Chapter 6
Comparison between WRFS 2 and WRFS 1

6.1 INTRODUCTION

In the mid 1980s, Australia commenced a change of approach to occupational health and safety (OHS) which involved simplifying legislation to enable more effective self-regulation, in keeping with principles developed by Lord Robens in his landmark report into OHS in the United Kingdom[272]. The legislation supporting this approach was largely in place by the late 1980s and the resulting activity has occurred from then onwards. However, several years might be expected to pass before any effect of this change in approach became evident.

The first comprehensive study of work-related traumatic death in Australia (WRFS 1) was conducted in the late 1980s and covered the three years 1982 to 1984 inclusive[4]. The more recent study (WRFS 2), which is the focus of this thesis, covered all work-related traumatic deaths that occurred in the four-year period 1989 to 1992 inclusive. Both studies were based on information obtained from coronial files.

The two studies provide an opportunity to examine whether there were any significant changes in the number, rate and circumstances of work-related traumatic deaths over an eleven-year period during which a Robens' style approach to OHS was being adopted.

Comparing the results between the current study (WRFS 2) and the similar one conducted by NOHSC ten years previously (WRFS 1) allows an assessment of how the number, rate and circumstances of work-related fatalities in Australia have changed over time. However, comparisons between the two studies are not straightforward. For

example, it was expected at the beginning of the current study that there might be more complete identification of commuting cases in WRFS 2 than there was in WRFS 1. This was for a number of reasons. Some of these are discussed in Section 3.6, but they include, in particular, cross–checking with OHS and compensation agency information, an improvement in the quality of information in more recent coronial files and the availability of more resources in WRFS 2 to collect and check files.

In WRFS 2 there was extensive cross–checking of coronial information with information from OHS and compensation agencies to help identify cases, but this was probably only done to a minor extent, if at all, in WRFS 1. This allowed identification of commuting (and a few other) cases in WRFS 2 that would otherwise have been excluded as indeterminate or non-cases because of insufficient information in the coronial file. For example, 27% of all commuting cases in WRFS 2 were only identified as such because of compensation list information.

Inspection of a sample of coronial files from 1982 to 1984 during data collection for WRFS 2 revealed that coronial files for the WRFS 2 study period generally contained more detail than those for the WRFS 1 period. This made it more likely that these more recent files contained information about the origin, destination and/or purpose of road trips resulting in death, allowing a greater proportion of files to be coded definitively as a case or non-case.

The methodology used in the second study for the collection and coding of coronial files of interest meant that the WRFS 2 study team could more extensively review files in the coronial office and also later at the time of detailed coding. This process

probably allowed files to be coded more accurately and more definitively than was possible for WRFS 1.

These factors are less of a concern for incidents involving persons who were working at the time of the incident, as the detail available in the coronial files for working cases was usually sufficient in both studies to identify the circumstances as meeting the definitions of work-relatedness. This is likely to be particularly so for workplace cases. However, some work-road cases might have been missed if the coronial file contained limited information which did not identify the journey as being connected to work. The more comprehensive identification of working cases compared with commuting cases using coronial file information is supported by the fact that only 3% of working cases (compared with 27% of commuting cases) for WRFS 2 were identified as cases primarily because of information from an OHS or compensation agency.

Therefore, it can be expected that a much higher proportion of commuting cases would be identified in WRFS 2 than in WRFS 1. Comparisons between WRFS 1 and WRFS 2 are consequently most usefully made on the basis of working cases only, and these are the main focus of the comparisons presented in this Chapter.

6.2 OVERALL COMPARISON

Data usually cited from WRFS 1 include both working and commuting deaths and usually only include members of the ECLF. The main paper reporting WRFS 1 results reported 1,544 deaths (later papers revised the number to 1,542 deaths) in the ECLF over three years, or 514 deaths per year[4]. The same inclusion criteria for the current study shows 2,322 deaths over four years, or 580 deaths per year. If working and commuting cases outside the ECLF are included, the pattern is similar, with 532 deaths per year for WRFS 1 and 603 deaths per year for WRFS 2.

Consideration of the main categories of workplace, work-road, working and commuting shows that the major difference between the two studies is in the commuting category, with nearly twice as many persons identified in this category in WRFS 2 than in WRFS 1 (Figures 6.1 and 6.2 and Table 6.1). This supports the a-priori suspicion (discussed earlier in this Chapter) of better ascertainment of commuting cases in WRFS 2, as there is no reason to suspect that the rate of commuting deaths would have increased over time, and supports the earlier concern that comparisons would be better made by excluding commuting cases.

Fig 6.1 Duty context for working, commuting and total deaths
ECLF only. Number per year. Australia, 1982 to 1984, 1989 to 1992

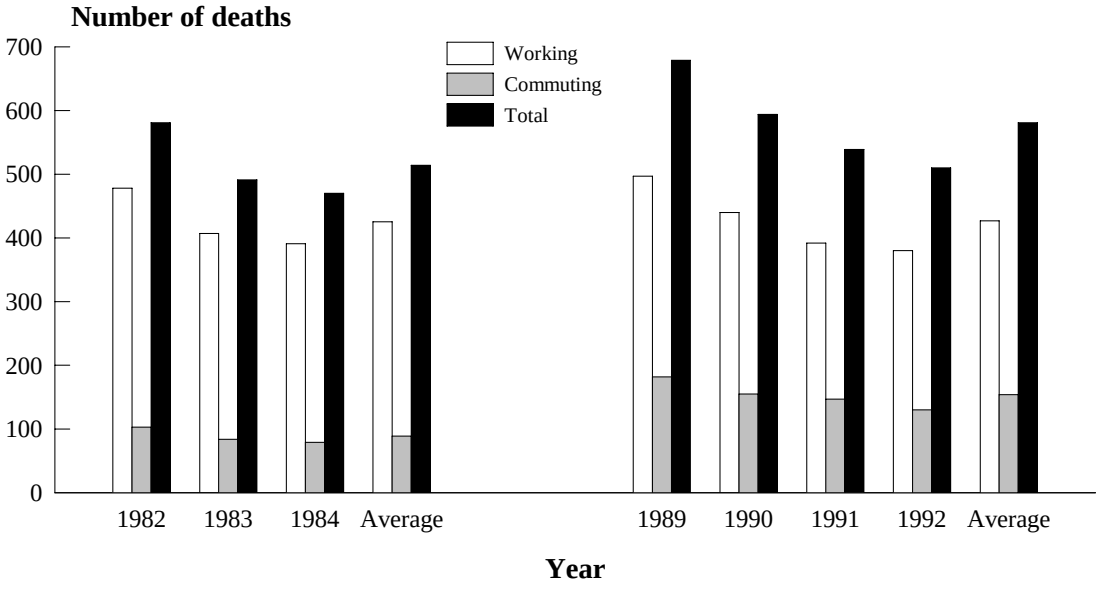


Fig 6.2 Duty context for workplace, work-road and total working deaths
ECLF only. Number per year. Australia, 1982 to 1984, 1989 to 1992

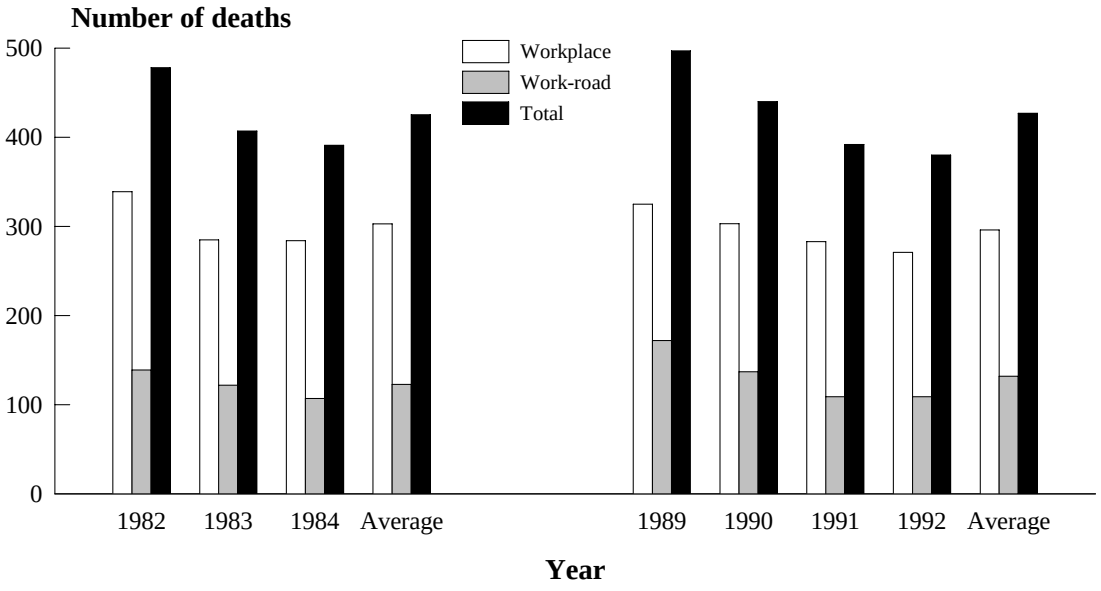


Table 6.1 Duty context for commuting, workplace, work-road and working total deaths
Number per year – ECLF only. Australia, 1982 to 1984, 1989 to 1992

	WRFS 1						WRFS 2						
	1982	**1983**	**1984**	**Average**	**Total**	**%**	**1989**	**1990**	**1991**	**1992**	**Average**	**Total**	**%**
Working													
Workplace	339	285	284	303	908	58.9	325	303	283	271	296	1182	50.9
Work-road	139	122	107	123	368	23.9	172	137	109	109	132	527	22.7
Total	478	407	391	425	1276	82.7	497	440	392	380	427	1709	73.6
Commuting	103	84	79	89	266	17.3	182	154	147	130	153	613	26.4
Total	**581**	**491**	**470**	**514**	**1542**	**100.0**	**679**	**594**	**539**	**510**	**581**	**2322**	**100.0**

Valid comparisons between the two studies are best made on the basis of rate of death rather than the frequency of death in order to take account of changes in the populations at risk. The relevant results are shown in Table 6.2 and Figures 6.3 and 6.4. Bearing in mind that there is no direct information on work-related fatality experience available for the years 1985 to 1988 inclusive (the years between WRFS 1 and WRFS 2), comparison of rates from the two studies suggests the following:

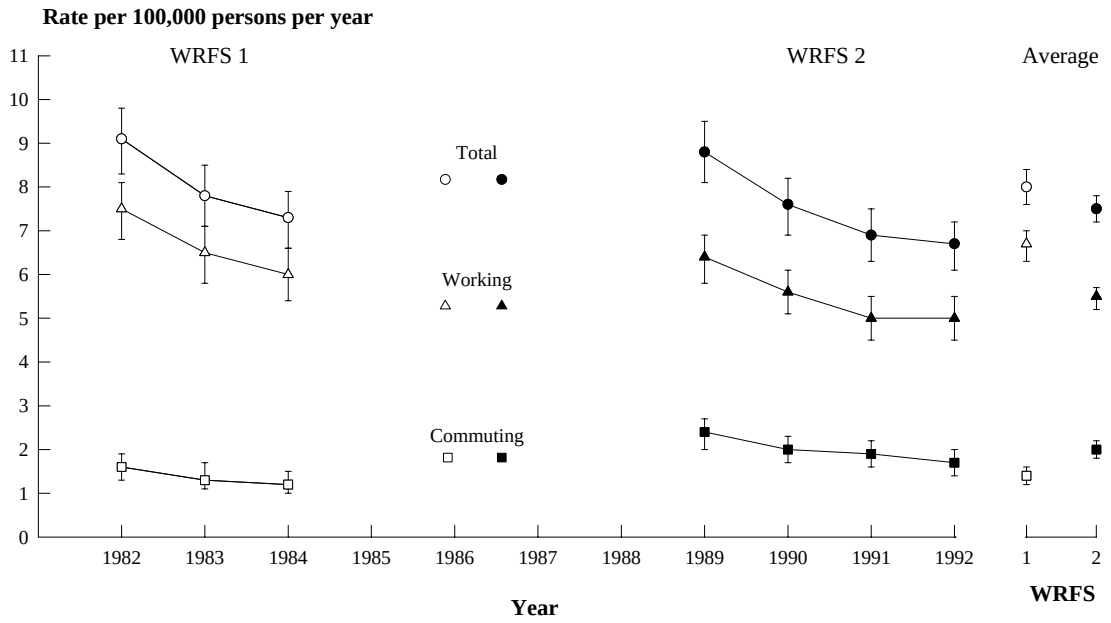
- The overall rate of workplace deaths declined reasonably steadily over the period 1982 to 1992.
- The overall rate of work-road deaths also decreased over the period 1982 to 1992, but not as smoothly as for workplace deaths. The rate in 1989 was the same as that in 1982, yet there was a decline in the rate during each study.
- The overall rate of working deaths followed the pattern of the workplace and work-road categories (which is expected, since they are the individual components making up the working category), with a general, but not smooth, decline in fatality rate over time.
- The overall rate of commuting deaths fell during each study period, but the rates in WRFS 2 were much higher than in WRFS 1, with the rate in 1989 at the beginning of the current study being twice that reported for 1984 at the end of the first study.
- The overall rate for working and commuting combined reflected the patterns seen separately for working and commuting, with a decrease in rate during each study, but with the rate at the beginning of the current study being much higher than that at the end of the first study.

Table 6.2 Duty context for commuting, workplace, work-road and total working deaths Rate[1] (CI[2]) per year. Australia, 1982 to 1984, 1989 to 1992

	WRFS 1				WRFS 2				
	1982	**1983**	**1984**	**Total**	**1989**	**1990**	**1991**	**1992**	**Total**
Working									
Workplace	5.3 *(4.7-5.9)*	4.5 *(4.0-5.1)*	4.4 *(3.9-4.9)*	4.7 *(4.4-5.0)*	4.2 *(3.8-4.7)*	3.9 *(3.4-4.3)*	3.7 *(3.3-4.1)*	3.6 *(3.1-4.0)*	3.8 *(3.6-4.1)*
Work-road	2.2 *(1.8-2.5)*	1.9 *(1.6-2.3)*	1.7 *(1.3-2.0)*	1.9 *(1.7-2.1)*	2.2 *(1.9-2.6)*	1.7 *(1.5-2.0)*	1.4 *(1.2-1.7)*	1.4 *(1.2-1.7)*	1.7 *(1.6-1.9)*
Total	7.5 *(6.8-8.1)*	6.5 *(5.8-7.1)*	6.0 *(5.4-6.6)*	6.7 *(6.3-7.0)*	6.4 *(5.9-7.0)*	5.6 *(5.1-6.1)*	5.0 *(4.6-5.6)*	5.0 *(4.5-5.5)*	5.5 *(5.3-5.8)*
Commuting	1.6 *(1.3-1.9)*	1.3 *(1.1-1.7)*	1.2 *(1.0-1.5)*	1.4 *(1.2-1.6)*	2.4 *(2.0-2.7)*	2.0 *(1.7-2.3)*	1.9 *(1.6-2.2)*	1.7 *(1.4-2.0)*	2.0 *(1.8-2.1)*
Total	**9.1** ***(8.3-9.8)***	**7.8** ***(7.1-8.5)***	**7.3** ***(6.6-7.9)***	**8.0** ***(7.6-8.4)***	**8.8** ***(8.1-9.5)***	**7.6** ***(7.0-8.2)***	**7.0** ***(6.4-7.6)***	**6.7** ***(6.1-7.3)***	**7.5** ***(7.2-7.8)***

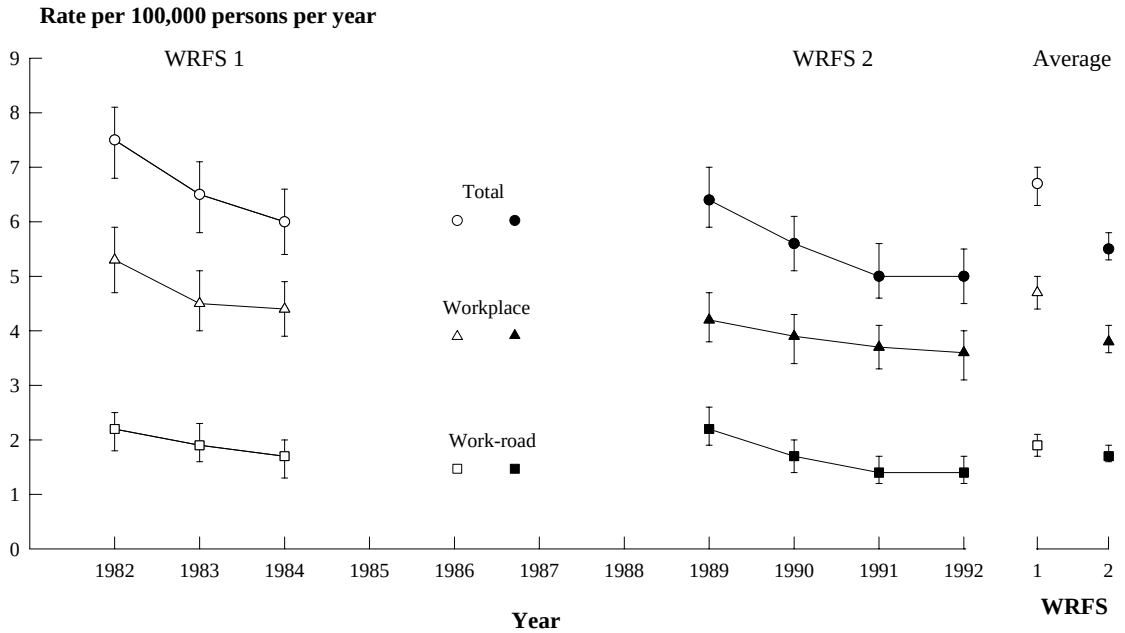
1: Incidence rates — deaths per 100,000 persons per year —- based on ECLF.
2: 95% confidence interval.

Fig 6.3 Duty context for working, commuting and total deaths
Rate[1](CI[2]) per year. Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.
2: 95% confidence interval.

Fig 6.4 Duty context for workplace, work-road and total working deaths
Rate[1](CI[2]) per year. Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.
2: 95% confidence interval.

6.3 STANDARDISED COMPARISON

The overall differences between the two studies might be explained, at least in part, by changes in the industry or occupation mix between the two study periods, rather than being due to changes in the risks facing individual workers in specific industries or occupations. That is, a fall in the overall rate might be due to a decline in the proportion of workers in high risk industries or occupations rather than to any change in the risk of suffering a fatal work-related injury in those high risk areas.

This possibility can be examined by analysing industry–specific or occupation–specific rates. Alternatively, the overall rates can be standardised or adjusted to take account of changes in industry or occupation distribution of the workforce. Industry or occupation–specific rates provide more information, but standardised rates provide a more useful single measure. Both approaches are presented in this Chapter.

The unadjusted overall rates showed a 16.8% decline in the incidence of work-related fatalities of workers between the two studies. Adjusting the WRFS 2 rates by the WRFS 1 industry distribution showed a decline of 9.3% between the two studies. Therefore, standardisation of the overall rate of working death by industry suggests that about 45% of the apparent decline between the two studies is due to changes in industry distribution of the workforce rather than to a fundamental decline in the risk of death. Adjusting the WRFS 1 rates to the WRFS 2 industry distribution gives a similar result — a 10.8% difference between adjusted rates (a 36% decline due to industry changes) (Table 6.3).

Table 6.3 Industry of working persons – working deaths Rate[1] and percentage change in mortality rate Australia, 1982 to 1984, 1989 to 1992

Industry	82-84	89-92	% change
Agriculture	18.5	20.6	11.4
Forestry and logging	93.1	97.2	4.4
Fishing and hunting	110.2	95.7	-13.2
Mining	23.4	36.4	55.3
Manufacturing	3.6	2.9	-18.0
Electricity, gas and water	3.8	6.8	77.3
Construction	14.1	10.4	-26.2
Wholesale and retail trades	2.1	1.8	-12.7
Transport and storage	20.4	23.0	12.6
Communication	2.4	2.4	-1.5
Finance, property and business services	1.9	1.3	-30.6
Public administration and defence	3.8	3.3	-13.4
Community services	0.9	1.2	29.5
Recreation, personal and other services	3.6	3.5	-1.1
Overall mortality rate	**6.7**	**5.5**	**-16.8**
Adjusted mortality rate[2]	**6.7**	**6.0**	**-9.3**
Adjusted mortality rate[3]	**6.2**	**5.5**	**-10.8**

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: Rates from 1989 to 1992 have been adjusted by the 1982 to 1984 industry distribution (9 cases {or 0.5% of 1,709} for whom industry was not known in 1989 to 1992 have been distributed proportionately across all industries).
3: Rates from 1982 to 1984 have been adjusted by the 1989 to 1992 industry distribution (135 cases {or 10.6% of 1,276} for whom industry was not known in 1982 to 1984 have been distributed proportionately across all industries).

The slightly different results given by the two alternate methods of standardisation are primarily due to the larger proportion of cases with unknown industry in WRFS 1 compared with WRFS 2 (10.6% versus 0.5%). However, this does not alter the conclusion that there has been a decrease in the **overall** rate of work-related traumatic death of workers between the two studies.

Similar results are found when adjusting by occupation. The adjusted difference was 11.1% (11.8% using WRFS 1 rates) compared with 16.8% for the unadjusted rates, suggesting that changes in occupation account for about 30% of the observed difference between the overall rates in the two studies (Table 6.4).

Table 6.4 Occupation of working persons – working deaths Rate[1] and percentage change in mortality rate Australia, 1982 to 1984, 1989 to 1992

Occupation	82-84	89-92	% change
Managers and administrators	7.0	8.4	20.3
Professionals	1.6	1.5	-9.6
Para-professionals	6.8	7.0	2.0
Tradespersons	5.4	5.3	-1.8
Clerks	0.3	0.4	12.8
Salespersons and personal service workers	1.2	1.0	-13.4
Plant/machine operators and drivers	24.4	22.7	-7.1
Labourers and related workers	12.8	8.5	-33.4
Not known	-	-	-
Overall mortality rate	**6.7**	**5.5**	**-16.8**
Adjusted mortality rate[2]	**6.7**	**5.9**	**-11.1**
Adjusted mortality rate[3]	**6.2**	**5.5**	**-11.8**

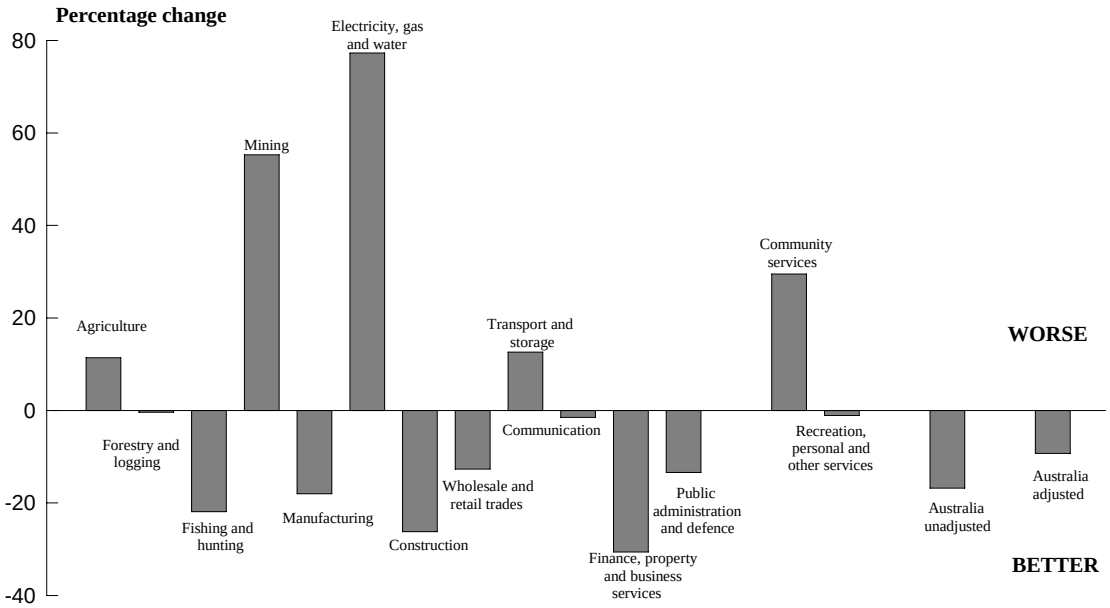
1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: Rates from 1989 to 1992 have been adjusted by the 1982 to 1984 occupation distribution (5 cases {or 0.3% of 1,709} for whom occupation was not known in 1989 to 1992 have been distributed proportionately across all occupations).
3: Rates from 1982 to 1984 have been adjusted by the 1989 to 1992 occupation distribution (18 cases {or 1.4% of 1,276} for whom occupation was not known in 1982 to 1984 have been distributed proportionately across all occupation).

6.4 INDUSTRY AND OCCUPATION

Overall rates provide a measure of **average** risk. Therefore, groups with significant increases or decreases in risk are not identifiable using an average measure. This problem can be overcome by examining the data on an industry–specific or occupation–specific basis. Comparison of industry–specific and occupation–specific rates from the two studies shows that there wasn't a consistent change in the risk of death across industries and occupations.

Of those industries with significant numbers of deaths and thus stable rates, mining clearly had a much higher rate in WRFS 2 compared with WRFS 1 (55% higher), and transport (13%) and agriculture (11%) had moderate increases. Manufacturing and construction industries showed substantial declines in the rate of death. Of the groups with the highest rates (forestry and logging and fishing and hunting), forestry and logging showed little change and fishing and hunting showed a 18% decrease. The rate estimates for both groups for both studies had wide confidence intervals, but clearly the true rate was high during both study periods (Figure 6.5 and Tables 6.3 and 6.5).

Fig 6.5 Industry of working persons - working deaths
Percentage change in mortality rate[1]. Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Table 6.5 Jurisdiction of working persons by industry – working deaths Rate[1] (CI[2]). Australia, 1982 to 1984, 1989 to 1992

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Agriculture									
Wrfs1									
Rate	*	19.9	143.9	23.2	15.6	30.5	13.1	13.7	18.5
CI		*(15.5-25.3)*	*(57.6-420.9)*	*(30.2-45.9)*	*(14.5-31.6)*	*(14.7-56.2)*	*(9.2-18.1)*	*(8.0-21.9)*	*(16.0-21.0)*
Wrfs2									
Rate	*	23.5	35.4	28.7	17.4	30.6	12.1	16.0	20.6
CI		*(19.0-28.0)*	*(11.3-82.9)*	*(23.3-35.1)*	*(11.7-24.8)*	*(17.4-49.7)*	*(9.0-16.1)*	*(10.5-23.4)*	*(18.4-22.8)*
Forestry, logging, fishing and hunting									
Wrfs1									
Rate	*	74.1	1302.9	102.6	71.6	167.2	111.0	79.6	101.3
CI		*(42.1-120.3)*	*(358.3-3322.5)*	*(59.7-164.1)*	*(22.9-167.6)*	*(88.7-285.5)*	*(64.6-177.6)*	*(36.3-151.3)*	*(97.3-146.6)*
Wrfs2									
Rate	*	82.1	*	93.2	107.3	147.5	74.5	91.4	94.5
CI		*(50.8-125.5)*		*(58.5-141.1)*	*(51.5-197.3)*	*(90.0-227.9)*	*(38.5-130.4)*	*(53.2-146.3)*	*(76.2-112.8)*
Mining									
Wrfs1									
Rate	*	24.4	*	22.1	43.6	*	22.6	20.6	23.4
CI		*(15.7-36.4)*		*(11.7-37.8)*	*(19.1-86.2)*		*(6.2-57.7)*	*(11.5-33.9)*	*(18.2-29.7)*
Wrfs2									
Rate	*	32.3	58.5	27.3	87.0	*	19.5	43.2	36.1
CI		*(22.3-45.1)*	*(25.6-115.5)*	*(17.8-40.0)*	*(49.5-141.4)*		*(6.2-45.5)*	*(31.9-57.2)*	*(30.1-42.1)*

Table 6.5 continued

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Manufacturing									
Wrfs1									
Rate	*	4.0	*	4.6	4.0	7.9	2.5	2.7	3.6
CI		*(3.0-5.3)*		*(2.8-7.2)*	*(2.1-6.8)*	*(2.9-17.2)*	*(1.6-3.5)*	*(1.0-6.0)*	*(2.9-4.2)*
Wrfs2									
Rate	*	2.9	38.0	3.8	1.2	6.1	2.7	2.6	3.0
CI		*(2.1-3.9)*	*(12.2-89.0)*	*(2.4-5.6)*	*(0.4-2.7)*	*(2.4-12.5)*	*(2.0-3.7)*	*(1.2-5.0)*	*(2.5-3.5)*
Electricity, gas and water									
Wrfs1									
Rate	*	5.7	*	*	*	*	4.1	*	3.8
CI		*(2.6-10.9)*					*(1.3-9.6)*		*(2.2-6.2)*
Wrfs2									
Rate	*	8.1	*	*	*	*	5.4	12.6	6.8
CI		*(4.3-13.9)*					*(2.0-11.8)*	*(4.0-29.4)*	*(4.5-9.7)*
Construction									
Wrfs1									
Rate	*	7.0	33.2	23.7	15.1	17.0	14.7	16.4	14.1
CI		*(4.8-9.9)*	*(12.2-72.5)*	*(18.0-30.5)*	*(8.5-24.9)*	*(6.2-37.0)*	*(10.7-19.6)*	*(10.1-25.0)*	*(12.1-16.2)*
Wrfs2									
Rate	*	10.4	31.7	11.7	10.3	19.3	10.0	6.8	10.4
CI		*(8.2-12.9)*	*(12.7-65.2)*	*(8.7-15.4)*	*(5.9-16.8)*	*(8.8-36.7)*	*(7.6-13.1)*	*(3.8-11.2)*	*(9.1-11.8)*

Table 6.5 continued

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Wholesale and retail trades									
Wrfs1									
Rate	*	1.9	*	1.9	*	*	2.7	3.7	2.1
CI		*(1.2-2.8)*		*(1.0-3.3)*			*(1.8-4.0)*	*(2.0-6.3)*	*(1.7-2.6)*
Wrfs2									
Rate	*	1.9	*	2.0	1.7	4.0	1.5	1.6	1.8
CI		*(1.4-2.6)*		*(1.3-3.0)*	*(0.8-3.2)*	*(1.5-8.7)*	*(1.0-2.2)*	*(0.8-2.9)*	*(1.5-2.1)*
Transport and storage									
Wrfs1									
Rate	40.6	21.0	46.9	23.7	22.7	19.7	15.6	19.4	20.4
CI	*(11.2-103.5)*	*(16.7-26.0)*	*(12.9-119.6)*	*(17.2-31.7)*	*(13.5-35.7)*	*(6.3-46.1)*	*(11.3-21.0)*	*(12.0-29.6)*	*(17.7-23.1)*
Wrfs2									
Rate	*	23.6	47.2	27.0	20.9	12.1	19.6	25.3	23.0
CI		*(19.6-27.6)*	*(20.7-93.2)*	*(21.3-33.6)*	*(13.1-31.6)*	*(3.3-30.9)*	*(15.4-24.6)*	*(17.8-34.8)*	*(20.6-25.3)*
Communications									
Wrfs1									
Rate	*	*	*	*	*	*	*	*	2.4
CI									*(1.2-4.5)*
Wrfs2									
Rate	*	3.2	*	*	*	*	*	*	2.4
CI		*(1.2-7.0)*							*(1.3-4.1)*

Table 6.5 continued

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Finance, property and business services									
Wrfs1									
Rate	*	0.7	*	3.1	*	*	2.0	3.8	1.9
CI		*(0.2-1.7)*		*(1.4-6.1)*			*(0.9-3.8)*	*(1.4-8.2)*	*(1.3-2.6)*
Wrfs2									
Rate	*	1.3	*	2.1	*	*	1.4	1.5	1.3
CI		*(0.7-2.0)*		*(1.0-3.7)*			*(0.7-2.4)*	*(0.5-3.5)*	*(1.0-1.8)*
Public administration									
Wrfs1									
Rate	*	4.3	*	6.8	8.1	*	3.3	*	3.8
CI		*(2.2-7.5)*		*(3.0-13.4)*	*(2.6-19.0)*		*(1.4-6.5)*		*(2.7-5.3)*
Wrfs2									
Rate	*	3.1	*	9.7	*	*	1.3	3.6	3.2
CI		*(1.6-5.5)*		*(5.9-14.9)*			*(0.4-3.1)*	*(1.0-9.1)*	*(2.4-4.3)*
Community services									
Wrfs1									
Rate	*	0.7	*	1.0	1.6	*	1.1	*	0.9
CI		*(0.3-1.4)*		*(0.3-2.4)*	*(0.5-3.6)*		*(0.5-2.0)*		*(0.6-1.3)*
Wrfs2									
Rate	*	1.2	*	1.7	0.9	*	1.3	0.7	1.2
CI		*(0.8-1.8)*		*(1.0-2.8)*	*(0.3-2.2)*		*(0.7-2.0)*	*(0.2-1.9)*	*(0.9-1.5)*

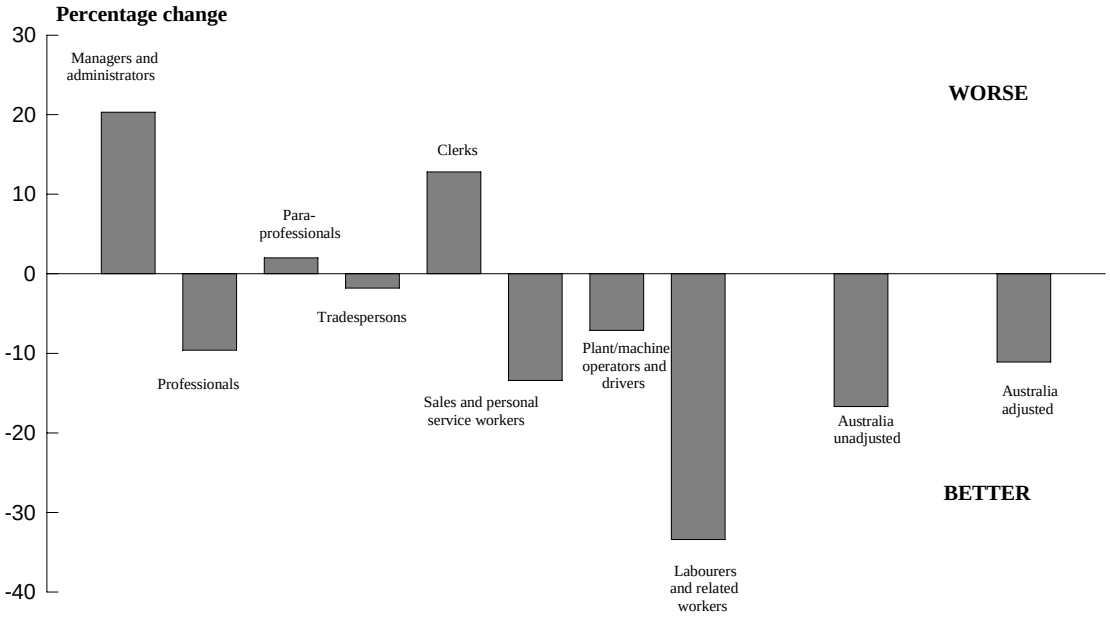
Table 6.5 continued

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Recreation, personal and other services									
Wrfs1									
Rate	*	2.2	*	5.9	*	10.9	3.8	*	3.6
CI		*(1.1-4.1)*		*(3.0-10.2*		*(3.0-27.7)*	*(1.9-6.8)*		*(2.6-4.8)*
Wrfs2									
Rate	*	2.5	21.2	7.2	*	*	3.4	*	3.5
CI		*(1.6-3.9)*	*(7.8-46.3)*	*(4.9-10.2)*			*(2.0-5.4)*		*(2.8-4.4)*
Total									
Wrfs1									
Rate	4.1	6.5	15.1	8.9	6.2	10.2	5.1	7.2	6.7
CI	*(2.2-7.0)*	*(5.9-7.1)*	*(9.9-22.1)*	*(7.8-10.0)*	*(5.0-7.4)*	*(7.6-13.4)*	*(4.5-5.7)*	*(5.9-8.4)*	*(6.3-7.0)*
Wrfs2									
Rate	1.2	5.3	13.9	7.8	4.7	8.8	4.0	6.2	5.5
CI	*(0.5-2.5)*	*(4.9-5.8)*	*(10.0-18.7)*	*(7.1-8.6)*	*(3.8-5.5)*	*(6.9-11.2)*	*(3.6-4.5)*	*(5.3-7.1)*	*(5.3-5.8)*

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: 95% confidence interval.
*: Rates based on less than four deaths have been deleted because they were considered too unstable.

Most occupation groups showed a decrease in the risk of death in WRFS 2 compared with WRFS 1. Managers and administrators had the biggest increase, with the rate changing by 20%. The rates for this group are based on high numbers of deaths and so are stable estimates. Most of the deaths in the manager and administrator occupational group were of farmers. Labourers and related workers had the biggest decrease in rates with a 33% fall. The group with the highest rate, plant and machine operators and drivers, had a small decrease in the rate between the two studies (Figure 6.6 and Table 6.4 and 6.6).

Fig 6.6 Occupation of working persons - working deaths
Percentage change in mortality rate[1]. Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Table 6.6 Jurisdiction of working persons by occupation – working deaths Rate[1] (CI[2]). Australia, 1982 to 1984, 1989 to 1992

Occupation	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Managers and administrators									
Wrfs1									
Rate	*	7.3	*	6.6	5.9	16.5	6.0	7.6	7.0
CI		*(5.5-9.5)*		*(4.3-9.5)*	*(3.2-10.2)*	*(7.5-31.4)*	*(4.3-8.3)*	*(4.4-12.2)*	*(5.9-8.1)*
Wrfs2									
Rate	*	7.2	*	14.7	8.0	17.8	5.8	8.9	8.4
CI		*(5.8-9.0)*		*(11.7-18.3)*	*(5.2-11.7)*	*(9.8-29.9)*	*(4.4-7.6)*	*(5.6-13.3)*	*(7.4-9.4)*
Professionals									
Wrfs1									
Rate	*	1.5	*	2.4	*	*	1.6	*	1.6
CI		*(0.8-2.6)*		*(1.0-4.9)*			*(0.8-2.9)*		*(1.1-2.2)*
Wrfs2									
Rate	*	1.4	*	2.9	1.3	*	0.9	1.1	1.5
CI		*(0.8-2.2)*		*(1.7-4.8)*	*(0.4-3.3)*		*(0.4-1.7)*	*(0.3-2.8)*	*(1.1-1.9)*
Para-professionals									
Wrfs1									
Rate	*	3.9	*	18.4	6.4	11.3	4.2	5.1	6.8
CI		*(2.2-6.4)*		*(12.6-26.0)*	*(2.6-13.3)*	*(3.1-28.8)*	*(2.2-7.2)*	*(1.9-11.2)*	*(5.4-8.5)*
Wrfs2									
Rate	*	6.5	35.3	11.4	5.6	*	3.6	8.0	6.8
CI		*(4.6-8.8)*	*(16.9-64.9)*	*(7.8-15.9)*	*(2.5-10.6)*		*(2.1-5.7)*	*(4.5-13.2)*	*(5.8-8.2)*

Table 6.6 continued

Occupation	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Tradespersons									
Wrfs1									
Rate	*	4.9	*	8.3	1.9	4.7	4.9	6.5	5.4
CI		*(3.7-6.4)*		*(6.0-11.2)*	*(0.6-4.3)*	*(1.3-11.9)*	*(3.5-6.7)*	*(3.9-10.2)*	*(4.6-6.2)*
Wrfs2									
Rate	*	5.2	14.0	5.6	4.5	5.8	4.4	7.4	5.3
CI		*(4.2-6.5)*	*(5.6-28.7)*	*(4.1-7.5)*	*(2.7-7.2)*	*(2.3-12.0)*	*(3.3-5.8)*	*(5.2-10.2)*	*(4.6-6.0)*
Clerks									
Wrfs1									
Rate	*	*	*	*	*	*	*	*	0.3
CI									*(0.2-0.6)*
Wrfs2									
Rate	*	0.4	*	0.6	*	*	0.3	*	0.4
CI		*(0.1-0.8)*		*(0.2-1.4)*			*(0.1-0.8)*		*(0.2-0.6)*
Salespersons and personal services workers									
Wrfs1									
Rate	*	1.0	*	1.8	*	*	0.8	1.8	1.2
CI		*(0.4-1.9)*		*(0.7-3.6)*			*(0.3-1.9)*	*(0.5-4.6)*	*(0.8-1.7)*
Wrfs2									
Rate	*	1.0	*	1.8	*	3.6	0.7	*	1.0
CI		*(0.6-1.7)*		*(1.0-2.9)*		*(1.0-9.1)*	*(0.3-1.4)*		*(0.7-1.4)*

Table 6.6 continued

Occupation	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Australia
Plant/machine operators and drivers									
Wrfs1									
Rate	32.5	27.4	83.4	30.3	21.8	29.1	18.2	21.1	24.4
CI	*(8.9-82.9)*	*(23.1-31.7)*	*(30.6-182.0)*	*(23.9-37.8)*	*(14.7-31.2)*	*(14.6-50.9)*	*(14.6-22.4)*	*(14.4-29.9)*	*(22.0-26.8)*
Wrfs2									
Rate	*	25.6	46.4	28.6	17.3	15.5	16.3	27.0	22.7
CI		*(21.9-29.3)*	*(21.1-88.2)*	*(23.2-33.9)*	*(11.9-24.5)*	*(8.0-27.1)*	*(13.2-19.5)*	*(20.7-34.7)*	*(20.7-24.7)*
Labourers and related workers									
Wrfs1									
Rate	18.1	12.1	56.7	13.5	15.5	27.7	8.2	15.5	12.8
CI	*(5.8-42.3)*	*(10.0-14.3)*	*(28.4-101.6)*	*(10.5-17.1)*	*(11.1-21.1)*	*(17.2-42.4)*	*(6.3-10.5)*	*(11.2-21.0)*	*(11.5-14.4)*
Wrfs2									
Rate	*	7.8	15.5	11.4	7.3	23.2	5.9	8.7	8.5
CI		*(6.5-9.2)*	*(6.8-30.7)*	*(9.2-13.6)*	*(4.9-10.4)*	*(15.4-33.6)*	*(4.6-7.5)*	*(6.2-11.9)*	*(7.7-9.3)*
Total									
Wrfs1									
Rate	4.2	6.5	18.6	8.9	6.2	10.2	5.1	7.1	6.7
CI	*(2.2-7.2)*	*(5.9-7.1)*	*(12.2-27.2)*	*(7.8-9.9)*	*(5.0-7.4)*	*(7.6-13.5)*	*(4.4-5.7)*	*(5.9-8.4)*	*(6.3-7.0)*
Wrfs2									
Rate	1.2	5.3	13.9	7.8	4.7	8.8	4.0	6.2	5.5
CI	*(0.5-2.5)*	*(4.9-5.8)*	*(10.0-18.7)*	*(7.1-8.6)*	*(3.8-5.5)*	*(6.9-11.2)*	*(3.6-4.5)*	*(5.3-7.1)*	*(5.3-5.8)*

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: 95% confidence interval.
*: Rates based on less than four deaths have been deleted because they were considered too unstable.

6.5 JURISDICTION

All jurisdictions showed an overall decrease in the rate of work-related traumatic death of working persons. Much of the apparent very large decrease in the Australian Capital Territory rate is probably due to unreliable rate estimates for both WRFS 1 and WRFS 2 because of the low number of deaths. Of the other jurisdictions, the smallest decrease was 12% in Queensland and the largest was 24% in the Northern Territory (Figure 5.7 and Table 6.7).

Table 6.7 Jurisdiction of working persons – working deaths Rate[1] (CI[2]) and percentage change in mortality rate Australia, 1982 to 1984, 1989 to 1992

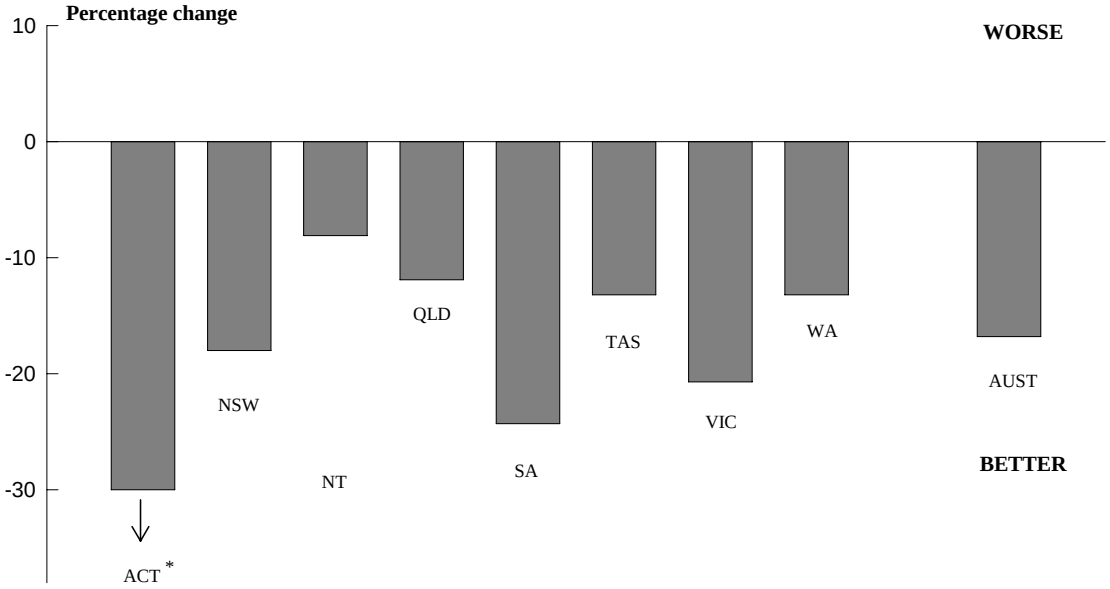
Jurisdiction	1982 to 1984		1989 to 1992		% change
	Rate	CI	Rate	CI	
ACT	4.1	*2.0-7.0*	1.2	*0.5-2.5*	- 70.1
NSW	6.5	*5.9-7.1*	5.2	*4.9-5.8*	- 18.0
NT	15.1	*9.9-22.1*	13.6	*10.0-18.7*	- 8.1
QLD	8.9	*7.8-10.0*	7.8	*7.1-8.6*	- 11.9
SA	6.2	*5.0-7.4*	4.7	*3.8-5.5*	- 24.3
TAS	10.2	*7.6-13.4*	8.8	*6.9-11.2*	- 13.2
VIC	5.1	*4.5-5.7*	4.0	*3.6-4.5*	- 20.7
WA	7.2	*5.9-8.4*	6.2	*5.3-7.1*	- 13.2
Australia	**6.7**	***6.3-7.0***	**5.5**	***5.3-5.8***	**- 16.8**

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: 95% confidence interval.

However, this overall improvement doesn't adequately reflect the changes within industries, occupations or jurisdictions. A consideration of the industries (or occupations) with the highest rates and/or significant numbers of deaths across jurisdictions gives a better insight into general trends in these industries (Figure 5.8 and Tables 6.5 and 6.6). This analysis shows that mining rates increased considerably in most jurisdictions, rates in transport and storage increased moderately in most jurisdictions and rates in agriculture showed small increases in half the jurisdictions and

small decreases in the other half. Rates in forestry, logging, fishing and hunting (examined as a group because of the low numbers of death in most jurisdictions) showed inconsistent changes but remained high in all jurisdictions. Rates in manufacturing and construction showed at least moderate decreases in most jurisdictions.

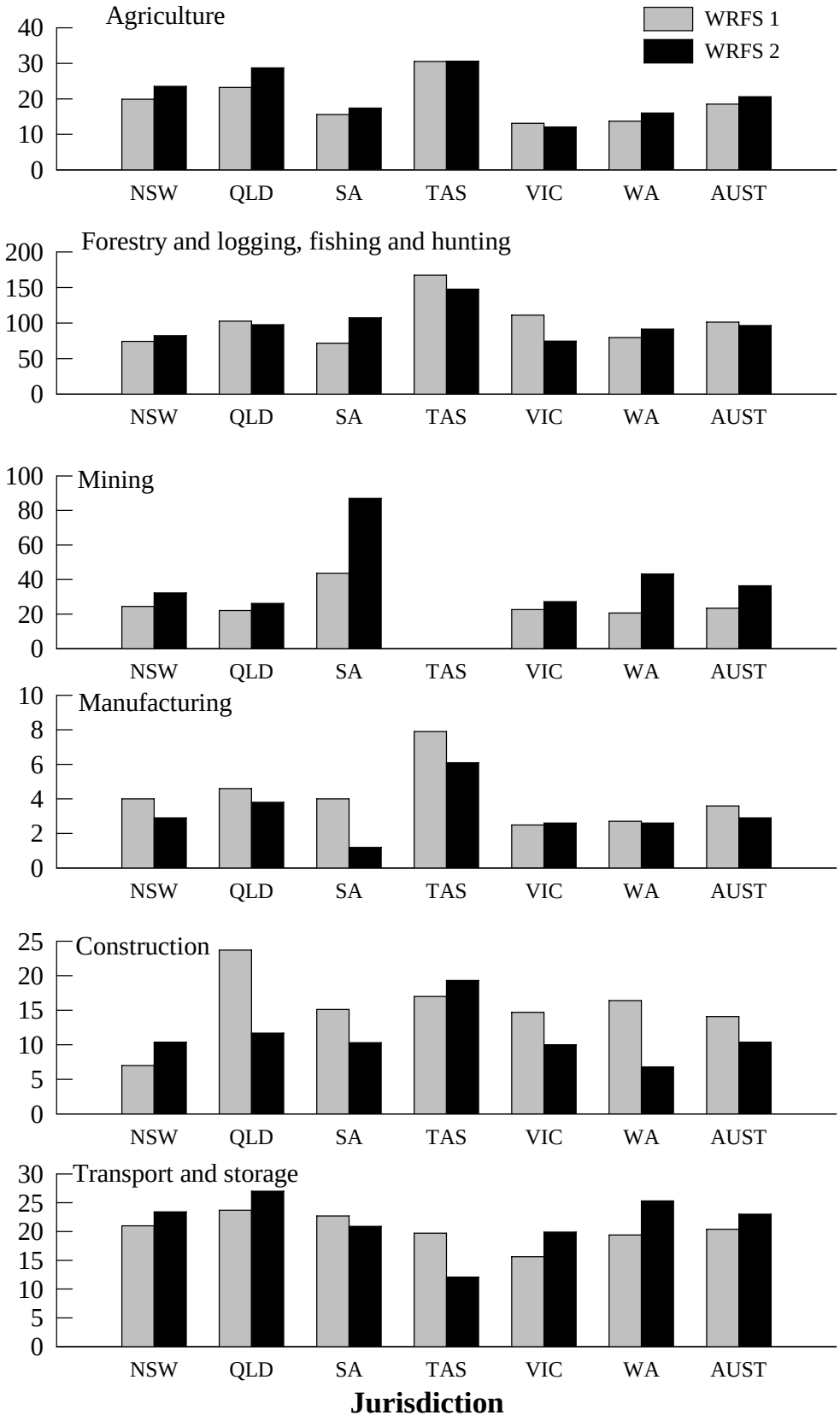
Fig 6.7 Jurisdiction of working persons - working deaths
Percentage change in mortality rate[1]. Australia, 1982 to 1984, 1989 to 1992



* ACT rate change = -70.1

1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

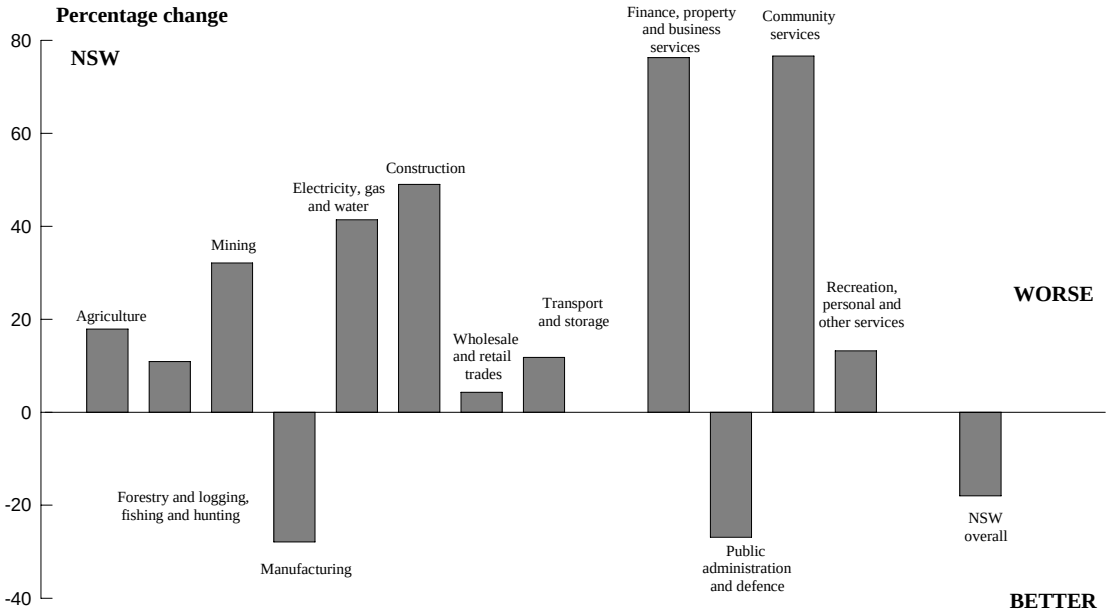
Fig 6.8 Industry mortality rate[1] by jurisdiction
WRFS 1 and WRFS 2 - working deaths
Australia[2], 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.
2: ACT and NT are not included due to lack of precision of relevant data.

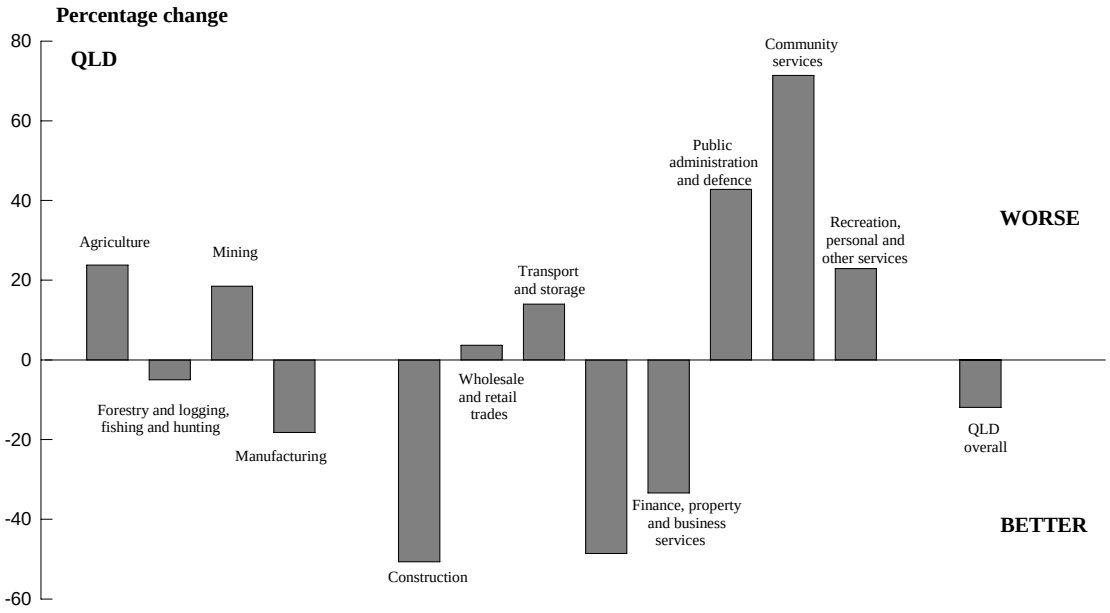
Changes in industry-specific rates between WRFS 1 and WRFS 2 for each jurisdiction also give a better indication of the general direction of OHS in the jurisdictions. Consideration of these rates where the number of deaths was high enough shows that Victoria had higher rates in WRFS 2 in only two out of 12 industries; Tasmania in one out of five industries; and Queensland, South Australia and Western Australia in about half of the industries. New South Wales showed higher rates in WRFS 2 for eight of the 12 industries for which adequate information was available (Figures 6.9 – 6.14 and Table 6.5).

Fig 6.9 Percentage change in mortality rate[1] by industry - working deaths New South Wales, 1982 to 1984, 1989 to 1992



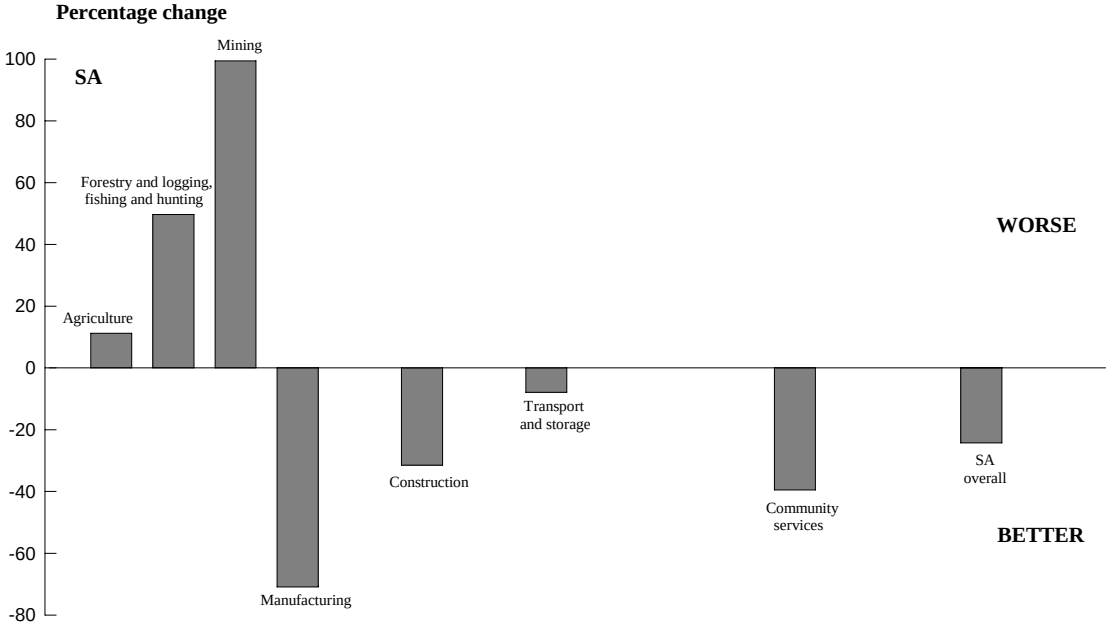
1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Fig 6.10 Percentage change in mortality rate[1] by industry - working deaths Queensland, 1982 to 1984, 1989 to 1992



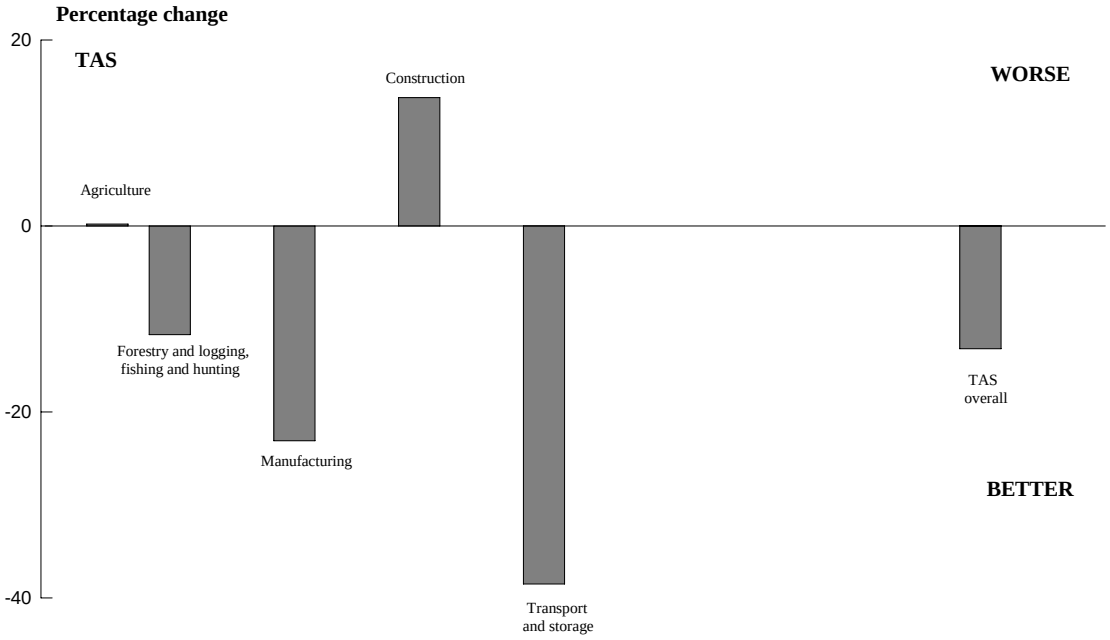
1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Fig 6.11 Percentage change in mortality rate[1] by industry - working deaths South Australia, 1982 to 1984, 1989 to 1992



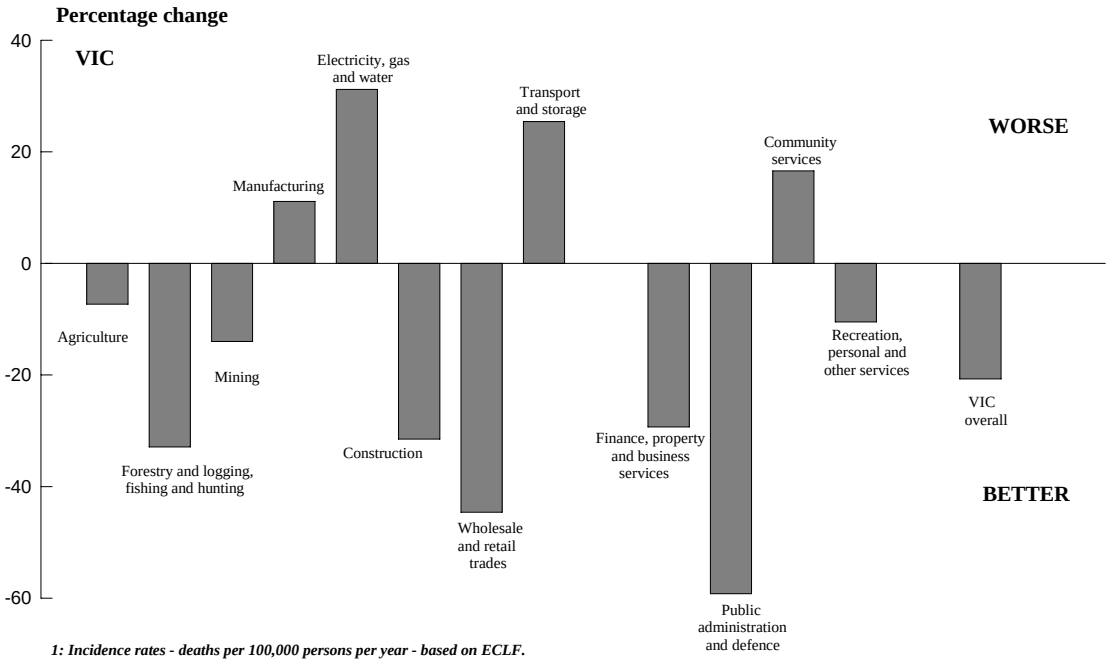
1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Fig 6.12 Percentage change in mortality rate[1] by industry - working deaths Tasmania, 1982 to 1984, 1989 to 1992



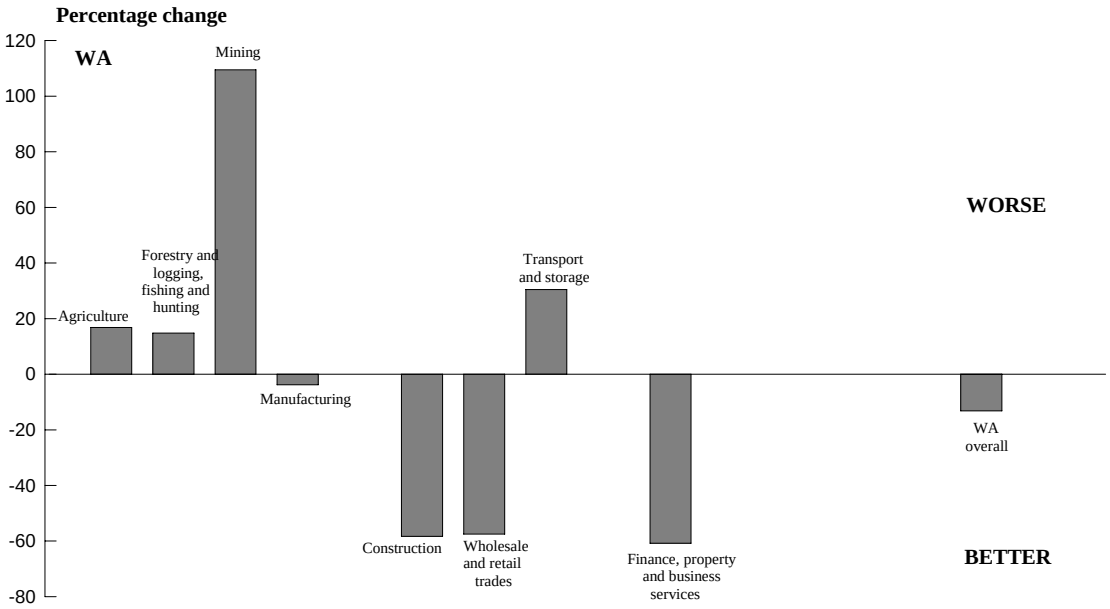
1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Fig 6.13 Percentage change in mortality rate[1] by industry - working deaths Victoria, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

Fig 6.14 Percentage change in mortality rate[1] by industry - working deaths Western Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 persons per year - based on ECLF.

6.6 DISCUSSION

The general decline in the rate of workplace death over both studies, and the lower value in 1989 compared with 1984, suggests that there has been a steady decline in the overall rate of workplace death in Australia for the period 1982 to 1992. The average workplace rate for WRFS 2 of 3.8 deaths per 100,000 persons per year was 19% lower than the average rate of 4.7 deaths per 100,000 persons per year for WRFS 1. In addition, in 1992 at the end of WRFS 2 the rate of 3.6 deaths per 100,000 persons per year was 32% lower than the rate of 5.3 deaths per 100,000 persons per year in 1982 eleven years earlier, at the beginning of WRFS 1. The steady decline in the estimated rates over time and the narrow confidence intervals around these estimates suggest that such differences reflect a true decrease in rate and are unlikely to represent chance variation on a stable background rate.

The rate of motor vehicle–related death in the general community has declined steadily over the past 15 to 20 years[273]. Since most commuting deaths in WRFS 2 and WRFS 1 involved motor vehicle incidents (96% in WRFS 2), a similar decline would be expected in the rate of commuting deaths to that seen in the community for all motor vehicle–related deaths. Factors that might prevent such a decline include an increasing rate of commuting over time (which is unlikely) or the increasing prevalence of work-related factors that increase the risk of motor vehicle deaths while commuting (such an increased risk is also unlikely, but could be caused by a factor such as longer working hours leading to fatigue). The high rates of death while commuting in WRFS 2 compared with WRFS 1 are therefore not expected on the basis of current understanding of likely risk patterns. They very likely reflect the expected effect of differing capture rates of commuting in the two studies, with WRFS 2 results close to the true situation in 1989 to 1992 and WRFS 1 results probably a significant underestimate of the true situation during 1982 to 1984. Such an underestimate was suspected by the WRFS 1 study team and specifically mentioned in the main study paper.

As for commuting, a general decline in work-road deaths might be expected over time because of the improvement in general road safety. However, unlike commuting, it is very possible that a higher proportion of workers travelled on the road in the course of work during 1989 to 1992 than they did during 1982 to 1984. Increased use of roads for the transport of freight is a clear example of this. However, there could also have been error introduced from the study methods, since 31% of all deaths in WRFS 1 (7% in WRFS 2) were coded as indeterminate, and about 80% of these indeterminate deaths in both studies were road-traffic deaths for which there was insufficient information in the coronial file to allow definitive coding. This suggests that there may well have been substantial underestimation of work-road deaths in WRFS 1, although the extent of this

is not clear. Therefore, although it is possible that the lack of a smooth downward trend (and the apparent higher rates in 1989 to 1992 compared with 1982 to 1984) might partly reflect more complete case ascertainment in WRFS 2, it is also quite possible that most of this difference reflects an increased use of public roads for the purposes of work, with a consequent increased risk of death from motor vehicle incidents on public roads while working. This change does not necessarily mean that driving for work has become more dangerous, just that more people are driving for work purposes.

The implications of the results describing the rate of all deaths while working reflects the discussion of workplace and work-road deaths. The results probably reflect a true decline in the overall rate of working deaths in Australia between 1982 and 1992. The apparent increase between 1984 and 1989 is probably due to a combination of greater use of the road for work purposes with an associated true increase in the risk of death at work due to motor vehicle incidents, and a slightly more complete case ascertainment in WRFS 2 than WRFS 1 resulting in an underestimate of the rate of working (especially work-road) deaths in WRFS 1.

Any differences in fatality rates between the two studies might be explained, at least in part, by changes in the industry and/or occupation mix of the workforce between the two study periods, rather than being due to changes in the risks facing individual workers in specific industries or occupations. That is, each particular job may not be any safer, but there may be less people doing the more dangerous jobs. This possibility was examined by analysing industry–specific and occupation–specific rates, and by standardising or adjusting the overall rates to take account of changes in industry or occupation distribution of the workforce. Industry or occupation–specific rates provide more information, but standardised rates provide a more useful single measure. Standardising

for changes in industry and occupation distribution of the workforce suggested that 30% to 40% of the apparent decline in working death rates could be attributed to workforce changes, rather than other factors. Standardisation by major industry group (as was performed in this analysis) is a fairly crude approach, since the hazards and risks can be quite different within each industry group. Using more detailed industry groupings would provide a better (though still fairly crude) estimate of the effect of changes in industry distribution of the workforce, but there were not enough deaths in many of the industries to allow stratification of the information into smaller groups. Rates were standardised separately to the WRFS 1 and WRFS 2 populations. The slightly different results given by the two alternate methods of standardisation are primarily due to the larger proportion of cases with unknown industry in WRFS 1 compared with WRFS 2 (10.6% versus 0.5%). However, this does not alter the conclusion that there has been a decrease in the **overall** rate of work-related traumatic death of workers between the two studies.

Overall rates provide a measure of **average** risk. Groups with significant increases or decreases in risk are not identifiable using such average measures. This problem can be overcome by examining the data on an industry–specific or occupation–specific basis. The results for specific industries, occupations and jurisdictions showed that the apparent overall Australia-wide improvement in work-related fatality rates was not seen in all areas. This emphasises the importance of looking at the information in enough detail to identify groups whose members face similar risks (eg electrical hazards; working at heights), rather than using broad groups whose members may have quite different risks. The absolute rates and the changes in rates within jurisdictions are likely to be affected by a number of factors, and interpretation of the results needs to take this into account. For example, between the two studies the rate of death in the

construction industry increased by 49% in New South Wales and decreased by 51% in Queensland, yet the final rate for New South Wales was still less than the final rate for Queensland. Similarly, the higher fatality rate in mining in Western Australia compared to New South Wales may be primarily due to the different methods being used to extract different material. However, the fact that the rate of death in the mining industry increased considerably between the two studies for **both** jurisdictions remains a cause for concern. Other longitudinal studies of fatality rates in Jordan[220], New Zealand[68], Quebec[216], Scandinavia[221] and the United States[224-226], have all shown a decrease over time (although not all of the same magnitude) and a similar lack of consistency in change in rates across different industries and/or occupations.

The reasons for the observed decline in the overall risk of workers suffering a traumatic work-related fatality in the workplace or on the road are not clear. It is not due simply to less people working, as the rates take account of any changes in the number of persons in the workforce. Nor is it just the result of changing workforce patterns, as shown by the industry-standardised and industry-specific comparisons. The observed decline in work-related fatalities may in fact reflect widespread improvements in OHS. The Australian studies, particularly WRFS 2, covered a period when there was a lot of activity in the OHS sector in Australia as the Roben's style approach began to be reflected in legislation and OHS agency activity at the jurisdictional level, and policies and procedures at the workplace level. However, it is not likely that any of these activities would cause sudden changes in OHS performance. Another factor that should be considered is that Australia experienced economic recessions during the years covered by both studies, with improved economic activity in the intervening years. The downturn in activity in many industry sectors could be expected to have varying effects. Persons might be less likely to enter an industry sector where less work was available,

meaning the remaining persons would tend to be more experienced and the work less demanding. Alternatively, greater competition for less work might lead to under-quoting for work and consequent cutting of corners to save money. So, in fact, the effect on OHS of changes in economic activity is hard to predict, as described in a recent review of this area[274]. The observed mechanisms in the fatal workplace incidents in the two studies were remarkably similar. This suggests that, even though there has been a fall in the rate of deaths, the characteristics of the fatal events have not changed. The observed decline may simply be a continuation of a decline in work-related fatality rates over many decades (see Chapter 13), although this does not explain the cause of such a decline.

6.7 METHODOLOGICAL CONSIDERATIONS

Comparing results between studies covering different periods allows an assessment of how the number, rate and circumstances of work-related fatalities have changed over time. However, validly making such comparisons is not straightforward, because of the potential bias introduced by differences in the collection methodologies used in the studies. The relevant methodological issues are considered in detail in Section 3.6. The main aspects are again presented here to aid in interpretation of the findings.

Any effect of better case ascertainment due to the cross-checking of WRFS 2 data collection results with the OHS and compensation agency lists should be able to be nullified by excluding from the analysis any WRFS 2 cases which were only identified as cases because of the OHS or compensation agency list information. Only 50 (2.8%) of the 1,787 working cases were identified as cases primarily because of the information in the OHS and compensation agency lists. Therefore, the significance of this effect, if it exists, is minimal. The extent of other causes of better case ascertainment is difficult

to assess. However, for the reasons discussed earlier in this Chapter and in Section 3.6 in Chapter 3, better case ascertainment is not likely to account for the differences observed in the rate of death of working persons over the period 1982 to 1992.
The decline in rates during both WRFS 1 and WRFS 2 might also be explained by a design fault in the studies, leading to better ascertainment of deaths that occurred earlier in the study period. Since the studies were based on ABS Deaths Data, significant delay in the registering of deaths might cause a significantly higher proportion of deaths occurring towards the end of the study period not to be recorded by the time the list was supplied to the study teams. This could lead to decreased ascertainment of the later cases because the relevant coronial files for the non-registered deaths would not have been inspected.

As discussed for WRFS 2 results in Section 5.17, this was clearly not a problem for WRFS 2 data. Assessment of the possibility of bias from design error in the overall results for WRFS 1 is difficult as there is little relevant information available. Similarly to WRFS 2, the WRFS 1 study team received their information from the ABS after the end of the registration year following the end of the study period (ie the end of the 1985 registration year), by which time nearly all deaths were likely to have been registered (although the precise proportion might not have been the same as for WRFS 2). However, there is no evidence of non-ABS list deaths ('Extras' in WRFS 2) being identified or included in WRFS 1. So, to the extent that deaths that occurred in the 1982 to 1984 period were not registered for the 1985 ABS Deaths Data List, there may have been a small underestimate of 1984 work-related deaths in WRFS 1. Also, files were not inspected randomly in WRFS 1. However, files were generally collected from several jurisdictions at the same time and files within each jurisdiction were not inspected in any set order. So, it is unlikely that any drift in the approaches to data

collection would be reflected in variation over time and probably not in variation between jurisdictions. There is no indication as to the order in which coding was done, but such coding is not likely to have significantly affected the final decision on the inclusion or exclusion of cases.

The percentage of working cases with unknown occupation for both studies was low (WRFS 1: 1.4%, WRFS 2: 0.3%) and is unlikely to have affected comparisons between the two studies based on occupation. There was a much higher proportion of cases with unknown industry in WRFS 1 (10.6%) than WRFS 2 (0.5%), with work-road cases accounting for most of the difference. The lower percentage of cases where industry was not known in the second study is almost certainly due to the better quality data available for WRFS 2 cases. Cases with unknown industry had to be excluded from industry–specific comparisons, leading to industry–specific fatality rate estimates which would have been slightly lower than the true rates. This will have affected the industry–specific rates from WRFS 1 more than those for WRFS 2, where the unknown proportion was much smaller. The exact effect of this is not known, although it is clearly much more of a problem for work-road cases in both studies than for workplace cases in either study, and a larger problem for WRFS 1 than for WRFS 2. If the true industries of the unknown cases were distributed in the same proportions as the cases with known industry, the rates for industries in WRFS 1 would be underestimated by about 11% for all working cases. For WRFS 2, the industry rates would be underestimated by less than 1% for all working cases.

Finally, a rough estimate of the number of work-related deaths is provided by examining ABS Deaths Data and considering E-code groupings having a high proportion of work-related deaths. Consideration of external cause deaths assigned to

these E-code groupings over the period 1979 to 1995 shows that for the periods of both studies there was a decline in the number of deaths assigned to the relevant E-code groupings. Between the two studies there was a slight rise in the numbers of relevant deaths (Harrison, 1998 — unpublished information). This issue is considered in more detail in Chapter 12. Therefore, the ABS Deaths Data and the information from WRFS 1 and WRFS 2 show very similar trends. This further supports the above arguments that the findings of a decline in the number of work-related fatalities during the periods of both studies are valid.

In summary, all the available evidence suggests that the observed temporal pattern in fatality rates in WRFS 2 is not due to selection or measurement bias due to the study methodology. Assessment of this possibility for WRFS 1 is difficult because of lack of relevant information, but what information is available suggests that this was not a major factor in WRFS 1 either.

6.8 CONCLUSION

In conclusion, the results from this analysis of two studies of work-related traumatic death in Australia suggest that there was a modest but real decline in the rate of these deaths for workers from 1982 to 1992. The decline was more consistent for workplace deaths than for work-road deaths. Probable under-enumeration of commuting deaths in the first study makes it very difficult to know what the trend in commuting deaths has been. All the available evidence suggests that the observed temporal pattern in fatality rates within and across the two studies is not due to selection or measurement bias due to study methodology. There is no reliable, comprehensive data on work-related traumatic deaths in Australia since 1992, but workers' compensation information

suggests that there has not been any major change in the rate of work-related fatalities since that time, with perhaps some marginal improvement more recently[275].