Australian Government

National Occupational
Health and Safety Commission

Fatal Occupational Injuries

– How does Australia compare internationally?

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EXECUTIVE SUMMARY

Due to differences in scope and methodology, comparisons of occupational injury fatalities data between countries have many limitations. Despite these limitations, fatality incidence rates continue to be published in a form that encourages direct comparison without due consideration of the caveats and conditions of the individual data. While benchmarking of Australia's performance on this area of occupational health and safety is viewed as highly desirable by a range of policy makers and stakeholders, attention must be drawn to the differences between the collections of data undertaken in each country. The main areas of concern lie in the exclusion of self-employed workers, the inclusion of fatalities from occupational disease, the lack of data relating to road traffic fatalities and the incomplete coverage within the data of the working population. While this report attempts to harmonise and standardise the data so that a more accurate comparison can be undertaken, these issues have not been fully resolved and may impact on the final results of this analysis.

Based on 2000–01 non-standardised, non-harmonised international fatalities data obtained from the International Labour Office (ILO), Australia has the seventh lowest fatality rate of 20 Established Market Economies considered in this analysis, after the UK, Sweden, Norway, Denmark, Switzerland and Finland. The research in this paper demonstrates that year-to-year changes can be quite substantial, and that choosing only one year for analysis does not provide a robust measure of the ranking of Australia in terms of fatal occupational injury rate. Therefore, data covering a longer period of time were used in the analysis.

The main aim of this report is to obtain a measure of the gap in performance between Australia and the best performing countries. Countries were therefore included in this analysis if they had a lower and comparable incidence of fatality as reported to the ILO. This resulted in most of the countries included in this comparison being European. These countries have similar social and economic patterns to Australia compared to other regions around the world. The European Union has made major efforts to harmonise the data across their member states resulting in data for the latter part of the 1990s having a higher level of comparability than seen previously. For this report data covering the period 1998–1999 to 2000–2001 have been used. This period was chosen due to the availability of consistent data.

After analysis of the coverage of the available data, ten countries were selected for this analysis on the basis that their fatality incidence rate was lower than or comparable to Australia. These countries are:

Australia	Belgium	Denmark	Finland	Germany
New Zealand	Norway	Sweden	Switzerland	United Kingdom

It was initially thought that differing employment profiles in the selected countries could account for some of the apparent differences in performance. However the results of this analysis show that when the data are standardised by industry, the standardised rates differ only marginally from the non-standardised rates, leaving Australia still with the seventh lowest fatality rate. More extensive research would be required to identify the underlying reasons for the gap in performance.

The non-standardised, harmonised data, for the above countries, averaged over the three year period shows:

- Sweden and the United Kingdom have the lowest rate of work related fatalities. Australian rates are 71% higher than Sweden and 62% higher than the UK.

- Sweden has a lower fatality rate than Australia for all industries except *Agriculture, hunting and forestry*.
- The United Kingdom has a lower fatality rate than Australia for all industries except *Construction*.
- *Mining and quarrying* recorded the highest fatality rate in most countries, including Australia.
- Over the past five years, Australia's rate of improvement has averaged 11%, whereas the UK has shown no consistent improvement in this time. If Australia continues to improve at its current rate and the UK continues to plateau, then Australia could equal the performance of the UK in around five years, which is within the life span of the *National OHS Strategy 2002–2012*. To achieve this objective however, Australia would need to improve at more than three times the rate targeted in the strategy.

However fatality rates do not necessarily give a clear picture of exposure to risks. For example, there may be smaller gaps between countries in their non-fatal injury rates but larger numbers of deaths due to intervening variables eg health care. Analysis of non-fatal injury data has not yet been attempted and presents much greater challenges. As a next step the NOHSC Office will examine injury rates for serious injuries for Australia against the best performing countries as identified in this report in an attempt to provide a clearer picture of Australia's OHS performance.

1 INTRODUCTION

There are two significant events that have highlighted the need to establish where Australia stands internationally on work-related fatalities.

The first occurred in November 2002 when the Senate Estimates committee posted a Question on Notice[1] asking why Australia stood in the 5th worst position internationally on workplace fatalities. This ranking came from an article published in 1999[2], which recorded Australia's incidence rate at 7.0 fatalities per 100,000 employees. At this level Australia was then placed in 18th position out of the 23 'established market based economies' listed (i.e. 5th worst). These data were based on information collected and published by the International Labour Office (ILO).

However, the comparability of the ILO figures listed for each country is problematic with different scope and methodologies used for compiling the data. The response to the Question on Notice stated:

> A recent study[3] that compared work-related fatal injuries in the United States, Australia and New Zealand, examined the issue of data comparability. Researchers from the three countries undertook considerable preparatory work to harmonise the datasets in order to compare the data reliably.
>
> When factors such as varying industry distribution, definitions of work-relatedness, inclusion of different types of employees and industries were taken into account, it was found that the three countries had similar rates, with the New Zealand rate slightly higher and the US rate slightly lower than that for Australia.
>
> The study concluded that, without initial and time-consuming preparatory work to harmonise the data, omnibus statistics such as those used by the ILO are of limited value in drawing international comparisons.

It should also be noted that the study mentioned above was performed on data that are now nearly 10 years old. In that time Australia has significantly improved its rates of fatality due to injury[4].

The second significant event was the appointment of a new chairman to NOHSC, Mr Jerry Ellis. Mr Ellis brings to NOHSC a strong interest in international benchmarking and the need to align our National OHS Strategy with the best performing countries.

The aim of this report is to compare the rate of work-related fatal injury in Australia to the corresponding rates in other industrialised countries, taking into account, as much as possible, the main differences in the available data. International Labour Office (ILO) data are used because the best compendium source of information on work place fatalities is the ILO yearbook or website (www.laborsta.ilo.org). The ILO compiles statistics of occupational injuries on the basis of information supplied by relevant national organisations. To enhance their usefulness they also compile basic

[1] Question Number W217_03, 2002-03 Supplementary Senate Estimates, 21 November 2002
[2] Takala, J. "Global estimates of fatal occupational accidents" *Epidemiology*. Vol 10. 1999. pp.640-646
[3] Feyer, A-M. et. al. "Comparison of work-related fatal injuries in the United States, Australia and New Zealand: method and overall findings." 2001, *Injury Prevention,* Vol. 7, No. 1, pp.22-28.
[4] National Occupational Health and Safety Commission (NOHSC),2003, Compendium of Workers' Compensation statistics

information on the sources and methods used in each country. The ILO splits the world into eight World Bank Regions grouping countries with similar economic profiles. The region in which Australia is included is called Established Market Economies (EME) and hence this group is the focus of this report.

The Methods section of the report considers the main issues relevant to a comparison of fatality data between countries, and describes the methods used to address these issues. These include adjusting United Kingdom data for missing traffic-related deaths and standardising data to take account of differences in industry distribution. The Results section presents the non-standardised data first, and then the standardised data. Similar information from Eurostat is also presented. The implications and shortcomings of the results are considered in the Discussion and Conclusion sections. Other information of relevance, and some of the detailed results, is presented in the appendices.

This report is the beginning of what will probably be ongoing research into the experiences of other similar economies and the scope and methodological issues regarding their collection of work-related injury data.

In particular it is recognised that fatality rates do not necessarily give a clear picture of exposure to risks. For example, there may be smaller gaps between countries in their non-fatal injury rates but larger numbers of deaths due to intervening variables eg health care. Analysis of non-fatal injury data has not yet been attempted and presents much greater challenges. As a next step the NOHSC Office will examine injury rates for serious injuries for Australia against the best performing countries as identified in this report in an attempt to provide a broader picture of Australia's OHS performance.

2 METHODS

2.1 Included Countries

For the purposes of this report, nine countries have been selected for comparison with Australia. These are the UK, Sweden, Belgium, Denmark, Finland, Norway, New Zealand, Germany and Switzerland. The USA was not included (the reasons for this are presented in the Discussion section).

2.2 Addressing Differences in Scope and Methodology

Before inter-country comparisons can be validly undertaken, differences in the scope and methodology of each country's collection need to be addressed. Consideration of the available data identified seven main limitations to direct comparison of international fatality data:

- Incomplete coverage
- Differing industry classifications used
- Inclusion of self-employed workers
- Inclusion of occupational disease fatalities
- Exclusion of road traffic fatalities
- Unavailable denominator data
- Differences in industry distribution

Other coverage issues were also identified, but these were not investigated due to the lack of further information. These include identifying the age of the workforce covered by the data, whether trainees, unpaid family workers and bystanders were covered by the data, and the period between injury and death. Additional information on the schemes operating in each country can be found in Attachment C.

2.2.1 Incomplete coverage

Incomplete coverage of the whole working population by the insurance scheme and non-claiming of the compensable injuries can impact on the quality of the data used by countries to compile occupational fatal injury rates. This is particularly important if the data do not cover a considerable part of the population, as is the case in Belgium, where less than half the workforce is insured for workers' compensation (see Appendix A). Compensation schemes operate in Australia, Sweden, Switzerland, Finland, Germany and New Zealand, but the schemes in some of these countries do not cover all categories of worker. However for all countries in this analysis, apart from Belgium, the percentage of the workforce covered by the data has been estimated[5] as being from 83% in Australia to 100% in Denmark and Germany.

While the UK, Norway and Denmark collect their fatalities data through notification systems rather than compensation schemes, there is a legal requirement to make notifications within a few days in the event of a fatality. Despite this legal requirement there are concerns of underreporting in some countries, although research undertaken by the UK into this area concluded 'Fatalities by their nature, are different and are virtually fully reported. HSE and local authorities reckon to get to know about all fatalities at work.'[6]

2.2.2 Differing industry classifications used

While the ILO request that data be aligned to the International Standard Industrial Classification (ISIC), in practice many countries convert their own industry

[5] International Labour Office Yearbook Synoptic Table
[6] Health and Safety Executive, Statistical Note on Progress Measurement 2000–01

classification as best they can to ISIC. At the broad (one digit) level, most countries' industry classifications are similar enough to ISIC to make general comparisons. However it is should be noted that this area has not been explored in detail for this report and should there be large differences in industry classifications, the analysis in this report may produce invalid conclusions. In addition, it should be noted that the composition within each industry division could be substantially different between countries, thereby impacting on their overall incidence rates. This analysis was not extended beyond the broad industry level, as the data were not readily available. At this stage it is considered that these differences could be substantial.

Another issue is that some countries do not include particular industries in their data. For example, Belgium excludes employees in the public services and the UK excludes air transport and sea fishing. The extent of this issue has not been explored in detail for this report.

The USA's industry classification is very different to ISIC and therefore the USA has been excluded from this comparison. The USA has recently introduced a new industry classification that is more closely aligned with ISIC. This will allow comparisons to be performed more easily in the future.

2.2.3 Inclusion of self-employed workers

One of the main areas of difference between the selected countries is that some countries cover self-employed workers under their workers' compensation schemes while others do not. Analysis of the data supplied to the ILO and cross checking with statistical web sites have shown that Sweden, Norway and Denmark supply data to the ILO covering all employed persons (employees and self-employed workers in total). However, while the UK scheme also covers self-employed workers, only data for employees are supplied to the ILO. Separate information on self-employed workers is available on the Health and Safety Executive web site (www.hse.gov.uk). In Australia, fatalities involving self-employed workers are not included in the data as they are generally not covered by the workers' compensation system.

In the case of Sweden, it is known from data extracted from the Statistics Sweden web site that around 30 per cent of fatalities occur in the self-employed sector. However, no data source has been found to allow self-employed workers to be extracted from the employment base used for the rate denominator, and hence adjusted incidence rates cannot be calculated. No similar data have been found for Norway or Denmark. Therefore some assumptions need to be made about the incidence rates for employees compared to self-employed workers.

A recently published report[7] concluded for Australia that there is no strong evidence of an increased fatality rate in self-employed persons compared with employees, once differences in industry and occupation are taken into account. Based on the outcomes of this research, the analysis presented here is based on the assumption that the rates for the two categories of workers are similar, within a given industry, although it is acknowledged that the experience in other countries may be different. It is also worth noting that if self-employed workers are not distributed across a similar industry pattern as employees, then the total employee fatality incidence rate for the selected country may not be representative of the self-employed. This is an issue for the Swedish data where self-employed workers are mainly operating in the agriculture and construction sectors possibly inflating their overall incidence rate.

[7] Driscoll, T. et al. "Are the self-employed at higher risk of fatal work-related injury?" *Safety Science* 41 (2003) 503-515

2.2.4 Inclusion of occupational disease data

The ILO definition of an occupational injury is 'any personal injury, disease or death resulting from an occupational accident', with the definition of an occupational accident being 'an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death'. The ILO requests only data on occupational accidents.

These definitions are similar to Australia with occupational diseases being those that result from repeated or long-term exposure to an agent or event. However, in some countries (Sweden, Norway and Switzerland) it is unclear from the information supplied to the ILO whether this definition has been applied to their data. In the case of Sweden it has been confirmed from additional information contained on their website that the ILO data only contain injuries consistent with the Australian data. This has not been confirmed for Norway and Switzerland but based on the experience with Sweden it has been assumed that only data for injuries are included in each country's data supplied to the ILO.

2.2.5 Exclusion of road traffic accidents

The UK data do not include fatalities resulting from traffic accidents, therefore some adjustment is necessary to enable the UK to be included in direct comparisons. Since it was not possible to remove traffic accident fatalities from the data reported for all other countries, it was necessary to increase the UK data by a factor representing the incidence of traffic accidents that would be likely for this country. This was done using industry-specific data from Australia and Eurostat data for a number of European countries (see Appendix A).

2.2.6 Unavailable denominator data

When calculating incidence rates, the numerator and denominator data should have the same coverage. For example, if self-employed persons are included in the numerator then they should be included in the denominator. For this analysis, data on employees only would assist the comparability across countries. However it has not been possible to separately extract these data in some countries with self-employed workers included in some and only insured workers included in others.

In Australia, specific denominators are calculated to match the scope of the various jurisdictions, using a sub-set of the labour force figures. This methodology takes into account part-time employment and multiple jobholders. This will increase Australia's denominator data as multiple job holders are counted more than once, and will result in Australia having a lower incident rate than if a simple count of all employees were used.

The Belgium scheme covers less than half the working population and hence it was necessary to obtain comparable denominator data from their website[8]. This was readily available, though in French. However it should be borne in mind that if all fatalities in Belgium were included in the data, then the incidence rate could be substantially different to that shown in this report.

Obtaining the correct denominator data required some manipulation for some countries. As a first step employment data by industry was extracted from the ILO website. These data were generally supplied from labour force surveys and hence may not match those data used by the area compiling the injuries data. Therefore it was necessary to check that these numbers of employees were the same

[8] http://www.meta.fgov.be/excel/frec03.xls

employment data used to calculate the fatality incidence rate for each country. If the calculation produced the same rate as the fatality rate reported on the ILO website this verified that these data were used as the denominator data. These results were verified for Denmark, New Zealand and Norway. For other countries it was clear that the denominator data used for calculating fatality incidence rates was not from the same sources as the industry level employment data.

Where the rates differed from that on the website, it was necessary to determine the denominator from other sources. For Sweden, the United Kingdom, Finland and Switzerland, employment data were reconstructed using the non-fatal injuries cases and non-fatal incidence rates, as these data had a higher level of precision than fatality incidence rates.

Germany did not supply fatalities data to the ILO to the same level of detail at the industry level as the other countries. Therefore denominator data could not be reconstructed using the non-fatal injuries rates information as was done with other countries. As no other information could be found either on the German or the ILO website data was drawn from a variety of sources. This reconstruction has resulted in a slightly higher rate being recorded for Germany than they reported to the ILO. This is a little concerning when Germany expressed their incidence rate as ‘per full-time equivalent workers’ which when the full number of employees is used should reduce their rate.

2.3 Standardisation of Data

In the analysis of statistical information, variations in the composition of populations being compared can confound the results of the comparison. One common confounding factor is industry. As different industry groups can have very high or very low fatality incidence rates, the proportion of a country’s workforce in those industries will affect the overall fatality incidence rate for that country.

To remove the influence of industry compositions, data can be compared across countries for specific industry divisions. However trying to compare 10 countries across 13 broad industry divisions is cumbersome and impractical. An alternative method of comparison is to standardise the data to remove the influence of the varying industry profiles that exist in the different countries. This provides a single rate that can be compared between countries.

There are two ways in which data can be standardised, direct and indirect. Direct uses the same population to standardise the industry specific rates in each country and provides an unbiased standardised rate. However, it can only be validly used if the number of deaths in each industry group is large enough for the rates to be considered reasonably stable.

Indirect standardisation applies the same rates to the potentially different industry distributions in each country, but confounding due to industry can remain despite this process. This method is used if the number of deaths in an industry group is considered to be unstable.

For this study the direct standardisation approach was used.

With this method a standard population is chosen to provide an industry profile to be applied to all the countries in the study. In this case Australia was chosen as the standard population. Industry profiles for all countries, including the standard population can be seen in Table 3 in the Results section on page 18.

The next step is to multiply each country's total population by the Australian industry proportions. This would provide the number of persons who would be in each industry group if the country has the same industry distribution as the reference population (i.e. Australia).

The expected number of deaths in each country based on this new industry profile is then calculated. This is done by applying the crude fatality incidence rates for each industry in each country to the new industry profile. As the number of fatalities in each industry can vary substantially from year to year, particularly for the smaller countries, a three-year average of fatalities was used to calculate crude fatality incidence rates by industry for each country. These non-standardised incidence rates, based on data from 1999–2001 appear in the Results section as Table 2 on page 16.

The final step is to add together the expected number of deaths in each industry for each country to give a total of expected deaths for the country. This number of expected deaths is then divided by the country's population to derive a standardised rate for that country. The standardised incidence rates for each country appear in the Results section in Table 4 on page 19.

3 RESULTS

3.1 Published ILO Data

Table 1 contains data for selected countries extracted from the ILO website (as at March 2004). However for Australia and New Zealand, data from the National Data Set published in the Comparative Performance Monitoring (CPM) Report have been used as a more reliable data source. The Scope column in this table highlights the main differences in the compilation of these data. All listed countries exclude commuting and diseases claims as well as claims from self-employed workers, except where noted. It has been necessary to calculate incidence rates for some countries to enable this comparison. See the footnotes to Table 1 for details.

Table 1: Fatality incidence rates (per 100,000 workers), selected ILO countries, 2001.

Country	Incidence Rate	Per 100,000	Source	Scope
UK	0.8	employees	ILO	Excludes road and air traffic incidents claims.
Sweden	1.4	workers	ILO	Includes self-employed.
Norway	1.6	workers	ILO	Includes self-employed in Agriculture and Construction and partial coverage of "injury equivalent" diseases.
Denmark	1.8[a]	workers	ILO	Includes self-employed.
Switzerland	2.0	employees	ILO	Possibly includes diseases.
Finland	2.1	employees	ILO	
Australia	**2.6**	employees	CPM	
Germany	3.0 [b]	FTE employees	ILO	Only includes deaths within 1 month of accident.
New Zealand	3.1	employees	CPM	
Belgium	3.3[c]	Insured workers	ILO	Includes only insured workers
United States	4.0	employees	ILO	

a. The ILO has recorded the rate for Denmark in whole numbers. This number has been recalculated using ILO data on the number of fatal cases and employment.
b. This rate is per 100,000 full time equivalent workers
c. Belgium provides the ILO with frequency rates. The incident rate has been calculated using data from the Belgium website on claims and the number of insured workers.

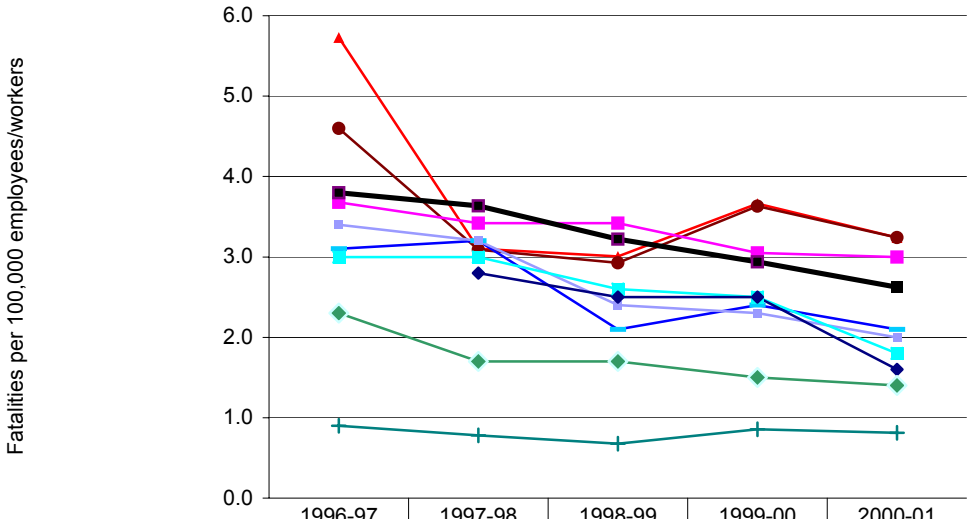
While there are 25 countries in the Established Market Economies (EME) group, nine were not selected for this analysis, as their incidence rates were higher than Australia's based on the data published by the ILO. These countries are: Ireland (4.2), Malta (4.4), Austria (4.5), France (4.5), Greece (6.2), Italy (7), Canada (7.1), Spain (7.9) and Portugal (8.7). These countries have not been included in this analysis as the report's main objective was to identify the gap in performance between Australia and the best performing countries.

A further group of countries were not selected due to inadequate available data. The number of fatalities recorded for Iceland, Luxembourg and San Marino were small but since their populations are also very small consideration of their data would provide little meaningful comparison with Australia particularly since these countries do not have employees in a wide variety of industries. The Netherlands was excluded from this analysis, as the available data does not include road traffic fatalities or any fatalities occurring in the public sector. In the Eurostat comparison, the Netherlands ranks as having a higher fatalities incidence rate than Germany but lower than Belgium suggesting that the Netherlands would have a higher fatalities incidence rate than Australia should all data be available. The Japanese data also excludes some industries but more importantly only reports for enterprises employing more than 100 employees. It is therefore not possible to include Japan in this analysis.

Based on these non-standardised non-harmonised data, Australia has the seventh lowest fatality rate of the 20 EMEs that could be considered comparable. This direct comparison does not take account of the very substantial differences in various important aspects of the data between countries and so therefore must be considered at best a very crude guide to relative performance.

3.2 Available Time Series Data from ILO

Figure 1: Fatality incidence rates, selected countries, 1996–2001



	1996-97	1997-98	1998-99	1999-00	2000-01
Belgium	5.7	3.1	3.0	3.7	3.2
New Zealand	4.6	3.1	2.9	3.6	3.2
Germany	3.7	3.4	3.4	3.1	3.0
Australia	3.8	3.6	3.2	2.9	2.6
Finland	3.1	3.2	2.1	2.4	2.1
Switzerland	3.4	3.2	2.4	2.3	2.0
Denmark	3.0	3.0	2.6	2.5	1.8
Norway		2.8	2.5	2.5	1.6
Sweden	2.3	1.7	1.7	1.5	1.4
United Kingdom	0.9	0.8	0.7	0.9	0.8

Fatality incidence rates for selected countries are shown in Figure 1. In general, these incidence rates show a decline over five years, though few countries show any

significant sustained improvement in performance in the last couple of years. Of note is Norway, which recorded a dramatic decline for 2001, with their incidence rate falling from 2.5 to 1.6 (per 100,000 workers). This rate has remained low with 2002 recording 1.7. As the Norwegian website publishes very little information in English it is difficult to know if the drop is due to a change in reporting methodology.

The fluctuation in incidence rates displayed by most of the selected countries is in contrast to Australia, which has recorded regular sustained improvements in its fatality rate over the past five years. This trend is continuing, with an incidence rate of 2.4 (per 100,000 employees) published for 2001–02[9].

3.3 Non-Standardised Comparison

Table 2 shows the non-standardised fatality incidence rates for each industry in each country. As the number of fatalities in each industry can vary substantially from year to year, particularly for the smaller countries, a three-year average of fatalities was used to calculate fatality incidence rates. These incidence rates are based on data from 1999–2001.

In Australia the agriculture, mining and transport industries typically have the worse fatality incidence rates. When each of these industries is compared across countries in Table 2, Australia ranks 7th place for *Agriculture, hunting and forestry* and *Transport, storage and communication* and 5th place for *Mining and quarrying*. The 5th place for mining results from two countries, Belgium and Sweden, not participating in mining activities.

While Australia ranks 7th place for the *Agricultural, hunting and forestry* industry with a rate of 13.7 fatalities per 100,000 employees, Sweden, who has a lower rate for all other industries than Australia, has a rate of 19.4. Table 1 also shows that both Australia and Sweden have similar proportions of their population involved in agriculture. These data are confounded by Sweden including self-employed workers in their data of which agriculture fatalities are a significant proportion.
Of the eight countries that undertake *Mining and quarrying*, five countries (New Zealand, Denmark, Finland, Australia and the United Kingdom), have mining as their highest risk industry. New Zealand has the highest incidence rate of 52.2 compared to Australia's rate of 20.4, while Norway with a rate of 4.6 is the lowest. The large variation in the mining sector is probably due to small employment bases and very small numbers of fatalities producing unstable rates. However it is clear that this industry is still one of the most dangerous in every country.

For the *Transport, storage and communication* industry, Australia has a fatality incidence rate of 9.1 compared to New Zealand that recorded the highest fatality rate of 16.5 deaths per 100,000 employees. The Scandinavian countries, Denmark, Norway, Finland and Sweden have the lowest incidence rates ranging from 3.7 to 5.0. It could be that the smaller distances travelled in these countries may keep rates lower, but this theory is rejected for New Zealand, which while being small, has the highest rate for this industry.

Nine of the ten countries have incidence rates for the *Construction* industry ranging from 4.6 to 8.5. Australia has a rate of 7.7, while Norway recorded the lowest incident rate at 4.6. Belgium, however, has an unusually high incidence rate of 22.0. The United Kingdom has a lower fatality rate than Australia for all industries except *Construction* where the UK's average rate of 7.8 is marginally higher than Australia's.

[9] see 4

Table 2: Non-standardised fatality incidence rates per 100,000 employees[a] by industry, 1998–99 to 2000–01

ISIC	Australia	Sweden	UK	Belgium	Denmark	Finland	Norway	New Zealand	Germany	Switzerland
Agriculture, Hunting and Forestry	13.7	19.4	9.1	0.0	13.1	4.5	14.6	10.3	25.7	8.9
Mining and Quarrying	20.4	9.9	16.4	n.a.	25.6	28.9	4.6	52.2	10.4	n.a
Manufacturing	2.0	1.1	1.6	3.0	2.0	3.0	2.7	2.4	2.4	2.0
Electricity, Gas & Water Supply	4.0	1.9	2.7	6.0	2.5	1.6	20.4	47.3	1.0	3.0
Construction	7.7	4.8	7.8	22.0	5.9	8.5	4.6	6.8	6.8	7.3
Wholesale and Retail Trade	1.5	0.9	0.4	0.7	2.1	0.9	1.1	0.6	1.5	0.8
Hotels & Restaurants	0.7	0.2	0.1	0.0	1.1	0.5	1.0	0.4	0.9	0.6
Transport, Storage and Communication	9.1	4.8	5.9	7.4	4.4	5.0	3.7	16.5	13.8	9.5
Financial Intermediation	0.7	0.0	0.1	0.8	0.0	0.0	3.4	0.7	0.2	0.0
Real Estate, Renting and Business Activities	2.0	0.4	0.4	3.0	1.0	0.8	0.4	0.9	0.1	0.7
Public Administration and Defence	1.9	1.2	0.5	1.9	1.4	3.4	1.3	5.3	0.5	0.0
Education	0.7	0.2	0.1	1.0	0.7	0.0	0.5	0.6	0.2	4.7
Health & Social Work, Other Community	1.4	0.1	0.5	0.9	0.5	0.5	0.3	0.6	2.0	0.7
TOTAL	**2.8**	**1.5**	**1.4**	**3.3**	**2.2**	**2.1**	**2.2**	**3.3**	**3.2**	**2.2**

a employed workers for Sweden, Denmark and Norway b UK data have been adjusted with an estimate of traffic accidents

n.a. - no employees in this industry

3.4 Standardised Comparison

Table 4 shows the percentage of the workforce by industry. The standardisation process will have the greatest impact on those countries whose workforce is considerably different to Australia's. So for example, the *Agricultural, hunting and forestry* industry employs only around 1.0% of the UK workforce whereas in Australia this sector employs more than twice this percentage. Hence the standardisation process will increase the impact of this sector on the overall standardised rate of fatality for the UK.

The results of the standardisation process, as outlined in the Methods section of the report, are shown in Table 3. This table shows that there has been little change to the incidence rates once industry has been standardised indicating that employment profiles are not a significant factor in the gaps in performance between these countries. Identification of other factors to explain the gap in performance will require extensive research.

While specific rankings are shown in Table 3 these data should only be used in conjunction with all the caveats mentioned in this report. The use of these data without the caveats would imply a greater level of confidence in the data than actually exists.

Table 3: Standardised incidence rates, selected countries, 1998–2001

	Non-standardised incidence rates 1998–2001	Standardised rate 1998–2001
Sweden	1.5	1.7
UK[a]	1.4	1.7
Norway	2.2	2.0
Finland	2.1	2.1
Denmark	2.2	2.3
Switzerland	2.2	2.3
Australia	**2.8**	**2.8**
Germany	3.2	3.0
Belgium	3.3	3.0
New Zealand	3.3	3.6

a Data for the UK have been adjusted to include traffic accident fatalities.

This analysis shows that even after standardising for industry, Sweden and the UK are still displaying better performances for work related fatalities compared to the other countries, and Australia continues to rank seventh. The Australian standardised rate for 1998–2001 is 65% higher than Sweden and the UK.

Over the past five years, Australia's rate of improvement has averaged 11%, whereas the UK has shown no consistent improvement in this time (Figure 1). If Australia continues to improve at its current rate and the UK continues to plateau, then Australia could equal the performance of the UK in around five years, which is within the life span of the current National OHS Strategy.

Table 4: Percentage of Total Employment by Industry, selected countries, 2001

ISIC category	Australia	Sweden	UK	Belgium	Denmark	Finland	Norway	New Zealand	Germany	Switzerland
Agriculture, Hunting and Forestry	2.5	2.0	1.0	0.1	3.3	1.9	3.9	8.3	2.6	1.6
Mining and Quarrying	0.9	0.2	0.3	0.0	0.1	0.1	1.6	0.2	0.4	0.0
Manufacturing	13.0	19.3	14.4	23.3	18.0	21.6	12.6	13.0	23.5	27.9
Electricity, Gas & Water Supply	0.8	0.9	0.5	1.3	0.5	1.1	0.8	0.3	0.8	0.7
Construction	5.4	5.8	4.5	4.5	6.7	5.8	6.7	6.0	7.9	8.6
Wholesale and Retail Trade	19.7	12.5	17.4	9.0	13.9	11.4	14.5	17.8	14.3	16.6
Hotels & Restaurants	5.6	6.9	6.5	1.2	2.3	3.3	2.9	4.6	3.4	5.5
Transport, Storage and Communication	6.4	6.9	6.1	9.4	6.7	7.5	7.4	5.2	5.6	5.3
Financial Intermediation	4.0	2.2	4.1	8.1	3.1	2.4	2.2	3.0	3.7	7.1
Real Estate, Renting and Business Activities	12.2	10.8	15.4	6.7	9.5	10.5	9.9	11.3	8.2	13.1
Public Administration and Defence	4.7	5.5	5.5	15.6	6.0	5.5	6.6	3.5	8.4	1.9
Education	7.8	8.4	8.3	6.4	7.4	8.0	8.4	7.3	5.4	0.2
Health & Social Work, Other Community	16.8	18.6	15.8	14.5	22.5	21.0	22.5	19.5	15.9	11.4
Total	100	100	100	100	100	100	100	100	100	100

Note: data for Sweden, UK and Switzerland were reconstructed using incidence rates and number of cases.

3.5 Comparisons Undertaken by Eurostat

Corroboration of these results was sought from other sources. Eurostat also compiles comparison data on workplace fatalities. Eurostat, together with its member states and selected other European countries, are working on a program to give consistency to workplace injury statistics in the EU. The results of this program are published in *Accidents at Work in the EU* with the latest available data for 1999–2000. Due to the UK not including traffic accidents in their workers' compensation data, the EU adjusted all other member states' data to exclude road traffic and transport accidents at work. (This would be equivalent to Australia removing vehicle accident claims.) Norway was not included in this analysis as they were unable to separate out traffic accident data. In addition Switzerland was not included as it is not part of the EU.

As the fishing, mining and public sectors are not covered for some Member states, Eurostat calculates incidence rates on only nine branches of activity (industry). Direct standardisation is used to reduce the impact of the different industry profiles in each country.

Table 5: Standardised work-related non-traffic fatality incidence rates for EU countries, 2000

	Employment[a] '000s	Fatality cases excl traffic	non-standardised rate	standardised rate
Sweden	2587	25	1.0	1.1
UK	18728	228	1.2	1.7
Denmark	1738	31	1.8	1.9
Finland	1604	31	1.9	2.1
Germany	24356	455	1.9	2.1
The Netherlands	4334	76	1.8	2.3
Belgium	2021	56	2.8	3.1
Italy	14952	469	3.1	3.3
France	13119	375	2.9	3.4
Austria	2714	146	5.4	5.1

Source: Eurostat Accidents at Work in the EU
a. Includes only 9 ISIC industry groups i.e. excludes Mining, Public Administration, Education, Health and Social.

The results of Eurostats' analysis are shown in Table 5, which indicates that after excluding traffic accidents, Sweden had a considerably lower fatality rate than the other countries, with the UK in second position. The UK did not appear to be performing as well in the Eurostat analysis compared to the analysis in this study due to the fact that the industries removed from the calculations had high employment and very low incidence rates and their removal resulted in a much higher non-standardised rate for the UK than shown in their own data. The Eurostat analysis supports the findings of the analysis undertaken in this report, with the ranking of common countries the same i.e. Sweden and the UK the best, followed by Denmark and Finland.

It is difficult to know where Australia would fit into Table 5 without having the data to repeat the exercise. However, if traffic accidents are excluded and similar industries

are selected, Australia's rate would be 2.9 (working not shown), which on a non-standardised basis is comparable to Belgium. Judging by the changes in position of some countries as a result of the standardisation process, it is reasonable to expect that Australia would remain in about the same position.

4 DISCUSSION

4.1 Exclusion of the USA

The USA was not selected for this comparison as their data, particularly at industry level, would require significant manipulation before it could be included. In addition, as the USA's incidence rate (4 deaths per 100,000 employees per year) is considerably higher than the countries selected, it is unlikely its inclusion would alter the findings of this report. This is in contrast to the report by Feyer et al (2001)[10] which concluded using 1989–92 data that the USA performed better than Australia. Since this time Australia's performance has improved substantially whereas the USA's rate appears to have remained fairly constant based on data supplied to the ILO, but it should be noted that the Feyer et al study was based on all work-related fatalities, not just compensated deaths.

4.2 Time Series Data

The falls in fatal incidence rates experienced by industrialised countries since the mid 1990s have been related to the shift of employment from heavy manufacturing and agriculture to the service sector. A recent ILO report[11] stated that

> 'on average, the rates of occupational fatalities, accidents and illness are declining in the industrialized countries. The reasons for this are complex. Certainly, better prevention and better emergency facilities have played an important part in bringing the rates down in the industrialized countries. But so has the export of dangerous jobs. Much of the world's most hazardous work is no longer performed in the older-established industrial countries. In the industrialized economies, the nature of occupational ill health is changing. There are fewer physical injuries, but ailments related to stress and overwork are on the increase.'

Sweden has also made reference to these factors, stating in one of their reports[12] that

> 'between 1988 and 1993, the work accident frequency fell by more than half. This decline, which began during the boom years, accelerated with the downturn and many activities with hazardous working environments were put out of business'.

4.3 Differences Between Countries That Were Not Considered

Other differences between the schemes operating in each country that were not fully considered for this analysis include the age of workers covered, inclusion of claims by unpaid family workers and bystanders, and the time between the incident and death. Of these, the unpaid family helpers, and time to death are not likely to have major effects on the rates or resultant conclusions, based on Australian data from Work Related Traumatic Fatalities in Australia 1989 to 1992 (WRFS 2). That study found that the vast majority of people die on the day of the incident (at least 75%) and most of the rest (about 22%) before leaving hospital[13]. Information on the ILO website indicates for Germany that there may be a restricted time period from the

[10] See 3
[11] Safety in numbers, pointers for global safety culture at work, ILO, 2003, p6
[12] Occupational Accidents and Work-related Diseases in Sweden, Swedish Work Environment Authority, Jan 2001
[13] Work-related traumatic fatalities in Australia, 1989 to 1992, National Occupational Health and Safety Commission (NOHSC), December 1998

time of accident to the time of death for the fatality to be included in the data. The Synoptic table (see Appendix B) compiled by the ILO indicates no such period exists yet the data table on fatality incidence rates has a footnote to imply that the data only include deaths occurring within one month of the incident, but WRFS 2 results suggest that even such a restrictive inclusion criteria is unlikely to exclude many work-related injury deaths. WRFS 2 also showed that, for Australia at least, the number of deaths of unpaid family workers is not high (1.6% in WRFS 2: Driscoll et al, 2003)[14].

While some countries (the UK in particular) collect data on the number of members of the public who are killed at a worksite (bystander deaths) these are not included in the data supplied to the ILO. Similarly while a number of countries collect data on commuting claims, these too have not been supplied to the ILO by the countries selected in this report.

The data for this study were based on broad industry divisions. While it is expected that at the broad level most countries should classify industries in the same way, this may not always be the case. This is especially true for Australia and New Zealand who base their industry classification on the Australian and New Zealand Industry Classification (ANZSIC), while the other selected countries base theirs on the International Standard Industry Classification (ISIC). Furthermore, the types of tasks and level of hazard within the same broad industry may differ between countries due to different sub-industry mixes and differing work practices. Further analysis of sub-industry workforce populations should be undertaken to more comprehensively understand the gap in performance between Australia and the best performing countries.

As well as differing definitions between countries of what constitutes a case, different denominator data are used to calculate rates. This means that rates will not be truly comparable between countries, unless the same type of denominator is used. A full explanation of this can be found in section 2.2.6 Unavailable denominator data on page 10.

4.4 Compensated fatalities

The data included in this analysis for Australia, relate to those that have resulted in a claim for workers' compensation. Where there are no dependents to lodge a claim the data will be deficient. As covered in section 2.2.1, Sweden, Switzerland, Finland, Germany and New Zealand also use compensation systems.

A study undertaken in Australian using coronial data from 1989 to 1992, the WRFS2[15], concluded that 33% of working deaths were not covered by an OHS or workers' compensation agency. This percentage possibly includes a high proportion of deaths from the self-employed sector for which no workers' compensation is payable or where notifications to OHS Authorities are less likely to occur. Projects are currently underway in NOHSC to identify the size of the problem as it currently stands. It is expected that notifications systems today are more comprehensive than ten years ago.

4.5 Differences in industry definitions

As mentioned in section 2.2.2, industry classifications used around the world differ. While the countries participating in the ILO survey take reasonable care in mapping

[14] See 13
[15] See 12

their data to the international classification there still remain differences in the practical application of industry definitions, and differences between countries in tasks and hazards for ostensibly the same industry.

Only a detailed analysis of industry and occupation details for each fatality can determine the extent of the problem. This is the type of work undertaken by Feyer et al in their comparison of Australia, New Zealand and the USA.

4.6 Definition of work-related injury deaths

While it is assumed in this report that all countries have equally applied the ILO definition of a work-related injury (see section 2.2.4) it is possible that there remain issues with this assumption that could mean that certain deaths have been excluded in some countries but included in others.

4.7 Denominator data.

As is the case in Australia, specific denominator data is used by each collection agency that differs from their official workforce numbers. While every effort has been made in this report to calculate (see section 2.2.6) denominator data that matches the same population as the fatalities numbers, there may be some inaccuracies with the methods undertaken. The effect of these inaccuracies is considered small.

4.8 Reference population

In Australia, the data used are workers' compensation claims, which in general only cover employees. Employees currently constitute 85% of the Australian workforce. Should the fatalities experience in other segments of the workforce be worse than for employees, then the Australian incidence rates used in this analysis may understate the true position for Australia. This is particularly an issue when comparing Australia's performance against Sweden's where it is known that the Swedish data includes fatalities in the self-employed sector and that these fatalities make a disproportionally large segment of the total fatalities for this country. Preliminary contact with Sweden has not resulted in data on employees only within the time constraints of completing this report. Comparison with the UK is not hampered by this condition as separate data on employees was supplied to the ILO and confirmed with the UK's HSE website.

4.9 Estimation of UK data

As the UK data do not include fatalities from road traffic accidents, it has been necessary to make some adjustment to the UK data to enable a comparison with other countries. The methodology and calculations for this adjustment are shown in Appendix A. Data from the EU and Australia were used to estimate the likely proportion of fatalities due to road traffic accidents. Problems from this approach could arise from the extent to which the EU and Australian data are not representative of the UK experience. A substantial underestimation in road traffic fatalities would be required to substantially alter the UK's ranking in this analysis.

4.10 What other authors have found.

Apart from the literature cited in this report, few other international comparisons have been found comparing more than a couple of countries.

One notable report undertaking a comparison of scope and methodological differences in international fatalities data was published by New Zealand[16]. This report concluded that

> ‘ it is next to impossible to make an accurate direct comparison of occupational fatality rates due to the distinct differences in coverage of data, sources of data, denominator data and exclusion/inclusion criteria among countries.’

[16] Feyer A-M, Lilley R, Langley J. Work-related fatal injuries in New Zealand: International comparisons of official published data, Jan 2001

5 CONCLUSION

Benchmarking fatality performance without making adjustments for differences in scope and collection methodology is of little value.

The standardisation process shown in this report indicates that Sweden and the UK have the lowest fatality rates in the Established Market Economies and hence most likely in the world. Australia would need to improve by around 65% to equal their performance. The data suggest the main contribution to the higher overall fatality rate in Australia comes from the agriculture and mining sectors.

As was seen in Figure 1, the UK has not shown any significant improvement in their fatality rate in the past five years. However over this period Australia's rate of improvement has averaged 11 percent, indicating that if this current rate of improvement continues then Australia could equal the UK's fatality rate in around 7 years. This is within the period of the *National OHS Strategy 2002–2012*. However the experience of other countries has indicated that once a certain lower level of fatalities is reached that it is then more difficult to record improvements.

5.1 Additional Analysis that could be undertaken

While countries with only slightly higher incidence rates than Australia's have been included in this study, it is possible based on the dramatic improvements in position that Belgium and New Zealand have recorded from 1996–97 to 2000–01, that other countries may also improve to a level to necessitate their inclusion in this study. As mentioned in this report the USA has not been included due to difficulties with obtaining data by industry. As the USA would be placed in 11th position on non-standardised data, they should be the first country to be selected in an expanded analysis. This is also based on previous research that indicated that in the early 1990s Australia and the USA recorded similar fatality incidence rates once the effects of occupation and industry were removed.

The issue of self-employed workers needs to be more fully researched than time allowed for this study. Particular countries would need to be approached to supply more detailed data for analysis. However, Australia at this point in time, has limited readily available data on fatalities of self-employed workers to contribute to this analysis.

In addition, to enable more indicators of differences between countries to be explored, the classifications used to code mechanism of injury, could be obtained and the data further analysed. The agency of injury (that is the object, substance or circumstance at which things started going wrong that ultimately led to the persons death) and the pathophysiological cause of death are further areas that could be investigated, but obtaining these data could prove more difficult.

It would also be useful to extend this analysis to a finer level of industry classification. This study has assumed that at the broad level the data are comparable but with different classifications used in each country, this assumption could be flawed.

5.2 Further research required

In addition to analysing available data, analysis of available literature will also be undertaken to identify the main reasons behind the differences in fatality rates and OHS performance between Australia and the best performing countries. Some issues to be researched include:

- Occupational health and safety systems – including differences in legislation and regulation, penalties, enforcement: size and effectiveness of inspectorate;

- Investment in OHS – for example, provision of compliance support such as occupational health services, investment in training and education, investment in appropriate research;

- Employer/employee relations - worker participation, union membership;

- Industry structural issues – structure within industry sectors, for example, type of agriculture or mining operations; size of small business sector; age of plant, equipment, processes;

- Cultural and attitudinal differences – awareness of OHS; general safety awareness; responsibility for OHS being assumed at all levels of management and employees;

- Geographical differences – for example, are differing rates in the transport and storage sector as a result of greater distances travelled? Does the remoteness of many of Australia's mining and farming operations account for differing survival rates when a worker is seriously injured?

- Intervening variables – for example, differences in emergency and critical care facilities meaning different survival rates of seriously injured people.

In particular it is recognised that fatality rates do not necessarily give a clear picture of exposure to risks. For example, there may be smaller gaps between countries in their non-fatal injury rates but larger numbers of deaths due to intervening variables eg health care. Analysis of non-fatal injury data has not yet been attempted and presents much greater challenges. In addition to the research identified above, the NOHSC Office will also examine injury rates for serious injuries recorded by Australia against the best performing countries as identified in this report in an attempt to provide a broader picture of Australia's OHS performance.

Appendix A - Adjustment of UK for Lack of Traffic Accidents Data

The problem faced for the overall standardization analysis was that there were no available data regarding work-related road deaths in the United Kingdom, and no way of excluding road traffic deaths from the data available for some of the other countries to be included in the comparison. Eurostat information provides data on work-related traffic accident and non-traffic accident deaths for many European countries, which could be used as the basis of an estimate of road traffic accident deaths in the United Kingdom.

However, this information is only available for all industries combined, whereas Australian information indicates that the proportion of work-related deaths due to road traffic accidents varies considerably between industries with some industries recording much higher incidence rates than others. For example in Australia over the last 4 years, deaths due to traffic accidents have averaged 57% of the non-traffic accident fatalities, but in the *Transport and storage* industry there were nearly twice as many traffic accident claims as non-traffic claims. At the other end of the scale, in the *Manufacturing* industry, there were five non-traffic claims for every traffic claim (Table A1).

Table A1: Work-related traffic deaths, Australia, 1998–2001. Number and per cent.

Industry	Number of traffic accidents	Number of non-traffic accidents	Traffic accidents as a ratio of non-traffic accidents
Agriculture, Forestry and Fishing	33	83	4 : 10
Mining	18	46	3.9 : 10
Manufacturing	17	85	2 : 10
Electricity, Gas & Water supply	3	8	3.8 : 10
Construction	26	103	2.5 : 10
Wholesale Trade	20	25	8 : 10
Retail Trade	15	39	3.8 : 10
Accommodation	3	25	1.2 : 10
Transport and Storage	123	65	18.9 : 10
Communication services	3	3	10 : 10
Finance and Insurance	3	4	7.5 : 10
Property & Business services	32	44	7.3 : 10
Government Administration	11	13	8.5 : 10
Education	6	11	5.5 : 10
Health and Community services	10	10	10 : 10
Cultural & Recreational	4	17	2.4 : 10
Personal & Other	12	21	5.7 : 10
Total	343	605	5.7 : 10

Source: CPM unpublished data

The Australian industry-specific percentages may not be appropriate to apply directly to United Kingdom data, because the different geography, climate and industrial make-up of the two nations could be expected to influence the risks of a road traffic accident occurring.

Eurostats, the statistical agency of the European Union, in addressing this issue to enable their comparisons, have been able to obtain data on fatalities separately for traffic accidents. The average of the member states excluding the UK and Ireland indicates that traffic accidents are around 83% of non-traffic accidents, with results ranging from 16% for the Netherlands to 104% for Italy (see Table 1).

Table A2: Work-related traffic deaths, selected European Union countries, 2000. Number and per cent.

	Traffic incidents	Non-traffic incidents	Ratio Traffic to Non-traffic
Austria	70	146	4.8 :10
Belgium	43	56	7.7 :10
Denmark	24	31	7.7 :10
Finland	7	31	2.3 :10
France	389	375	10.4 :10
Germany	455	455	10 :10
Greece	11	36	3.1 :10
Italy	610	469	13 :10
Luxembourg	2	11	1.8 :10
Netherlands	12	76	1.6 :10
Portugal	53	256	2.1 :10
Spain	273	415	6.6 :10
Sweden	25	25	10 :10
Total	1974	2382	8.3 :10

Source: European Statistics on Accidents at Work, 2000

Therefore, the approach that was adopted was to use the Eurostat data to provide the estimate of the basic relationship between work-related road traffic deaths and work-related non-traffic deaths in the United Kingdom. This basic proportion was 0.83, compared to 0.57 in Australia (using unpublished workers' compensation data from 1997–1998 to 2000–2001). Industry-specific proportions for the United Kingdom were estimated by multiplying this basic proportion (0.83) by the ratio of the relevant Australian industry-specific proportion to the total Australian proportion. For example, in Australia, the number of work-related traffic accident deaths in the manufacturing industry (17) was 20% of the number of work-related non-traffic accident deaths in the manufacturing industry (85). The all industries percentage for Australia was 57%. Therefore, on the basis of these data, it was estimated that the number of road traffic deaths in the manufacturing industry in the United Kingdom was 29% (0.20 / 0.57 * 0.83 = 0.29) of the number of work-related non-traffic deaths in the manufacturing industry in the United Kingdom. Since the number of work-related non-traffic deaths in the manufacturing industry in the United Kingdom was known (48 in 2000–2001), this allowed the total number of work-related deaths in the manufacturing industry in the United Kingdom to be estimated as 62 in 2000–2001 (48 + 0.29*48).

The main potential problems with this approach arise from the extent to which the European and Australian data are not representative of the United Kingdom experience. The extent to which this might be a problem is not clear, but it is probably not very significant. The estimated all-industry percentage for the United Kingdom

was 0.76, compared to 0.87 for the countries included in the Eurostat figures. No other data that would provide a better estimate appear to be currently available.

Table A3: Work-related fatalities in the United Kingdom. Original (unadjusted) fatalities incidence rates and adjusted rates, 1997–98 to 2000–01

	1997–98	1998–99	1999–00	2000–01
Unadjusted rate	0.8	0.7	0.9	0.8
Adjusted rate	1.4	1.1	1.6	1.4

Appendix B - ILO Synoptic Table

The ILO has put together a synoptic table detailing key points of the various data and methodologies used by each country in collecting their data. However it does not relate to the data actually supplied to the ILO particularly in the areas of workers, diseases and commuting accidents. Table B1 is an extract of this table from the ILO Yearbook.

Table B.1 Synoptic table for occupational injuries

Synoptic table

Country, area or territory	Type of data and source	Minimum period of absence	Maximum period for death	Coverage					Days lost	Reference year
				Workers		Economic activities	Occupational diseases	Commuting accidents		
				Type	% of total emp.					
Europe - Europe - Europa										
Austria	R/Ins	none	none	E, SE	71.0	All	Excl.	Excl.	.	C 3
Belarus	R/Not	1 day	same year	E	...	All	Excl.	Excl.	WD(TI)	C
Belgique	C/Ins	1 day	none	IE	47.5	All x P,AF	Excl.	Incl.	CD(TPD)	C 2
Bulgaria	R/Not	...	...	E,SE	35.1	All	Incl.	Incl.	.	C
Croatia	C/Ins	none	immediate	E,SE	83.5	All	Excl.	Incl.	WD(TI)	C 2
Czech Republic	R/Not	1 day	none	E,SE	95.1	All x AF,Pol	Excl.	Excl.	CD(TI)	C 1
Denmark	R/Not	1 day	1 year	E,SE	100	All x ASO	Excl.	Excl.	.	C 1
España	R/Not	1 day	none	I	85.3	All x PA,AF	Excl.	Excl.	CD(TI)	C 1
Estonia	C/Ins	1 day	1 year	I	100	All x AF,Pol	Incl.	Incl.	CD(TPD)	C 1
Finland	C/Ins	3 days	1 year	E	84.8	All	Non-fatal	Excl.	CD(TI)	C 1
France	C/Ins	1 day	varies	E	74.5	All x P	Excl.	Excl.	CD(TI)	C 3
Germany	C/Ins	3 days	none	E,SE	100	All	Excl.	Incl.	CD	C
Grèce	C/Ins	1 day	none	E	48.1	All	Excl.	Incl.	CD(TPD)	C 2
Hungary	R/Not	3 days	90 days	E,SE	98.4	All	Excl.	Excl.	CD	C
Iceland	R/Not	2 days	...	E	...	All	Incl.	Excl.	.	C
Ireland	R/Not	3 days	none	E,SE	100	All	Excl.	Excl.	CD	C
Isle of Man	R/Not	4 days	1 year	E	...	All x SF,AT	Excl.	Excl.	.	C
Italy	C/Ins	3 days	none	I	76.1	All	Excl.	Incl.	CD(TI)	C
Latvia	R/Survey	1 day	none	E	...	All	Excl.	Excl.	WD	C
Lithuania	R/Not	1 day	none	E,SE	63.8	All x AF	Excl.	Incl.	CD(TPD)	C 1
Macedonia, Former Yugoslav Rep. of	C/Ins	...	...	I	...	All	Excl.	Excl.	.	C
Malta	C/Ins	4 days	...	E,SE	...	All	Incl.	Excl.	WD	C
Moldova, Rep. of	R/Not	1 day	none	E	52.4	All	Excl.	Excl.	WD(TPD)	C
Norway	R/Not	none	none	E (7)	99.8	All	Excl.	Excl.	CD(IT)	C 1
Poland	R/Not	none	6 months	E,SE	76.1	All x Agr	Excl.	Excl.	CD(TI)	C 1
Portugal	R/Not	none	one year	E,SE	67.1	Al x PA,AF	Excl.	Excl.	CD(TI PI)	C 3
Roumanie	R/Not	3 days	same year	E,SE	60.6	All x AF,P	Excl.	Incl.	CD(TPD)	C 2
Russian Federation	R/Not	1 day	none	E	4.9	AllxLowrates	Excl.	Incl.	WD(TPD)	C 1
San Marino	R/Not	...	...	E	...	All	Excl.	Excl.	.	C
Slovakia	R/Not	1 day	none	IE	97.9	All	Excl.	Excl.	CD(TI)	C
Slovenia	R/Not	1 day	1 month	I	85.2	All	Excl.	Incl.	WD(TI)	C 1
Suisse	C/Ins	3 days	same year	IE	88.0	All	Incl.	Excl.	.	C 2
Sweden	R/Ins	1 day	none	E,SE	97.3	All	Excl.	Excl.	WD(TPD)	C 1
Turkey	R/Ins	...	...	IE	25.3	All	Incl.	Excl.	WD	C
Ukraine	R/Not	1 day	4 months	E	71.3	All xAF	Excl.	Excl.	WD(TI D)	C 1
United Kingdom	R/Not	3 days	1 year	E,SE	91.8	All x SF,AT	Excl.	Excl.	.	F 1
Oceania - Océanie - Oceania										
Australia (7)	C/Ins	5 workdays	3 years	E	83.0	All x AF	Incl.	Excl.	WD(TI)	F 3
New Zealand	R/Ins	6 days	1 year	E,SE	100	All	Incl.	Incl.	...	F

Source: International Labour Office Yearbook

Type of data source: R- reported C –compensated, Not- notification system, Ins– insurance system
Type of worker: E-employees, SE – self-employed, IE – insured employees, I- insured persons
Economic activities – x-excluding, P-public sector, AF- armed forces, Pol-police, ASO- air, sea and offshore accidents, AT – air transport, PA- public administration, SF- sea fishing
Days lost: WD- work days, CD – calendar days
Reference year: C-calendar, F- financial, 1-injuries included in statistics for year of accident, 2- injuries included in statistics for year of notification, 3- injuries included in statistics for year in which compensation paid.

Appendix C - Data collection in selected countries

Australia

Australian data are collected via claims from 10 jurisdictional workers' compensation authorities plus Seacare. Data collected conform to the concepts and definitions set out in the National Data Set for Compensation-based Statistics (NDS). Data from the year ending June 30 are generally sent to NOHSC in March of the next year for publication in September, resulting in the information relating to claims being publicly available a year after the end of the yearly collection period in which the injury or disease was first notified.

Data supplied to the ILO by Australia have in the past been matched to that used in the *Compendium of Workers' Compensation Statistics Australia* publication. These data include fatalities due to disease, which account for about a third of all fatalities. Also up until 1999–00 this publication excluded Victorian data from the non-fatal claims due to higher excess periods in Victoria. The Compendium also excluded ACT Private data. Data on fatalities in this publication however did include those occurring in Victoria. It appears however that when the data was extracted for the ILO to go into the ILO Yearbook 2002, that Victorian data were not included for fatalities. Data were also rounded to the nearest whole number, reducing their usefulness.

The inclusion of disease data, exclusion of the Victorian and ACT private data and the rounding of the results have resulted in Australia displaying a much higher fatality rate in the ILO database than that currently published in the Compendium. A better source of information is that contained in the Comparative Performance Monitoring (CPM) Report.

Table C.1: Published fatality incidence rates, Australia, ILO and CPM, 1997–2000

	1996–97	1997–98	1998–99	1999–00
Data in ILO database (accessed July 2003)	5	5	4	4
Data from CPM	3.8	3.6	3.2	2.9

Due to these differences, it is feasible that other international agencies using the ILO data prior to the 2003 collection could conclude that Australia is in 11th position not the 7th identified in this report.

This situation has been rectified with the last five years of data on the ILO database being updated in August 2003 to match that published in NOHSC's recent publications.

United Kingdom

In the UK there is a compulsory insurance system (Employees' Liability Compulsory Insurance) to cover employees for injuries or ill-health suffered at work. This insurance is provided through private insurance companies. In addition there are some provisions for state benefits such as statutory sick pay, which is paid for periods of sick leave between 4 days and 28 weeks. When an injury occurs that involves more than 3 days off work for the employee, the employer is required to report the incident using the RIDDOR system (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995). The Health and Safety Executive (HSE) are responsible for the RIDDOR system and statistical publications. Preliminary fatalities data are published in July each year for the financial year just gone. This immediate publication results in significant revisions when non-fatal injuries data are published at a later date.

The main difference with the UK system is that traffic accidents including commuting claims are reported to the police and therefore are not recorded in the HSE data. This poses significant problems when comparing the UK to other countries.

HSE had significant concerns about the quality of their data and recently conducted a survey to measure the extent of the problem. The results of the Labour Force Survey confirmed HSE's concerns that non-fatal injuries were substantially under-reported by employers. The survey suggested that employers reported around 46% of the injuries that should have been reported under RIDDOR in 1998–99. A similar survey conducted in Australia showed a much better reporting rate than that found for the UK (For injuries involving 5 or more days of absence the Australian survey[17] recorded an incidence rate of 12.5 compared to NOHSC's rate of 10.0). Fatalities however, by their nature, are different and the HSE believe they are virtually fully reported. Therefore any concerns about the reliability of the non-fatal injuries data do not affect the comparability of the UK data to other countries in regards to this report.

Sweden

In Sweden, occupational injury insurance is co-ordinated with the public system of sickness benefits that compensate for absences from work. However an important aspect of the Swedish system is that the worker has to pay for their first day of absence due to sickness or an injury. Swedish employees, therefore have a greater economic interest in work-place health and safety. However recent discussions with a representative of the Swedish Work Environment Authority (SWEA) indicated that Swedish workers receive additional annual leave due to length of service with their employer combined with their age up to around 7 weeks a year. It appears that many Swedish workers then use this additional annual leave to cover the first day's sick leave.

After the first day's absence the employer is responsible for sickness benefits for the first two weeks of illness, payable at the rate of 80 per cent of ordinary income. This has only recently been increased from 75% of ordinary income. However, if the illness or injury is assessed to be work-related then full remuneration is payable (except for the first day). Indications are, however, that it can take some time to assess an employer's liability for a workers' compensation claim and hence recent non-fatal statistics may not be so reliable. This system was introduced to increase employer motivation to improve the working environment and to halt rising public-sector expenditures for absenteeism due to illness.

The Work Injuries Insurance Act defines a work injury as an injury resulting from an accident or other harmful influence at work. The term 'other harmful influence' refers to a factor, which with a high degree of probability is capable of causing an injury of the kind sustained by the person in question. While there was some initial concern that some disease related fatalities were in the Swedish data, this is not the case and hence the fatalities data included in this report are for occupational accidents only.

The Statistics Sweden website contains a comprehensive document on their system of occupational health and safety[18]. This states that the Swedish occupational health and safety system is the result of a tripartite collaboration between strong governments, well-organised employers and influential trade unions. During the past 30 years, Sweden has had one of the best occupational health and safety records in

[17] Survey of Employment Arrangements and Superannuation conducted by the Australian Bureau of Statistics

[18] www.sweden.se/templates/FactSheet_4163.asp Occupational safety and Health

the world and has pioneered many efforts in this field. Over 70 per cent of the Swedish labour force has access to occupational health services, which may be organised as in-house occupational health services or at outside centres. These services provide preventative measures, rehabilitation and medical care. A government commission report presented in December 2001 emphasised the preventative role of these services.

Another interesting research project conducted recently sheds some light on why Sweden is so much better than other countries[19]. In the 1990s Denmark and Sweden jointly built a rail and road tunnel connecting the two countries. The injury reports from both countries relating to this project were analysed. Where workers on both sides undertook similar tasks injury data were compared. This analysis showed that Danish workers had a nearly fourfold higher rate for lost time injury (LTI) compared to their Swedish counterparts. The report concluded that factors at the micro-level such as differences in education and experience, training and learning, and attitude were important for the explanation of the significant difference in LTI-rates between Danish and Swedish construction workers.

New Zealand

Before 1 July 1999, workers' compensation in New Zealand was covered by the Employers' Account administered by the Accident Rehabilitation and Compensation Insurance Corporation (ACC). From 1 July 1999 a new act was introduced which compelled employers to purchase workers' compensation cover from private insurers or from @WorkInsurance, a state-owned enterprise. However after only one year, and with a change in government, this situation was reversed. In 2000, the ACC established a new fully funded scheme to manage accident-compensation insurance. The ACC is also the sole provider of accident-insurance cover in all non-work contexts. This includes cover for earners' non-work injuries, motor vehicle injuries and non-earners' injuries. As the level of benefit available is the same whether an employee claims through their employer or through the sickness benefit scheme, there is some concern, particularly in relation to road accidents, that data for work-related incidents may under-represent the 'true' picture. In New Zealand commuting claims are only valid where the employee is using a vehicle supplied by the employer. Hence there are very few commuting claims in the New Zealand data.

Data supplied to the ILO and to NOHSC for 1998 and 1999 inadvertently included data for self-employed persons. Since the denominator data was only for employees, this resulted in inflated incidence rates being published for these years. The situation has been corrected in the CPM publication for 2002.

While New Zealand provides NOHSC with data according to the NDS specifications, they do not initially process it using NOHSC's TOOCS codes. New Zealand used a system known as Read codes. While NZ has applied a concordance to their data, recent investigations have shown that particularly where Mechanism of injury is concerned, that this concordance was not satisfactory. To address some of these issues NZ will be moving to TOOCS 3.0 during 2003–04.

Norway

Under the National Insurance Act, all occupational injuries should be reported to the local National Insurance Office. There is no minimum period of absence from work and hence the statistics cover all work-related injuries due to all types of occupational accidents. Commuting accidents are not covered by the statistics but accidents

[19] Spangenberg S, et al, "Factors contributing to the differences in work related injury rates between Danish and Swedish construction workers", *Safety Science* 41 (2003) 517-530

occurring while employees are travelling by car or some other means of transport, as required by the nature of their work, are covered. Statistics of occupational disease are compiled separately. However, in Norway certain illnesses are recognised as equivalent to an occupational injury and are covered as such in the statistics. These include illness caused by solvents, asbestos or other minute particles, poisoning or other effects from chemicals, and allergic skin and lung diseases.

The ILO requests data relating to occupational accidents rather than the broader definition of occupational injury. Hence while the Norwegian injury statistics cover the illnesses mentioned above as 'equivalent to an occupational injury'it is believed that the statistics supplied by Norway to the ILO are only those for occupational accidents. This would be consistent with other countries, however since the Norwegian website has published little in English this has not been confirmed.

In addition the Norwegian statistics covered self-employed workers in agriculture and construction. This is similar to Sweden and it is believed the Norwegian statistics would include any fatalities of these self-employed workers and similarly the employment figures would also include them.

Denmark
The Danish Working Environment Service compiles the Danish Registry of Occupational Injuries for the primary purpose of prevention. In providing data to the ILO, the international statistical standards and guidelines were not followed, as they did not suit the purposes of this registry. The minimum period of absence from work is one day in addition to the day on which the accident occurred.

Similar to Australia, Denmark only supplies incidence rate data to the ILO in whole numbers (per 100,000 employed workers). However, using the number of cases and employment data, rates to one decimal place were calculated. For the 2000–01 year Denmark recorded a fatality rate of 1.8 down from 2.5 in the previous year due to a fall in the number of fatalities from 68 to 50.

Similar to Sweden, Denmark's data include all employed persons (including self-employed) and do not include diseases or commuting claims. Denmark employs around 2.7 million workers. The number of recorded fatalities has fallen significantly in the last four years from 80 down to 50 with significant improvements in the Agriculture and Manufacturing sectors. Little further information has been obtained at this stage due to the website being mainly in Danish.

Belgium
The National Statistical Institute compiles statistics from the Fund for Occupational Accidents. Self-employed workers are not covered by this fund. Commuting accidents are covered, though they are not included in the ILO data. Data on occupational diseases are compiled and published separately. There is no minimum period of absence from work. However employees in the public services are not covered by this scheme and as a result less than half the workforce is covered by the statistics in this report.

In 2001, Belgium recorded 69 fatalities with an additional 70 commuting related fatalities. So while their incidence rate is significantly better than ours, their deaths due to commuting are twice that of Australia. Belgium's fatalities have remained fairly stable over the past few years.

Frequency rates rather than incidence rates were provided to the ILO, so to enable comparison with other countries the rates and employment data were used to

calculate an incidence rate. As their website is mainly in French and Dutch little information has been obtained at this stage.

Finland
The Ministry of Labour and Statistics Finland compile statistics from the Federation of Accident Insurance Institutions. Only some self-employed persons are covered by the Act but the figures are not published. Statistics for farmers are also compiled separately, which may explain why Finland has a comparably low incidence rate in the Agriculture sector. Statistics on diseases are compiled and published separately by the Finnish Institute of Occupational Health. While commuting accidents are covered under the Act, these data are compiled separately. The minimum period of absence from work is at least three days following the day of the accident.

Incident rate data have only been provided to the ILO up to 1999, however the number of fatalities has been recorded up to 2000. This shows an increase from 42 fatalities in 1999 to 47 fatalities in 2000. No further information seems to be available in English on the Statistics Finland website.

Switzerland
The Centralised Accident Insurance Service compile the statistics based on claims submitted to them. Self-employed workers are not required to have insurance and consequently are not included in the statistics. The minimum period of absence from work is three days. Little other information was provided to the ILO and the website is mainly in French and German.

Germany
Little information has been obtained on the German system as they have not supplied information to the ILO. From the Synoptic table (see Attachment C) it would appear that the data supplied for Germany includes commuting claims. If this is the case then it is reasonable to expect that Germany would have a substantially lower overall incidence rate once the commuting cases are removed. This may be one reason why in the Eurostats data, Germany appears to be better than in the analysis shown in this report.

Appendix D - Direct Standardisation

This attachment has been created to provide additional data and information on the calculations actually performed in the standardisation process. The direct standardisation method takes the incidence rates in each country and applies them to the standard population. It is basically answering the question, 'if the incidence rates in country1 were applied to the standard population, how many fatalities would be expected to occur'. The incidence rates generated through this process are then directly comparable amongst the countries.

Step 1: Determine which population you are going to use as your standard.
For this study it was decided that the standard population would be Australia. Table D.1 provides the employment data by industry used in this study. Due to difficulties in obtaining accurate information for all countries, data for 2001 was used rather than a three-year average. Changing to an average is unlikely to have an impact on the results, as employment in a particular country remains relatively stable over short periods of time.

Step 2: Determine incidence rates by industry for each country. To calculate these, three years of data were averaged to give the number of claims likely each year. This was necessary due to the small number of claims in some industries in some countries. The data relating to average number of fatalities are shown in Table D.2. These fatality numbers are then divided by the relevant employment numbers to obtain incidence rates for each industry division. Data on incidence rates are shown in the report in Table 6.

Step 3: Then for each industry in each country an expected number of fatalities is calculated by taking the incidence rate for the country in the particular industry and multiplying it by the Australian population for that industry. These calculations are summarised in Table D.3.

Step 4: The sum of these expected deaths for each country are then divided by the Australian population to calculate a direct standardised rate for each country which can then be compared across countries.

Table D.1: Employment by industry (in '000 of employees), selected countries, 2001

ISIC	Australia	Sweden[a]	UK[a]	Belgium	Denmark	Finland[a]	Norway	New Zealand	Germany	Switzerland[a]
Agriculture, Hunting and Forestry	202	77	267	2	89	38	89	143	942	56
Mining and Quarrying	75	7	73	0	3	2	36	3	139	0
Manufacturing	1038	760	3733	497	488	444	286	224	8609	995
Electricity, Gas & Water supply	67	35	136	28	14	22	18	6	282	26
Construction	434	228	1175	97	182	118	152	104	2904	307
Wholesale and Retail Trade	1579	493	4516	191	379	234	330	308	5248	591
Hotels & Restaurants	453	272	1694	25	63	68	67	80	1228	194
Transport, Storage and Communication	515	273	1577	199	183	154	169	90	2055	189
Financial Intermediation	320	87	1071	172	84	49	49	52	1346	255
Real Estate, Renting and Business Activities	976	426	3981	143	257	216	224	195	3005	468
Public Administration and Defence	380	218	1425	332	162	112	151	60	3065	69
Education	624	332	2156	136	202	163	190	127	1996	8
Health & Social Work, Other Community	1346	732	4099	308	611	430	511	337	5825	407
Total	**8010**	**3941**	**25901**	**2129**	**2717**	**2049**	**2272**	**1727**	**36644**	**3564**

[a] These data were reconstructed from non-fatal cases and incidence rates

Table D.2: Average number of fatalities by industry, selected countries

	Australia	Sweden	UK (incr for traffic)	Belgium	Denmark	Finland	Norway	New Zealand	Germany	Switzerland
Agriculture, Hunting and Forestry	28	15	24	0	12	2	13	15	242	5
Mining and Quarrying	15	1	12	0	1	1	2	2	14	0
Manufacturing	20	9	60	15	10	13	8	5	203	20
Electricity, Gas & Water supply	3	1	4	2	0	0	4	3	3	1
Construction	33	11	92	21	11	10	7	7	197	23
Wholesale and Retail Trade	24	5	18	1	8	2	4	2	78	5
Hotels & Restaurants	3	1	2	0	1	0	1	0	11	1
Transport, Storage and Communication	47	13	94	15	8	8	6	15	284	18
Financial Intermediation	2	0	1	1	0	0	2	0	2	0
Real Estate, Renting and Business Activities	20	2	16	4	3	2	1	2	2	3
Public Administration and Defence	7	3	7	6	2	4	2	3	15	0
Education	4	1	2	1	1	0	1	1	3	0
Health & Social Work, Other Community	18	1	19	3	3	2	1	2	115	3
Total	**225**	**60**	**352**	**70**	**59**	**44**	**51**	**57**	**1170**	**79**

Table D.3: Expected number of fatalities, selected countries

	Australia	Sweden	UK	Belgium	Denmark	Finland	Norway	New Zealand	Germany	Switzerland
Agriculture, Hunting and Forestry	28	19	59	0	9	2	8	5	238	8
Mining and Quarrying	15	4	40	0	7	6	1	8	36	0
Manufacturing	20	6	54	8	7	8	8	5	112	9
Electricity, Gas & Water supply	3	1	6	1	1	0	4	7	3	1
Construction	33	10	110	25	9	9	6	6	135	14
Wholesale and Retail Trade	24	7	20	3	11	4	5	2	107	6
Hotels & Restaurants	3	1	2	0	2	1	1	0	19	1
Transport, Storage and Communication	47	12	99	10	8	7	5	18	325	22
Financial Intermediation	2	0	1	1	0	0	3	0	3	0
Real Estate, Renting and Business Activities	20	2	13	8	3	2	1	2	2	3
Public Administration and Defence	7	2	6	2	2	3	1	4	9	0
Education	4	1	2	2	1	0	1	1	4	13
Health & Social Work, Other Community	18	1	21	3	2	2	1	2	122	4
TOTAL	225	65	433	63	61	43	46	61	1114	81
Standardised Rate	**2.8**	**1.7**	**1.7**	**3.0**	**2.3**	**2.1**	**2.0**	**3.6**	**3.0**	**2.3**

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