International Occupational Injury Mortality Comparisons

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Statistical collections of workplace fatal injury data have a critical role to play in identifying hazards and, consequently, the most appropriate targets for prevention. They also have a critical role to play in benchmarking national occupational health and safety performance. International comparisons of such statistical collections have a major contribution to make in both of these roles. International comparisons can provide unique insights into the influence of geographic, social, economic and political factors on different hazards and how they come about. From examination of similarities and differences in the circumstances of fatal injuries between comparable countries, possible directions for prevention can be identified. For example, effective control of hazards in one of several comparable countries, identified through a low rate of fatal injury, can prompt the question: what is being done in that country that is not being done elsewhere? Thus, international comparisons have the potential to be a powerful catalyst for change: in areas where a given country's performance is poor, comparisons can stimulate change; in areas where comparisons indicate that a given country performs well, it may be possible to transfer practice to other areas. Finally, international comparisons can be very revealing about the best ways of recording, analyzing and applying surveillance data.

Despite all of these potential benefits, to date, there have been few direct international comparisons of work-related fatal injuries data. Usual practice has been to examine international published data and to simply use these to draw comparisons. This practice has serious shortcomings, however. At best, such comparisons are poor estimates while at worst they are misleading about similarities and differences between countries. Stout, Frommer and Harrison (1990), comparing Australian and U.S. fatal injury experience, highlighted the serious impediments to making accurate comparisons: differences in case ascertainment, inconsistent case definitions and inconsistent classification of occupation and industry variables making the comparison of rates very problematic. The issue then, is to undertake accurate informative comparison of work-related fatal injury experience among comparable countries, in order to harness the potential benefits that such comparisons offer.

The present project aims to compare the extent, nature, distribution and circumstances of occupational fatal injuries in three countries: the U.S., Australia and New Zealand. This presentation reports on progress of this collaborative effort to date.

Aims

To compare the patterns of occupational injury in three countries overall and by gender, age, manner of death, mechanism of injury, occupation and industry.

Method

The essential starting points for undertaking a formal international comparison study are identifying suitable countries for comparisons, and establishing the collaborative links among those countries necessary for exchange of data. For this collaboration, initial discussions were held at two international meetings, the National Occupational Injury Research Symposium (NOIRS) meeting in Morgantown in October 1997, and followed up at the occupational mortality symposium held at the 4th World Conference on Injury Prevention and Control in Amsterdam in May 1998. In addition, the custodians of the data met in Sydney in January 1998 to discuss the nature of the data available in each country and the structural impediments such as institutional agreements and data access.

Data sources

Recent data collections in Australia and New Zealand provide data comparable to the data routinely collected from vital records in the U.S. Although New Zealand and Australia currently have no on-going surveillance, both countries had recently undertaken purpose-specific studies based on vital records.

Each of the data sets are designed to be a national census of all occupational fatalities, although there are indications of underreporting in the U.S. dataset.[1,2,3,4] Both the Australian and New Zealand datasets come from Coroners' records from a period of years - four years in Australia (1989–1992 inclusive) and ten years in New Zealand (1985–1994 inclusive). The Australian data set includes cases from all states and territories. The U.S. data includes data from the on-going National Traumatic Occupational Fatality (NTOF) data set which includes all states and the District of Columbia in which the data by year and age group cover the period 1989-1992 inclusive and the data by industry and occupational group cover the years 1990-1992 inclusive. The New Zealand dataset includes all deaths nationally. The period 1989–1992 inclusive was selected as the comparison period because it is the common period available for all three datasets, but the entire ten year period is being used for the New Zealand dataset in order to increase the number of deaths available to include in the comparison.

Results

At this stage, work on achieving comparable datasets has been completed, and the results of that work are presented below.

Data comparability

Two main impediments compromised the comparability of the datasets.

1) Case classification and definition

Each of the three datasets had a number of different inclusion and exclusion criteria, so that the universe of deaths were rather differently defined in each country's data. To overcome this impediment, the same inclusion and exclusion criteria were applied to the data from each country to provide comparable final datasets for analysis. Table 1 shows the inclusion and

exclusion criteria of each of the initial datasets and those used for the final analysis. Perhaps the most significant example of difference between the datasets concerned deaths due to motor vehicle traffic crashes (MVTCs). It is well documented around the world that crashes are the leading mechanism involved in work-related fatal injuries. The Australian dataset was the most inclusive in this regard, including both those cases where the crash occurred in the course of work, and where the crash occurred in the course of commuting to/from work. The U.S. dataset included crashes during the course of work, but not commuting, and the New Zealand dataset did not include any deaths due to MVTCs. It should be noted that the absence of these data from the New Zealand dataset is not because MVTC deaths are considered non-occupational; rather, it reflects the current status of data collection there. A separate project to analyse work-related fatalities due to MVTC is about to begin in New Zealand. In the meantime, comparison of the MVTC deaths in the U.S. and Australian datasets is about to be undertaken.

Table 1: Case Selection Criteria: United States, Australia and New Zealand.

Groups	United States	Australia	New Zealand	Combined Data Set
Civilian Labor Force, > 15y	Y	Y	Y	Y
Civilian Labor Force, = 15y	N	Y	Y	N
Civilian Labor Force, < 85y	Y	Y	Y	Y
Civilian Labor Force, = 85y	Y	Y	N	N
Military personnel	N	Y	Y	N
Domestic/home duties	N	Y	N	N
Unpaid students	N	Y	Y	N
Trainees to work	N	Y	Y	N
Bystanders to work	N	Y	Y	N
Homicides	Y	Y	Y	Y
Suicides at work	Y	N	N	N
Injuries occurring during breaks	Y	Y	Y	Y
Injuries to volunteers	N	Y	Y	N
Injuries to unpaid family helpers in for-profit operations	Y	Y	Y	Y
Injuries to self employed people	Y	Y	Y	Y
Deaths occurring > or = to 1 year after the injury	Y	Y	N	N
Injuries on public highway which do not involve traffic	Y	Y	Y	Y
Traffic injuries occurring on a public road	Y	Y	N	N
Injuries occurring while commuting between home and work	N	Y	N	N

Further strategies to understanding the comparability of case definition are also being examined. Reliability of case classification based on a standard set of cases, using each country's classification criteria is also being undertaken.

2) Classification of occupation and industry

Comparison of information from specific occupation and industry groups was identified as one of the key aspects of analysis. The classifications systems for industry and occupation used for both the numerator and denominator data for each country are based on international classification systems. Despite this, there are a number of important differences between the classifications used in the three countries, even at the most aggregated levels of classification. Tables 2 and 3 provide some examples of the sort of harmonisation required to allow meaningful analysis by occupation and industry.

Table 2 shows examples of the problems of attaining compatibility of industry classification codes. It is clear that the categorisation of industry is basically the same for each country, but there are also a number of differences that required a range of strategies such as changing the coding of some categories, collapsing other categories, and if these were not possible, tolerating inconsistency between data sets for other categories.

Table 2: Examples for issues of harmonisation of industry classification between the U.S., Australia and New Zealand

INDUSTRY	*United States* SIC codes	*Australia* ASIC codes	*New Zealand* ANZSIC codes
Agriculture, Forestry & Fishing	A0 Logging not included (18..36% cases)	A0 Logging included	A0 Logging included
Mining	B1 Services to mining included but not specified	B1 Services to mining separately specified	B1 Services to mining separately specified
Manufacturing	D Logging included here	C2	C2/C3
Construction	C1	E4	E4
Transport, Storage, Communications	E4	I6	G5
Public Utilities	E4	D3	D3
Wholesale Sales	F5	F4	F4
Retail Sales	G5	G5	F4

For example, in the Australian and New Zealand collections, logging is coded in the Agriculture, Forestry and Fishing category, whereas for the U.S. collection it was coded in manufacturing. Examination of the U.S. data indicated that there were 341 cases of fatal injuries to loggers, which represented 18.36% of the Agriculture, Forestry and Fishing category for the U.S. if it had been compiled on the same basis as for the Australian and New Zealand data. Given the extent of this potential underestimate, the inconsistency needed to be overcome. It was possible to move logging in the NTOF collection into the Agriculture, Forestry and Fishing category, making all collections compatible. In contrast, in the U.S. collection, Public Utilities are coded in the same category as Transport, Storage and Communications, whereas it was coded in a separate category for Australia and New Zealand. To solve this problem, cases in the Public Utilities category were collapsed into the Transport, Storage and Communications category for Australia and New Zealand. While some categories are reasonably compatible at the two digit level of classification used thus far, it is likely that subgroups will not be entirely comparable. For example, the Mining code is inconsistent at more specific levels of classification between the three countries as in the Australian and New Zealand classification it includes an identifiable subgroup, Services to Mining, which is not separately specified in the U.S. coding system. On the other hand, it will be possible to tolerate some such inconsistencies if they are thought to reflect only a small number of cases or a relatively small number of workers. Taking Services to Mining as a case in point, preliminary examination of the Australian fatality data set indicated that there were only a small number of cases in the subgroup (4% of all Mining cases and 0.5% of the dataset) and examination of the New Zealand dataset showed that there were no cases that fell into this subcategory. In addition, the number of workers in each of these groups is not large.

Similar decisions were necessary to make occupational coding compatible between the three datasets. As shown in Table 3, it was necessary to collapse a number of categories to achieve similar classifications. For example, to achieve a reasonably comparable dataset, it was necessary to collapse Executive, Administrative and Managerial occupations with Professional Specialty and Technical occupations. Even when this was done, the classifications were not compatible as there were still a number of occupations that were in the U.S. coding, but were not included in the Australian and New Zealand codes. It was decided to tolerate these differences however, as they reflected only small numbers of cases in each collection (1.8% in Australia and 2% in New Zealand). Even where mapping across countries appeared to be reasonably consistent, grey areas still exist within classification systems. Sales occupations provide a case in point. For the U.S. classification, as Table 3 shows, some sales occupations are to be found in the amalgamated Executive, Administrative and Managerial/Professional Specialty and Technical occupations. In addition, the U.S. Sales and Service category includes a large proportion of the clerks, those who are coded as Sales Clerks (N=884, representing 51.3% of all Sales and Service deaths), which are coded in the Clerks category for Australia and New Zealand.

Table 3: Examples of issues for harmonisation of occupation classification

OCCUPATION	*United States* SOC codes	*Australia* ASCO codes	*New Zealand* ANZSIC codes
- Executive, Administrative, & Managerial - Professional Specialty - Technical, Sales & Administrative Support	1-3	1-3 *included elsewhere administrators, financial officers, funeral directors, underwriters, legal assistants, licensed practical nurses, sales occupations. (1.8% of cases)	1-3 *included elsewhere inspectors, compliance officers, adminsitrators, protective service workers, sales occupations, administrative support, investigators & adjusters, messengers (2% of cases)
Clerks	45-47	50-56,59	4
Sales & Service	50-52, 40-44	65-66,72,89	51-52

*denotes occupations that are displaced as a result of achieving compatibility with the U.S.: these occupations included in this category for U.S. data and but not included in this category for the Australian and New Zealand data.

All of the adjustments identified for classification of occupation and industry needed to be applied to both numerator and denominator data. A further complicating factor for being able to comparably manipulate the labor force (denominator) data was presented by the fact that in all cases the labor force data are collected separately by a different agency and provided in categorised form. Nevertheless, acceptable harmonisation of the numerator and denominator data for each country was achieved.

Other strategies for overcoming the problems associated with aggregated classification of occupation include examination of relatively homogenous high risk occupational groups common to each data set, and examination of mechanism of injury. Both of these comparisons are likely to yield data that are more revealing about the nature of the hazards related to occupational fatal injuries, compared with data in more coarsely defined occupational categories such as those described in Table 3.

Discussion

The collaborative effort described here underscores a number of important aspects of international comparisons of occupational fatal injury data. First, it is clear that even for apparently highly comparable datasets, considerable preparatory work is needed before meaningful analysis of the data can be undertaken. Second, it is clear that without this

preparatory work, as is the case when published data are used, comparability may be quite severely compromised.

The formal analysis of the harmonised datasets for fatal occupational injuries in the U.S., Australia and New Zealand is currently underway. The results will be submitted for publication in the refereed literature before the end of 1999. Several presentations describing the results are also planned for the proposed symposium of the International Collaborative Effort on Injury Statistics at the 5th World Conference on Injury Prevention and Control, in New Delhi in 2000.

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