records, two of which pertained to the same death. The 200 records about separate deaths contributed 60% of the estimated number of deaths.
  - Of these records, 79 were unique to the NCIS, representing 24% of the estimated number of deaths.

As noted, the NCIS contributed 60% of the estimated number of deaths, the NDS contributed 49% and the NF contributed 40% - these contributions summing to more than 100% due to duplication across the data sources. These percentage contributions should not, however, be taken to represent the exact proportion of deaths that would have been detected by a study restricted to that source alone. This is because information from more than one source was sometimes necessary to decide whether a record should be included.

It is reasonable to expect that all deaths would be identifiable in the NCIS, since virtually all injury deaths in Australia are reported to the coroner, and all deaths reported to the coroner should be recorded in the NCIS. Several factors may have led to the NCIS contributing just 60% of in-scope cases, and these are considered in Chapter 6.

### 5.3 The effect on the estimate of including names in data matching

The phase of the project involving liaison with some of the OHS and WC agencies which supplied the NDS and NF data to the ASCC to provide names resulted in a fairly small increase in information. The use of names confirmed matches already identified in the data and provided some additional cases and records. However, in one instance the availability of names downgraded a probable match to a non-match. A discussion on the utility of this approach, the post-hoc method used and the future use of names for matching is provided in Chapter 6.

### 5.4 Fatalities by type of work activity

Table 5 describes the work activity undertaken at the time of the injury event for the estimated deaths in Australia during 2003–04 from work-related injuries.

**Table 5: Number of in-scope records by source, number of in-scope cases and number of records per case, by type of work activity undertaken at time of injury event, Australia, 2003–04**

Type of work activity undertaken at time of injury event	In-scope records				Deaths (in-scope cases)	Records per case
	From NDS	From NF	From NCIS	Total		
Working for income, not a road crash	58	115	95	268	152	1.8
Working for income, road crash	49	7	51*	108	74	1.5
Commuting	55	0	48	103	89	1.2
Bystander	0	10	3	13	10	1.3
Other work (voluntary, etc.)	0	2	3	5	5	1.0
Unknown work activity <sup>(a)</sup>	2	0	0	2	2	1.0
<b>Total</b>	<b>164</b>	<b>134</b>	<b>200<sup>#</sup></b>	<b>499</b>	<b>332</b>	<b>1.5</b>

(a) Included solely on the basis of presence in a named case list from Victoria with little information provided.

\* Count is 52 if both of two NCIS records for a single death are counted separately.

# Count is 201 if both of two NICS records for a single death are counted separately.

About two of every three deaths (226 of 332) resulted from injuries sustained while working for an income, 74 of which involved a road crash. Another 89 deaths were of commuting workers, ten deaths were of bystanders, five deaths involved other work activity such as voluntary work, and two deaths involved unknown work activity.

Table 5 also provides a breakdown of the data sources contributing to each category of work activity undertaken at the time of the injury event. This information is presented in percentage terms in Table 6.

**Table 6: The contribution of in-scope records from each data source to the final count of cases, by type of work activity at time of injury, Australia, 2003–04 (per cent)**

Type of work activity at time of injury	In-scope records as a percentage of cases		
	From NDS	From NF	From NCIS
Working for income, not a road crash (n=152)	38%	76%	63%
Working for income, road crash (n=74)	66%	9%	69%
Commuting (n=89)	62%	0%	54%
Bystander (n=10)	0%	100%	30%
Other work (voluntary, etc.) (n=5)	0%	40%	60%
Unknown work activity <sup>(a)</sup> (n=2)	100%	0%	0%
<b>Total</b>	<b>49%</b>	<b>40%</b>	<b>60%</b>

(a) Included solely on the basis of presence in named case list from Victoria with little information provided.

The average number of records per case varied widely with type of work activity, 1.8 for *Working for income, not a road crash*, 1.5 for *Working for income, road crash*, 1.2 for *Commuting*, 1.3 for *Bystander* and 1.0 for *Other work*.

Three-quarters of cases of fatal injury while working (excluding those on the road) were found in NF and nearly two-thirds were found in NCIS. Of the 152 cases of this type, 21 were only found in NCIS. Four of these involved air transport and three involved water transport. Seven occurred on farms, involving tractors in two cases, probable farmers felling trees on their property in two cases, and drowning in two other cases. Two cases might have been considered road vehicle traffic accidents, but had characteristics that distinguish them from traffic crashes (a fence-builder hit by a passing vehicle and a person crushed by a parked truck, while under it doing repairs). The remaining five cases had various causes: three involved earth-moving equipment in circumstances that are not entirely clear, one was the result of a homicide, and another fatality was the result of the late consequences of a fall.

Most work-related road injuries were not included in NF. Most of those that were found in NF have characteristics that may explain this, three of seven were workers whose occupation required them to be pedestrians in or near road traffic (road workers, garbage collector), another three were car occupants, and one was a truck driver. The car occupants' inclusion in NF may be a reflection of the nature of their employers (police, an Australian Government agency and a telecommunications provider). As might be expected, no commuting cases were found in NF. However 100% of the bystander fatalities identified in this study were in the NF.

Only 38% of the largest category, *Working for income, not a road crash*, was found in the NDS. This may be related to the percentages of self-employed workers across a number of industries.

## 5.5 Fatalities by industry

The industry of employer was used in this analysis, as this would usually be the industry that was directly implied by the task of the deceased person and the circumstance of the fatal event.

### Cases and rates

Table 7 and Figure 2 describe the employer's industry for the estimated deaths during 2003–04 from work-related injuries.

**Table 7: Number of persons in the employed civilian labour force, estimated number of persons who died from work-related injuries, and fatality rate by industry of employer, Australia, 2003–04**

Industry of employer	Employed civilian labour force <sup>(a)</sup>	Estimated deaths (in-scope cases)	Fatality rate (cases per 100,000 employed)
Agriculture, forestry and fishing	374,500	72	19.2
Mining	96,550	8	8.3
Manufacturing	1,070,250	26	2.4
Electricity, gas and water supply	74,975	5	6.7
Construction	776,750	52	6.7
Wholesale trade	445,550	12	2.7
Retail trade	1,439,250	15	1.0
Accommodation, cafes and restaurants	470,350	7	1.5
Transport & storage	432,475	62	14.3
Communication services	174,025	5	2.9
Finance and insurance	346,350	3	0.9
Property and business services	1,119,850	18	1.6
Government administration and defence	445,350	6	1.4
Education	698,375	10	1.4
Health and community services	955,325	12	1.3
Cultural and recreational services	239,000	5	2.1
Personal and other services	369,050	12	3.3
Industry Unknown	..	2	..
<b>Total</b>	<b>9,527,975</b>	<b>332</b>	<b>3.5</b>

(a) Persons in the employed civilian labour force working one hour or more, based on the average of the ABS Labour Force Surveys, August 2003 to May 2004 (ABS 6291.0.55.001, May 2006).

.. Not applicable

Sources: ABS 6291.0.55.001 Labour Force, Australia. NDS, NF and NCIS data.

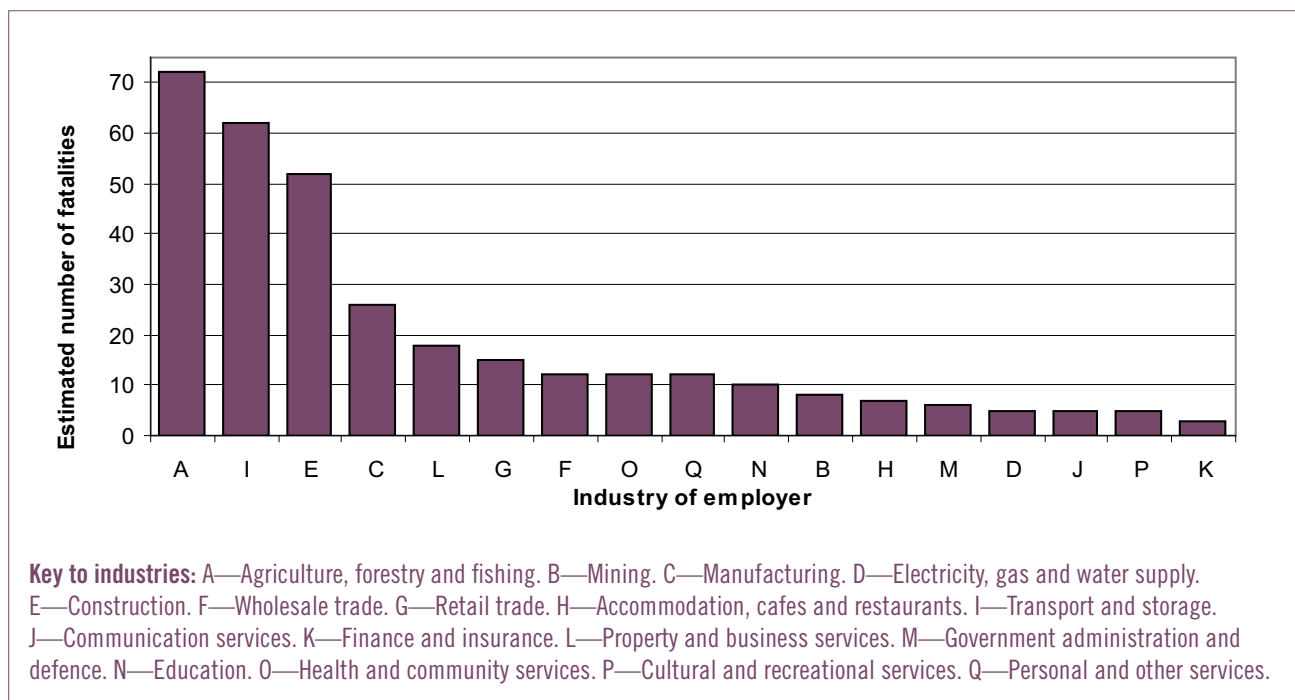
Across all industries, the fatality rate (deaths per 100 000 in the employed civilian labour force) was 3.5 for 2003–04.

The highest estimated number of work-related deaths was recorded for Agriculture, forestry and fishing (72), followed by Transport and storage (62) and Construction (52). Agriculture, forestry and fishing and Transport and storage also had the highest and second-highest fatality rates (19.2 and 14.3 work-related fatalities per 100 000 people in the employed civilian labour force respectively). The next highest fatality rates were for Mining (8.3), Electricity, gas and water supply (6.7) and Construction (6.7).

Industries with estimated work-related death rates below 10 per 100 000 employed but more than two per 100 000 employed were Mining, Manufacturing, Electricity, gas and water supply, Construction, Wholesale trade, Communication services, Cultural and recreational services, and Personal and other services.

Those industries which had fatality rates below two per 100 000 in the employed civilian labour force were the Retail trade, Accommodation, cafes and restaurants, Finance and insurance, Property and business services, Government administration and defence, Education, and Health and community services.

**Figure 2: Estimated number of persons who died from work-related injuries, by industry of employer, Australia, 2003–04. Source: NDS, NF and NCIS data**



### Contribution of the three data sources to industry totals

Tables 8 and 9 and Figure 3 show the sources of the records contributing to the estimated deaths within each industry category. They show considerable variation between industries in the contributions from the three data sources. This variation is probably significantly influenced by the circumstance of the fatal incident. For example, fatally injured workers in Transport and storage are likely to have been involved in road crashes, and so are not likely to appear in the NF but should appear in the NDS if they are employees. Fatally injured workers in Agriculture, forestry and fishing are as likely to be self-employed as they are to be an employee and so are not

necessarily covered by the NDS but should be covered by the NF. As noted previously, according to ABS data, 48% of those working in this industry are self-employed.

Whereas the NDS contributed 49% of in-scope cases across all industry groups, it contributed over 80% for cases in Health and community services, Wholesale trade, Property and business services, and Government administration and defence. Overall, the NDS best captured work-related fatalities in six out of the 17 industries—these were Health and community services, Wholesale trade, Property and business services, Government administration and defence, Education, and Retail trade.

However, the NDS was not the best data source for those industries which recorded the highest number of deaths or had the highest fatality rates, namely Agriculture, forestry and fishing, Manufacturing, Electricity, gas and water supply, Construction and Transport and storage.

A number of unexpected results were apparent in the coverage of the NDS based on the proportion of employed and self-employed workers in each industry. Agriculture, forestry and fishing is a sector known to have only half (52%) of the workforce covered by WC, however only 22% of these cases were found in the NDS.

The NDS contributed a fairly low proportion of cases for Construction (46%) although some 67% of the workforce are employees. Similarly, 93% of the Manufacturing workforce are employees but only 62% of the deaths in this industry were captured by the NDS. While 97% of the Mining workforce are employees, only 50% of the deaths were included in the NDS.

Whereas the NF contributed 40% of cases across all industry groups, it captured all of the Mining cases and 65% of cases in Agriculture, forestry and fishing. Overall, the NF best captured three out of 17 industries: Mining, Construction, and Personal and other services.

The NF contributed 20% or fewer cases in Retail trade, Transport and storage, Finance and insurance, Property and business services, Education, Health and community services, and Cultural and recreational services. This may be explained by the fact that most of these fatalities involved road traffic crashes; either working road crash, or commuting. These types of fatalities are not well covered by the NF. The NF contributed no cases at all in Finance and insurance and Health and community services.

The NCIS best captured five out of 17 industries: Agriculture, forestry and fishing, Accommodation, cafes and restaurants, Transport and storage, Communication services, and Cultural and recreational services. For most of these industries the estimated numbers of fatalities would have been substantially lower had the NCIS data source not been included in the project.

The NCIS contributed only three cases in Mining, in part due to Western Australia not recording the details of coroner's cases until they are classified as closed case (cases where the coroner has handed down findings about the death). This is not the case in other jurisdictions.

**Table 8: Number of in-scope records by source, estimated number of deaths and number of records per case by industry of employer, Australia, 2003–04**

Industry of employer	In-scope records				Estimated deaths (in-scope cases)	Records per in-scope case
	From NDS	From NF	From NCIS	Total		
Agriculture, forestry and fishing	16	47	51	114	72	1.6
Mining	4	8	3	15	8	1.9
Manufacturing	16	8	16	40	26	1.5
Electricity, gas and water supply	2	2	2	6	5	1.2
Construction	24	30	29	83	52	1.6
Wholesale trade	10	5	7	22	12	1.8
Retail trade	10	3	8	21	15	1.4
Accommodation, cafes and restaurants	2	2	4	8	7	1.1
Transport & storage	33	12	45	90	62	1.5
Communication services	1	2	4	7	5	1.4
Finance and insurance	2	0	2	4	3	1.3
Property and business services	15	3	9	27	18	1.5
Government administration and defence	5	2	3*	11	6	1.8
Education	7	2	4	13	10	1.3
Health and community services	11	0	3	14	12	1.2
Cultural and recreational services	0	1	4	5	5	1.0
Personal and other services	6	7	4	17	12	1.4
Industry Unknown	0	0	2	2	2	1.0
<b>Total</b>	<b>164</b>	<b>134</b>	<b>200#</b>	<b>499</b>	<b>332</b>	<b>1.5</b>

Source: NDS, NF and NCIS datasets.

\* Count is 4 if both of two NCIS records for a single death are counted separately.

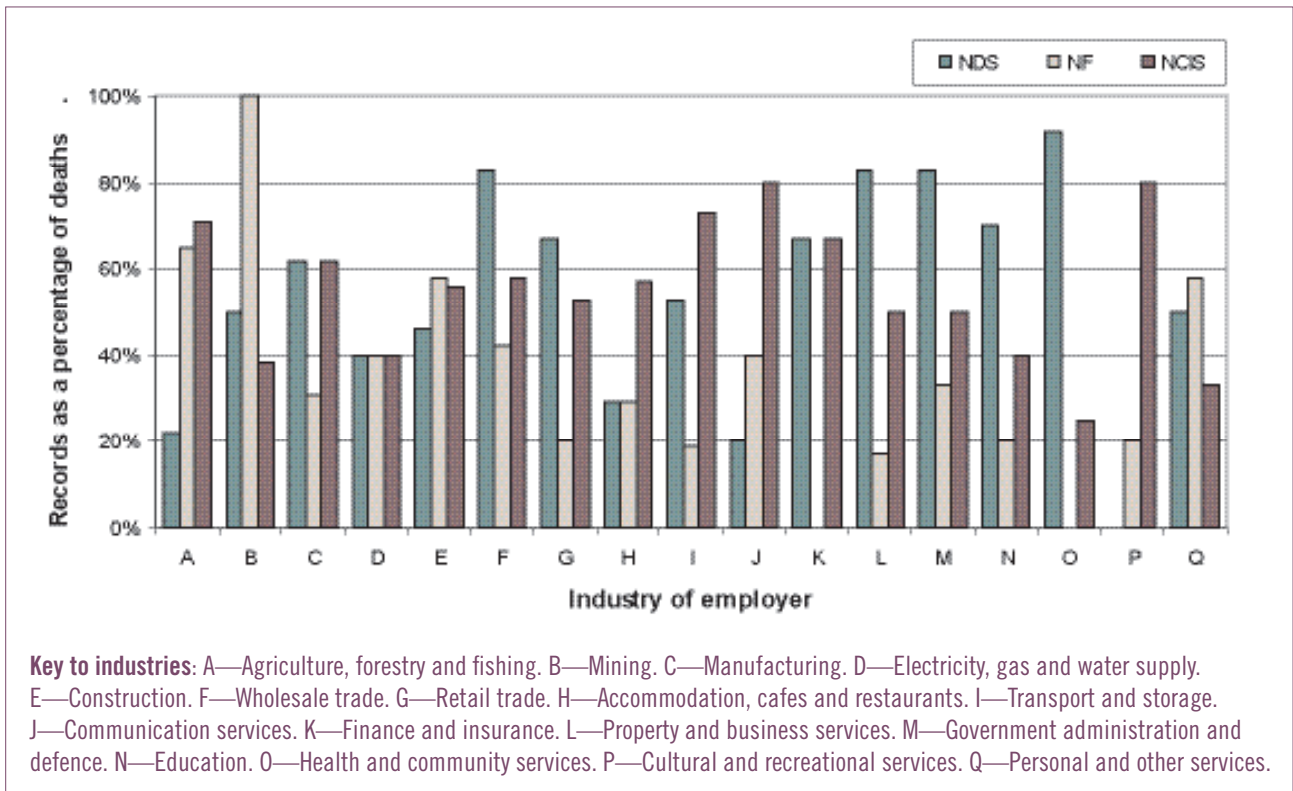
# Count is 201 if both of two NICS records for a single death are counted separately.

**Table 9: Contribution of in-scope records from each data source to the estimated number of deaths by industry of employer, Australia, 2003–04 (per cent)**

Industry of employer	In-scope records as a percentage of estimated deaths (in-scope cases)		
	From NDS	From NF	From NCIS
Agriculture, forestry and fishing	22%	65%	71%
Mining	50%	100%	38%
Manufacturing	62%	31%	62%
Electricity, gas and water supply	40%	40%	40%
Construction	46%	58%	56%
Wholesale trade	83%	42%	58%
Retail trade	67%	20%	53%
Accommodation, cafes and restaurants	29%	29%	57%
Transport & storage	53%	19%	73%
Communication services	20%	40%	80%
Finance and insurance	67%	0%	67%
Property and business services	83%	17%	50%
Government administration and defence	83%	33%	50%
Education	70%	20%	40%
Health and community services	92%	0%	25%
Cultural and recreational services	0%	20%	80%
Personal and other services	50%	58%	33%
Industry Unknown	0%	0%	100%
<b>Total</b>	<b>49%</b>	<b>40%</b>	<b>60%</b>

Source: NDS, NF and NCIS datasets.

**Figure 3: Contribution of each data source to estimated number of deaths by industry of employer, Australia, 2003–04 (per cent). Source NDS, NF and NCIS data**



### Work activity by industry type

Table 10 describes the work activity undertaken at the time of the injury event and the industry of employer for the estimated deaths during 2003–04 from work-related injuries.

**Table 10: Estimated number of deaths by type of work activity undertaken at time of injury event and industry of employer, Australia, 2003–04**

Industry of employer	Type of work activity					Total
	Working, not road crash	Working, road crash	Commuting	By-stander	Other/ not known	
Agriculture, forestry and fishing	56	5	6	3	2	72
Mining	8					8
Manufacturing	7	4	13	2		26
Electricity, gas and water supply	2		2		1	5
Construction	32	6	12	1	1	52
Wholesale trade	5	4	3			12
Retail trade	5	2	7	1		15
Accommodation, cafes and restaurants	1		5	1		7
Transport & storage	17	38	5	1	1	62
Communication services	1	4				5
Finance and insurance			3			3
Property and business services	6	2	10			18
Government administration and defence	3	1	2			6
Education	1	3	5		1	10
Health and community services			11		1	12
Cultural and recreational services	2		3			5
Personal and other services	6	4	1	1		12
Unknown <sup>(a)</sup>		1	1			2
<b>Total</b>	<b>152</b>	<b>74</b>	<b>89</b>	<b>10</b>	<b>7</b>	<b>332</b>

(a) Included solely on the basis of presence in named case list from Victoria with little information provided.

Source: NDS, NF and NCIS datasets.

Fatal injuries while working for income but not involving a road vehicle crash made up half or more of all identified cases in three predominantly blue-collar industries, all found in previous studies to have high rates of work-related fatal injuries: Agriculture, forestry and fishing, Mining, and Construction. These industries accounted for nearly two-thirds of all cases categorised as Working for income, not road crash. Half or more of all identified cases were of this type in two other industry sectors, each with small numbers of cases: Government administration and defence (three out of six) and Personal and other services (six out of twelve).

Not surprisingly, road crashes in the course of work were most prominent in Transport and storage (38 out of 62 cases). This sector contributed slightly more than half of these cases, the remainder occurring across a wide range of industries.

Commuting cases made up half or more of total recorded cases in Manufacturing and in several predominantly white-collar sectors. Commuting cases may be under-counted, especially in jurisdictions in which such cases are not covered by WC insurance, and for self-employed workers. Whereas all such deaths should be reported to a coroner and therefore result in an NCIS record, the fact that a person was commuting at the time of the crash is not always recorded in the relevant documentation, making the determination of work-relatedness very difficult.

Half of the small number of identified bystander cases pertained to Agriculture, forestry and fishing (three out of ten) or Manufacturing (two out of ten).

## 5.6 Fatalities by State/Territory

Table 11 describes the state and territory of the injury event for the estimated deaths during 2003–04 from work-related injuries. About 33% of the deaths (111) resulted from injury incidents in New South Wales, 23% in Victoria, 21% in Queensland, 10% in Western Australia, 7% in South Australia, 3% in Tasmania, 2% in the Northern Territory and less than 1% in the Australian Capital Territory.

Table 11 also explores the degree of overlap between the three data sources in each jurisdiction. Excluding the Australian Capital Territory (four records only), there was relatively little difference across jurisdictions in the degree of overlap between the data sources, with the ratio of records to cases ranging between 1.4 and 1.7. This provides some confidence about the comparability of the estimation methodology across the jurisdictions.

**Table 11: Number of in-scope records and estimated number of deaths by state/territory of injury event <sup>(a)(b)</sup>, Australia, 2003–04**

State/territory of injury event	Records	Estimated deaths (in-scope cases)	Records per in-scope case
New South Wales	165	111	1.5
Victoria	108	76	1.4
Queensland	100	69	1.4
Western Australia	55	34	1.6
South Australia	39	23	1.7
Tasmania	17	10	1.7
Northern Territory	11	8	1.4
Australian Capital Territory	4	1	4.0
Australia	499	332	1.5

- (a) Seven deaths resulted in records in more than one state or territory. The relevant cases (column 3) have been assigned on the basis of the state or territory in which the injury was sustained. For example, the four ACT records relate to a total of three in-scope deaths, one of which occurred in the ACT and two occurred in NSW.
- (b) NDS records advised by Comcare pertaining to Australian Government employees have been assigned to record and case totals (columns 2 and 3) on the basis of the state or territory in which the injury was sustained. For 2003–04, 6 Comcare deaths occurred in New South Wales, 5 in Victoria, 4 in Queensland, one in Western Australia, 2 in South Australia and one in Tasmania.

Source: NDS, NF and NCIS datasets.

## 6. DISCUSSION AND CONCLUSION

### 6.1 Introduction

The key outcomes of this project are a reliable estimate of the total number of persons who died in Australia during 2003–04 from work-related injuries, an improved understanding of the coverage of work-related deaths by the three datasets used for this estimate, guidance about how such coverage might be improved, and an improved understanding of other factors impinging on the precision of the estimate.

This Chapter provides a discussion on specific issues relating to the production of the estimate and the methodology used. It also provides a comparison with previous studies of work-related traumatic fatalities in Australia.

### 6.2 The ability of the individual data sources to contribute to the estimate

Based on the records provided by the three data sources, the project estimated that there were 332 persons who died in Australia during 2003–04 from work-related injuries. This was a substantially larger count than the numbers of in-scope records provided by any of the individual data sources (between 134 and 201). Overall the NDS contributed 49% of the estimated number of deaths, the NCIS contributed 60% and the NF contributed 40%, these contributions summing to more than 100% due to duplication across the data sources. Only 25 individual cases were found in each of the three datasets.

The implication of this incomplete overlap of fatality cases between the datasets is quite significant. This report establishes that no one source of data is sufficient to obtain a full understanding of the number of work-related injury fatalities and the circumstances surrounding these deaths and that all three datasets are essential to produce a valid estimate.

Also, as noted, a number of unexpected results were apparent in the coverage of the NDS based on the proportion of employed and self-employed workers in each industry. The NDS does not cover those who are self-employed. However it is not known whether these unexpected results can be attributed to a higher rate of fatalities among the self-employed in certain industries as this information was not available from the data. Neither the NF nor the NCIS provide information as to whether the fatally injured worker was self-employed.

The results of this project together with established knowledge about the scope and coverage of the individual data sources enable the following broad conclusions about the benefits of the project methodology:

- > For deaths from work-related events that were not road crashes, the NF and NCIS tend to compensate for the non coverage of self-employed workers in the NDS—with particular benefits to the individual estimates for Agriculture, forestry and fishing, and Construction.
- > The NF and NCIS compensate to a limited extent for the inability of the NDS to identify work-related road crash deaths of workers who were self-employed—with particular benefit to the individual estimate for the Transport and storage industry. Work-related road crash deaths are poorly covered by the NF due to the difficulty in identifying work-related road fatalities and the lack of established protocols for notifying work-related road crashes to OHS authorities. Whereas these deaths would generally be covered by the NCIS, their work-relatedness can not always be determined from the information available to the coroner about the purpose of travel. It is likely that this type of work-related injury fatality is still under-counted, despite the use of all three data sources.

- > The NF and the NCIS identify bystanders which are not covered by the NDS. However this is not comprehensive in the NCIS in relation to road crash bystander deaths due again to difficulties in determining work-relatedness from the material available to the coroner.
- > Commuting deaths are covered well by the NDS for those jurisdictions where these deaths are covered by workers' compensation, but the project methodology does not provide comprehensive coverage of commuting deaths for the other jurisdictions. Commuting deaths are outside the scope of the NF. Although such deaths will generally be referred to a coroner and should therefore be included within the NCIS, the information held on file about the cases will often be insufficient to enable them to be recorded as work-related.
- > The NF was particularly beneficial compared with the NDS and the NCIS in providing timely coverage of mining industry deaths for the reference year.
- > An absence of wide variation between jurisdictions in the degree of overlap of the three data sources provides confidence about the comparability of the estimation methodology across the jurisdictions.

### 6.3 Other factors relating to the estimate

Beyond the above considerations about the intrinsic coverage capabilities of the three data sources, the estimation of total work-related fatalities using the project methodology is reliant on reasonable precision in the following areas:

- > the coding of key data items used to discriminate in-scope records—in particular, the coding of work-relatedness in the NCIS
- > the data matching process,
- > the coding of key data items used in data matching and data disaggregations—in particular, the coding of Industry, and
- > the timing of data extraction.

Key issues are discussed below.

#### The coding of work-relatedness in the NCIS

As noted, the findings of this report suggest a considerable under-identification of work-related fatalities among the set of deaths recorded within the NCIS. Some work-related cases are not being identified as such. The major reason appears to be that the information available to the coroner's office staff is sometimes insufficient to allow work-relatedness to be confidently determined. Because of this, certain types of incidents, such as road crashes, are incompletely identified as work-related. It may be the case that certain occupations are also less likely to be considered as being involved in work-related deaths than others. Another factor is that the work-related flag will not always have been finalised for coronial cases of Open status.

This under-identification has important ramifications on the degree to which the NCIS is able to cover gaps in the other data sources such as self-employed persons (NDS) and persons killed in road crashes (NF). The NCIS is the only one of the three datasets likely to record, for example, the road crash death of a self-employed truck driver. If the NCIS record for such a case has Open status at the time of the data search or work-relatedness has been incorrectly coded, the case is unlikely to be included in the fatalities estimate.

It is reasonable to expect that a complete search of NCIS rather than relying solely on the work-relatedness flag would identify cases not recorded in the NDS or NF, and therefore it is likely that 332 is an underestimate of the true number of work-related deaths during 2003–04.

### **The availability of dates for the data matching process**

Dates were of foremost importance in the matching process. The project found that dates were usually consistent across the different data sources, which indicated that the date information was of good quality. An important consideration in the approach that might be taken to future matching is that the NF does not currently include date of birth. Similarly, whereas the NDS provides the date of the injury incident it does not currently include date of death, although this is somewhat less of a concern due to the fact that for most injury deaths the date of death is the same as the date of incident. The augmentation of the NF and NDS with date of birth and date of death respectively, would significantly enhance future attempts to estimate the number of work-related fatalities, particularly if future estimates did not include individuals' names in the matching process.

Of the three data sources, the NCIS has the best array of dates, although date of birth is not available for Open cases (date of death is usually available) and the NCIS web interface does not allow searching on date of birth.

### **The use of individuals' names in the data matching process**

Subsequent to the initial merging of the three individual datasets to identify duplicates and triplicates, a decision was made to use individuals' names in the identification of duplicate and triplicate records. This was done in one of two ways depending upon the data privacy considerations of the jurisdiction in question, either through the relevant jurisdictional OHS authorities providing name-identified NDS and NF data, or by the jurisdictions using name-identified NCIS data provided to them.

Whereas this process did identify some extra matches and also identified a small number of additional cases, the use of names served primarily to confirm or refute matches that had already been suggested by the earlier matching process based on other data items.

Some new cases and new matches were identified by the second of the above methods, but this may have resulted from the process of review by the jurisdictions rather than from the use of names. Similarly, the jurisdictions which supplied the lists of names to the Office of the ASCC supplied information on cases not previously known to the Office. The reason for the appearance of these additional cases was not clear. Presumably they were cases that had not been previously supplied to the Office because the relevant jurisdiction record had been created, or finalised.

It is therefore difficult to indicate the extent to which extra matches were identified by the use of names.

### **The coding of Industry**

The use of the three data sources in tandem is reliant upon reasonably-consistent coding of various key data items, such as Industry, across these data sources. This coding is, however, done by disparate agencies including the staff of each of the eight state and territory coroners' offices. This presents some challenges, notwithstanding the care taken to identify and follow up coding inconsistencies between the data sources wherever possible.

NDS data are provided to the jurisdictions from state and territory based OHS authorities where staff trained in the use of the TOOCS have coded the data. The data are provided to the Office of the ASCC each year, where a number of validity checks are applied. Any anomalies are reported to the relevant jurisdictions and clarifications

or corrections requested. It should, however, be noted that the Office of the ASCC has no official capacity to regulate coding methodology adopted at the jurisdictional level.

Data for the NF are provided to the Office of the ASCC from the relevant authorities around Australia and then coded by Office staff.

NCIS data are received by VIFM from state and territory coroners' offices, and most of the information is coded by the staff of those offices; however some of the information (Industry and Occupation) is coded by Office of the ASCC.

An additional complication is that the data supplied to the Office of the ASCC contains two codes for industry—industry of employer and industry of workplace. As noted, industry of employer has been used in this report as it would be the industry that was directly associated with the task and circumstances of the fatal incident.

### **The timing of data extraction**

The estimate used the preliminary NDS dataset for 2003–04. Updated NDS dataset are received annually by the Office of the ASCC, and the first update of the 2003–04 NDS dataset—received from all of the jurisdictions and cleaned by July 2006—would have provided additional in-scope NDS records for 2003–04, these being mainly compensation claims whose status had changed from 'Pending' to 'Accepted' during the intervening time period. To the extent that any such records were not brought to the attention of the Office of the ASCC by the jurisdictions during the special name-matching stage of the project, the use of the updated NDS dataset for the 2003–04 fatalities estimate would have increased the overlap between the NDS and the other two datasets beyond that set out in Table 4 and Figure 1.

Any fatality estimates that are to be made in future should therefore be deferred until the first update of the NDS dataset is received and validated by the Office of the ASCC by July two years after the end of the reference year. Deferral beyond this juncture is not, however, recommended, as this would be unlikely to provide a significant number of additional accepted claims.

The NDS dataset for a given year pertains to claims that were submitted during the year rather than to all deaths and injuries occurring during the year. The deferred construction of future fatalities estimates would therefore provide the additional benefit of enabling the use of the preliminary NDS dataset pertaining to the following year to identify accepted compensation claims submitted in that time period for work-related fatalities that occurred in the reference year. For example, the 2003–04 fatalities estimate used the NDS dataset for 2003–04, which contains only accepted compensation claims that were lodged between 1 July 2003 and 30 June 2004 irrespective of when the date of the incident occurred. From this dataset, only fatalities occurring during 2003–04 were extracted. The deferral of the estimate to permit the incorporation of NDS records about deaths during 2003–04 for which claims were lodged during 2004–05 would have increased the overlap between the NDS and the other two datasets beyond that set out in Table 4 and Figure 1.

The use of the updated NDS dataset should also lessen the chance of shortfalls in NDS coverage for specific groups of interest, such as those noted for 2003–04 in Section 5.5 between the level of employee versus self-employed participation within a given industry and NDS coverage of that industry.

### **Other factors**

Another factor that impinges on the precision of the estimation of total work-related fatalities using the project methodology is the fact that textual descriptions (police summaries and coroners' findings) are absent for many cases in the NCIS, in particular for most Open cases.

Similarly, a textual description of the injury event is not currently included in the NDS record. Such information would improve the efficiency and certainty of the case matching process and it would also assist with the resolution of coding conflicts, for example, the coding of Industry and Occupation, identified for cases recorded in multiple data sources.

The project relied to an extent upon access to the NCIS via a web interface. Limitations on the types of searches available in this medium restricted the search of this data source for work-related fatalities that had been incorrectly coded as not work-related. The use of the web interface was also very time consuming. Future estimates should utilise a complete data extract from the NCIS, including all data items and text documents, rather than rely on data and documents obtained piecemeal via the web interface. This would also avoid the problem of updates to the NCIS between periods of access via the web.

#### **6.4 Additional reports based on the existing data**

This report provides information on the estimated fatalities during 2003–04 by industry, work activity and jurisdiction. However, other factors in the circumstances of the deaths are of interest. For example, certain occupations may be more likely to be involved in work-related deaths than others. A further examination of the data will be undertaken by the Office of the ASCC on the basis of factors other than industry, such as mechanism of incident, nature of incident and occupation of the fatally injured person.

#### **6.5 Comparison with previous studies**

This study found an overall fatality rate of 3.5 per 100 000 in the employed civilian labour force for 2003–04. Previous studies had significantly higher fatality rates, with 6.7 over the period 1982–1984 and 5.5 for the period 1989–1992. It should be noted however that the previous two studies included persons killed while doing home duties, whereas the current study excluded this group.

Notwithstanding this difference in the exclusion criteria, there appears to have been a drop in both the numbers and rates of persons killed in a work-related traumatic incident for the current study.

It was also hoped that this study would provide a comparison of the relative coverage of work-related fatalities of the datasets with the coverage found in the study which examined the 1989–1992 data<sup>6</sup>. However this proved to be problematic. The previous study gave the coverage of WC and OHS agencies of work-related fatalities as a percentage of work-related fatalities in coroners' files, with 56% and 35% respectively. The underlying assumption of this was that all relevant work-related fatalities would be included in the coroners' files, and this is very likely to have been a valid assumption which still holds true. This project however, found that only 60% of the 332 in-scope cases were identified in the NCIS. In other words, both the NDS and the NF had cases (70 and 42 respectively) which were not identified in the NCIS during this project. It is likely that the relevant deaths were recorded in the NCIS but were not identified because the methodology of the current study relied on the work-relatedness flag applied by coronial staff. This means that a comparison of the relative coverage of the datasets across the two studies was not possible.

<sup>6</sup> T Driscoll et al. Coverage of work related fatalities in Australia by compensation and occupational health and safety agencies. *Occupational and Environmental Medicine* 2003, 60: 195-200.

## 6.6 Conclusion

This report demonstrates that it is possible to estimate the number of work-related fatalities in Australia by supplementing a primary dataset, in this case the NDS, with other datasets. When the NDS was supplemented with the NF and NCIS datasets, very little overlap of fatality cases between the datasets was found. This suggests that a combination of datasets is a valid method to obtain an estimate of all work-related fatalities in Australia.

The estimate of the number of people who died as a result of work-related injuries during the period 1 July 2003 to 30 June 2004 is 332. An additional 24 cases were omitted from this total due to insufficient information being available. The estimate may also be an under-enumeration due to coding issues in NCIS, particularly where a case has not been flagged as work-related.

Notwithstanding the differences in scope between this study and the previous two work-related traumatic injury fatality studies in Australia, the current study has demonstrated a reduction in traumatic fatalities over the period.

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