Work-related Fatal Injuries in New Zealand 1985-1994:

Recommendations on the establishment of ongoing work injury mortality surveillance

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Executive Summary

New Zealand currently has no effective strategy for ongoing surveillance of work-related fatalities. In 1987 Cryer reported on work-related fatalities for the period 1975-84[1]. In 1997/8 the Work-Related Fatal Injury Study (WRFIS) replicated that study for the period 1985-94. While the methods used in both studies were very thorough and exhaustive they are very resource intensive and the output is not timely. Accordingly, the Review of Ten Years Work-Related Fatalities had as one of its secondary aims:

“to make recommendations on the establishment of ongoing work injury mortality surveillance”

In theory, with the increasing use of electronic databases by various agencies concerned with work related injury deaths, merging of these databases offers the obvious method for creating a database of all deaths[2].

In Part 1, of this report we describe our attempt to establish a register of work-related fatalities electronically.

Our reference dataset was that produced by the WRFIS. We sought to link the cases identified by agencies which had either a statutory requirement to investigate work-related injury deaths or some other administrative need to record these deaths to the WRFIS dataset.

For the period 1985-94 the WRFIS identified 820 work related deaths, 751 of these were workers and 69 bystanders. 596, or 73%, were identified by OSH, ACC, or one or more of the other agencies, (referred to hereafter as “Other”), combined.

A method of case ascertainment based on linking all agencies data will not adequately describe the universe of work-related fatal injury prior to 1994. Moreover, as the sole method this is unlikely to achieve the desired outcome in the near to medium term future given differences in case definition, and the quality of various databases.

The various agencies interpret their responsibilities for recording work-related fatal injury in terms of their statutory or administrative requirements. The problems that underpin the development of a surveillance system for work-related injury mortality include the fact that there is not one agency to which employers have a statutory responsibility for reporting these events, and there is no agency which has the statutory responsibility for maintaining an accurate database of all these events. Until these problems are addressed, there will continue to be major difficulties in developing surveillance systems that produce accurate and meaningful information.

Thus in Part 2, we consider how New Zealand should proceed for its future work-related fatalities surveillance. Repeating another WRFIS in ten years time was not considered a sensible strategy since a comprehensive review of Coronial files for all potential cases is extremely time consuming and inefficient and the process does not result in timely information. We thus referred to overseas experience.
There is a dearth of publicly available documentation describing attributes of various overseas systems and critiques of them. A notable exception in this respect are the two independent systems operating in the USA which focus on work-related injury deaths, namely: the US National Traumatic Occupational Fatalities surveillance system (NTOF), and the US National Census of Fatal Occupational Injuries (CFOI). NTOF uses one source of information for determining the population of work-related injury deaths. This contrasts with CFOI which uses multiple sources, and as a consequence has superior case ascertainment.

Both CFOI and NTOF systems have shortcomings:

- they do not record bystander deaths. As we have highlighted in Part 1 of this report these deaths should be included, and identifiable as such, in a work-related injury surveillance system.

- capture is poor for work-related motor vehicle traffic crashes. These present unique difficulties and, as such, require special attention in any future proposals for a surveillance system in New Zealand.

- both systems record usual occupation. It would also be highly desirable to record the occupation at the time of death since the discrepancy between the two may provide insight into causation (e.g. experience).

Despite these shortcomings however, the systems are impressive in terms of providing routine, comprehensive, timely data. In this regard, one key feature is that both CFOI and NTOF systems are run by agencies which have no punitive powers in respect to work-related fatal or non-fatal injuries. Moreover, they have as one of their primary organisational objectives, the operation of a surveillance system. Therefore, statutory obligations do no impede the surveillance task.

Another key feature of the USA systems, and the proposed Australian Coronial database, is the central role of the death certification process and the key role of the Coroner in this respect.
Recommendations
One agency for all-cause injury surveillance

1. One agency be responsible for the development of an all-cause work-related injury surveillance system and the operation of the agency be independent of any existing agencies statutory enforcement or compensation requirements.

2. The agency be responsible for facilitating the implementation of the recommendations of this report

3. As a matter of priority the agency:
   a) establish a consultative process with a view to developing and promulgating a "standard working definition of work-relatedness" for use by all agencies concerned with collecting information on work-related injury.

   b) promote the establishment of a national Coronal database with a specific module for work related injuries

4. As a minimum the agency develop a surveillance system which meets the Centres for Disease Control’s system attributes. In this respect the CFOI system is a useful model, in particular its use of multiple sources and independent verification.

5. As a minimum, yearly analysis and dissemination of statistics on work-related fatal injury be a requirement of the agency.

Coroners

6. That Coroners be responsible for the determination of “work-relatedness”, “occupation at time of death”, and “usual occupation”.

New Zealand Health Information Service (NZHIS)

7. That NZHIS add:

   • “work-related ?”
   • “occupation at time of death”, and
   • “usual occupation”

   to the Coroner’s certificate and that guidelines for the completion of these fields be issued to all relevant parties.

__________________________
1 See Appendix 1
8. That NZHIS have fields on its mortality data base which record the determination of Coroners with respect to “work-relatedness” “occupation at time of death”, and “usual occupation”.

**Accident Insurance Corporation (ACC)**

9. That ACC:

   a) continue to maintain its work-related indicator for all claims, irrespective of which account they are debited to
   b) that this indicator be consistent with the proposed “standard working definition of work-relatedness”.
   c) issue guidelines to those responsible for recording work-relatedness

**New Zealand Police and Land Transport Safety Authority**

10. New Zealand Police and Land Transport Safety Authority be consulted with a view to determining the feasibility of modifying the Traffic Crash Report to identifying work-related motor vehicle traffic crashes (consistent with the “standard working definition of work-relatedness”) and the occupations of the crash victims and the development of guidelines for the completion by investigating officers of the same.
Part 1: Establishing a work-related fatality ‘register’ electronically

1. Introduction
There is a statutory requirement for all work-related fatal injuries on land to be reported to Occupational Safety and Health (OSH), those on water to be reported to Maritime Safety Authority (MSA), and those in the air to the Civil Aviation Authority (CAA). Given the increasing use of computers by many government agencies, it should, in theory, be possible to produce a work-related fatality file by merging data from various agencies\(^2\). If this were achievable it would avoid the extensive search of Coroners records and provide a more timely information.

Our aim was:

a) to determine whether we could create an accurate work-related fatality file by merging electronic data from various agencies.

b) assess to what degree ACC and OSH/Other Agency data files cover the population of work-related fatal deaths
2. Method
Our reference dataset was that produced by the WRFIS. Case definition and identification of the population of work-related fatal injuries is described in detail in a separate report[3]. Case identification is of particular relevance to this report and, as such, the methods are summarised below.

The WRFIS identified the population of work-related fatal injury cases by two independent processes.

**First**, potential cases were identified from New Zealand Health Information Service’s (NZHIS) electronic national mortality data files. Potential cases were defined as follows:

All fatalities between 1985-94 involving persons aged 15-84 years which were coded by NZHIS as follows:

- Railway accidents (E800-E807)
- Motor vehicle non-traffic accidents (E820-E825)
- Other road vehicle accidents (E826-E829)
- Water transport accidents (E830-E838)
- Air and space transport accidents (E840-E845)
- Vehicle accidents not elsewhere classifiable (E846-E848)
- Accidental poisoning by drugs, medicaments and biologicals (E850-E858)
- Accidental poisoning by other solid and liquid substances, gases and vapours (E860-E869)
- Accidental falls (E880-E888)
- Accidents caused by fire and flames (E890-E899)
- Accidents due to natural and environmental factors (E900-E909)
- Accidents caused by submersion, suffocation and foreign bodies (E910-E915)
- Other accidents (E916-E928)
- Late effects of accidental injury (E929) (provided < 12 months after event)
- Injury undetermined whether accidentally or purposely inflicted (E980-E989)
- Homicide and injury purposely inflicted by other persons (E960-E969)

Work-related motor vehicle traffic crashes and suicides were specifically excluded.

Coronal files for these cases were then reviewed and a determination of work-relatedness made. Further details of the method used for this process can be found elsewhere[3].

The **second** process was to identify potential cases by referring to the files of agencies which had either a statutory requirement to investigate work-related injury deaths or some other administrative need to record these deaths. There are a variety of agencies in New Zealand which record details on work-related injury deaths. Potentially the agency with the greatest coverage is the Accident Rehabilitation and Compensation Insurance Corporation (ACC). Most deaths result in some compensation being paid (e.g. funeral expenses). There are, however, exceptions. For example,
compensation depends on a claim being lodged and accepted and this may not occur in a small number of cases for a variety of reasons (e.g. body never recovered). It should be noted that the ACC has no statutory obligation to investigate these deaths or record them.

In theory OSH, which unlike ACC, has a legislative mandate to investigate work-related deaths, should have the best coverage. In practice, the presence of other specialist agencies with responsibilities for specific classes of injury death, irrespective of whether they are work-related (e.g. Maritime Safety Authority), means the OSH will always have an underestimate of the number of deaths.

By definition, specialist agencies such as the Maritime Safety Authority cover a small percentage of the population of work-related deaths. Nevertheless these agencies may identify deaths which are not recorded by ACC or OSH. The following specialist agencies had been identified as sources of work-related cases:

- Civil Aviation Authority
- New Zealand Defence Force
- Electrical Inspection Group - Ministry of Commerce
- Maritime Safety Authority
- Mining - Ministry of Commerce
- Gas - Ministry of Commerce

For convenience these specialist agencies are hereafter referred to as “Other”.

The Coronial files for all potential cases from the various agencies were reviewed to determine work-relatedness in those instances where this had not been previously determined by the first process.

The final dataset was created by combining the information from the two processes.

Bystanders were included and identified as such. Bystanders were included since the long title of The Health and Safety in Employment Act 1992, “An Act to reform the law relating to the health and safety of employees, and other people at work or affected by the work of other people” clearly covers bystanders in their database. Moreover, OSH have confirmed that they include bystanders in their database. In addition, it was unclear to us whether other agencies included these in their databases, and more importantly, none had a facility of identifying them as such.

The commercially available software package AutoMatch (MatchWare Technologies Inc. 1995) was used for the purpose of linking the various databases to that for the WRFIS. AutoMatch allows probabilistic and deterministic record linkage, and has been used in a variety of settings, including the linkage of public health data bases. A strength of this procedure is that it allows for errors and missing values to be present in the fields used. The fields used in linking the databases were age, gender, date of birth, date of death, surname, first and second names. Outputs of matches, possible matches, and non-matches were obtained, and manual checking was performed after each run. Possible links were manually reviewed in this process.
It was expected that all death records in the coronial files and agency files should link to corresponding records in the NZHIS mortality database since this is a database of all deaths in New Zealand. Where Automatch failed to find a match, or through manual review, it was clear the link was spurious, the linkage process proceeded to another level. Software was written to match on names only comparing all syllables in a person’s full name with each other corresponding set of syllables in the other data source. This allowed for rearrangement of names within name fields and gross misspellings both of which Automatch would not overcome effectively. All linkages were reviewed manually and any cases still unlinked were manually linked, which was a very time-expensive process.
3. Results

For the period 1985-94 the WRFIS identified 820 work-related deaths, 751 of these were for workers and 69 bystanders. 596, or 73%, were identified by OSH, ACC, or one or more of the other agencies, (referred to hereafter as “Other”), combined.

Figure 1 shows that ACC had records for 513 WRFIS cases, that is 63%. OSH, with 327 WRFIS cases, only identified 40%. As expected the “Other” agencies identified a relatively small number of cases. What is of more interest however, is that 16 of their cases were not recorded in either ACC or OSH files.

Figure 2 shows the number of cases which ACC, OSH, and Other recorded as work-related, where we were able to find a matching file in the NZHIS mortality files but: 1) there was insufficient information in the agency, NZHIS, or Coronial files to confirm these deaths were work-related, or 2) we were able to determine that the case did not meet the criteria for work-relatedness.

In addition, there were 53 cases from ACC, and 15 cases from OSH, and 2 cases from Other, where after comprehensive searching and linkage routines we were unable to find any matching NZHIS or Coronial data files. None of these cases were common to all three agencies. There are at least two possible explanations for these cases. They may have been miscoded as deaths, or the deceased may have been recorded in the various databases under substantially different names, thus precluding the discovery of their coronial file.

It was our intention to examine the original files for the ACC cases to establish first of all if the victim had died, and if so whether we could confirm that it was a work-related injury incident. Unfortunately, there were difficulties in obtaining files for this purpose which precluded us undertaking this task and meeting our contractual obligations.

In summary, our estimate of 820 work-related death is likely to be a minimum estimate.

Since there is a financial incentive for dependents to make a claim and ACC has no work-related enforcement powers we expected ACC to have the best coverage. Nevertheless, 37% (n=307) of the WRFIS cases not recorded is substantial. It seems unlikely that all of this could be attributed to the absence of a successful claim being lodged with ACC. Other explanations include that the file was not recorded as work-related, or a death, or both. In order to gain some insight into these matters we searched for the 307 cases among all ACC cases recorded as deaths. We found 195 recorded as non work-related deaths and the remaining 112 were unaccounted for. We then examined the accounts to which the 195 were debited and this revealed: earners 17, employers 105, motor vehicle 13, and non-earners 60. It is important to note that for historical reasons some employers have been paying for non-work injuries. The non-earners figure may be due to the WRFIS including bystanders.

The 112 unaccounted deaths were explored no further. They may be elsewhere in ACC’s compensated claims database but be incorrectly recorded as non-fatal.
Figure 1: Agency coverage of the WRFIS dataset

AGES: 15-84 years  YEARS: 1985-1994  ECODES: as per Work-related Fatalities Project
Figure 2: Cases identified by Agencies as work-related but not in WRFIS dataset

AGES: 15-84 years YEARS: 1985-1994 ECODES: as per Work related Fatalities Project
In summary, had the ACC work-related indicator been more accurate then linkage with ACC would have yielded 86% of the cases in the WRFIS dataset.

Tables 1 & 2 show that there is substantial variation in agency coverage of the WRFIS dataset by industry and occupation respectively. The industrial division Forestry and Fishing contributed the largest number (n=336) of cases to the WRFIS dataset. This industrial grouping is one of the more poorly covered by all agencies combined. OSH’s coverage at 35% is particularly poor. Not surprisingly, a similar finding is evident for the major occupational group within this industry, namely, Agricultural and Fishery Workers (Table 2). Plant and Machine Operators and Assemblers were the second leading contributor to the total number of deaths. While coverage (88%) of this group by the agencies combined is an improvement, it is still significantly less than optimal. Construction and Mining have particularly high averages. This may be due to the expectation of the agencies of serious injury events in these industries, hence there are better mechanisms in place for reporting.
<table>
<thead>
<tr>
<th>Industry Divisions</th>
<th>WRFIS</th>
<th>ACC</th>
<th>OSH</th>
<th>Other</th>
<th>Agencies Combined</th>
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<td>Agriculture, Forestry and Fishing</td>
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<td>214</td>
<td>117</td>
<td>13</td>
<td>248</td>
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<td>22</td>
<td>3</td>
<td>23</td>
<td>27</td>
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<tr>
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<td>52</td>
<td>51</td>
<td>1</td>
<td>58</td>
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<tr>
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<td>10</td>
<td>9</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Construction</td>
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<td>9</td>
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<td>16</td>
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<td>1</td>
<td>4</td>
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<td>4</td>
<td>1</td>
<td>10</td>
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<td>Government Administration and Defence</td>
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<tr>
<td>Health and Community Services</td>
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<td>3</td>
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<td>Bystander</td>
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<td>4</td>
<td>0</td>
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<tr>
<td><strong>ALL</strong></td>
<td>820</td>
<td>513</td>
<td>327</td>
<td>83</td>
<td>596</td>
</tr>
</tbody>
</table>
### Table 2: Agency Coverage of Work-Related Fatal Injuries by Occupation (NZSCO 1995)

<table>
<thead>
<tr>
<th>Occupation Major Groups</th>
<th>WRFIS</th>
<th>ACC</th>
<th>OSH</th>
<th>Other</th>
<th>Agencies Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislators, Administrators and Managers</td>
<td>15</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>9</td>
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<tr>
<td>Professionals</td>
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<td>5</td>
<td>0</td>
<td>6</td>
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<tr>
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<td>2</td>
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<td>Clerks</td>
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<td>3</td>
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<td>6</td>
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<td>Service and Sales Workers</td>
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<td>Agriculture and Fishery Workers</td>
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<td>Trades Workers</td>
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<td>55</td>
<td>11</td>
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<tr>
<td>Plant and Machine Operators and Assemblers</td>
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<td>121</td>
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<td>ALL</td>
<td>820</td>
<td>513</td>
<td>327</td>
<td>83</td>
<td>596</td>
</tr>
</tbody>
</table>
4. Discussion

The results show that the creation of a fatality data file by electronic means underestimates the size of the work-related injury problem by at least 27%. This finding is similar to that reported (33%) in the recent Australian Work Related Traumatic Fatalities Study. More importantly, there are substantial agency biases in terms of occupations and industry in this coverage. This has also been the experience in Australia[4]. This means that a more accurate estimate of the number of fatalities could not be derived by applying a multiplier to estimates based on a multiagency derived file.

There are a variety of explanations for the combined agency underestimate most of which do not warrant detailed discussion here. Some key issues, however, deserve highlighting as they have implications for the future surveillance of work-related fatal injuries.

ACC
ACC had the best coverage at 63%. This figure is comparable to the 65% obtained from compensation reports in USA[5] and 59% in Australia[4]. Nevertheless, 37% non-recorded coupled with evidence of miscoding, is of concern.

OSH
At 40% OSH coverage is similar to comparable agencies in the USA[5] and Australia[4]. There is no legislative requirement for OSH to maintain a fatality database. Case ascertainment largely depends on a combination of police notification, media reports, and local knowledge, none of which are mandatory for the providers of information. The Health and Safety in Employment Act 1992, however, requires every employer to notify the Secretary of Labour within 7 days of occurrence of all accidents and serious harm (Section 25, 3b). There are two significant exceptions in this respect, namely, deaths to the crew of aircraft and or ships (Section 2, 3).

The results presented here suggest that this is not occurring in a substantial number of cases. It may well be that employers mistakenly believe they have fulfilled their obligation by participating in enquiries undertaken by the Police.

There are several other potential reasons why OSH did not have records for 60% of the cases. First, as has been indicated, OSH is not responsible for following up all work-related injury deaths. Unfortunately, there is no mandatory requirement for specialist agencies such as MSA to report work-related incidents to OSH. Nor are there any formal agreements to this end. Second, OSH rely to a large extent on the police notifying them of work-related deaths. There thus may have been cases where the police incorrectly considered the event not to be work-related. Third, fatalities to owner/operators, that is persons not classifiable as employees, are not covered by The Health and Safety in Employment Act 1992.
Quality of information systems
In undertaking this task we assumed that all agencies had electronic records for the period in question and that these were readily accessible, particularly since all the agencies listed above had indicated to the funders of the study that they would be willing to assist us. Regrettably this was not the case. Some agencies did not have any electronic records, others had a mix of hard copy and electronic records, and some had all records in electronic format. Similarly, accessing the data proved to be extremely time consuming. This was due to variety of factors including: a) some files were not in a format readily transferable to another platform, b) documentation on the dataset was non existent, poor, or difficult to access, in a number of cases, and c) some agencies were ill equipped to respond to requests for their data in a timely manner.

Diffusion of responsibility
Provisional results, similar to those produced here, were presented in September 1998 to representatives of the various agencies. This was followed by a discussion of the various possible reasons for some of the mismatches. For several examples the explanation given was that the case was not covered by the agencies governing Act and as a consequence they would not necessarily have details. The absence of one single agency with a statutory responsibility to record all work-related injury deaths, irrespective of which Act is intended to prevent them, was seen as a significant barrier to developing a comprehensive database. While the Accident Insurance Act 1998 places specific responsibilities on insurers to provide returns to the “Regulator” for the purposes of maintaining an injury database (Section 194) this will only relate to compensated cases. Moreover, to be captured by the database such a case has to meet the Act’s criteria of “work-related personal injury” (Section 32). Person’s who are not working but are nevertheless injured by a work process (e.g. bystander struck by falling scaffold from construction site) do not appear to meet these criteria even though most people would agree this is a work related event. This highlights the mismatch between administrative requirements and those of surveillance. This difficulty could be overcome if the (new) Accident Compensation Corporation, which provides cover for all non work-related injuries maintain the work indicator on its claims database which is independent of the account (e.g. motor vehicle, non-earners) to which the claim is debited. As the results show, however, the reliability of this indicator would need to be improved.

Motor vehicle traffic incidents
It should also be noted that the WRFIS excluded all motor vehicle traffic incidents since determination of work-relatedness is not undertaken by any existing agency and there are limited clues available on existing electronic data files as to which fatalities would have a higher probability of being work-related. This means a large number of files would have to be reviewed, a time consuming and expensive task. USA and Australian data show the proportion of all work-related fatalities (excluding bystanders) which are motor vehicle traffic incidents is approximately 25% and 37% respectively[6,4]. As such they lead all other events, in terms of activity, in the number of work-related fatalities.
5. Conclusion
A method of case ascertainment based on linking all agencies data will not adequately describe the universe of work-related fatal injury prior to 1994. Moreover, as the sole method this is unlikely to achieve the desired outcome in the near to medium term future given differences in case definition, and the quality of various databases.

The problems with the data collected by ACC, OSH, and Other agencies, identified by this work, are as follows:

• The ascertainment of cases by OSH and other agencies is incomplete.

• There is more complete ascertainment of cases by the ACC, however, the actual level of completion is uncertain, and the identification of cases is problematic, due to inaccuracies in data recording within the ACC database.

• Each of the databases include cases that are not work-related.

The various agencies interpret their responsibilities for recording work-related fatal injury in terms of their statutory or administrative requirements. The problems that underpin the development of a surveillance system for work-related injury mortality include the fact that there is not one agency to which employers have a statutory responsibility for reporting these events, and there is no agency which has the statutory responsibility for maintaining an accurate database of all these events. Until these problems are addressed, there will continue to be major difficulties in developing surveillance systems that produce accurate and meaningful information.
Part 2. Future surveillance of work-related fatalities

1. Introduction
It has been demonstrated that:

1) a method of case ascertainment based on linking all agencies data will not adequately describe the universe of work-related fatal injury.

2) while use of existing multiple sources in combination with a review of Coronial files (the method adopted in the WRFIS) can provide reasonably reliable estimates the following is noted:

   a) comprehensive review of Coronial files for all potential cases is extremely time consuming and inefficient.

   b) the process does not result in timely information

In considering how New Zealand should proceed for its future work related fatalities surveillance it is useful to refer to overseas experience. We have not attempted to undertake a review of other countries systems for a number of reasons:

a) That work has been undertaken, to some degree, in the wider context for all causes of work related injury and illness. That exercise was part of a report by the Wellington School of Medicine entitled “Independent Review of Occupational Injury and Illness Statistics”. The report was prepared for the Labour Market Policy Group and has not been publicly released but has been made available to the WRFIS. The report covers Australia, United Kingdom, Finland, and Denmark although not to the degree we have described below for USA and Australia.

b) There is a dearth of publicly available documentation describing attributes of various systems and critiques of them. This observation was also made in the report to the Labour Market Policy Group[7].

A notable exception in respect to b) are the two independent systems operating in the USA which focus on work-related injury deaths namely: the US National Traumatic Occupational Fatalities surveillance system, and the US National Census of Fatal Occupational Injuries. We have provided an overview of these below as they provide some useful information in considering how New Zealand should proceed in the future. We have also provided some brief notes on key issues as they pertain to Australia where there is a new and unique development occurring in relation to Coronial data which has significant implications for the future recording of work-related injury death.

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3 Part 1 of this report has been primarily concerned with one key aspect of surveillance, namely, determining the number of relevant events. In Part 2 we consider wider aspects of surveillance. It is thus important to describe what we mean by surveillance. We have used the term surveillance as defined by USA’s Centers for Disease Control namely, “Epidemiologic surveillance is the ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating public health interventions and programs. Surveillance data are used both to determine the need for public health action and to assess the effectiveness of programs.”
2. United States of America

2.1 US. National Traumatic Occupational Fatalities (NTOF) surveillance system

The National Traumatic Occupational Fatalities (NTOF) surveillance system was developed by the National Institute for Occupational Safety and Health (NIOSH).

The material below represents a combination of extracts and a summary of relevant key parts from a recent NIOSH report[8].

2.1.1 Death Certificates

Information in the NTOF surveillance system is taken directly from death certificates. To gather data for the system, NIOSH collects and “automates” death certificates from the 52 vital statistics reporting units in the 50 states, New York City, and the District of Columbia for workers 16 years of age or older for whom an external cause of death (International Classification of Diseases, Ninth Revision; E800-E999) was noted, and for whom the certifier entered a positive response to the “Injury at Work?” item.

The NTOF data contain variables useful for describing characteristics of victims as well as injury circumstances - including demographic, employment, and cause of death variables. In addition to coded data, narrative text from the death certificate for industry, occupation, causes of death, and injury description is entered and maintained.

Death certificates were utilised for this surveillance system because they are available for all workers who died during the period, regardless of size or nature of employment, coverage by workers’ compensation systems, or other jurisdictional restrictions. State-based studies show that death certificates identify a greater proportion of occupational trauma fatalities than any other single source. They indicate that death certificates capture 67% to 90% of all fatal work injuries.

The limitations of death certificates as a source of occupational injury fatality surveillance have been discussed by several authors. The primary issues of concern in the use of death certificates are the ability to identify and to retrieve the certificates that meet the study criteria. Studies indicate that motor vehicle crashes and homicides are the external causes of death most likely to be missed in death certificate surveillance of occupational injuries.

Each vital statistics reporting unit is responsible for identifying and providing cases that meet the NTOF criteria. Prior to 1992, there were no standardised guidelines for the completion of the “Injury at Work?” item on the death certificate. Thus, this item on the death certificate, which is one of the three criteria for inclusion in the NTOF surveillance system, was subject to certifier interpretation. Although the lack of standardised reporting of this item may result in both false positives - if a liberal definition of injury “at work” was used - and false negatives - if a very restrictive definition was used or the item was left blank, the numbers reported by NTOF are likely to represent the minimum number of work-related deaths that occurred. This is particularly the case since neither commuting nor bystanders are included.

To improve the quality of occupational injury fatality reporting, national guidelines for completing the “Injury at Work?” item were developed and disseminated in 1992 by
the Association for Vital Records and Health Statistics, NIOSH, the National Center for Health Statistics, and the National Center for Environmental Health.

2.1.2 Occupation, Industry and Cause of Death Coding
Employment information is coded from the usual industry and occupational narratives from the death certificate using software developed by NIOSH.

Death certificates require the “usual” occupation and industry of the person who died, which may not necessarily reflect the occupation or industry engaged in at the time of the fatal injury. Studies comparing death certificate entries for usual occupation and industry to employment information for occupation and industry at the time of death, found agreement for occupation to be 64% to 74% of the cases, and the industry to be 60% to 76% of the cases. Though the query on death certificates is for “usual” occupation and industry, some studies indicate that the death certificate entries may actually better reflect occupation or industry at time of death than usual, lifetime employment.

Cause of death codes are assigned based upon the ICD-9 supplementary chapter for the classification of external causes of injury and poisoning.

2.1.3 Denominator Data
Because no single source of employment data provides information by state, industry, occupation, and demographic characteristics, employment estimates used in calculating occupational injury fatality rates are derived from several sources.

2.2 US National Census of Fatal Occupational Injuries (CFOI)
The CFOI has been briefly described and evaluated by Connie Austin. The material below represents a combination of extracts and a summary of relevant key parts of that report[9].

The CFOI is a surveillance system administered by the Bureau of Labor Statistics (BLS). It was established nationally in 1992.

The primary objective of the CFOI system is to collect information on fatal occupational injuries that is comprehensive, timely, and verifiable. The CFOI system is a passive surveillance system and is a cooperative venture between the BLS and State agencies. The system is administered by the States, which collect, code, and verify fatality data. BLS provides reports from Federal agencies, such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration, and the Employment Standards Administration, to CFOI personnel in each State; collects data from each State; reviews each fatality; and assembles national data.

Fatality data are gathered by State personnel from workers’ compensation reports, death certificates, news stories, and other sources. State CFOI personnel routinely review these to identify and collect information on workplace fatalities. They are trained by BLS in computer software use and coding of data elements for the CFOI program.
2.2.1 Verification
After receiving an initial fatality report, CFOI staff search for additional documentation to verify the fatality. This may include requesting reports from coroners and medical examiners\(^4\) or doing a follow-up questionnaire with the employer. BLS receives final data on all fatalities in June of the following year. Following a review of the data, BLS compiles the national dataset.

To determine whether a fatality is work-related, State personnel use a case definition that stipulates that “the decedent must have been employed (that is, working for pay, compensation, or profit or in the family business) at the time of the event and engaged in a legal work activity or present at the site of the incident as a requirement of his or her job. Suicides and homicides meet the case definition if they occur at work. Fatalities that occur while travelling to and from work (commuting) are not considered work-related.

In general, each fatality must be verified by two source documents. In those instances where a second source document cannot be located, the fatality is included only if sufficient information exists from the first source to determine that the fatality was work-related.

2.2.2 Elements in the dataset
Up to 30 injury data elements are included in the national CFOI dataset, including demographic information about the deceased, employer information, and data elements related to the circumstances of the injury.

Data elements that are collected must be applicable to all types of fatalities and kept simple. Because of this, information that might be useful for particular areas of study may not be available. For example, when examining fatalities caused by motor vehicle crashes, it would be useful to have information on seatbelt use and the estimated speed of the vehicle at the time of the crash. However, this same type of information would not be useful for burns or falls. Even in cases where some information relevant to a particular type of injury, such as seatbelt use, may be included in a narrative description of the injury, this information may not be available for the majority of the fatalities in that category.

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\(^4\) In the USA death investigation is a state function and as a result the type and quality of death investigation varies widely. Some states (about 20) have well developed medical examiner systems. Medical examiners are specialist forensic pathologists who do in-depth death investigations - they may have deputy medical examiners to help them who may just be regular physicians especially in rural areas. All are medical practitioners. Coroners on the other hand are elected officials and in most states have no qualifications, only seven of the 28 states with coroners have any mandatory training requirements. As a result the quality of death investigation varies widely between states. It should also be noted that there is no public inquest.

The USA situation contrasts with that in New Zealand where the post-mortem is performed by a pathologist but the inquest is undertaken by the Coroner and there is a public hearing. The Coroners Act 1988 is not prescriptive with respect to Coroners qualifications. In recent years the majority of Coroners have had tertiary qualifications in law.
2.2.3 Evaluation of system
In 1995 the CFOI was evaluated against the Centre for Disease Control’s seven major attributes of a surveillance system, namely: simplicity, flexibility, acceptability, sensitivity, predictive value positive, representativeness, and timeliness. It was concluded that high levels of acceptability, timeliness, and representativeness of the CFOI system represented an improvement over other occupational fatality recording systems. Although it was suggested that multiple reporting sources may contribute to high sensitivity, and predictive value positive neither of these were directly evaluated. It was considered too premature to evaluate the flexibility of the system. Although simplicity was considered to be affected by the use of multiple source documents, it was noted this approach allows for the most complete collection of fatalities possible.

3. Observations of the USA systems
The CFOI is the more comprehensive system currently operating in USA. It uses multiple sources of information and has verification procedures. In this respect WRFIS was similar. One important difference, however, is that CFOI unlike the WRFIS was able to identify deaths from the “Injury at Work?” item on death certificates. This source of information is also the foundation of the alternative NTOF system. It has been estimated that this item on death certificates has the ability to capture approximately 80% of worker deaths.

A shortcoming of both the CFOI and NTOF systems is that they do not record bystander deaths. As we have highlighted in Part 1 of this report these deaths should be included, and identifiable as such, in a work-related injury surveillance system.

It should be noted that capture is poor for work-related motor vehicle traffic crashes. These present unique difficulties and as such require special attention in any future proposals for a surveillance system in New Zealand. As discussed earlier, motor vehicle traffic crashes contribute substantially to the total burden of work-related fatal events.

Another issue is the need to determine the victims occupation at the time of death. This is important for the calculation of accurate occupation specific rates. It would also be highly desirable to record usual occupation since the discrepancy between the two may provide insight into causation (e.g experience). The recent Australian work-related fatalities study estimated that about 12% of deaths involved persons whose documented usual occupation was different to their occupation at the time of the fatal incident.

It is important to note that both CFOI and NTOF systems are run by agencies which have no punitive powers in respect to work-related fatal or non-fatal injuries. Moreover they have, as one of their primary organisational objectives, the operation of a surveillance system.

4. Australia
The main avenues for monitoring deaths due to occupational injury in Australia are conceptually virtually identical to those presently available in New Zealand. All jurisdictions have some form of notification system in place for work-related fatalities through their Occupational Health and Safety (OHS) agencies. However, State, Territory,

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5 See Appendix 1
and Commonwealth compensation data, and the National Data Set (NDS) derived from them, are the primary source of regular national occupational injury information in Australia. The NDS, which was approved by the National Occupational Health and Safety Commission (NOHSC) in 1987, recommends a standard set of items, concepts and definitions for inclusion in workers' compensation collections. The primary purpose of the NDS is to allow the production of nationally comparable workers' compensation-based data. Since its release, it has progressively been implemented in State, Territory, and Commonwealth systems. Although, serious limitations remain in these data, particularly with respect to data quality and differences in the scope of the collections, they have allowed compilation of a national compendium by NOHSC each year since 1990. Apart from jurisdictional differences in data quality, the coverage provided by the NDS (or any compensation-based data system for that matter) is substantially less than would be desirable for adequately describing work-related traumatic deaths. Any compensation data-based system will suffer from the fact that only those events for which compensation is sought will be recorded and that a number of important key areas will not be covered or be very poorly covered, notably bystander deaths. In addition, the system in Australia is only designed to cover employees.

It is noteworthy that the similarities between the New Zealand and Australian data collections has produced very similar patterns of gaps in knowledge available for the health and safety prevention process. As discussed earlier (Part 1), coverage of traumatic fatalities by OSH agencies has been estimated at around 40% of all events. While performing better, compensation data provided only around 60% coverage. A staggering one third of deaths was covered by neither agency nor compensation data[4]. Thus, the NDS has been seen as providing the broadest of indicators only, rather than the timely and sensitive indicators that would be ideal in the main national occupational injury data.

In discussing future directions the most recent Australian report[4] on work-related fatalities states that:

“The reasons that there are delays in producing information from a study such as this include:

the need to wait for relevant ABS Deaths Data List to be released;

the files being paper-based and difficult to access;

the coronial system not having codes that can be used to screen out unwanted files;

the coronial offices being widely spread across the country;

the complexity of the information in the files;

the large number of files that need to be read in order to identify the work-related deaths; and

the time required to code the data in as much detail as reasonable in order to be able to answer a wide range of questions regarding work-related traumatic death.
Many of these problems would be overcome by the establishment of a national computer-based system for coronial information. This would allow the information to be coded, stored and accessed more easily. The National Coronial System (NCIS) is currently being established by the Australian Coroners' Society and the State and Territory governments. It is a computerised data storage, coding and retrieval system designed to allow prompt access to coronial information.

Occupational health and safety is not the main reason that the NCIS is being developed. However, the information available from the system will be very important to the monitoring and prevention of work-related traumatic death at both State and Territory and national level.

The NCIS will allow most work-related traumatic deaths to be identified quickly and with little effort, and will provide some basic information on each fatal incident. This will allow major outcomes of interest such as the number, rate, mechanism, agencies involved, place, age, gender, role of alcohol, and jurisdiction, to be known on a regular basis. Some coding may still be needed if this information is to be provided, but the huge resources required for a study such as the one reported here will no longer be required. In the medium term, the system will not provide detailed information. However, it certainly could be used to rapidly identify specific groups of files if more in-depth information on a particular area is required."

Further details on the NCIS are available at: www: http://info.vifp.monash.edu.au/ncis/

It is important to note that NCIS is in its development phase and as a consequence there are a number of important issues relating to key attributes of a public health surveillance system which have yet to be determined in the context of work-related fatal injuries.

Nevertheless, it seems likely that unlike the USA systems, the system will record “work-related” fatal injury and that this will include:

• working people fatally injured whilst performing work activity;
• working people fatally injured as a result of work activity even if not performing work duty at the time (eg shot at home by a disgruntled employee);
• working people fatally injured whilst commuting;
• non-working people fatally injured as a result of exposure to the work activity or workplace or other work-related aspects of the work of a working person.

In addition the focus of occupational recording will be actual occupation as opposed to usual occupation.

The response to data provided by the NCIS will continue to take place at the state and territory level. However, it is not yet clear which area will be responsible for the occupational health and safety surveillance aspects of the system. It is likely that the National Occupational Health and Safety Commission will play a key role in this, either by summarising national and state/territory data on a regular basis and reporting to the states/territories, and/or by facilitating the state/territory authorities to do it for themselves.
5. Coroners and the New Zealand situation

Common and central to the USA and the proposed Australian method for case identification is the Coroner. It should be noted however, that the CFOI does not rely entirely on Medical Examiners, through their completion of the death certificate, to determine the total population of work-related deaths. Worksafe Australia published a report in 1995 on improved coverage and relevance of national occupational health and safety surveillance\(^{[11]}\) which stated:

“as is the case in other countries which monitor occupational health and safety, the extent of work-related deaths, injury and disease and insight into possible causes can only come from utilising information from a range of sources”

In New Zealand Coroner’s, under the Coroner’s Act, order post mortems and hold inquests into most injury deaths. One of the purposes of the inquest is to establish the circumstances of the death (S15, a, v) and to “Make any recommendations or comments on the avoidance of the circumstances similar to those in which persons should act in such circumstances, that, in the opinion of the coroner, may if drawn to public attention reduce the chances of the occurrence of other deaths in such circumstances” (S15, b)

It is Coroners who determine the causes and circumstances of death. This occurs even in those incidents involving murder (e.g. bank teller shot) where the process of the criminal courts works alongside the process of the Coroner’s Court. In these circumstances a coroner cannot proceed with an inquest hearing until the proceedings of the criminal court have been dealt with. It is then a discretionary matter for the coroner as to whether an inquest hearing takes place. It is the Coroner’s summary which is used by NZHIS to code the circumstances and intent of all injury deaths in New Zealand.

The New Zealand Coroner’s Council have recently been advocating to the Department of Courts that New Zealand establish a national coronial data system modelled on the Australian system. Discussions among interested parties are in the preliminary stages. Australian experience suggests there is a significant start-up time for such a system. It should also be emphasised that the Australian system is in the pilot phase and the occupational component is still being developed. It should be noted that the Australian NCIS is concerned primarily with, identification of cases and the recording of the details of the circumstances of injury. Equally important is analysis and interpretation of the data and dissemination of the results (see footnote 2). In Australia this will primarily be a function of individuals and agencies with specialist interests. Nevertheless, the establishment of a Coronial database in New Zealand is the most appropriate cornerstone of a work-related fatal injury surveillance system in the medium to long term.
Recommendations
One agency for all-cause injury surveillance

1. One agency be responsible for the development of an all-cause work-related injury surveillance system and the operation of the agency be independent of any existing agencies statutory enforcement or compensation requirements.

2. The agency be responsible for facilitating the implementation of the recommendations of this report

3. As a matter of priority the agency:
   a) establish a consultative process with a view to developing and promulgating a "standard working definition of work-relatedness" for use by all agencies concerned with collecting information on work-related injury.
   b) promote the establishment of a national Coronial database with a specific module for work related injuries

4. As a minimum the agency develop a surveillance system which meets the Centres for Disease Control’s system attributes. In this respect the CFOI system is a useful model, in particular its use of multiple sources and independent verification.

5. As a minimum, yearly analysis and dissemination of statistics on work-related fatal injury be a requirement of the agency.

Coroners

6. That Coroners be responsible for the determination of “work-relatedness”, “occupation at time of death”, and “usual occupation”.

New Zealand Health Information Service (NZHIS)

7. That NZHIS add:
   • “work-related?”
   • “occupation at time of death”, and
   • “usual occupation”

    to the Coroner’s certificate and that guidelines for the completion of these fields be issued to all relevant parties.

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6 See Appendix 1
8. That NZHIS have fields on its mortality data base which record the determination of Coroners with respect to “work-relatedness” “occupation at time of death”, and “usual occupation”.

**Accident Insurance Corporation (ACC)**

9. That ACC:

   a) continue to maintain its work-related indicator for all claims, irrespective of which account they are debited to
   b) that this indicator be consistent with the proposed “standard working definition of work-relatedness”.
   c) issue guidelines to those responsible for recording work-relatedness

**New Zealand Police and Land Transport Safety Authority**

10. New Zealand Police and Land Transport Safety Authority be consulted with a view to determining the feasibility of modifying the Traffic Crash Report to identifying work-related motor vehicle traffic crashes (consistent with the “standard working definition of work-relatedness”) and the occupations of the crash victims and the development of guidelines for the completion by investigating officers of the same.
References


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