Chapter 5
Work–related traumatic deaths of workers

5.1 INTRODUCTION

The main focus of the overall study was the workers who died of work-related trauma and the incidents in which they were fatally injured. This Chapter provides the information on these workers and the fatal incidents.

5.2 OVERALL RESULTS

There were 2,413 persons who were fatally injured while working or commuting during the four-year period 1989 to 1992. That is, an average of 603 deaths each year (or 12 deaths each week). Of the 2,413 persons, 1,787 were injured while working (74.1%) and 626 were commuting to or from work (25.9%). The working deaths involved 1,244 workplace deaths and 543 work-road deaths. The numbers in each group decreased during each year of the study (Figures 5.1 and 5.2 and Table 5.1). Ninety six percent of the 1,787 working cases were in the ECLF.

Fig 5.1 Duty context for working, commuting and total deaths
Number per year. Australia, 1989 to 1992

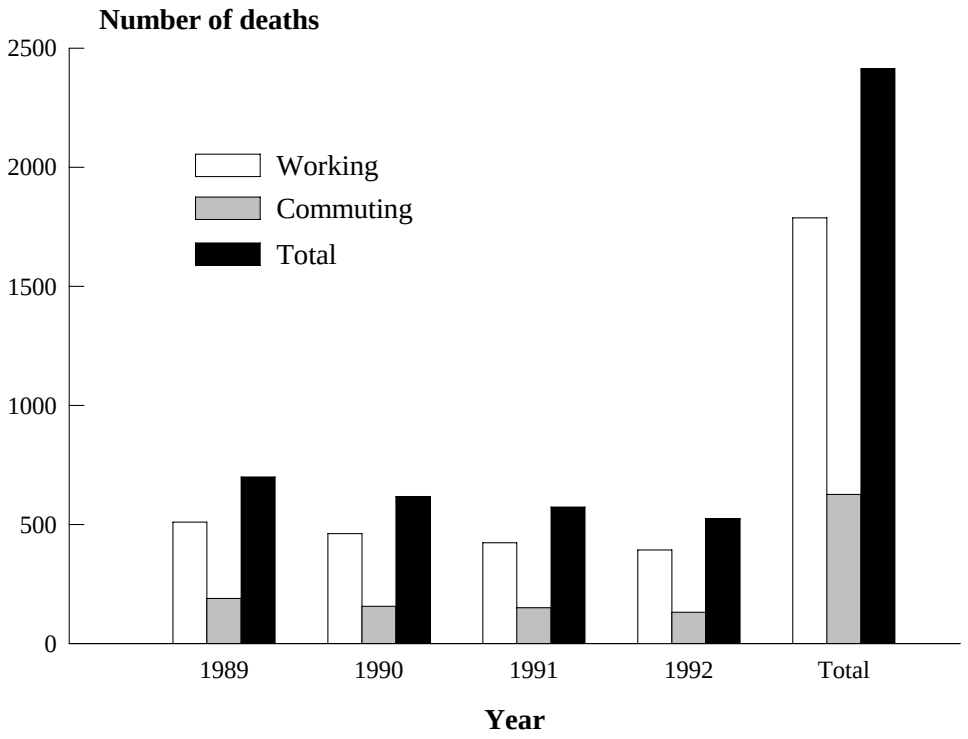


Fig 5.2 Duty context for workplace, work-road and total working deaths
Number per year. Australia, 1989 to 1992

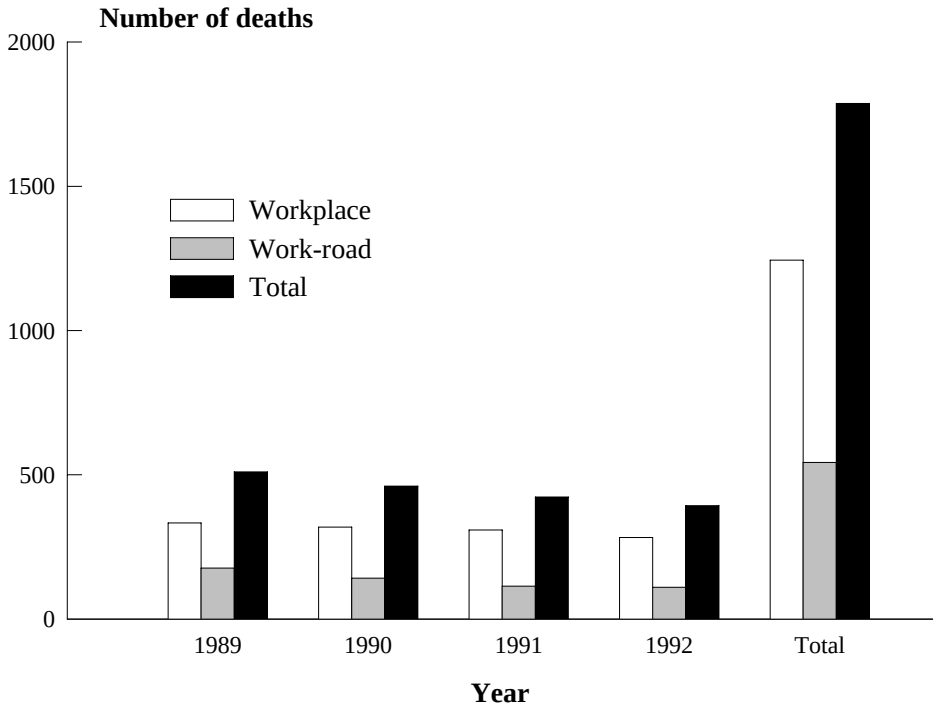
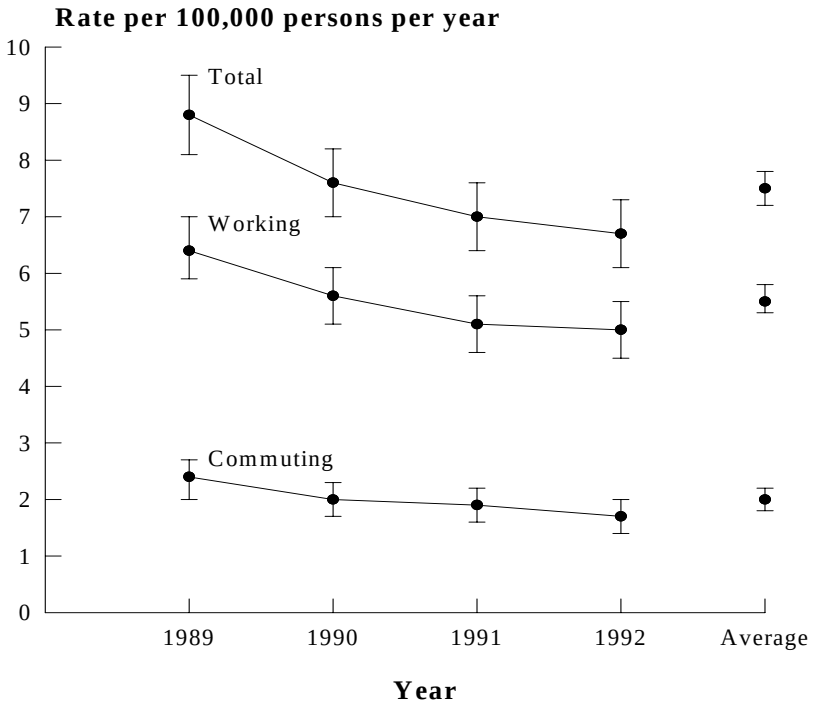


Table 5.1 Duty context for commuting, workplace, work-road and total deaths. Number and percent by year Australia, 1989 to 1992

Duty context	1989		1990		1991		1992		Total	
	n	%	n	%	n	%	n	%	n	%
Working										
Workplace	333	65.3	319	69.2	309	73.0	283	72.0	1,244	69.6
Work-road	177	34.7	142	30.8	114	27.0	110	28.0	543	30.4
Total	510	100.0	461	100.0	423	100.0	393	100.0	1,787	100.0
Total										
All working	510	73.0	461	74.7	423	73.8	393	75.0	1,787	74.1
Commuting	189	27.0	156	25.3	150	26.2	131	25.0	626	25.9
Total	**699**	**100.0**	**617**	**100.0**	**573**	**100.0**	**524**	**100.0**	**2413**	**100.0**

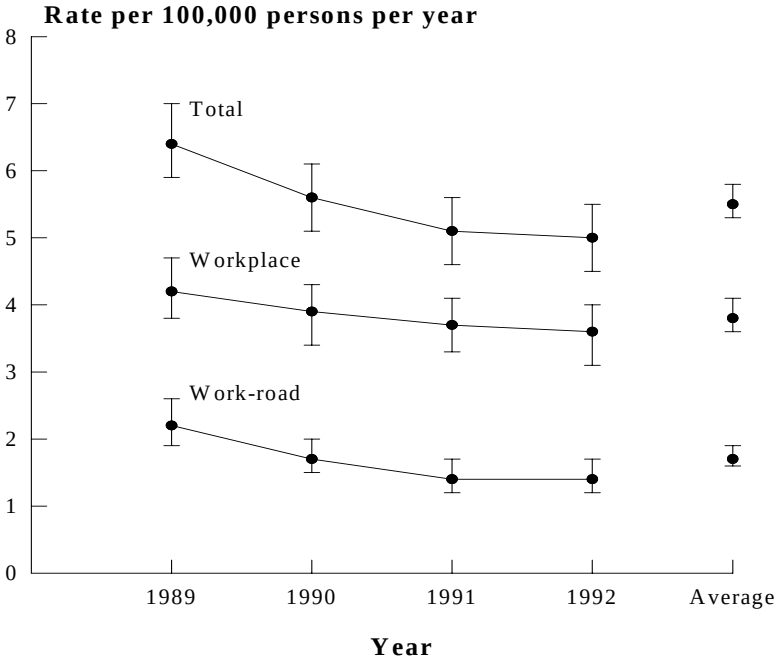
To assess the overall risk of work-related death and whether it changed during the study period, it is necessary to take account of the number of workers at risk of injury during the period. The overall rate of work-related death for workers and commuters for the four-year study period was 7.5 per 100,000 persons per year. The year-specific rate decreased for each year of the study. The overall rate of work-related working death for the study period was 5.5 per 100,000 persons per year, which was made up of a workplace death rate of 3.8 per 100,000 persons per year and a work-road death rate of 1.7 per 100,000 persons per year. These rates decreased for the first three years of the study and then remained fairly steady for the final year (Figures 5.3 and 5.4 and Table 5.2).

Fig 5.3 Duty context for working, commuting and total deaths Rate[1] (CI[2]). Australia, 1989 to 1992



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

Fig 5.4 Duty context for workplace, work-road and total working deaths. Rate[1] (CI[2]). Australia, 1989 to 1992



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

Table 5.2 Duty context for commuting, workplace, work-road and total working deaths. Rate[1] (CI[2]) per year Australia, 1989 to 1992

	1989	1990	WRFS 2 1991	1992	Total
Working					
Workplace	4.2	3.9	3.7	3.6	3.8
CI	*(3.8-4.7)*	*(3.4-4.3)*	*(3.3-4.1)*	*(3.1-4.0)*	*(3.6-4.1)*
Work-road	2.2	1.7	1.4	1.4	1.7
CI	*(1.9-2.6)*	*(1.5-2.0)*	*(1.2-1.7)*	*(1.2-1.7)*	*(1.6-1.9)*
Total	6.4	5.6	5.1	5.0	5.5
CI	*(5.9-7.0)*	*(5.1-6.1)*	*(4.6-5.6)*	*(4.5-5.5)*	*(5.3-5.8)*
Commuting	2.4	2.0	1.9	1.7	2.0
CI	*(2.0-2.7)*	*(1.7-2.3)*	*(1.6-2.2)*	*(1.4-2.0)*	*(1.8-2.2)*
Total	**8.8**	**7.6**	**7.0**	**6.7**	**7.5**
CI	***(8.1-9.5)***	***(7.0-8.2)***	***(6.4-7.6)***	***(6.1-7.3)***	***(7.2-7.8)***

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

These observed overall trends over time might reflect changes in the industry distribution of the workforce rather than a true decrease in the risk of death for each worker. Therefore, the rates for each year were directly standardised by industry to the 1989 population. These adjusted rates also showed a general decline in the rate of work-related death of workers, but not as marked as the unadjusted rates (Table 5.3).

Table 5.3 Industry of working persons - working deaths Rate[1](CI[2]) per year. Australia, 1989 to 1992

Industry	1989	1990	1991	1992	Total	CI
Agriculture	19.7	19.7	21.3	21.8	20.6	*18.4-22.8*
Forestry and logging	120.8	100.8	100.9	63.5	97.2	*70.7-130.6*
Fishing and hunting	84.1	113.1	65.3	110.5	92.5	*70.2-119.7*
Mining	35.9	24.4	44.5	40.7	36.1	*30.1-42.1*
Manufacturing	3.2	3.3	3.1	2.4	3.0	*2.5-3.5*
Electricity, gas and water	6.0	10.4	5.9	4.8	6.8	*4.5-9.7*
Construction	12.6	8.7	9.0	11.4	10.4	*9.1-11.8*
Wholesale and retail trades	2.3	1.8	1.8	1.4	1.8	*1.5-2.2*
Transport and storage	26.8	26.4	19.6	18.8	23.0	*20.6-25.3*
Communication	3.6	2.1	2.2	1.6	2.4	*1.3-4.1*
Finance, property and business services	1.5	1.5	0.6	1.7	1.3	*1.0-1.8*
Public admin and defence	4.3	5.3	1.4	2.0	3.2	*2.4-4.3*
Community services	2.0	0.9	1.2	0.8	1.2	*0.9-1.5*
Recreation, personal and other services	4.5	3.6	3.1	3.0	3.5	*2.8-4.4*
Overall mortality rate	**6.4**	**5.6**	**5.1**	**5.0**	**5.5**	
Adjusted mortality rate[3]	**6.4**	**5.7**	**5.3**	**5.3**	**5.7**	

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: 95% confidence interval.
3: Rates from 1990 to 1992 have been adjusted by the 1989 industry distribution (6 cases {or 0.5% of 1,212} for whom industry was not known in 1990 to 1992 have been distributed proportionately across all industries for each year).

5.3 GENDER

The vast majority of deaths in all categories were of males — 2,184 males (90.5% of working and commuting deaths) as against 229 females (9.5% of working and commuting deaths). Similarly, the rates of deaths were about ten times higher for males compared with females in all categories of working except commuting, for which the rate was about 2.5 times higher in males (Table 5.4).

Table 5.4 Duty context for commuting, workplace, work-road and total working deaths - by gender Number, percent, rate[1] (CI[2]). Australia, 1989 to 1992

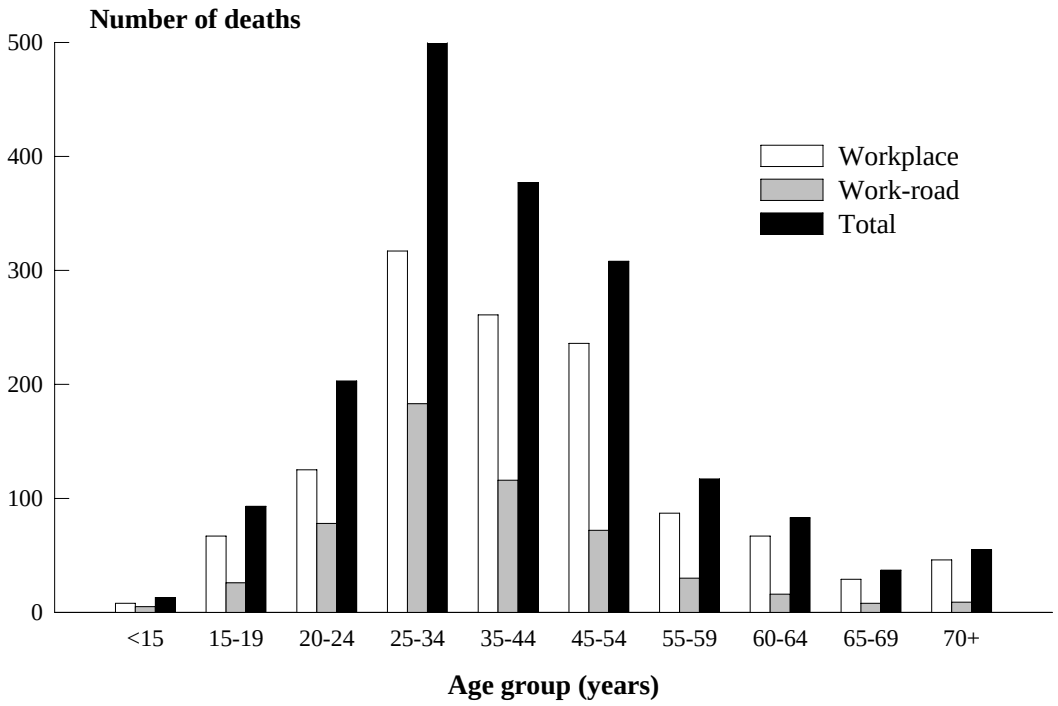
Duty context		Men	Women	Total
Working				
	Number	1,192	52	1,244
	Percent	95.8	4.2	100.0
	Rate	6.3	0.4	3.8
	CI	*(5.9-6.7)*	*(0.3-0.5)*	*(3.6-4.1)*
	Number	504	39	543
	Percent	92.8	7.2	100.0
	Rate	2.7	0.3	1.7
	CI	*(2.5-3.0)*	*(0.2-0.4)*	*(1.6-1.9)*
	Number	1,696	91	1,787
	Percent	94.9	5.1	100.0
	Rate	9.0	0.7	5.5
	CI	*(8.6-9.4)*	*(0.6-0.9)*	*(5.3-5.8)*
Commuting	Number	488	138	626
	Percent	78.0	22.0	100.0
	Rate	2.7	1.1	2.0
	CI	*(2.4-2.9)*	*(0.9-1.2)*	*(1.8-2.1)*
Total	**Number**	**2,184**	**229**	**2,413**
	Percent	**90.5**	**9.5**	**100.0**
	Rate	**11.7**	**1.8**	**7.5**
	CI	***(11.2-12.2)***	***(1.5-2.0)***	***(7.2-7.8)***

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

5.4 AGE

The mean age of deceased workers and commuters was 37.5 years, and was similar for workers in the workplace, work-road and commuting categories. The highest number of working deaths occurred to persons in the age range 25–34 and about three quarters of working deaths occurred to persons in the range of 20–54. However significant numbers of working deaths occurred to persons in the less than 20 years (106 deaths: 5.9%) and over 65 years (92 deaths: 5.1%) categories (Figure 5.5).

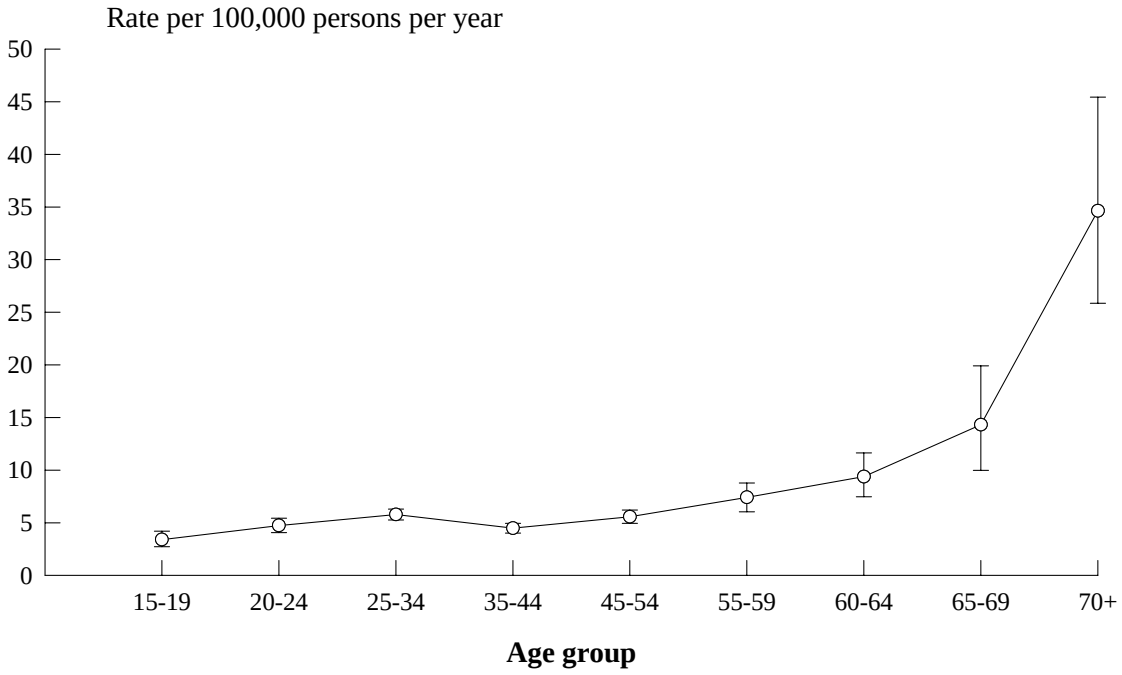
Fig 5.5 Age of working persons - workplace, work-road and total working deaths Number. Australia, 1989 to 1992



The age-specific rate of working deaths had a markedly different pattern to that of the number of deaths. For working deaths, there was a gradual rise with age in the rate from the 15 - 24 year group until the 55 - 64 year group, after which there was a dramatic increase (Figure 5.6). A similar pattern was seen for workplace deaths, but the

rate of work-road deaths had a fluctuating pattern for most age groups and a small rise above 64 years.

Fig 5.6 Age of working persons - working deaths Rate[1](CI[2]). Australia, 1989 to 1992



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

5.5 INDUSTRY

The forestry and fishing industries had by far the highest rates of death, with average rates of 97.2 (forestry) and 92.5 (fishing) deaths per 100,000 persons per year. This compares with a rate of 5.5 for the entire workforce. Other industries with rates well above the workforce average were mining (36.1), transport and storage (23.0), agriculture (20.6) and construction (10.4). The number of deaths in each industry did not follow the same pattern as the rates, with forestry and fishing having fairly small numbers of deaths but very high rates, and the manufacturing and wholesale and retail trades industries having significant numbers of deaths but low death rates. However,

the mining, transport and storage, agriculture and construction industries all had high numbers of deaths and high death rates (Figures 5.7 and 5.8 and Table 5.5).

There was not a uniform trend in the rate of work-related traumatic death in each industry over the four years of the study. Some industries, such as agriculture and mining, had a small increase over the study period, while wholesale and retail trades and transport and storage had a steady decrease over the study period. However, the differences in the rates between years for each industry were mostly within the expected random variability, as indicated by the confidence intervals (Tables 5.3 and 5.5).

Fig 5.7 Industry of working persons - working deaths Number. Australia, 1989 to 1992

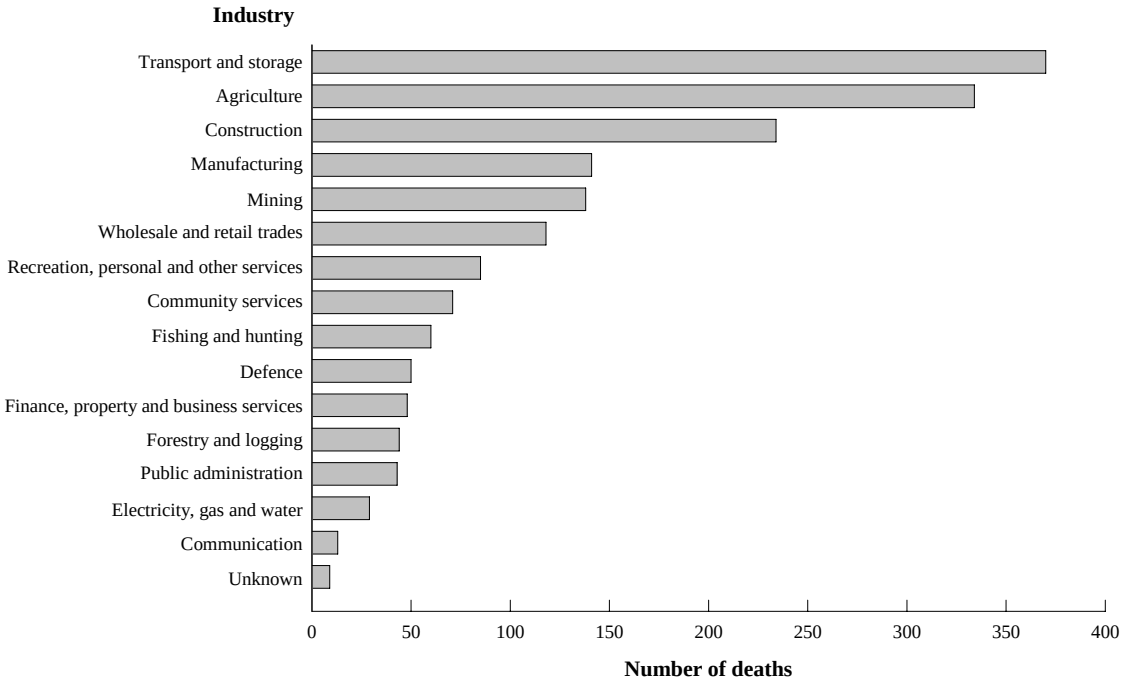
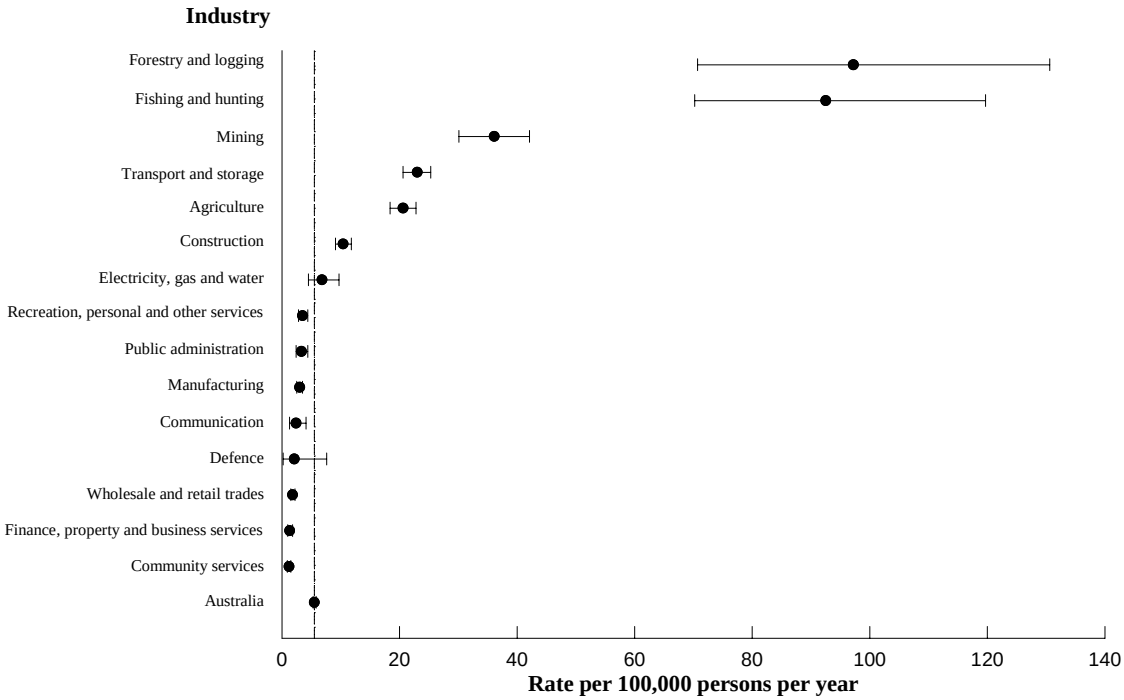


Fig 5.8 Industry of working persons - working deaths Rate[1] (CI[2]). Australia, 1989 to 1992



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

Table 5.5 Industry of working persons - working deaths Number, percent, rate[1] (CI[2]). Australia, 1989 to 1992

Industry	Number	%	Rate	CI
Agriculture	334	18.7	20.6	*18.4-22.8*
Forestry and logging	44	2.5	97.2	*70.7-130.6*
Fishing and hunting	60	3.4	92.5	*70.2-119.7*
Mining	138	7.7	36.1	*30.1-42.1*
Manufacturing	141	7.9	3.0	*2.5-3.5*
Electricity, gas and water	29	1.6	6.8	*4.5-9.7*
Construction	234	13.1	10.4	*9.1-11.8*
Wholesale and retail trades	118	6.6	1.8	*1.5-2.2*
Transport and storage	370	20.7	23.0	*20.6-25.3*
Communication	13	0.7	2.4	*1.3-4.1*
Finance, property and business services	48	2.7	1.3	*1.0-1.8*
Public admin and defence	93	5.2	3.2	*2.4-4.3*
Community services	71	4.0	1.2	*0.9-1.5*
Recreation, personal and other services	85	4.8	3.5	*2.8-4.4*
Not known	9	0.5	-	-
Total	**1,787**	**100.0**	**5.5**	***5.3-5.8***

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

5.6 OCCUPATION

The highest fatality rate of working persons in the broad categories of occupation was 22.7 deaths per 100,000 persons per year in plant and machine operators and drivers. This compares with an average of 5.5 for the entire workforce and was almost three times the rate of the next highest occupation group. Labourers and related workers (8.5), managers and administrators (including farmers) (8.4) and para-professionals (7.0) had rates above the all workforce average. Clerks (0.4), salespersons and personal service workers (1.0) and professionals (1.5) had rates well below the all-workforce average. The broad occupation groups with the higher rate of death generally had the higher number of deaths, with the exception of tradespersons, which had the fourth highest number of deaths, but a rate (5.3) close to the all-workforce average (Figures 5.9 and 5.10 and Table 5.6).

Fig 5.9 Occupation of working persons - working deaths Number. Australia, 1989 to 1992

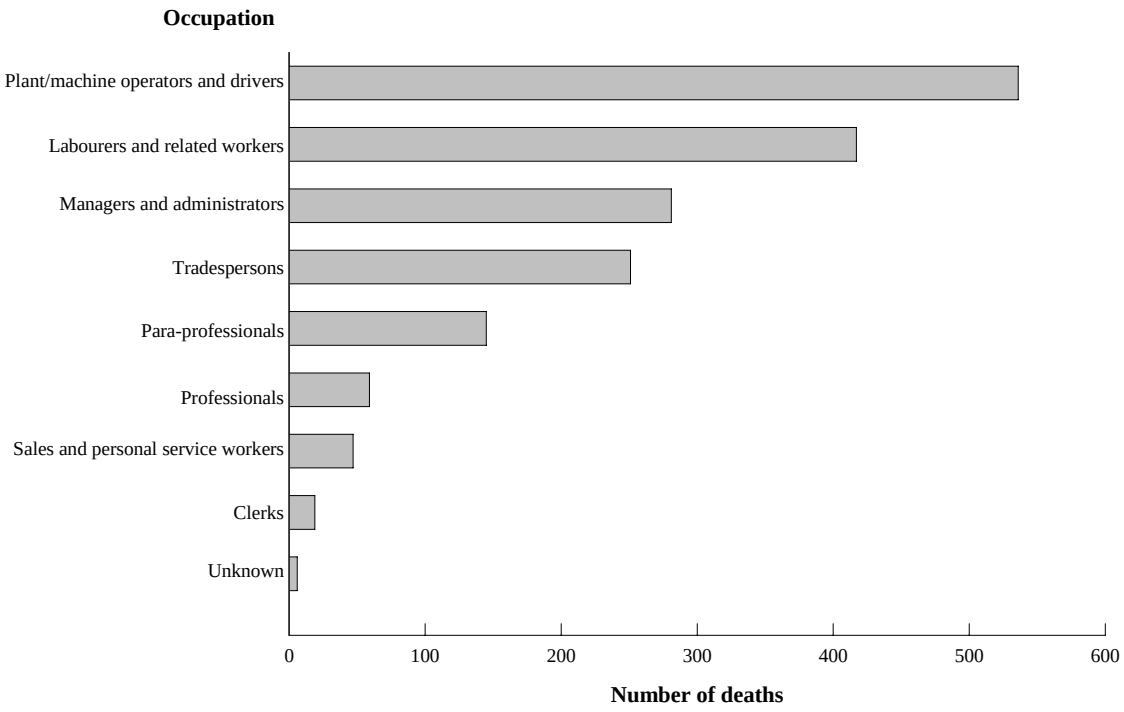
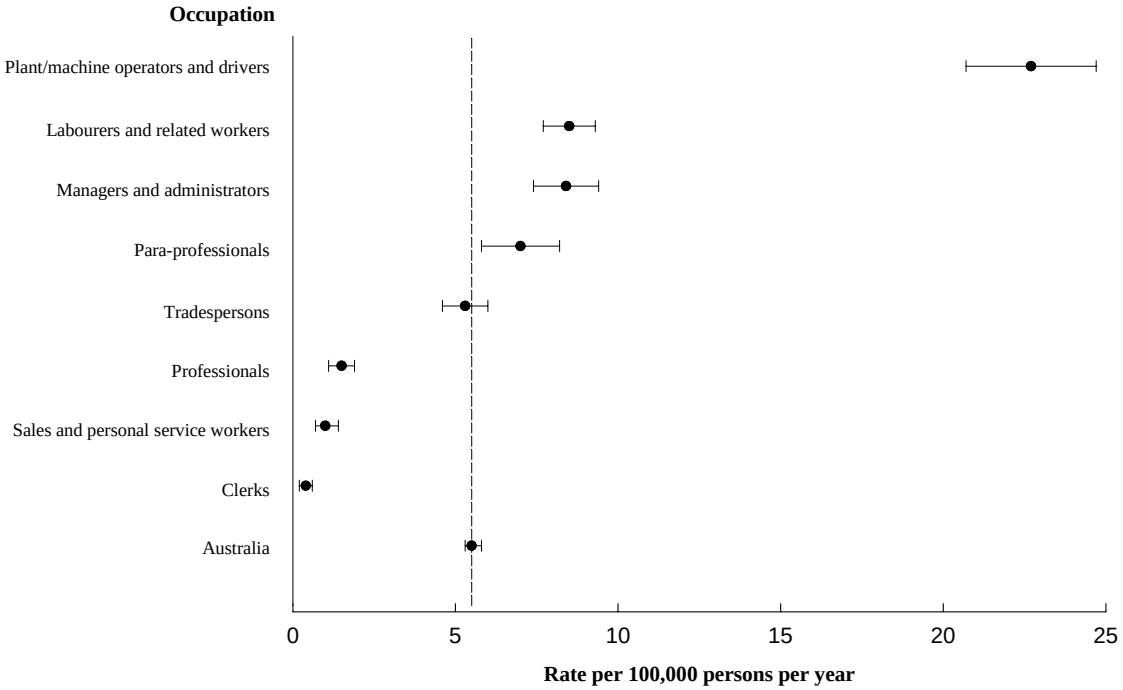


Fig 5.10 Occupation of working persons - working deaths Rate[1] (CI[2]). Australia, 1989 to 1992



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

Table 5.6 Occupation of working persons - working deaths Number, percent, rate[1] (CI[2]). Australia, 1989 to 1992

Occupation	Number	%	Rate	CI
Managers and administrators	295	16.5	8.4	*7.4-9.4*
Professionals	60	3.4	1.5	*1.1-1.9*
Para-professionals	148	8.3	7.0	*5.8-8.2*
Tradespersons	252	14.1	5.3	*4.6-6.0*
Clerks	19	1.1	0.4	*0.2-0.6*
Salespersons and personal service workers	47	2.6	1.0	*0.7-1.4*
Plant/machine operators and drivers	539	30.2	22.7	*20.7-24.7*
Labourers and related workers	422	23.6	8.5	*7.7-9.3*
Not known	5	0.3	-	-
Total	**1,787**	**100.0**	**5.5**	***5.3-5.8***

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

A broad occupational group, as used in this analysis, can mask large difference in rates between the small occupation groups (each with a more homogenous exposure to risk) that comprise it. The numbers killed and the rates of death for a selection of these more specific groups are shown in Table 5.7. The very high rate of death for particular occupation groups is clear. Fishing (122 deaths per 100,000 persons per year for fishermen/women and 58 for ship's pilots and deck officers, most of whom worked in fishing) and forestry (119) occupations, identified in WRFS 1 as being of very high risk, again stand out as being extremely dangerous occupations. Most striking is the rate for commercial pilots (197), most of whom were involved in crop-dusting, or small airplane freight or passenger transport. The rate for commercial pilots is based on 42 deaths, so it should be fairly stable, although the relatively small number of commercial pilots employed in Australia provides some uncertainty in the denominator. Nevertheless, the true rate of death for commercial pilots, estimated as 35 times the all-occupation average, is clearly very high. The mining occupations also had very high rates — 72 for drilling plant operators and 65 for mining labourers. Other occupation groups with high rates included structural steel labourers (43), truck drivers (41) and excavation and earthmoving machinery operators (38).

Table 5.7 Specific occupation groups of working persons – working deaths. Number, percent and rate[1] (CI[2]) Australia, 1989 to 1992

Occupation	Number	%	Rate	CI
Managers and administrators	**295**	**16.5**	**8.4**	***7.4-9.4***
Farmers	217	12.1	21.7	*18.8-24.6*
Professionals	**60**	**3.4**	**1.5**	***1.1-1.9***
Para-professionals	**148**	**8.3**	**7.0**	***5.8-8.2***
Pilots	55	3.1	197.4	*142.4-267.0*
Ship's pilots /deck officers	19	1.1	57.5	*34.2-90.7*
Police officers	19	1.1	11.3	*6.8-17.6*
Tradespersons	**252**	**14.1**	**5.3**	***4.6-6.0***
Electrical powerline workers	21	1.2	47.2	*29.2-72.1*
Electricians	39	2.2	13.0	*9.3-17.8*
Carpenters	18	1.0	4.3	*2.6-6.8*
Painters and decorators	10	0.6	5.4	*2.6-9.9*
Plumbers	21	1.2	10.1	*6.3-15.5*
All building tradespersons	65	3.6	6.2	*4.8-7.9*
Clerks	**19**	**1.1**	**0.4**	***0.2-0.6***
Salespersons and personal service workers	**47**	**2.6**	**1.0**	***0.7-1.4***
Plant/machine operators and drivers	**539**	**30.2**	**22.7**	***20.7-24.7***
Truck drivers	310	17.3	41.5	*36.9-46.1*
Excavation / earthmoving machinery operators	73	4.1	38.2	*29.9-48.0*
All mobile plant operators	110	6.2	27.6	*22.4-32.7*
Drilling plant operators	14	0.8	71.8	*39.5-120.5*
All stationary plant operators	41	2.3	16.4	*11.7-22.3*
Fixed machinery operators	20	1.1	3.2	*2.0-5.0*
Labourers and related workers	**422**	**23.6**	**8.5**	***7.7-9.3***
Farm hands	81	4.5	17.6	*13.8-22.2*
Forestry workers	36	2.0	119.0	*83.3-164.6*
All agricultural labourers	126	7.1	20.8	*17.0-24.6*
Structural steel labourers	20	1.1	42.8	*26.1-66.1*
Mining labourers	38	2.1	64.5	*45.7-88.6*
All construction and mining labourers	108	6.0	20.9	*17.0-24.9*
Security guards	15	0.8	12.0	*6.7-19.7*
Fishermen/women, etc	52	2.9	122.2	*88.9-164.2*
Not known	**5**	**0.3**	**-**	**-**
Total	**1,787**	**100.0**	**5.5**	***5.3-5.8***

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

5.7 EMPLOYMENT ARRANGEMENT

Employment arrangements are considered in detail in Chapter 9. They are mentioned briefly here. Of the 1,787 workers fatally injured as a result of work, about one fifth were self-employed. Most of the rest were employees (Table 5.8).

Table 5.8 Working arrangement of working persons - working deaths Number, percent, rate[1] (CI[2]). Australia, 1989 to 1992

Occupation	Number	%	Rate	CI
Wage/salary	1,357	75.6	5.0	*4.7 – 5.2*
Self employed	379	21.2	8.4	*7.5 – 9.2*
Unpaid	28	1.6	6.6	*3.9 – 10.4*
Other / unknown	23	1.3	-	-
Total	**1,787**	**100.0**	**5.5**	***5.3-5.8***

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

On a crude basis, the rate of death was about 70% higher in self-employed workers compared to employees (8.4 vs 5.0). However, this result was biased by the higher proportion of self-employed persons in many of the high-risk industries. Once standardised by differences in industry distribution, the rates for self-employed workers and employees were very similar (6.0 vs 5.8). Industry-specific rates showed that self-employed persons did not have a consistently higher rate of death than employees. Compared to the fatality rates for employees, the self-employed fatality rate was markedly higher in the mining industry and considerably lower in the construction industry. Unpaid family helpers had a similar fatality rate (18.2 per 100,000 persons per year) to the employed and self-employed persons in the agriculture industry, which

was the only industry where there was more than one death of an unpaid family helper (Table 5.9).

Table 5.9 Industry by employment arrangement - working deaths Rate[1] (CI[2]) per year. Australia, 1989 to 1992

Industry	Wage/salary	Self employed	Unpaid	Ratio wage : self[3]	Total
Agriculture	22.2	19.0	18.2	1.2	20.6
Forestry and logging, fishing and hunting	95.7	93.4	40.1	1.0	94.5
Mining	33.5	144.3	0.0	0.2	36.1
Manufacturing	3.0	2.2	0.0	1.4	3.0
Electricity, gas and water	6.5	0.0			6.8
Construction	13.5	5.2	0.0	2.6	10.4
Wholesale and retail trades	1.7	2.2	0.0	0.8	1.8
Transport and storage	23.9	19.1	0.0	1.3	23.0
Communication	2.4	0.0	0.0		2.4
Finance, property and business services	1.2	1.7	0.0	0.8	1.3
Public admin and defence	3.2	0.0	0.0		3.2
Community services	1.2	1.4	0.0	0.9	1.2
Recreation, personal and other services	3.5	3.4	0.0	1.0	3.5
Not known					
Overall mortality rate	**5.0**	**8.4**	**6.6**	**0.6**	**5.5**
95% CI	**4.7 – 5.2**	**7.5 – 9.2**	**3.9 – 10.4**		**5.3 – 5.8**
Adjusted mortality rate[4]	**5.8**	**6.0**	**1.1**		

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: 95% confidence interval.
3: Ratio of the rate for wage/salary earners to the rate for self-employed persons
4: Directly adjusted rates: rates from each employment arrangement group have been adjusted by the national industry distribution (9 cases {or 0.5% of 1,709} for whom industry was not known have been distributed proportionately across industries for each employment arrangement group).

5.8 JURISDICTION

The numbers killed and the rates of death differed significantly between jurisdictions, with the Northern Territory, Tasmania and Queensland having the highest rates, the Australian Capital Territory and Victoria having low rates, and the remaining jurisdictions having a rate close to the average for the whole of Australia (Figures 5.11 and 5.12 and Table 5.10). Seventy–five percent of deaths occurred in the three most populous jurisdictions — New South Wales, Queensland and Victoria. The general decline in working deaths over the four-years of the study that was seen for Australia was evident in most jurisdictions, with departures from this general decline being consistent with random variability, especially in the smaller jurisdictions. (Tables 5.11 to 5.13).

Fig 5.11 Jurisdiction of working persons - working deaths Number. Australia, 1989 to 1992

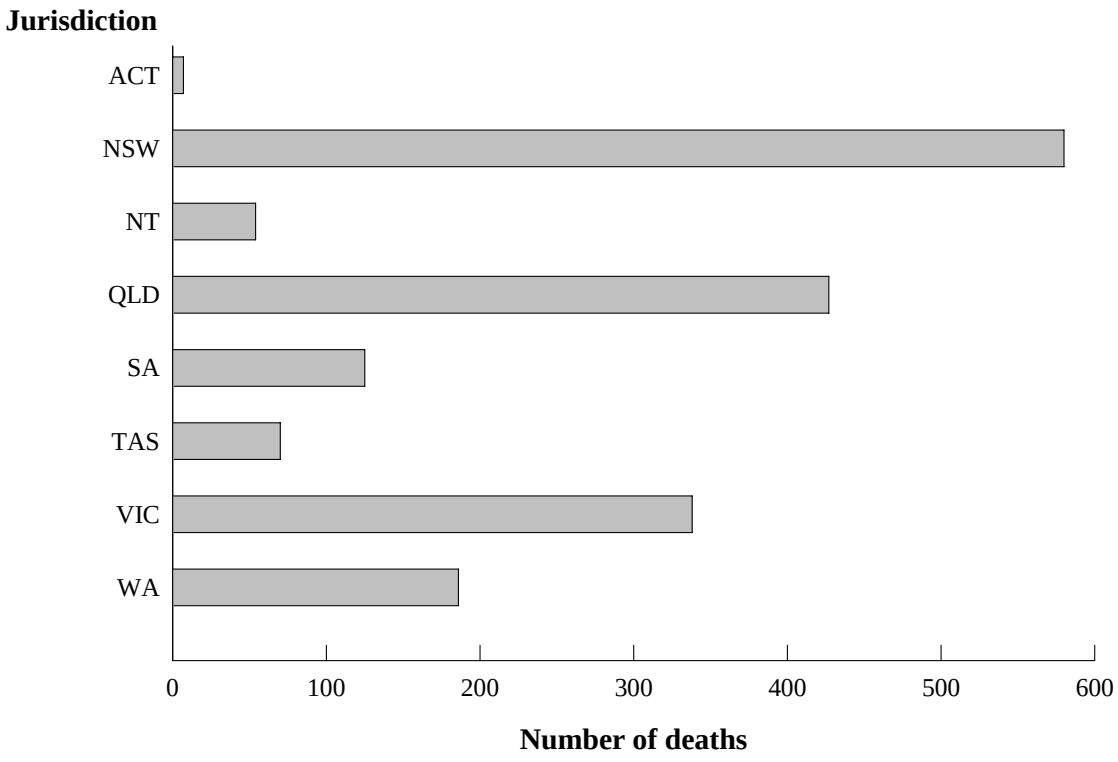
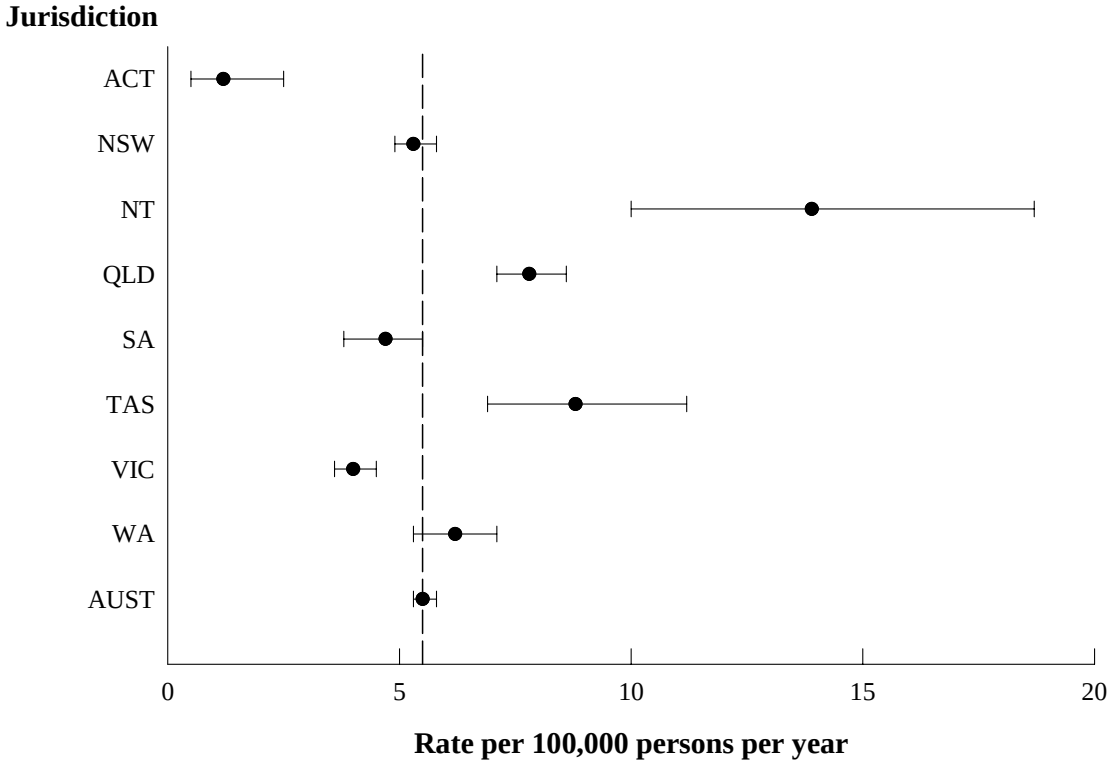


Fig 5.12 Jurisdiction of working persons - working deaths Rate[1] (CI[2]). Australia, 1989 to 1992



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

Table 5.10 Jurisdiction of working persons - working deaths Number, percent, rate[1] (CI[2]). Australia, 1989 to 1992

Jurisdiction	Number	%	Rate	CI
ACT	7	0.4	1.2	*0.5-2.5*
NSW	580	32.5	5.3	*4.9-5.8*
NT	54	3.0	13.9	*10.0-18.7*
QLD	427	23.9	7.8	*7.1-8.6*
SA	125	7.0	4.7	*3.8-5.5*
TAS	70	3.9	8.8	*6.9-11.2*
VIC	338	18.9	4.0	*3.6-4.5*
WA	186	10.4	6.2	*5.3-7.1*
Australia	**1,787**	**100.0**	**5.5**	**5.3-5.8**

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

Table 5.11 Jurisdiction of working persons – working deaths Number and percent per year. Australia, 1989 to 1992

Jurisd.	1989		1990		1991		1992		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
ACT	2	*0.4*	2	*0.4*	2	*0.5*	1	*0.3*	7	*0.4*
NSW	159	*31.2*	151	*32.8*	143	*33.8*	127	*32.3*	580	*32.5*
NT	18	*3.5*	17	*3.7*	9	*2.1*	10	*2.5*	54	*3.0*
QLD	126	*24.7*	112	*24.3*	97	*22.9*	92	*23.4*	427	*23.9*
SA	32	*6.3*	29	*6.3*	28	*6.6*	36	*9.2*	125	*7.0*
TAS	21	*4.1*	21	*4.6*	15	*3.5*	13	*3.3*	70	*3.9*
VIC	94	*18.4*	79	*17.1*	90	*21.3*	75	*19.1*	338	*18.9*
WA	58	*11.4*	50	*10.8*	39	*9.2*	39	*9.9*	186	*10.4*
AUST	**510**	***100.0***	**461**	***100.0***	**423**	***100.0***	**393**	***100.0***	**1,787**	***100.0***

Table 5.12 Jurisdiction of working persons - working deaths Rate[1] (CI[2]) per year. Australia, 1989 to 1992

Jurisdiction	1989	1990	1991	1992	Total	CI
ACT	1.4	1.4	1.4	0.7	1.2	*0.5-2.5*
NSW	6.0	5.6	5.1	4.7	5.3	*4.9-5.8*
NT	20.6	14.3	7.9	12.7	13.9	*10.0-18.7*
QLD	9.4	8.1	7.2	6.7	7.8	*7.1-8.6*
SA	5.0	4.1	4.1	5.6	4.7	*3.8-5.5*
TAS	10.8	10.5	7.2	6.8	8.8	*6.9-11.2*
VIC	4.5	3.7	4.1	3.7	4.0	*3.6-4.5*
WA	7.9	6.6	5.0	5.3	6.2	*5.3-7.1*
Australia	**6.4** ***(5.9-7.0)***	**5.6** ***(5.1-6.1)***	**5.1** ***(4.6-5.6)***	**5.0** ***(4.5-5.5)***	**5.5** ***(5.3-5.8)***	

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

Table 5.13 Industry by jurisdiction - working deaths Rate[1] per year. Australia, 1989 to 1992

Industry	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	AUST
Agriculture	-	23.5	35.4	28.7	17.4	30.6	12.1	16.0	20.6
Forestry and logging	-	113.9	-	85.0	80.8	163.8	63.2	71.8	97.2
Fishing and hunting	-	59.8	-	97.7	124.7	128.4	90.6	99.8	92.5
Mining	-	32.3	58.5	27.3	87.0	8.3	19.5	43.2	36.1
Manufacturing	8.9	2.9	38.0	3.8	1.2	6.1	2.7	2.6	3.0
Electricity, gas and water	16.5	8.1	-	1.8	5.2	7.0	5.4	12.6	6.8
Construction	-	10.4	31.7	11.7	10.3	19.3	10.0	6.8	10.4
Wholesale and retail trades	1.1	1.9	3.6	2.0	1.7	4.0	1.5	1.6	1.8
Transport and storage	-	23.6	47.2	27.0	20.9	12.1	19.6	25.3	23.0
Communication	-	3.2	-	2.4	2.5	-	1.9	2.4	2.4
Finance, property and business services	1.5	1.3	-	2.1	-	-	1.4	1.5	1.3
Public admin and defence	-	3.1	3.3	9.7	2.1	2.2	1.3	3.6	3.2
Community services	1.6	1.2	1.3	1.7	0.9	0.6	1.3	0.7	1.2
Recreation, personal and other services	-	2.5	21.2	7.2	1.1	4.9	3.4	0.8	3.5
Not known									
Overall mortality rate	**1.2**	**5.3**	**13.9**	**7.8**	**4.7**	**8.8**	**4.0**	**6.2**	**5.5**
Adjusted mortality rate[2]	**2.3**	**5.6**	**15.7**	**7.1**	**5.1**	**6.6**	**4.4**	**4.9**	**5.5**
Adjusted mortality rate[3]	**1.8**	**5.6**	**12.0**	**7.0**	**4.8**	**7.0**	**4.5**	**5.1**	**5.5**

1: Incidence rates — deaths per 100,000 persons per year — based on ECLF.
2: Directly adjusted rates: rates from each jurisdiction have been adjusted by the national industry distribution (9 cases {or 0.5% of 1,709} for whom industry was not known have been distributed proportionately across industries for each jurisdiction).
3: Indirectly adjusted rates: denominators from each jurisdiction have been adjusted by the national distribution of rates (9 cases {or 0.5% of 1709} for whom industry was not known have been distributed proportionately across industries).

Given the different industry distributions between jurisdictions, and the differences in hazards faced within the same industries between jurisdictions, comparisons between jurisdictions have limitations. However, if such comparisons are considered, the potential effect of factors specific to industry and occupation need to be taken into account. The extent to which differences between jurisdictions were due to different industry mixes can be examined in a number of ways. The most informative is to look at industry–specific rates for each jurisdiction. However, this requires consideration of a substantial amount of information. An alternative is to adjust (or standardise) the rates to take account of differences in the industry mix between jurisdictions and to

compare the standardised rates. Standardisation by industry takes account of differences in industry mix to some extent, although the final adjusted rate is affected by the mix of industries used in the standardisation procedure. Such methods also do not take into account the fact that hazards within the same industry can differ between jurisdictions.

The fatality rates for each jurisdiction were standardised using both direct and indirect methods. Direct standardisation used the industry distribution for the whole of Australia, while indirect rates used the Australian industry-specific rates. Standardised rates for the smaller jurisdictions (Australian Capital Territory, Northern Territory and Tasmania) may be somewhat unstable because they had very low numbers of deaths for some industry categories. The biggest difference between adjusted and unadjusted rates was in Western Australia and Tasmania. This probably reflects the larger proportion of deaths in these jurisdictions that occurred in industries which had a lower proportion at the national level (eg fishing and mining). Differences between the directly and indirectly adjusted rates arise from the different approaches used to calculate the rates. For reasons discussed previously (Section 2.8), the directly standardised rates are considered to be more appropriate (Table 5.13).

There was considerable variation in the rates of fatal injury for major industries (those with reasonably large numbers of deaths and workers) between States and Territories. The Northern Territory had comparably much higher rates in many industries, but the small number of deaths meant that industry-specific rates in the Northern Territory were somewhat unstable. This is considered in more detail in Chapter 6 (see Table 6.5).

5.9 AGENCY OF INCIDENT

INTRODUCTION

There were two main components to the coding of agency:

- **agency of injury -** This was defined as the object, substance or physical condition which made contact with the person to **directly cause the injury**. This may or may not have been the agency most 'responsible' for the incident. Only one agency of injury was coded for each incident.
- **agency of incident -** This was defined as the object, substance or physical condition which was **most responsible** for the incident occurring or that was most intimately involved in the incident. Up to three such agencies were coded for each incident.

For example, if someone suffered a fatal head injury following a fall to the ground from a ladder, the agency of the injury would be the surface onto which they fell and the ladder would be an agency of the incident. The agency of the incident was considered more relevant for prevention purposes than the agency of injury, because the agency of injury may have been irrelevant to the fatal outcome of the incident. This Section considers only the agency of the incident.

Up to three significant agencies were coded for each incident — 38% of deaths had only one agency coded, 49% had two agencies coded and 13% had three agencies coded. The percentages for each agency presented in this Section, and shown in the tables and figures, refer to the percentage of all deaths in which that agency was involved. Since each death could have more than one agency involved, the total percentages can add up to more than 100.

RESULTS

Vehicles were involved in 56% of fatalities, with trucks and buses being the single largest category. Most of the fatal incidents involved motor vehicles and occurred on public roads. Environmental agencies (such as water, rough or slippery terrain, unstable walls and buildings) were significantly involved in 31% of the deaths. Materials, substances and chemicals (such as electricity and toxic gases) were involved in 17% of deaths and machinery and fixed plant in 17%. When only workplace deaths were considered, the predominance of vehicles as the key agencies diminished, with environmental agencies, machinery and fixed plant, and materials, substances and chemicals being the most common categories. (Figure 5.13 and Table 5.14). Of the deaths from incidents involving motor vehicle incidents on public roads, almost half primarily involved trucks and prime movers. Another 42% primarily involved cars, utilities, etc, but virtually all types of vehicles were involved in one or more incidents (Table 5.15).

Fig 5.13 Key agencies involved in the fatal incident - workplace and working deaths
Percent of all workplace and working deaths. Australia, 1989 to 1992

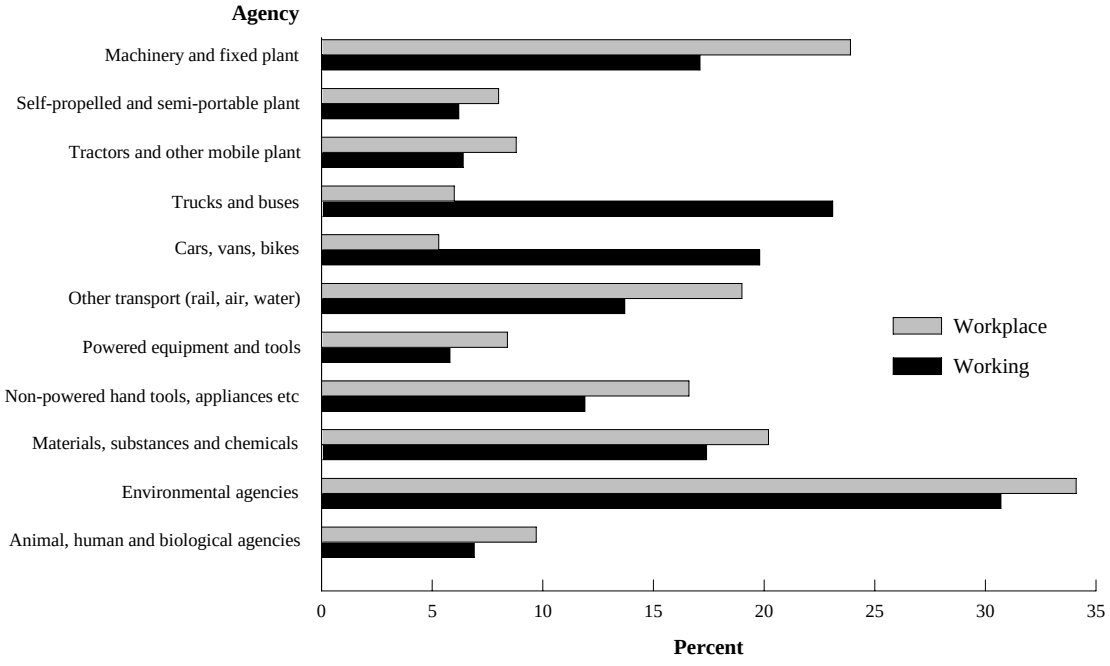


Table 5.14 Key agencies involved in fatal incidents - workplace and working deaths. Percent[1]. Australia, 1989 to 1992

Agency	Workplace only n = 1,244	All working n = 1,787
Machinery and fixed plant	23.9	17.1
Self propelled and semi-portable plant	8.0	6.2
Tractors and other mobile plant	8.8	6.4
Trucks and buses	6.0	23.1
Cars, vans, bikes etc	5.3	19.8
Other transport (rail, air, water)	19.0	13.7
Powered equipment and tools	8.4	5.8
Non-powered hand tools, appliances and equipment	16.6	11.9
Materials, substances and chemicals[2]	20.2	17.4
Environmental agencies[3]	34.1	30.7
Animal, human and biological agencies	9.7	6.9

1: Percentage of deaths with each agency group involved. Percentages do not add to 100 because each incident may have had up to three relevant agencies recorded.
2: Includes toxic gases.
3: Includes water, rough or slippery terrain, holes in the ground, and unstable walls and buildings.

The overall pattern of key agency distribution differed substantially when examined on an industry basis, reflecting the different hazards between industries. For example, the most commonly involved agencies in manufacturing were machinery and fixed plant, and materials and substances; in agriculture, they were environmental agencies and tractors; in wholesale and retail trade, they were vehicles and machinery and fixed plant; and in the defence industry, they were vehicles and environment (Table 5.16).

Similar differences in the types of key agencies involved were seen across the various occupations, reflecting the specific hazards associated with different occupations. For example, machinery and fixed plant were the most commonly involved key agencies for tradespersons and plant and machinery operators and drivers, whereas environmental agencies and tractors were the most commonly involved key agencies in the management group (who were mainly farmers) (Table 5.17).

There were also variations between jurisdictions in the prevalence of involved agencies. These probably reflect differences in the industry and/or occupation distribution and are not discussed further in this thesis.

Table 5.15 Motor vehicles[1] involved in work-related motor vehicle incident deaths on public roads. Number and percent Australia, 1989 to 1992.

Vehicle type	Number	%	Number	%
Car, etc				
Panel van	22	9.6		
Utility	43	18.8		
Other	164	71.6		
Total cars etc	**229**	**100.0**	229	42.2
Motorcycle, trail bike, bicycle			27	5.0
Bus			5	0.9
Truck				
Light truck	8			
Table top truck	24			
Pantechnic	13			
Tip or cement truck	6			
Other truck	10			
Total truck	**61**	**100.0**	61	11.2
Prime mover				
Table top prime mover	87			
Pantechnic prime mover	13			
Prime mover other or unknown	90			
Total prime mover	**190**	**100.0**	190	35.0
Plant, tractor, other			21	3.9
Not known			10	1.8
Total			**543**	**100.0**

1: The vehicle identified is the vehicle in which the deceased was a driver or passenger, or the vehicle that struck the deceased if the deceased is a pedestrian.

Table 5.16 Key agencies involved in fatal incidents by industry - working deaths Percent[1]. Australia, 1989 to 1992

Industry	n[2]	Fixed plant	Other mobile plant	Tractors etc	Trucks buses etc	Cars vans bikes	Rail air water	Powered tools etc	Hand tools etc	Materials etc	Environ -ment	Animal human etc
Agriculture	334	13	2	26	7	16	14	9	10	14	37	12
Forestry and logging	44	2	9	7	7	-	-	11	5	55	52	2
Fishing and hunting	60	3	5	-	-	3	86	5	12	15	37	10
Mining	138	16	20	4	18	12	7	5	8	28	47	1
Manufacturing	141	48	4	1	13	13	4	5	16	31	21	3
Electricity, gas and water	29	52	3	-	7	34	10	-	21	28	24	3
Construction	234	32	18	2	13	13	3	6	27	22	33	-
Wholesale and retail trades	118	18	1	2	25	47	4	9	12	16	12	9
Transport and storage	370	8	1	0	66	14	18	0	6	11	27	2
Communication	13	8	-	-	39	54	-	-	8	8	15	-
Finance, property and business services	48	17	6	4	13	35	6	21	8	17	18	17
Public administration	43	5	9	2	16	23	30	5	2	7	49	9
Defence	50	4	-	-	6	30	50	4	4	10	22	2
Community services	71	1	7	3	14	52	6	10	11	7	28	14
Recreation, personal and other services	85	14	-	6	5	27	12	7	15	9	24	34
Total	**1,787**	**17**	**6**	**6**	**23**	**20**	**14**	**6**	**12**	**18**	**31**	**7**

1: Percentage of deaths with each agency group involved. Percentages do not add to 100 because each incident may have had up to three relevant agencies recorded.
2: Number of deaths in each industry group (nine persons had an unknown industry and are only included in the total row of the table).

Table 5.17 Key agencies involved in fatal incidents by occupation - working deaths Percent[1]. Australia, 1989 to 1992

Occupation	n[2]	Fixed plant	Other mobile plant	Tractors etc	Trucks buses etc	Cars vans bikes	Rail air water	Powered tools etc	Hand tools etc	Materials etc	Environ -ment	Animal human etc
Managers and administrators	295	13	1	23	9	20	13	10	8	15	37	13
Professionals	60	7	5	2	12	35	27	8	10	15	30	12
Para-professionals	148	9	-	1	3	23	58	3	3	8	35	14
Tradespersons	252	36	5	3	6	13	5	9	27	27	28	7
Clerks	19	5	5	-	26	58	11	5	5	5	16	11
Salespersons and personal service workers	47	2	2	2	30	53	9	15	6	17	15	19
Plant/machine operators and drivers	539	14	13	2	55	18	5	2	6	15	28	1
Labourers and related workers	422	20	5	6	11	17	14	6	18	21	32	5
Total	**1,787**	**17**	**6**	**6**	**23**	**20**	**14**	**6**	**12**	**18**	**31**	**7**

1: Percentage of deaths with each agency group involved. Percentages do not add to 100 because each incident may have had up to three relevant agencies recorded.
2: Number of deaths in each occupation group (five persons had an unknown occupation and are only included in the total row of the table).

5.10 MECHANISM OF INCIDENT

5.10.1 INTRODUCTION

Up to two mechanisms were coded for each incident. The mechanism described the physical event that best described the circumstances of the fatal incident. For example, in the scenario described previously involving a fall from a ladder, the mechanism would be coded as 'fall from a height'. If the person fell because they suffered a non-fatal electric shock from a handtool they were using while on the ladder, the 'fall from a height' would be coded as the first mechanism and 'contact with electricity' as the second.

Since only 6.0% of workplace cases had two mechanisms coded, the information presented here describes only the primary mechanism.

5.10.2 RESULTS

Vehicle incidents (mainly involving motor vehicles) were by far the most common mechanisms involved in the fatal incidents, accounting for 37% of all working deaths and virtually all the commuting deaths. About three quarters of these incidents primarily involved motor vehicles of some sort (76%), with the rest primarily involving aircraft (17%), mobile equipment (2%) or trains (2%). Being hit by moving objects (28%) was the next most common mechanism. Since pedestrian deaths are coded to this category, it is clear that motor vehicles play a major role in the death of working persons.

Looking only at workplace deaths (ie excluding vehicle incidents on public roads), the most common mechanism was being hit by moving objects (36%). Other mechanisms involved in a significant number of workplace deaths were vehicle incidents not on

public roads (15%), falls (14%), contact with electricity (9%) and drowning (8%) (Figure 5.14. and Table 5.18). Almost all fatal falls were from a height. The majority of the incidents in which people were hit by moving objects involved being hit by falling objects and being hit by vehicles. Among weapons, firearms were the most commonly involved in the fatal incident. (Figure 5.15 and Table 5.19).

Fig 5.14 Mechanism of the fatal incident - workplace and working deaths
Percent of all workplace and working deaths. Australia, 1989-1992

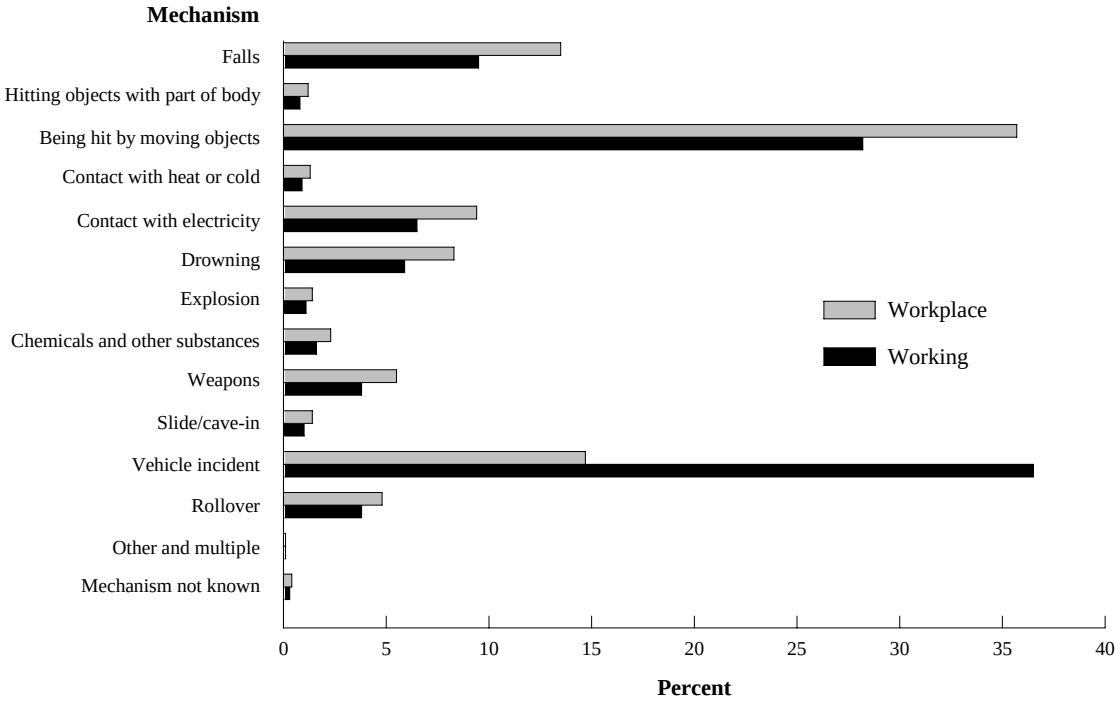


Table 5.18 Mechanism of the fatal incident by duty context Workplace, work-road and total working deaths Number and percent[1]. Australia, 1989 to 1992

Mechanism of fatal incident	Workplace		Work-road		Working	
	Number	%	Number	%	Number	%
Falls	168	13.5	2	0.4	170	9.5
Hitting objects part of body	15	1.2	-		15	0.8
Being hit by moving objects	444	35.7	61	11.2	505	28.2
Contact heat or cold	16	1.3	-		16	0.9
Contact electricity	117	9.4	-		117	6.5
Drowning	103	8.3	2	0.4	105	5.9
Explosion	18	1.4	1	0.2	19	1.1
Chemical other substances	29	2.3	-		29	1.6
Weapons	68	5.5	-		68	3.8
Slide or cave-in	17	1.4	-		17	1.0
Vehicle incident	183	14.7	470	86.6	653	36.5
Rollover	60	4.8	7	1.3	67	3.8
Other and multiple	1	0.1	-		1	0.1
Mechanism not known	5	0.4	-		5	0.3
Total	**1,244**	**100.0**	**543**	**100.0**	**1,787**	**100.0**

1: Percentage of deaths with each mechanism group involved.

Fig 5.15 Mechanism of fatal incidents involving being hit by moving objects Workplace and working deaths. Percent of relevant workplace and working deaths. Australia, 1989 to 1992

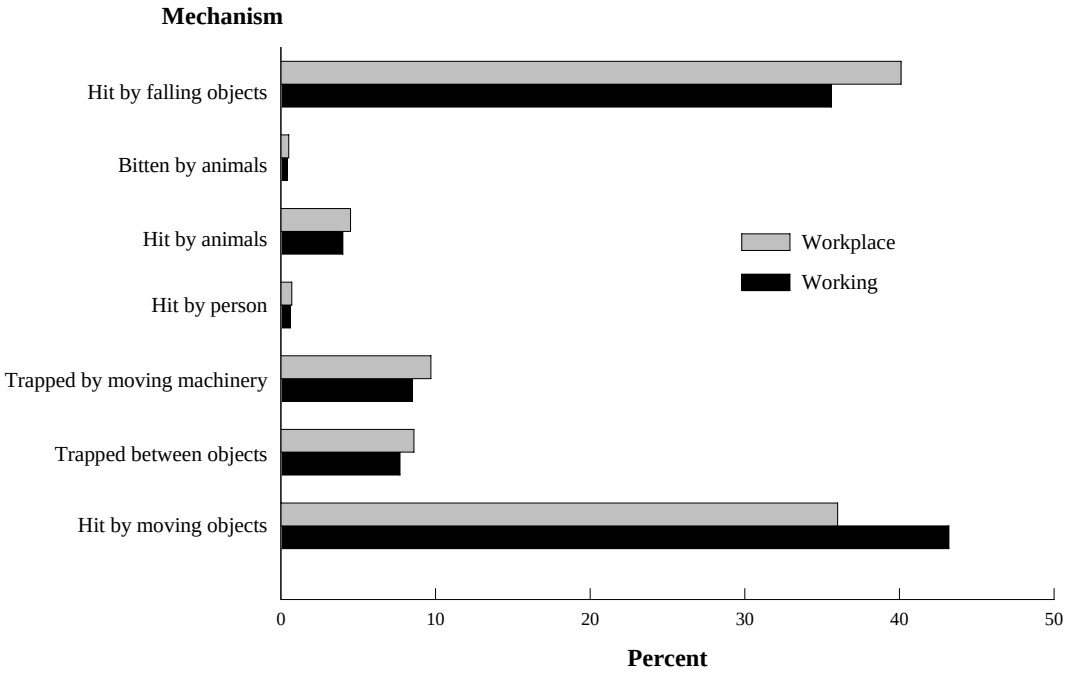


Table 5.19 Mechanism[1] of the fatal incident – specific mechanism groups Workplace, work-road and working deaths Number and percent[2]. Australia, 1989 to 1992

Mechanism of fatal incident	Workplace		Work-road		Working	
	Number	%	Number	%	Number	%
Fall from height	159	94.7	2	100.0	161	94.6
Other falls	9	5.3	-		9	5.4
Total falls	**168**	**100.0**	**2**	**100.0**	**170**	**100.0**
Hit by falling objects	178	40.1	2	3.3	180	35.6
Bitten by animals	2	0.5	-		2	0.4
Hit by animals	20	4.5	-		20	4.0
Hit by person	3	0.7	-		3	0.6
Trapped by moving machinery	43	9.7	-		43	8.5
Trapped between objects	38	8.6	1	1.6	39	7.7
Hit by moving objects	160	36.0	58	95.1	218	43.2
Total hit by moving objects	**444**	**100.0**	**61**	**100.0**	**505**	**100.0**
Weapons — firearm	50	73.5	-		50	73.5
Weapons — knife, etc	11	16.2	-		11	16.2
Weapons — other	7	10.3	-		7	10.3
All weapons	**68**	**100.0**	**-**		**68**	**100.0**

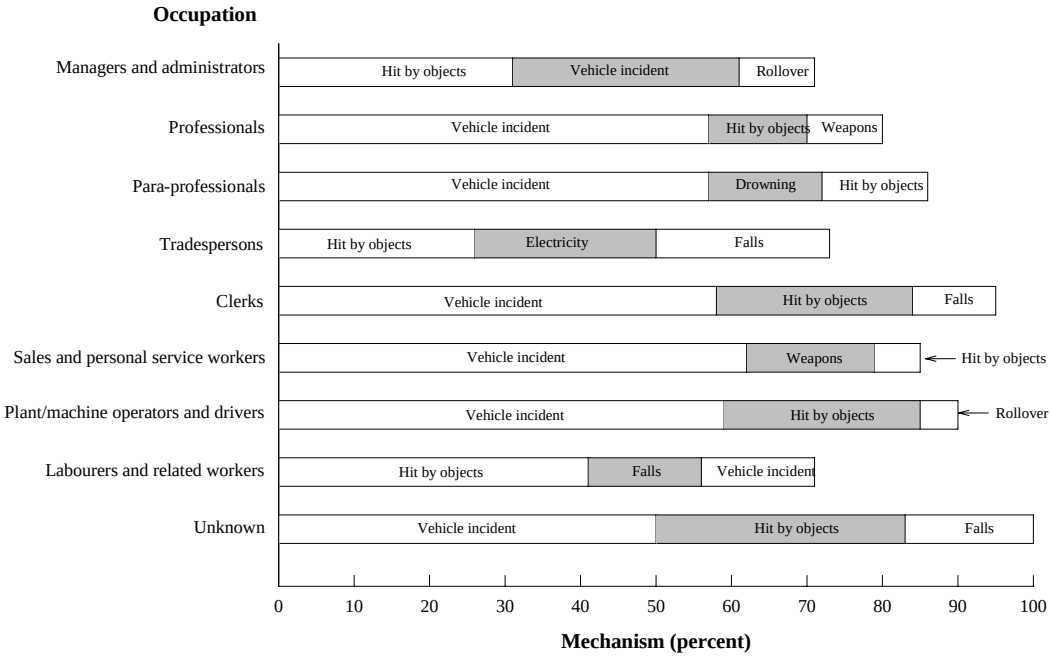
1: Some broad mechanisms with more detailed categories are examined in this table.
2: Percentage of deaths within each broader mechanism group.

The mechanism of the fatal incident varied widely with different industries and occupations, again reflecting the specific hazards faced in each area (Tables 5.20 and 5.21). The predominance of motor vehicle incidents is seen in many of the occupation and industry groups. Other combinations of note included:

- falls accounted for about one quarter of the deaths in the construction and recreation industries and of tradespersons;
- being hit by moving objects was a particular problem for the forestry industry (usually falling trees) and for labourers (commonly falling objects and vehicles);
- contact with electricity was the main mechanism in one-third of the deaths in the electricity, gas and water industry (mainly during work with high voltage wires) and about one fifth of deaths in the construction industry and of tradespersons;
- drowning accounted for 80% of the deaths in the fishing industry;

- weapons were involved in 17% of deaths in the finance and property industry, 14% of deaths in the community services industry and in 17% of the deaths of salespersons and personal service workers; and
- rollovers were mainly a problem in the agricultural and forestry industries and for farmers (who are included in the managers and administrators group) (Figures 5.16 and 5.17).

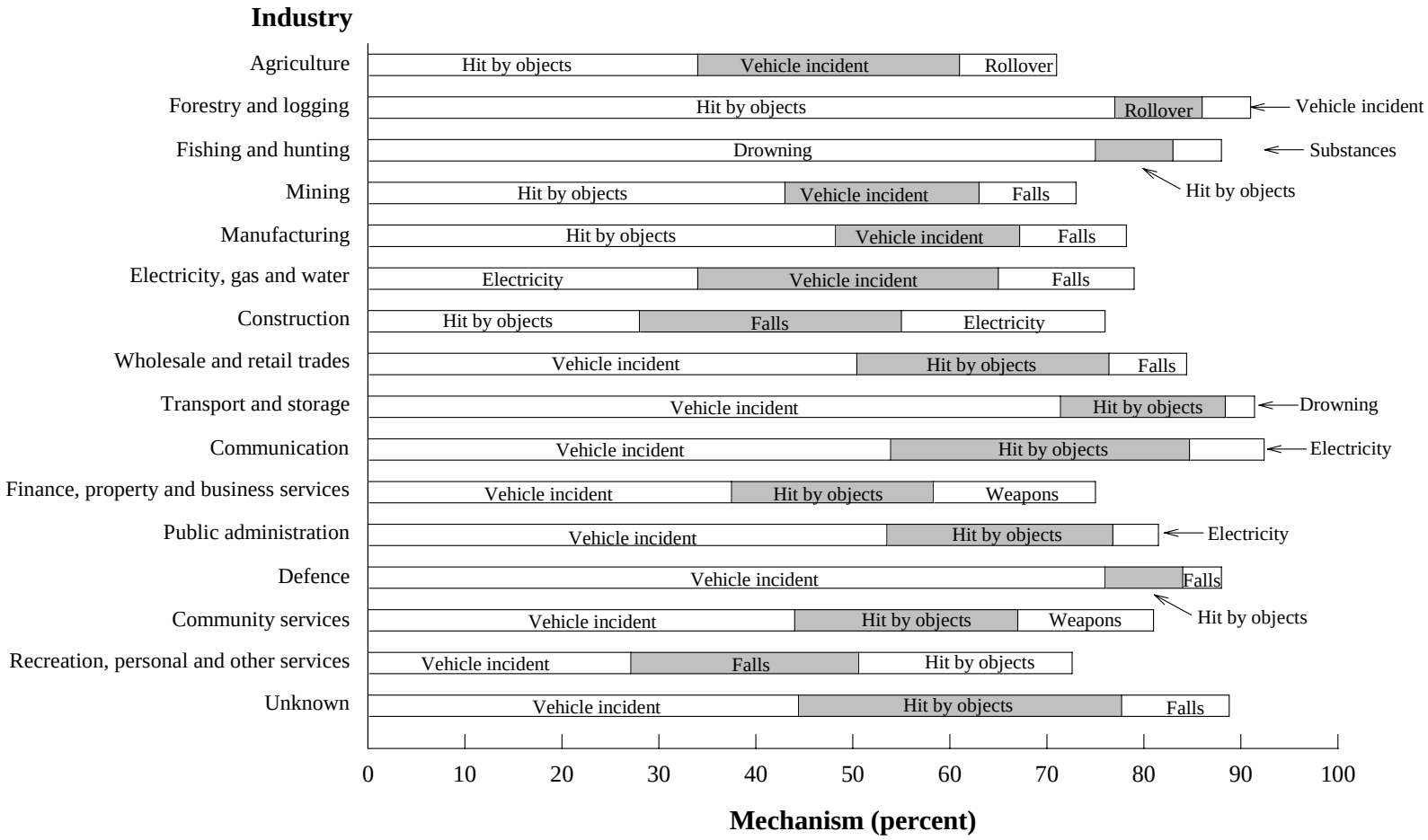
Fig 5.16 Mechanism[1] of the fatal incident for each occupational group - working deaths
Percent of each occupational group. Australia, 1989 to 1992



1: The three most common mechanisms are shown for each occupation.

A consideration of the different agencies involved with certain mechanisms provides further insight into common circumstances. For example, mechanisms where there was contact with electricity commonly involved fixed plant and tools, rollovers commonly involved tractors and environment (uneven or slippery ground), and explosions commonly involved materials (the explosive substance), tools and fixed plant. Aspects of the physical environment were involved in over a third of incidents in many of the mechanism groups (Table 5.22).

Fig 5.17 Mechanism[1] of the fatal incident for each industry group - working deaths
Percent of each industry group. Australia, 1989 to 1992



1: The three most common mechanisms are shown for each industry.

Table 5.20 Mechanism of the fatal incident by industry- working deaths Percent[1]. Australia, 1989 to 1992

Industry	n[2]	Falls	Hitting objects	Hit by objects	Heat / cold[3]	Elect[4]	Drown[5]	Explode[6]	Substa[7]	Weapons[8]	Slide / cave-in	Vehicle incident	Rollover
Agriculture	334	6	2	34	2	5	5	0	1	7	1	27	10
Forestry and logging	44	-	2	77	-	2	-	-	2	-	-	5	9
Fishing and hunting	60	3	-	8	2	-	75	-	5	3	-	2	-
Mining	138	10	-	43	-	4	7	3	7	-	5	20	2
Manufacturing	141	11	1	48	2	8	1	4	4	-	-	19	1
Electricity, gas, water	29	14	-	3	7	34	7	-	3	-	-	31	-
Construction	234	27	0	28	-	21	2	1	0	-	2	13	5
Wholesale/retail trade	118	8	1	26	-	3	1	1	1	8	-	50	2
Transport and storage	370	3	1	17	0	1	3	1	1	1	0	71	1
Communication	13	-	-	31	8	8	-	-	-	-	-	54	-
Finance, property and business services	48	6	-	21	2	10	-	2	-	17	2	38	-
Public administration	43	2	2	23	-	5	2	-	-	5	2	53	5
Defence	50	4	-	8	2	-	4	2	-	4	-	76	-
Community services	71	6	1	23	1	1	6	-	-	14	-	44	3
Recreation, personal and other services	85	22	2	24	-	7	7	-	-	9	-	27	-
Total	**1,787**	**10**	**1**	**28**	**1**	**7**	**6**	**1**	**2**	**4**	**1**	**37**	**4**

1: Percentage of deaths within each industry group
2: Number of deaths in each industry group (nine persons had an unknown industry and are only included in the total row of the table)
3: Contact with heat or cold
4: Contact with electricity
5: Drowning
6: Explosion
7: Contact with chemicals and other substances
8: Weapons: includes firearms, knives, etc

Table 5.21 Mechanism of the fatal incident by occupation- working deaths Percent[1]. Australia, 1989 to 1992

Occupation	n[2]	Falls	Hitting objects	Hit by objects	Heat / cold[3]	Elect[4]	Drown[5]	Explode[6]	Substa[7]	Weapons[8]	Slide / cave-in	Vehicle incident	Rollover
Managers and administrators	295	6	1	31	2	5	4	0	1	9	1	30	10
Professionals	60	5	2	13	2	-	7	2	3	10	-	57	-
Para-professionals	148	5	-	14	1	2	15	-	1	3	-	57	1
Tradespersons	252	23	1	26	1	24	3	4	4	1	2	9	1
Clerks	19	11	-	26	-	-	-	-	-	1	-	58	-
Salespersons and personal service workers	47	4	-	6	-	4	6	-	-	17	-	62	-
Plant/machine operators and drivers	539	3	0	26	0	2	1	1	1	1	1	59	5
Labourers and related workers	422	15	2	41	1	6	12	1	2	3	1	15	2
Total	**1,787**	**10**	**1**	**28**	**1**	**7**	**6**	**1**	**2**	**4**	**1**	**37**	**4**

1: Percentage of deaths within each occupational group involved
2: Number of deaths in each occupation group (five persons with an unknown occupation and are only included in the total row of the table).
3: Contact with heat or cold
4: Contact with electricity
5: Drowning
6: Explosion
7: Contact with chemicals and other substances
8: Weapons: includes firearms, knives, etc

Table 5.22 Key agencies involved in the fatal incident by mechanism - working deaths Percent[1]. Australia, 1989 to 1992

Mechanism of fatal incident	n[2]	Fixed plant	Mobile plant	Tractors etc	Trucks buses etc	Cars vans bikes	Rail air water	Powered tools etc	Hand tools etc	Materials etc	Environ -ment	Animal human etc
Falls	170	26	1	1	5	2	2	2	40	21	46	12
Hitting objects with part of body	15	7	7	7	-	20	7	-	40	27	27	20
Being hit by moving objects	505	23	13	13	13	12	5	3	12	21	22	5
Contact heat/cold	16	19	6	-	-	6	6	-	6	63	31	-
Contact electricity	117	88	3	3	3	2	2	21	28	14	13	1
Drowning	105	1	1	-	-	4	65	-	10	10	64	5
Explosion	19	26	-	5	-	5	-	37	5	89	16	-
Chemical, other substances	29	10	14	-	-	-	21	3	14	45	55	24
Weapons	68	-	-	-	-	3	-	78	21	1	9	75
Slide/cave-in	17	-	29	-	-	-	-	-	12	82	82	-
Vehicle incident	653	3	2	1	50	42	21	-	1	11	26	1
Rollover	67	16	25	57	8	1	-	-	10	19	85	-
Other & multiple	1	-	-	-	-	-	-	-	-	-	-	100
Total	**1,787**	**17**	**6**	**6**	**23**	**20**	**14**	**6**	**12**	**18**	**31**	**7**

1: Percentage of deaths with each agency group involved. Percentages do not add to 100 because each incident may have had up to three relevant agencies recorded.
2: Number of deaths in each mechanism group (five persons had an unknown mechanism and are only included in the total row of the table).

5.11 PLACE OF INCIDENT

5.11.1 INTRODUCTION

Each workplace can have a variety of hazards. The risks at a particular workplace depend on the specific hazards and how well they are controlled, but similar types of workplaces usually have similar types of hazards and associated risks from exposure to those hazards. Knowledge of the types of workplaces where fatal incidents occur is therefore helpful in assessing the types of hazards likely to be present, the likely control measures that were or could have been used, and the possible approaches to prevention that might be appropriate. People are also likely to identify with particular types of workplaces with which they are familiar (eg farms, construction sites, factories). Therefore, summarising the features of fatal incidents on the basis of the type of place where they occur is a useful way of providing information to workers, employers and the general public.

The information on place presented in this Section is provided in several layers of increasing detail, from the general description of the place to a specific part of the site. It also includes consideration of the common mechanisms involved in fatal injuries that occur at particular places.

5.11.2 RESULTS

One third of the fatally injured working persons were injured on a public road, 20% on a farm or other rural workplace and 13% in an industrial or construction area. Mines or quarries (7%) and trade or service areas (7%) were the next most common places that fatal injuries occurred (Figure 5.18 and Table 5.23).

Fig 5.18 Level one place of fatal incident - workplace and working deaths Percent. Australia, 1989 to 1992

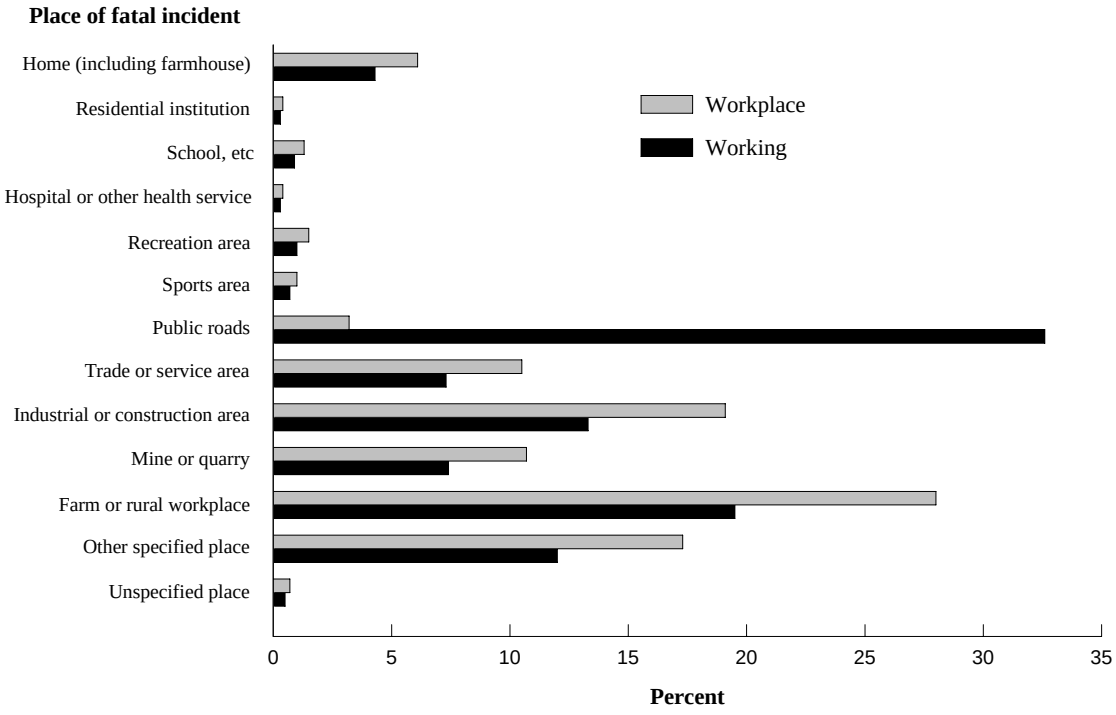


Table 5.23 Level one place of fatal incident[1] – workplace and working deaths. Number and percent. Australia, 1989 to 1992

Place of fatal incident	Workplace only		Working	
	Number	%	Number	%
Home (includes farmhouse)	76	6.1	76	4.3
Residential institution	5	0.4	5	0.3
School, other institution, or public administrative area	16	1.3	16	0.9
Hospital or other health service	5	0.4	5	0.3
Recreation area	18	1.5	18	1.0
Sports or athletics area	12	1.0	12	0.7
Street or highway (public roads)	40	3.2	583	32.6
Trade or service area	130	10.5	130	7.3
Industrial or construction area	237	19.1	237	13.3
Mine or quarry	133	10.7	133	7.4
Farm or rural workplace (excluding farmhouse)	348	28.0	348	19.5
Other specified place (includes bushland, open water, etc)	215	17.3	215	12.0
Unspecified place	9	0.7	9	0.5
Total	**1,244**	**100.0**	**1,787**	**100.0**

1: Based on Level 1 of NDSIS place variables.

The remaining results concentrate on workplace deaths. They therefore exclude the 543 working deaths that occurred in vehicle incidents on public roads, but still include vehicle incidents which occurred elsewhere. Farm or other rural workplaces (28%), industrial or construction areas (19%), mines or quarries (11%) and trade or service areas (11%) accounted for 68% of all workplace deaths. Farms accounted for 82% of the 348 rural workplace deaths. Factories or plants (42%) and construction sites (26%) were the main place of fatal injury of the 237 incidents that occurred on an industrial or construction site. Underground mines accounted for just over half the 133 fatal injuries that occurred in mines or quarries, while other trade areas (35%) and shops (18%) were the main place of fatal injury of the 133 deaths resulting from injuries that occurred in trade or service areas (Table 5.24).

Looking at the place of incident in more detail, 47% of workplace fatal injuries occurred somewhere external on a site and 19% in or around a structure other than a normal building (such as a home, office or shop) (Table 5.25). Paddocks/fields, roadways, factory yards/production areas and tunnels/trenches were common specific sites where the fatal injuries occurred, but most conceivable workplaces had at least one fatal incident (Table 5.26).

Table 5.24 Specific level one place[1] of fatal incident – workplace deaths Number and percent[2]. Australia, 1989 to 1992

Place of fatal incident	Number	Category percent[2]	Total percent[3]
Farm (excluding farmhouse)			
Farm	286	82.2	
Other rural place	41	11.8	
Timber plantation	6	1.7	
Rural workplace unspecified (excluding farmhouse)	15	4.3	
Total farm (excluding farmhouse)[4]	**348**	**100.0**	28.0
Industrial or construction area			
Factory or plant	100	42.2	
Construction site	61	25.7	
Other industrial area	27	11.4	
General industrial area	25	10.5	
Storage area	11	4.6	
Demolition site	8	3.4	
Industrial or construction area unspecified	5	2.1	
Total industrial or construction area	**237**	**100.0**	19.1
Mine or quarry			
Underground mine	68	51.1	
Open mine or quarry	40	30.1	
Other mine or quarry	6	4.5	
Oil or gas extraction facility	3	2.3	
Mine or quarry unspecified	16	12.0	
Total mine or quarry	**133**	**100.0**	10.7
Trade or service area			
Other trade area	46	35.4	
Shop	23	17.7	
Airport	16	12.3	
Warehouse	12	9.2	
Commercial eating place	8	6.2	
Amusement drinking place	8	6.2	
Bus or railway station	6	4.6	
Service station	5	3.8	
Office building	2	1.5	
Trade or service area unspecified	4	3.1	
Total trade or service area	130	100.0	10.4

1: Based on Level 1 of NDSIS place variables – selected major categories
2: Percentage of each major place category.
3: Percentage of all workplace deaths
4: There were an additional 18 fatalities where the incident occurred in a farmhouse.

Table 5.25 Level two place of fatal incident[1] – workplace and working deaths. Number and percent. Australia, 1989 to 1992

Place of fatal incident	Workplace only		All working	
	Number	%	Number	%
Parts of grounds, site, street	581	46.7	1,124	62.9
Structure	232	18.7	232	13.0
Body of water and surrounds	140	11.3	140	7.8
Part of building or structure	57	3.9	49	2.7
Room	55	4.4	55	3.1
Residual interior and exterior categories	173	13.9	173	9.7
Unspecified part of place	14	1.1	14	0.8
All working	**1,244**	**100.0**	**1,787**	**100.0**

1: Based on Level 2 of NDSIS place variables.

A more specific part of the place could be appropriately coded for 598 (48%) of the 1,244 workplace deaths. Twenty-four percent of workplace deaths involved some sort of transport vehicle (aircraft, boat or car/ truck/ bike) — these were not classed as work-road deaths as they did not occur on a public road. Other mobile equipment, tractors, ladders, roofs, horses and forklifts were the more common remaining specific places where the deceased person was at the time of the fatal incident. Note that the categories were not mutually exclusive (eg someone could have been standing on a ladder that was on a roof) (Table 5.27).

The most common mechanisms in various places were:

- electrocutions in homes (usually involving tradespersons) and on public roads (usually involving powerline workers);
- falls and being hit by falling and moving objects in trade areas, industrial/construction areas, mines and farms; and
- vehicle incidents on farms (Figure 5.19 and Table 5.28).

Table 5.26 Specific level two place[1] of fatal incident – workplace deaths Number and percent[2]. Australia, 1989 to 1992

Place of fatal incident	Number	%
Part of grounds, site or street		
Paddock or field	183	31.5
Roadway	86	14.8
Factory yard	55	9.5
Production area	54	9.3
Footpath or path	19	3.3
Railway tracks and surrounds (excludes railway station and crossing)	21	3.6
Driveway	19	3.3
Garden	20	3.4
Racecourse or racetrack	15	2.6
Car park	16	2.8
Stock yard or other outdoor animal enclosure	12	2.1
Railway crossing	3	0.5
Bridge	2	0.3
Pedestrian crossing	1	0.2
Playground without play equipment	1	0.2
Part of grounds, site or street unspecified	74	12.7
Total part of grounds, site or street	**581**	**100.0**
Structure		
Tunnel or trench	63	27.2
In or around a structure being erected, demolished or renovated	68	29.3
Specialised structures (silo, tank, pylon)	37	15.9
Shed	30	12.9
Workshop	23	9.9
Animal shelter or stable	5	2.2
Garage or carport	4	1.7
Structure unspecified	2	0.9
Total structure	**232**	**100.0**
Body of water and surrounds		
Sea, surf, bay or ocean	82	58.6
Wharf or jetty	25	17.9
River, creek, lake or reservoir	14	10.0
Dam	13	9.3
Swimming pool	3	2.1
Beach	2	1.4
Body of water unspecified	1	0.7
Total body of water and surrounds	**140**	**100.0**

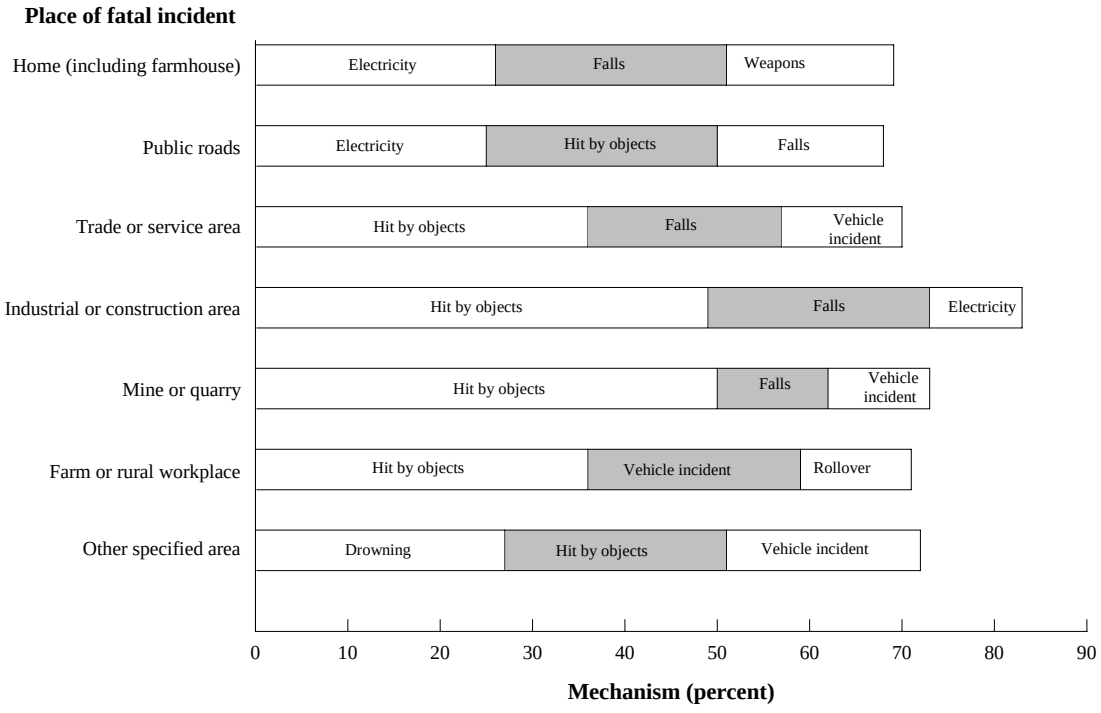
1: Based on Level 2 of NDSIS place variables.
2: Percentage of each major place category.

Table 5.27 Specific level three place of fatal incident – workplace deaths Number and percent[1]. Australia, 1989 to 1992

Place of fatal incident	Number	%
On board an aircraft	121	9.9
On board a boat	86	7.0
On board cars, trucks or bikes	80	6.6
On board an other mobile vehicle nec (eg. excavator, backhoe)	68	5.6
On board a tractor	65	5.3
Up a ladder	42	3.4
On a roof	41	3.4
On a horse	28	2.3
On board a forklift	23	1.9
On board an other non-mobile vehicle (eg. Cranes)	21	1.7
On either stairs on ladders	9	0.7
Area beneath a building	5	0.4
Escalator or elevator	5	0.4
On stairs	4	0.3
Not known	17	1.4

1: Percentage of all workplace deaths (n=1244) within each specific place group.

Fig 5.19 Mechanism[1] of the fatal incident for various places - workplace deaths Percent of each place. Australia, 1989 to 1992



1: The three most common mechanisms are shown for each place.

Table 5.28 Level one place of fatal incident[1] by mechanism– workplace deaths Percent. Australia, 1989 to 1992

Mechanism of fatal incident	Place of Incident						
	Home	Street	Trade	Industrial/ Construction	Mine	Farm	Other
	n = 76	n = 40	n = 130	n = 237	n = 133	n = 348	n = 271
Falls	16	18	21	24	12	7	8
Hitting objects part of body	1	5	2	0	1	1	1
Being hit by moving objects	18	25	36	49	50	36	24
Contact heat or cold	-	5	1	1	1	1	1
Contact electricity	26	25	10	10	3	7	8
Drowning	-	3	2	1	5	5	27
Explosion	5	-	1	3	4	-	1
Chemicals, other substances	1	-	-	3	7	1	3
Weapons	25	10	12	1	-	5	3
Slide or cave-in	-	-	1	3	5	1	-
Vehicle incident	7	3	13	3	11	23	21
Rollover	-	8	2	3	2	12	1
Other mechanisms	-	-	-	-	-	-	1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

1: Based on Level 1 of NDSIS place variables.

About one third of workplace deaths involved an unusual aspect of the place where the fatal incident occurred, such as height (18%), remoteness (11%), an awkward or cramped work space (5%) or a confined space (5%) (Table 5.29).

Table 5.29 Unusual place of fatal incident[1] – workplace and working deaths. Number and percent. Australia, 1989 to 1992

Place of fatal incident	Workplace only[2]		Working[3]	
	Number	%[4]	Number	%[5]
	n = 1,244		n = 1,787	
Height	225	18.1	227	12.7
Remote area	131	10.5	147	8.2
Awkward or cramped space	65	5.2	68	3.8
Confined space	57	4.6	58	3.3
Down a hole	12	1.0	12	0.7
Not certain/ not known	104	8.4	142	8.0

1: The unusual workplaces were not mutually exclusive – a case could have two or three of the choices.
2: 34% of workplace deaths occurred in an unusual place.
3: 25% of working deaths occurred in an unusual place.
4: Percentage of deaths within each place group for workplace deaths.
5: Percentage of deaths within each place group for working deaths.

5.12 PATHOPHYSIOLOGICAL CAUSE OF DEATH

5.12.1 INTRODUCTION

Cause of death was defined as the pathophysiological cause of death. In a minority of cases, the injured person died not directly from the injuries received, but from a pathological process that occurred as a result of the injuries. Pulmonary embolism, sepsis and fat embolism were examples. These cases had the cause of death coded to the pathological process, not the original injuries.

5.12.2 RESULTS

Multiple injuries, head injuries and injuries to the trunk were the most common types of injuries for both workplace and work-road deaths. Electrocution, drowning and mechanical asphyxia were other of the more common causes of death in the workplace.

Five percent of working persons died of medical complications of their injuries (Figure 5.20 and Table 5.30).

Fig 5.20 Pathophysiological cause of death - workplace and work-road deaths Number. Australia, 1989 to 1992

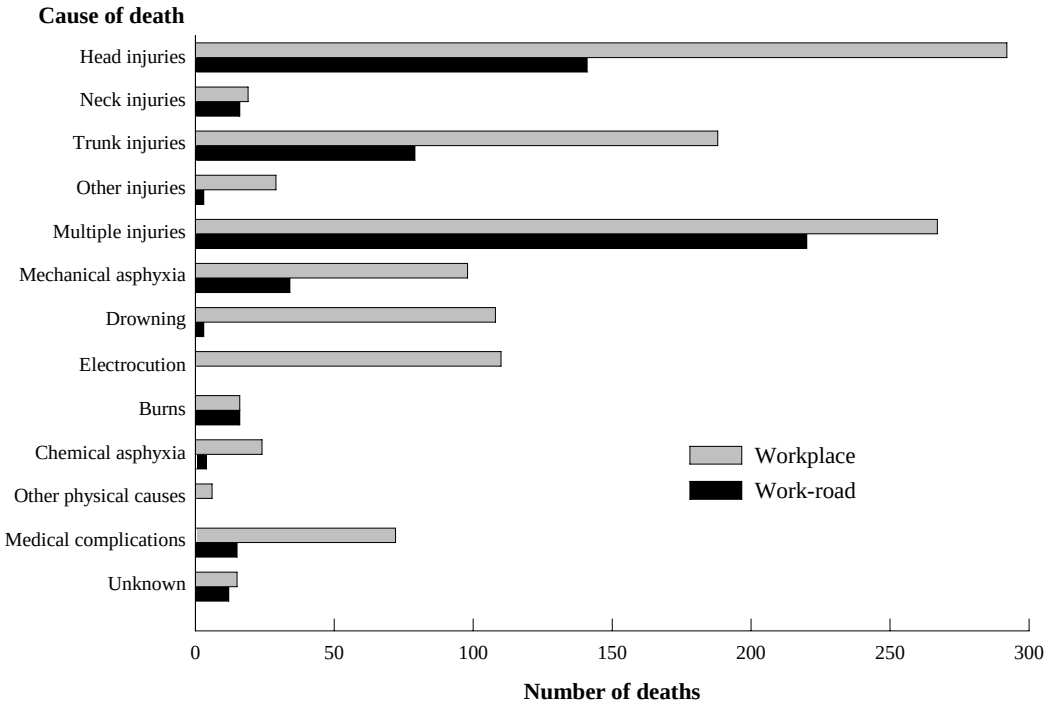
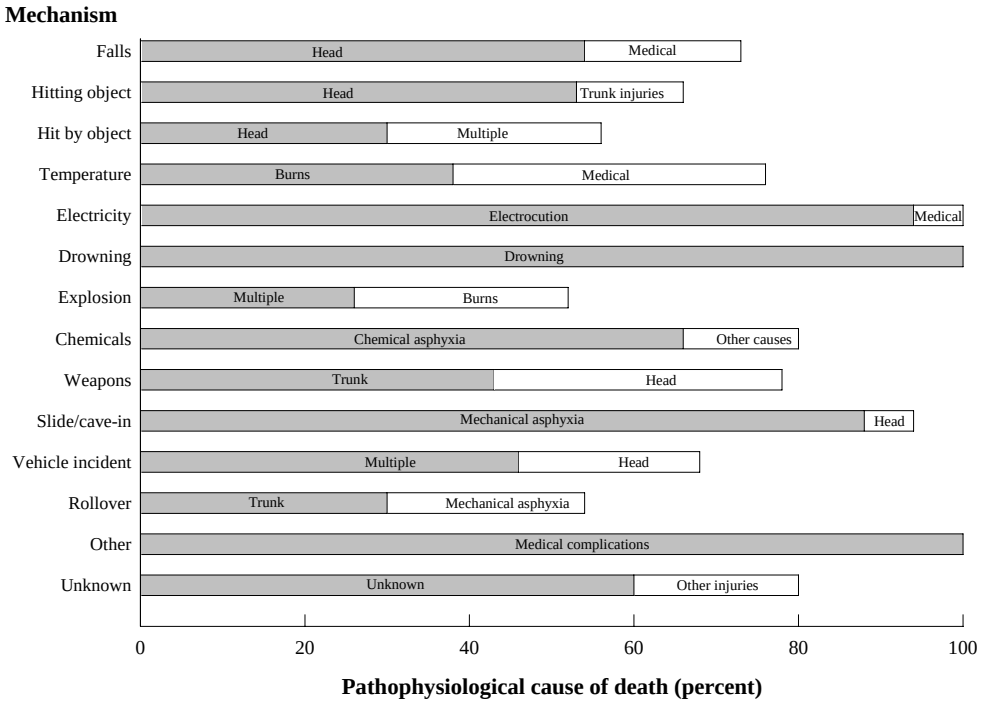


Table 5.30 Pathophysiological cause of death – workplace, work-road and total working deaths. Number and percent Australia, 1989 to 1992

Cause of death	Workplace		Work-road		All working	
	Number	%	Number	%	Number	%
Head injury	292	23.5	141	26.0	433	24.2
Neck fracture/dislocation	19	1.5	16	2.9	35	2.0
Trunk injuries	188	15.1	79	14.5	267	14.9
Other injuries	29	2.3	3	0.6	32	1.8
Multiple injuries	267	21.5	220	40.5	487	27.3
Mechanical asphyxia	98	7.9	34	6.3	132	7.4
Drowning	108	8.7	3	0.6	111	6.2
Electrocution	110	8.8	-	-	110	6.2
Burns	16	1.3	16	2.9	32	1.8
Chemical asphyxia/anoxia	24	1.9	4	0.7	28	1.6
Other physical causes	6	0.5	-	-	6	0.3
Medical complications	72	5.8	15	2.8	87	4.9
Not known	15	1.2	12	2.2	27	1.5
Total	**1,244**	**100.0**	**543**	**100.0**	**1,787**	**100.0**

Head injuries were the most common cause of death in falls, trunk injuries and mechanical asphyxia were the most common cause of death in rollovers, and mechanical asphyxia accounted for nearly all of the slide/cave-in deaths (Figure 5.21 and Table 5.31). Head injuries and multiple injuries were the main causes of death in persons hit by falling objects, although 17% of the persons in this mechanism group died due to mechanical asphyxia, usually when rock fell from the wall or roof of a tunnel during mining operations.

Fig 5.21 Pathophysiological cause[1] of death by mechanism of the fatal incident Working deaths. Percent of each mechanism. Australia, 1989 to 1992



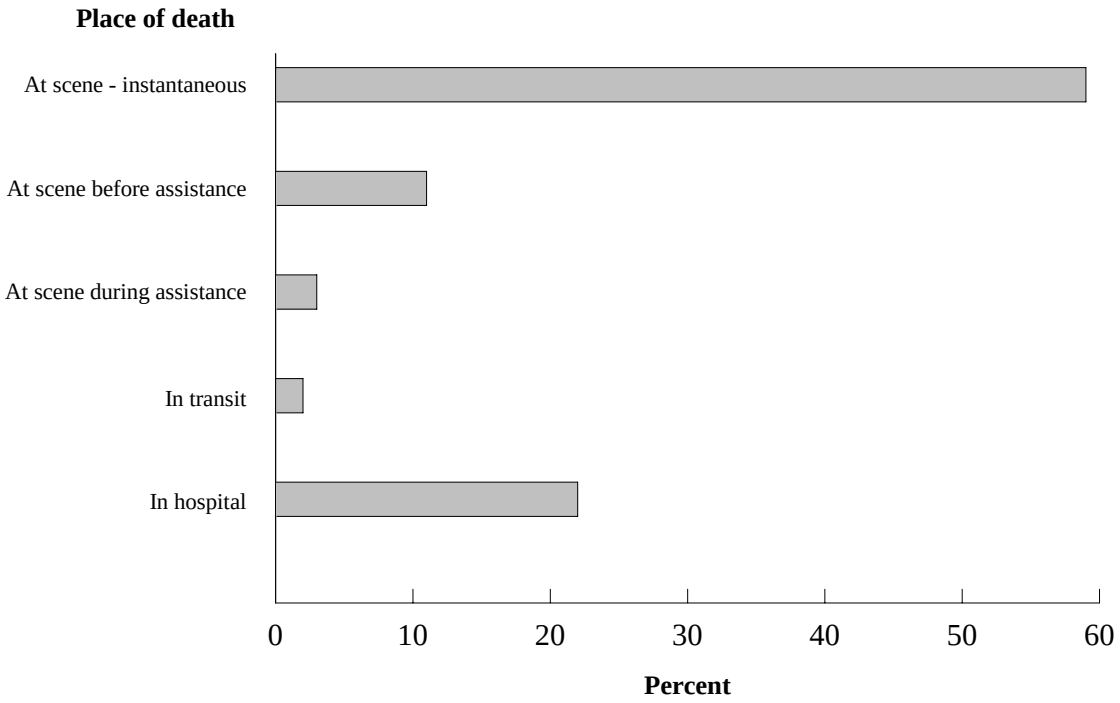
1: The two most common causes of death are shown for each mechanism.

Table 5.31 Pathophysiological cause of death by mechanism of fatal incident – working deaths Percent. Australia, 1989 to 1992

Mechanism of fatal incident	n	Head injuries	Neck injuries	Trunk injuries	Other injuries	Multiple injuries	Mechanical asphyxia	Drowning	Electro-cution	Burns	Chemical asphyxia	Other causes	Medical Comp	Not known	Total
Falls	170	54	2	9	1	19	1	-	-	-	-	-	13	2	100.0
Hitting objects part of body	15	53	-	13	13	7	7	-	-	-	-	-	7	-	100.0
Being hit by moving objects	505	30	2	22	3	26	12	0					4	1	100.0
Contact heat or cold	16	-	-	-	-	-	-	-	-	38	13	13	38	-	100.0
Contact electricity	117	-	-	-	-	-	-	-	94	-	-	-	6	-	100.0
Drowning	105	-	-	-	1	-	-	99	-	-	-	-	-	-	100.0
Explosion	19	16	-	5	-	26	5	-	-	26	5	-	16	-	100.0
Chemical other substances	29	-	-	-	-	-	3	3	-	3	66	14	10	-	100.0
Weapons	68	35		43	7	10	-	-	-	-	-	-	4	-	100.0
Slide or cave-in	17	6	6	-	-	-	88	-	-	-	-	-	-	-	100.0
Vehicle incident	653	22	3	14	1	46	6	1	-	3	1	-	3	2	100.0
Rollover	67	16	5	30		18	24	1	-	-	-	-	3	3	100.0
Other and multiple	1	-	-	-	-	-	-	-	-	-	-	-	100	-	100.0
Total	**1,787**	**24**	**2**	**15**	**2**	**27**	**7**	**6**	**6**	**2**	**2**	**0**	**5**	**2**	**100.0**

The deceased person died at the scene of the incident in 73% of the working incidents — death was instantaneous or virtually so for 59%, at the scene before assistance for 11% and at the scene during assistance for another 3%. Two percent of persons died during transit to hospital, 22% in hospital, 1% from long term complications and the remainder from other or unknown causes (Figure 5.22).

Fig 5.22 Place of death - working deaths
Percent. Australia, 1989 to 1992



5.13 EXTERNAL CAUSE CODES

External cause codes are considered in detail in Chapters 12 and 13. They are mentioned briefly here. Overall, the single biggest E-code category was "Motor vehicle traffic accidents" (MVTAs), which accounted for 31% of the working deaths and, as expected, virtually all the work-road deaths. E-code categories covering machinery, falling objects, aircraft crashes, falls and electricity each accounted for more than six

percent of working deaths and ten percent of workplace deaths, with machinery accounting for 20% of the workplace deaths (Table 5.32).

Table 5.32 E-code categories. Workplace, work-road and working deaths. Number and percent. Australia, 1989 to 1992

E-code category	Workplace		Work-road		Working	
	Number	%	Number	%	Number	%
Railways	18	1.4	1	0.2	19	1.1
Motor vehicle traffic accident	31	2.5	520	95.8	551	30.8
Motor vehicle non-traffic accident	75	6.0	5	0.9	80	4.5
Other road vehicle accident	26	2.1			26	1.5
Water transport	56	4.5			56	3.1
Air transport	118	9.5			118	6.6
Vehicle accident nec	11	0.9			11	0.6
Accidental poisoning	19	1.5			19	1.1
Falls	117	9.4			117	6.6
Fire and flames	10	0.8	1	0.2	11	0.6
Environmental factors	34	2.7			34	1.9
Submersion, suffocation, etc	56	4.5	1	0.2	57	3.2
Falling objects	128	10.3	2	0.4	130	7.3
Strike against/struck by	13	1.1			13	0.7
Caught in/between	3	0.2			3	0.2
Machinery	253	20.3	3	0.6	256	14.3
Cutting/piercing	4	0.3			4	0.2
Pressure vessels	7	0.6			7	0.4
Firearm missile	20	1.6			20	1.1
Explosives	10	0.8			10	0.6
Hot/corrosive material	2	0.2			2	0.1
Electricity	116	9.3			116	6.5
Other/unspecified	14	1.1	5	0.9	19	1.1
Late effects of accidents	6	0.5			6	0.3
Adverse effects of therapeutics, etc	1	0.1			1	0.1
Assault	48	3.9	1	0.2	49	2.7
Uncertain intent	6	0.5			6	0.3
Unknown	42	3.4	4	0.7	46	2.6
Total	**1,244**	**100.0**	**543**	**100.0**	**1,787**	**100.0**

5.14 ALCOHOL AND DRUGS

5.14.1 INTRODUCTION

Very little is known about the role of alcohol and drugs in work-related injury, whether fatal or non-fatal, because information on the levels of alcohol and drugs is rarely available. However, since the blood alcohol level of the deceased is routinely determined as part of the coronial investigation, this information was often available in the coronial files used for this study. Information on drug levels was also available in some of the coronial files. The information on alcohol and drug levels was usually based on testing of post-mortem blood specimens, but sometimes came from blood or breath tests prior to death or from other sources. An assessment of the importance of alcohol or drugs to the occurrence of the fatal incident was made on the basis of the level of the substance in the blood or other body tissue and of the circumstances of the incident.

Most of the percentages presented here are calculated in two ways – firstly using all persons as the denominator and secondly using only persons for whom blood alcohol (or drug) levels were available.

5.14.2 RESULTS

Alcohol

Information on blood alcohol levels was available for 1,252 (70%) of the working deaths. For 126 (10.1%) of these deaths with available blood alcohol levels, the blood alcohol was greater than zero, and for 74 (5.9%) the blood alcohol was 0.05 g/100ml or greater. On the basis of available information in the coronial file, raised blood alcohol levels appeared to have contributed to at least 64 working deaths (although formal blood alcohol levels were only available for 55 of these) — 3.6% of all working deaths

(based on all 64 deaths where alcohol appeared to have contributed) and 4.4% of working deaths for which blood alcohol levels were available (based on the 55 persons for whom blood alcohol was available and alcohol appeared to have contributed). Since blood alcohol levels were not available for about 30% of working deaths, it is likely that alcohol contributed to somewhere between 4% and 5% of working incidents. The alcohol had been consumed at least partly in connection with work in at least 28 (44%) of the 64 deaths where high blood alcohol levels appeared to contribute to the incident occurring. For these 28 deaths, the alcohol had been consumed either at work during normal duties or at a work-sponsored function.

Of the 543 work-road deaths, blood alcohol levels were available for 442 (81%) and were 0.05 g/100 ml or greater in 38 (8.6%) of those with available blood alcohol levels. Alcohol appeared to be important in 34 work-road deaths — 6.3% of all work-road deaths and 7.2% of work-road deaths for which blood alcohol was available.

Of the 1,244 workplace deaths, blood alcohol levels were available for 810 (65%) and were 0.05 g/100 ml or greater in 36 (4.4%) of those with available blood alcohol levels. Alcohol appeared to be important in 30 workplace deaths — 2.4% of all workplace deaths and 2.8% of workplace deaths for which blood alcohol was available.

Blood alcohol levels were available for 502 (80%) of commuting deaths. Blood alcohol levels were known to have been 0.05 g/100ml or greater in 54 (10.8%) of the commuting deaths for which alcohol levels were available. Alcohol appeared to contribute to 56 commuting deaths — 8.9% of all commuting deaths and 10.8% of commuting deaths for which blood alcohol was available (there were two cases where formal blood alcohol levels were not known but other evidence showed that raised

blood alcohol levels had probably contributed to the incident occurring). For commuting deaths, the alcohol had been consumed either at work or at work-related social functions in 25 (45%) of the 56 deaths where alcohol appeared to contribute to the incident occurring.

Relevant results for blood alcohol are shown in Tables 5.33 and 5.34.

Table 5.33 Blood alcohol level – commuting, workplace, work-road and total working deaths. Number and percent Australia, 1989 to 1992

Blood alcohol level	Workplace		Work-road		Working		Commuting	
	n	%	n	%	n	%	n	%
Zero	744	59.8	382	70.4	1,126	63.0	425	67.9
0.010 – 0.049	30	2.4	22	4.1	52	2.9	23	3.7
0.050 – 0.079	7	0.6	3	0.6	10	0.6	8	1.3
0.080 – 0.099	7	0.6	5	0.9	12	0.7	6	1.0
0.100 – 0.199	10	0.8	15	2.8	25	0.7	18	2.9
0.200 – 0.299	8	0.6	12	2.2	20	1.4	19	3.0
0.300 – 0.399	4	0.3	3	0.6	7	1.1	2	0.3
0.400 – 0.499	-		-		-	0.4	1	0.2
Not measured[1]	382	30.7	85	15.7	467		122	19.5
Not known[2]	52	4.2	16	3.0	68	26.1	2	0.3
						3.8		
Total	**1,244**	**100.0**	**543**	**100.0**	**1,787**	**100.0**	**626**	**100.0**

1: No blood alcohol level estimated.
2: Blood alcohol level estimated but result not known.

Table 5.34 Importance of blood alcohol level – commuting, workplace work-road and total working deaths. Number and percent Australia, 1989 to 1992

Alcohol important	Workplace	Work-road	Working	Commuting
Number[1]	30	34	64	57
% of all cases	2.4	6.3	3.6	8.9
% of cases with known blood alcohol levels[2]	2.8	7.2	4.4	10.8

1: Number of deaths to which raised blood alcohol probably contributed.
2: There were seven workplace deaths, two work-road deaths and two commuting cases where formal blood alcohol levels were not known but other evidence showed that raised blood alcohol levels had probably contributed to the incident occurring.

Drugs

Information on drug levels was available less comprehensively than for alcohol. Of the working deaths, amphetamine levels were available in 676 (37%), cannabis levels in 662 (37%) and some sort of information on drug levels in 718 (40%). Drugs appeared to contribute to 23 working deaths — 1.3% of all working deaths and 3.2% of working deaths for which drug levels were available. The types of drugs found to have contributed to the fatal incidents included stimulants (amphetamines and related compounds), cannabis, barbiturates and narcotics. On the basis of available information in the coronial file, stimulants appeared to contribute to 18 deaths, all of them work-road deaths (1.0% of all working deaths and 3.3% of work-road deaths). Considering drugs and alcohol together, at least 92 (5.1%) of the working deaths probably occurred in part because of one or both of these groups of substances.

5.15 MULTIPLE DEATH INCIDENTS

5.15.1 INTRODUCTION

Reports in the press about work-related traumatic death often concern incidents in which a number of people are killed. Mining incidents are the most common examples of this. Hazards which have the potential to cause multiple death in the one incident should be the subject of considerable prevention effort, but should not necessarily command more attention than single death incidents. The impact of ten deaths resulting from ten single incidents is the same as one incident which results in ten deaths. Therefore, the hazards which lead to the occurrence of all fatal incidents need to be carefully controlled. In fact, the circumstances surrounding single and multiple death incidents may be similar. This Section describes multiple death incidents and compares their characteristics to those of incidents involving single deaths. Most of the information presented here deals only with the deaths of workers. Incidents which involved the death of only one worker but also one or more non-working persons are included in Chapter 7.

5.15.2 RESULTS

The 1,787 deaths of working persons resulted from 1,657 incidents. Eighty-five (5.1%) of these incidents involved more than one working person being killed. The number of persons killed in multiple incidents ranged from two to eleven, with 215 working persons in total being involved in these incidents. There were 64 incidents in which two persons were killed, 13 incidents in which three persons were killed and eight incidents in which between four and eleven persons were killed (Table 5.35).

Table 5.35 Number of working persons[1] killed in each fatal incident Number and percent. Australia, 1989 to 1992

Number of persons killed per incident	Incidents		Workers	
	Number	%	Number	%
1	1,572	94.9	1,572	88.0
2	64	3.9	128	7.2
3	13	0.8	39	2.2
4	1	0.1	4	0.2
5	4	0.2	20	1.1
6	1	0.1	6	0.3
7	1	0.1	7	0.4
11	1	0.1	11	0.6
Total	**1,657**	**100.0**	**1,787**	**100.0**

1: Non-working persons killed in multiple death incidents are not included here. They are discussed in Chapter 7

Overall there were 274 working persons killed in multiple death incidents. However, for 59 of these working persons, the other person(s) killed in the incident were not working at the time (that is, they were commuting, were bystanders or were not cases). Some of these incidents are described in more detail in Chapter 7.

The incidents involving the death of two or three working persons were examined separately. The more common industries of the persons involved were transport and storage, agriculture and fishing (Table 5.36).

Table 5.36 Incidents involving the death of two or three working persons compared with single death incidents by industry Number and percent. Australia, 1989 to 1992

Industry	Multiple death incidents (involving 2 or 3 working persons)				Single death incidents	
	Workers		Incidents			
	Number	%	Number	%	Number	%
Agriculture	26	15.6	10	13.0	303	19.3
Forestry and logging	2	1.2	1	1.3	42	2.7
Fishing and hunting	15	9.0	7	9.1	40	2.5
Mining	9	5.4	3	3.9	116	7.4
Manufacturing	9	5.4	3	3.9	132	8.4
Electricity, gas and water	2	1.2	1	1.3	27	1.7
Construction	12	7.2	5	6.5	222	14.1
Wholesale and retail trades	13	7.8	6	7.8	103	6.6
Transport and storage	45	26.9	16	20.8	322	20.5
Communications	1	0.6	-		12	0.8
Finance and property	4	2.4	1	1.3	44	2.8
Public administration	3	1.8	-		31	2.0
Defence	11	6.6	5	6.5	30	1.9
Community services	4	2.4	1	1.3	66	4.2
Recreation, personal and other services	11	6.6	4	5.2	74	4.7
Different industries[1]	-		14	18.2	-	
Not known	-		-	-	8	0.5
Total	**167**	**100.0**	**77**	**100.0**	**1,572**	**100.0**

1: Incidents in which the persons killed worked in different industries.

The most commonly involved occupational group was plant and machinery operators and drivers, but half the incidents involved workers from more than one occupational group (Table 5.37).

Over half of these incidents were vehicle incidents, either on the road (involving cars, trucks and/or buses) or in the air (aircraft). Drowning was the next most common mechanism (Table 5.38).

A brief summary of the events resulting in the deaths of more than three working persons is shown in Table 5.39. These incidents all involved vehicles or drowning.

Table 5.37 Incidents involving the death of two or three working persons compared with single death incidents by occupation Number and percent. Australia, 1989 to 1992

Occupation	Multiple death incidents (involving 2 or 3 working persons)				Single death incidents	
	Workers		Incidents			
	Number	%	Number	%	Number	%
Managers and administrators	30	18.0	8	10.4	250	15.9
Professionals	12	7.2	1	1.3	45	2.9
Para-professionals	28	16.8	5	6.5	106	6.7
Tradespersons	16	9.6	4	5.2	234	14.9
Clerks	-		-		19	1.2
Salespersons and personal service workers	9	5.4	2	2.6	36	2.3
Plant/machine operators and drivers	44	26.3	14	18.2	494	31.4
Labourers and related workers	28	16.8	5	6.5	383	24.4
Different occupations[1]	-		38	49.4	-	
Not known	-		-		5	0.3
Total	**167**	**100.0**	**77**	**100.0**	**1,572**	**100.0**

1: Incidents in which the persons killed worked in different occupations.

Table 5.38 Incidents involving the death of two or three working persons compared with single death incidents by mechanism Number and percent. Australia, 1989 to 1992

Mechanism of fatal incident	Multiple death incidents (involving 2 or 3 working persons)				Single death incidents	
	Workers		Incidents			
	Number	%	Number	%	Number	%
Fall from height	6	3.6	3	3.9	155	9.9
Hitting stationary object	1	0.6	-		12	0.8
Being hit by falling object	12	7.2	5	6.5	168	10.7
Being hit by moving object	2	1.2	1	1.3	214	13.6
Contact with hot object	2	1.2	1	1.3	11	0.7
Contact with electricity	2	1.2	1	1.3	116	7.4
Drowning	24	14.4	10	13.0	70	4.5
Contact with chemical or substance	8	4.8	4	5.2	13	0.8
Hypoxic atmosphere	3	1.8	1	1.3	2	0.1
Shot by gun, rifle, etc	9	5.4	4	5.2	41	2.6
Slide or cave-in	2	1.2	1	1.3	15	1.0
Vehicle incident — road	52	31.1	25	32.5	520	33.1
Vehicle incident — air	44	26.3	20	26.0	-	
Vehicle incident — train	-		-		-	
Different mechanisms[1]	-		1	1.3	-	
Other mechanisms	-		-		235	14.9
Total	**167**	**100.0**	**77**	**100.0**	**1,572**	**100.0**

1: Incident in which the mechanism of the incident was different for the persons killed.

The fishing, defence and mining industries had the highest proportion of work-related deaths occurring in multiple death incidents. Sales persons and personal service workers and para-professionals were the occupation groups with the highest proportion of deaths occurring in multiple incidents. Of the various mechanisms involved, air crashes had by far the highest proportion of deaths occurring in multiple death incidents.

Table 5.39 Incidents involving the death of more than three working persons. Number, industry, occupation, place and circumstance[1]. Australia, 1989 to 1992

Number killed	Industry	Occupation	Place	Circumstance
4	Defence	Para-professionals	Bushland	Plane crash - loss of control on training flight
5	Trades/ farming/ transport	Managers/ salespersons	Farm paddock	Plane crash - flying at night for business reasons
5	Agriculture	Managers/ professionals	Airport	Plane crash - loss of control on takeoff for inspection flight of properties
5	Defence	Para-professionals	Ocean	Plane crash - loss of control on training flight
5	Fishing	Labourers and related workers	Ocean	Drowning - boat capsized in poor weather
6	Mining	Labourers and related workers	Mine shaft	Drowning - mine wall collapsed releasing banked-up water
7	Mining	Labourers and related workers	Highway	MVA – van leaving oil rig collided with prime-mover
11	Public administration	Managers and administrators	Bushland	Plane crash - returning from local government conference – poor weather

1: The Table describes the major category relevant to most persons.

5.16 TIME, DAY AND MONTH OF INCIDENT

5.16.1 INTRODUCTION

This Section considers the time, day and month in which the fatal incidents occurred in an attempt to identify temporal factors which may be important in the occurrence of the incidents, or which might be markers for important factors such as fatigue. Since some incidents involved more than one death, consideration of temporal factors has been conducted on the basis of incidents which occurred rather than deaths which resulted. For this reason, the numbers are less than those cited elsewhere in the thesis. Note that the time of incident is used rather than time of death. This approach was taken because the factors of interest that may influence when an incident occurs would not necessarily influence the time of the resulting death.

5.16.2 TIME OF DAY

The time at which the incident occurred was available for 97% of fatal incidents. The vast majority of incidents occurred in daylight hours, between 0700 and 1700, with clear peaks mid-morning (1000—1100) and mid-afternoon (1500—1600) (Figure 5.23). This pattern was seen for a number of different circumstances in this study (eg agriculture, forestry and logging, mining, manufacturing and construction industries) (Figure 5.24). The transport industry was a notable exception, with the mid-morning and mid-afternoon peaks still evident, but with a much higher proportion of deaths at night and during the early hours of the morning (Figure 5.25). Not surprisingly, the graph describing the time that commuting incidents occurred showed two very strong peaks, in the morning (0600—0700) and the late afternoon (1700—1800) (Figure 5.26).

5.16.3 MONTHLY AND WEEKLY VARIATION

There was no clear variation with the number or rate of incidents during the year.

Incidents less commonly occurred on Friday to Sunday than Monday to Thursday.

Fig 5.23 Time of fatal incident - working deaths Number. Australia, 1989 to 1992

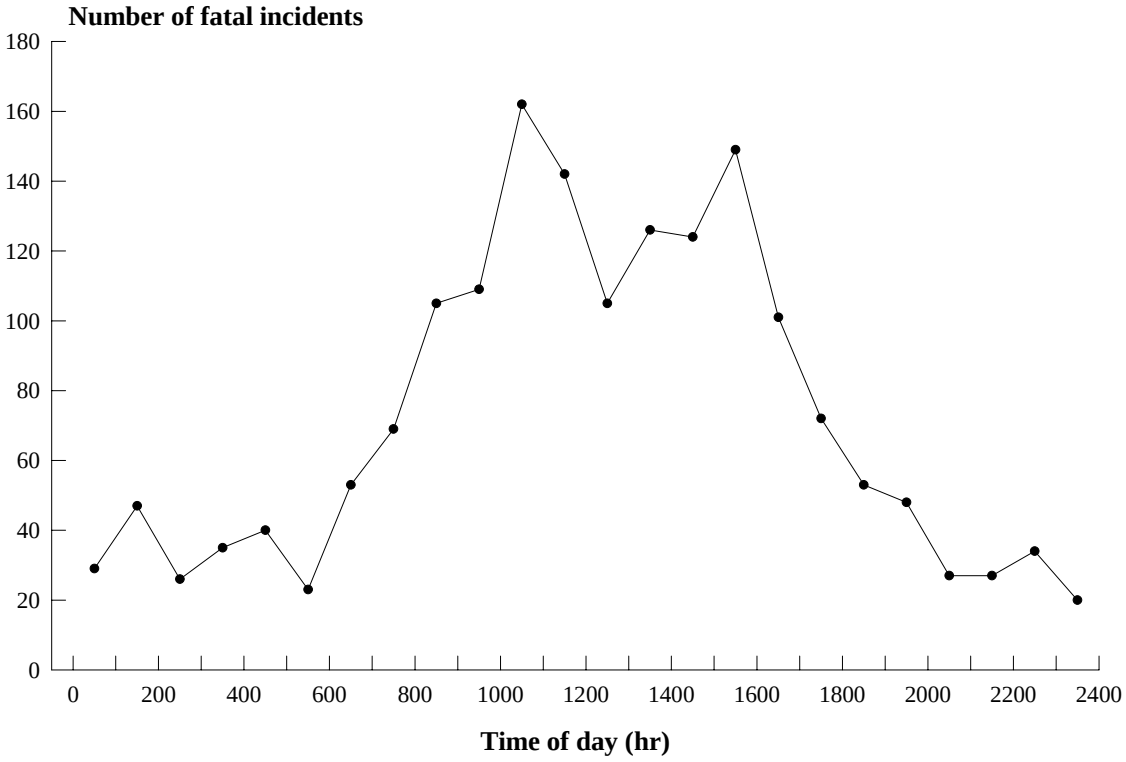


Fig 5.24 Time of fatal incident for selected industries - working deaths Number. Australia, 1989 to 1992

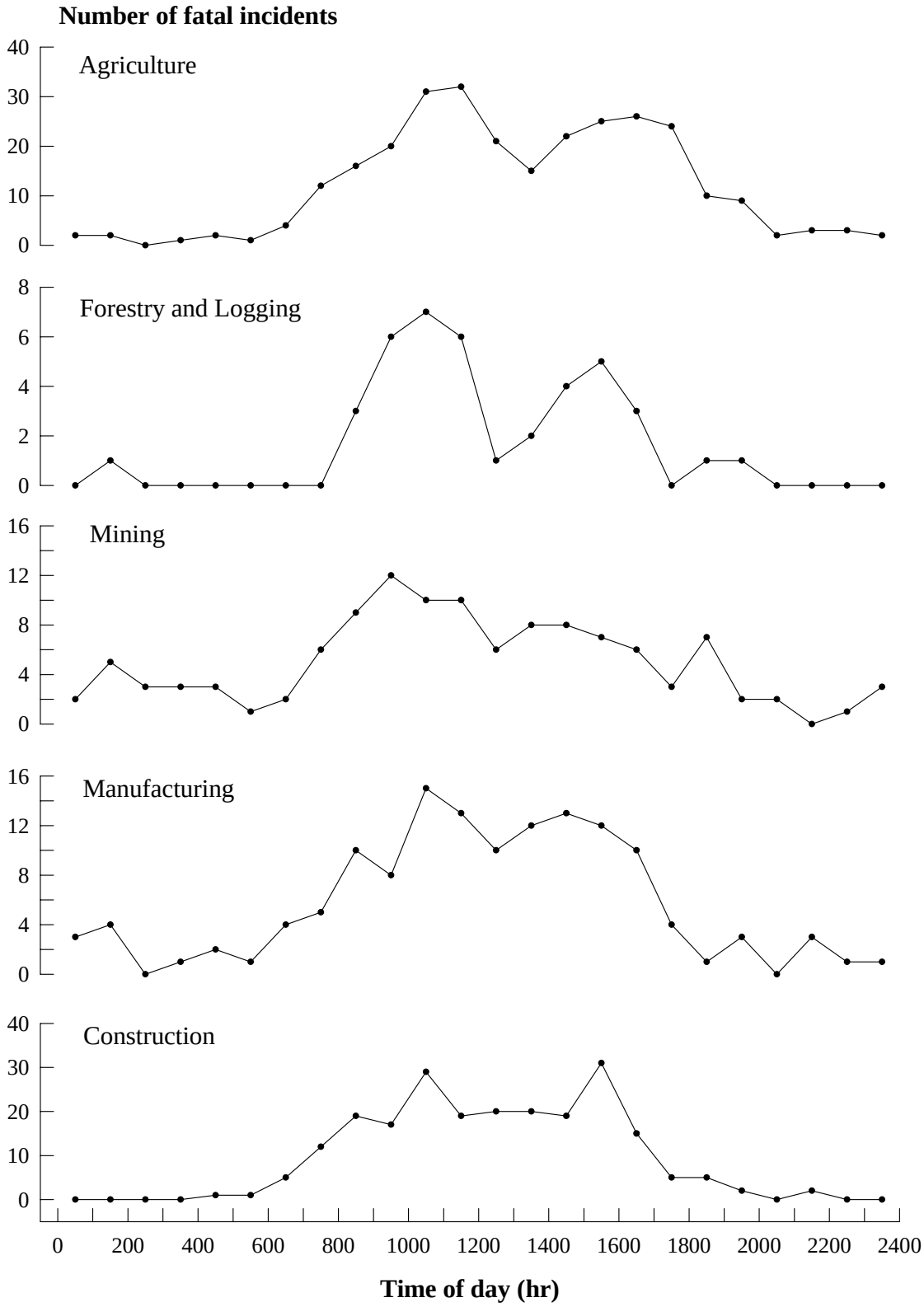


Fig 5.25 Time of fatal incident for the transport and storage industry
Working deaths. Number. Australia, 1989 to 1992

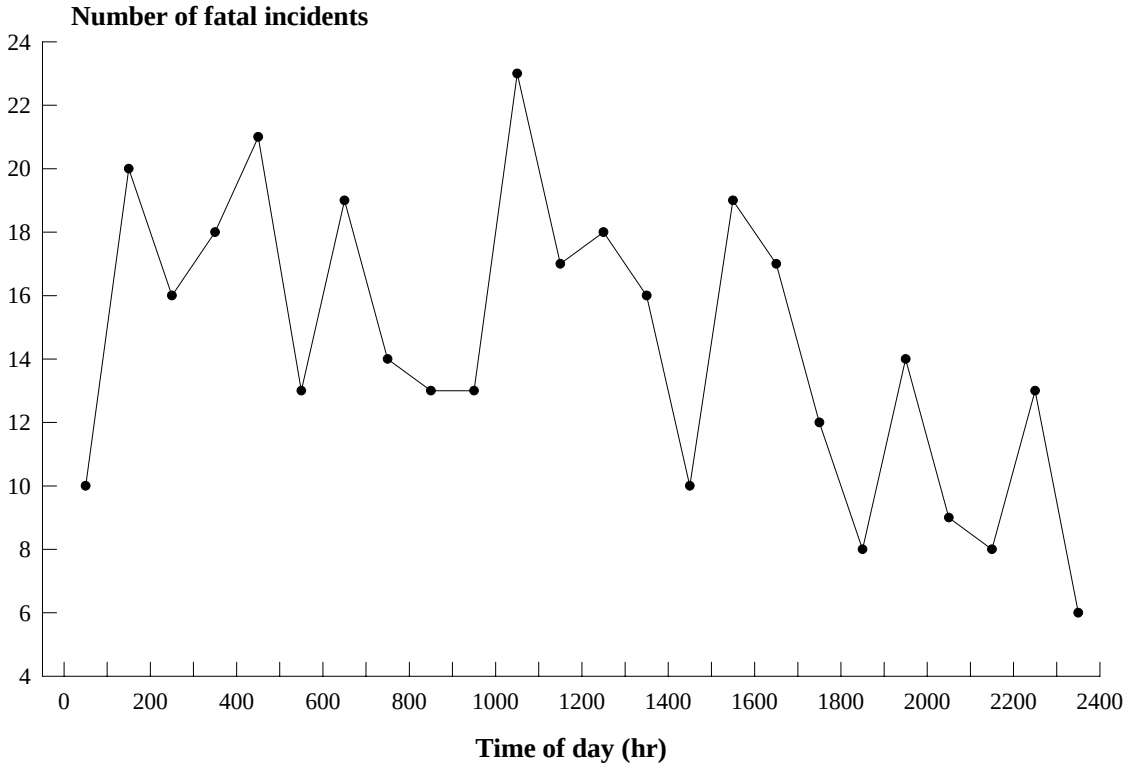
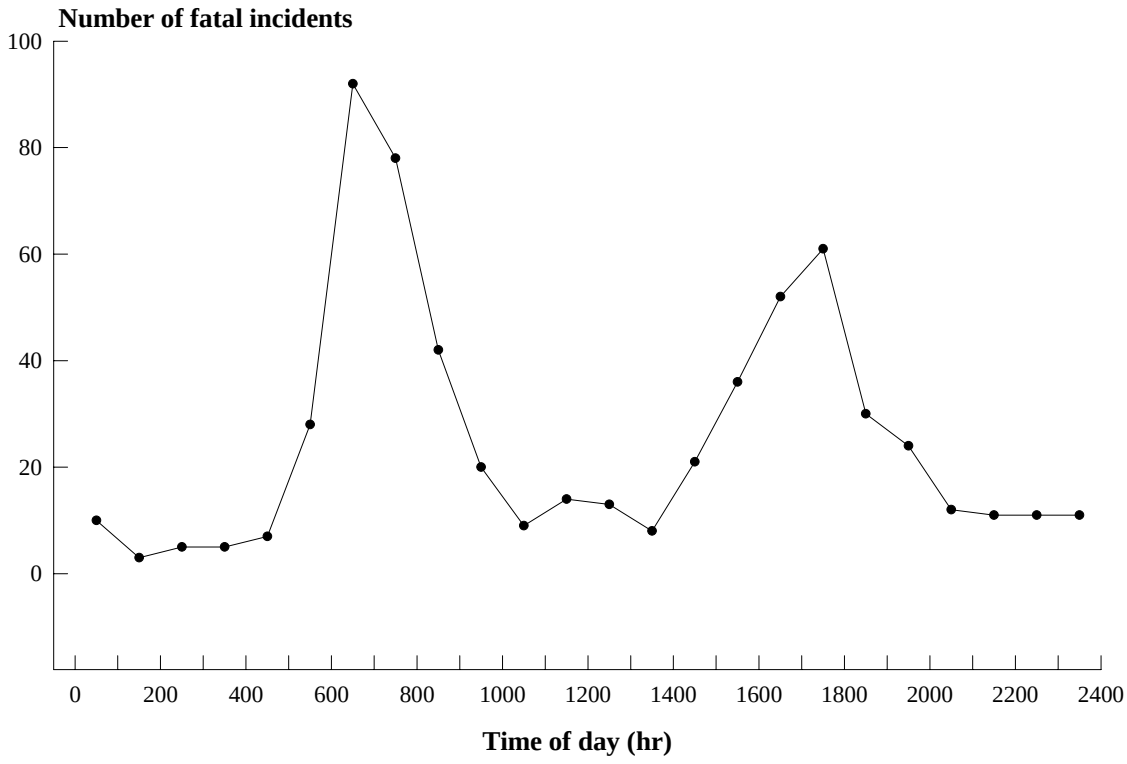


Fig 5.26 Time of fatal incident - commuting deaths
Number. Australia, 1989 to 1992



5.17 DISCUSSION

5.17.1 PATTERNS OF FATAL INCIDENTS

This study used an epidemiological approach to describe and summarise the circumstances surrounding fatal work-related incidents and the characteristics of the persons killed as a result. This was done by examining all cases with certain characteristics. Although each fatal incident has a unique set of circumstances surrounding it, there are often similarities between certain incidents.

To determine exactly and comprehensively what 'caused' a single incident, the circumstances must be examined in detail. The relevant factors can be put into temporal and spatial order and approaches such as those based on engineering models can be used to determine the relationships between each of the factors. Epidemiological approaches are usually not appropriate to examine individual incidents in this way.

However, using an engineering approach has limitations when attempting to identify common factors in more than one fatal incident. In contrast, an epidemiological approach aggregates data to look for patterns, and these patterns can provide insight into how such circumstances may arise and what might be done to prevent them. The engineering and epidemiological approaches therefore complement each other. (There are a number of other approaches, such as human factors analysis, which are also useful).

This study attempted to identify the main factors which contributed to an event occurring, without intending to label one factor as more important than another, nor to identify every possible factor. These main factors can help identify appropriate avenues

for prevention. Often certain factors occur in combinations which are present in many similar circumstances. For example, the dangers presented by a combination of a steep slope and a tractor without a rollover protective device and/or seat belts is well known and the combination was again identified as a problem in this study.

Some other examples where similar combinations of factors led to work-related deaths in this study include:

- working alone under a raised vehicle that was not adequately secured and/or supported;
- working on a roof without a safety harness and falling through a skylight not properly signposted, with similar colouring to the roof material and without underlying protective mesh;
- performing maintenance or installation work and coming into contact with live wires on a circuit not protected by a residual current device, often when the electricity should have been disconnected;
- a combination of high speed, lack of sleep, night driving and sometimes alcohol and/or drugs in long distance truck drivers involved in motor vehicle incidents on public roads;
- construction and mining labourers on worksites being run over by reversing vehicles from which the driver's vision was restricted because of blind spots;
- falls from ladders that were not secured;
- children (especially those under five) on farms drowning in dams when they wandered away from their parents, often climbing through inadequate fencing and/or following a pet to a small dam into which they fall due to the steep slopes (these are considered in more detail in Chapter 7); and

- members of the public being killed when their vehicle was struck by a semi–trailer whose driver had lost control of the truck (these are considered in more detail in Chapter 7).

5.17.2 OVERALL RESULTS

The overall results suggest that there has been a steady decline in the overall rate of work-related death of workers in Australia for the period 1989 to 1992. The working rate for 1992 of 5.0 deaths per 100,000 persons per year was 22% lower than the working rate of 6.4 deaths per 100,000 persons per year for 1989. The steady decline in the estimated rates over time and the narrow confidence intervals around these estimates suggest that such changes are unlikely to represent chance variation on a stable background rate.

5.17.3 POSSIBLE CAUSES OF THE DECLINE IN DEATH RATES

The reasons for this decline in the risk of suffering a traumatic work-related death are not clear. They are not due simply to less people working, as the rates take account of any changes in the number of persons in the workforce. However, the overall rates are an average of the rates from various more homogenous industry or occupation groups. Changes in the distribution of these groups can lead to a change in the overall rate, even when the rates within each group do not change. That is, each particular job may not be any safer, but there may be less people doing the more dangerous jobs. Such changes in the industry distribution were adjusted for using standardisation, with the results suggesting that changes in the industry distribution account for a small amount of the differences observed between years. Standardisation by major industry group 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.

Improvement in OHS

The observed decline in work-related fatalities may in fact reflect widespread improvements in OHS. The study 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.

Level of economic activity

Another factor that should be considered is that Australia experienced a recession during the years covered by this study (and did during WRFS 1 as well). The downturn in activity in many industry sectors could be expected to have varying effects on OHS. 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, the work less demanding, and the level of OHS consequently better. 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 of changes in economic activity is hard to predict.

Improvement in acute care

Improvements in acute care could also potentially contribute to a decline in fatality rate. However, there did not appear to be many cases in either WRFS 1 or WRFS 2 where persons died as a result of sustaining severe, but potentially survivable, injuries. This

suggests that changes in acute trauma care are unlikely to have had an important effect on the fatality rate during the years considered here.

Study design factors

Apart from improvements in OHS, the decline in rates during WRFS 2 might be explained by a design effect in the study, leading to better ascertainment of deaths that occurred earlier in the study period. Since the study was based primarily 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. This potential problem can be confidently discounted for the current study for a number of reasons.

Firstly, the ABS information for WRFS 2 was obtained towards the end of 1994. The data included all deaths appearing on the 1993 Deaths Data List or on earlier lists, with the 1993 list closing approximately June 1994. This was the end of the first registration year after the last day of the study period, and allowed a minimum of 18 months for the registration of all study deaths, and over two years for about three quarters of the relevant deaths (which occurred prior to 1992). Analysis of the information supplied by the ABS for WRFS 2 (excluding the Northern Territory, for which information on year of registration was not available for all deaths) indicated that in 1989, 85.2% of deaths were registered on the Deaths Data List of the year in which they occurred, 14.1% of deaths were registered by the end of the following year and 0.7% of deaths were registered in the second year after they occurred (Table 3.12). Therefore, 99.3% of deaths were registered by the end of the year after they occurred and, even without other

information sources on non-registered cases, lower case ascertainment due to delayed registration cannot explain the trend of declining rates over time in the current study.

In addition, the coronial indexes were searched thoroughly for **all** persons who died of non-suicide traumatic causes during the study period, regardless of whether they were on the Deaths Data List supplied by the ABS. This resulted in the identification of a further 529 persons who did not have records on the ABS Deaths Data list but who were included in the study (these were the 'Extras'). These represented only 2.6% of all deaths of interest in the coronial system. Therefore, decreased case ascertainment over time due to a delay in ABS registration can be confidently excluded as a cause of the observed decline in rates for WRFS 2.

Another possible cause for this time-related pattern could have been some sort of systematic bias in the data collection and/or coding procedures. This possibility was anticipated at the design stage of the study and effectively excluded by randomising both the order of coronial file review and final case coding. The only significant departure from this randomisation was in Victoria (where all 1989 files were inspected randomly before the files from the other three years), so bias due to the collection methodology can effectively be excluded.

A third cause of the temporal pattern might be a change in the coronial system. For example, deterioration in the information content of the files in more recent years would make definitive case coding more difficult, which would be reflected in a higher proportion of indeterminate cases in the later years of the study period. However, there is no reason to believe that the information quality of coronial files has changed for the worse. In fact, the experience of the study team was that the quality of files has

improved with time. Consideration of overall file classification ratios shows that the proportion of subjects in each main study category (case, non-case and indeterminate) was very similar over time so there was no increase in the proportion of indeterminate cases over time. This also demonstrates the success of the randomisation procedure (Table 3.14).

A more plausible time–related effect in the coronial system is an increased proportion of missing files for recent deaths because the investigation procedure was still being processed in the coronial system or the courts at the time of data collection. The very small number of missing files (0.3%) means that this factor could not have had an important effect on the study even if most missing files were from the final year (and a check of the 69 missing cases revealed that they were evenly spread over the four-years).

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.

5.17.4 AGE AND GENDER

The observed differences in fatality rates between men and women are probably largely due to differences in the type of job (ie the occupation and industry) performed by them and has been noted in many other studies of work-related deaths of workers[67, 224, 229].

An elevated fatality rate in much older workers was also seen in WRFS 1 and has been noted elsewhere[86, 148, 152, 153, 220, 265]. The reason for this pattern has not been explained, although there are a number of plausible explanations. It may be due to older people being more likely to be injured or to die from a given injury than younger workers[266]. However, it may also be partially artefactual, being a result of under-counting in the number of people at risk (ie older wocrking people may not have been properly recorded as part of the Labour Force). This is especially an issue for elderly farmers, who may continue to work but not be recorded in the Labour Force Survey as a worker, thereby producing an erroneously low denominator and a correspondingly erroneously high fatality rate. Alternatively, elderly farmers may describe themselves as farmers even when they do little or no farm work, causing the opposite problem. The extent to which either of these possibilities contribute is not clear, but 64% of the working deaths of persons 70 years of age or older were farmers, compared to 12% of all working deaths. The worrying number of deaths of young workers associated with farm work has also been documented elsewhere[151, 155].

5.17.5 INDUSTRY AND OCCUPATION

Consideration of the fatality rates in different industry and occupation groups shows that the level of OHS performance in Australia cannot be adequately described in a few summary numbers. Different industry and occupation groups showed different trends over the four-years of the study. The true trends are difficult to determine over the

relatively short time period of the study because of the variability in the data. However, the data suggest that some groups improved and others worsened over the study period.

In addition, the value of looking in detail at groups is reinforced by the results. Risks are more similar in occupation groups than industry groups, and within each area it is helpful to use as narrowly defined sub-groups as the data will allow. For example, the high rate of fatality for commercial pilots (which has recently been reported elsewhere[108, 267, 268]) is not reflected in the larger occupation group to which they belong (para-professionals). Similarly, the high rates for forestry, mining and structural steel labourers and fishermen/women are hidden by the overall rate for all labourers and related workers.

5.17.6 JURISDICTION

The data have been obtained in the same manner in each jurisdiction, using an approach that should provide virtually 100% coverage of work-related traumatic death. The study results are therefore not affected by the coverage problems that limit the usefulness of most other OHS data sources regarding work-related fatalities. Comparisons between jurisdictions that might be currently made on the basis of these other data sources can therefore be more confidently made with the results from this study.

However, for this analysis, detailed analysis of the information from WRFS 2 was not conducted on the basis of jurisdiction for many of the variables. This is because the project is primarily aimed at providing a national summary of work-related fatalities. Differences between jurisdictions are likely to have been caused by a number of factors, including the industry distribution, the type of work performed within each industry

group, the region-specific hazards that may be encountered (such as steep terrain or mining type), and the approaches used to control hazards and prevent work-related injury. With the exception of a few specific areas, this thesis has not attempted to investigate these factors. Therefore, comparison between jurisdictions should be conducted with caution. A series of jurisdiction-specific reports has been published elsewhere (NOHSC 1999 – State reports: see Appendix 2)

5.17.7 MECHANISM AND AGENCY

The prominent role played by vehicles in work-related traumatic death was clearly shown by the study results, with vehicular incidents on public roads being the most common single mechanism of fatal incident for most occupation groups and many industry groups. This has been found elsewhere[220, 224, 269]. In addition, many of the incidents in the 'hit by moving objects' category involved vehicles hitting persons, either in pedestrian incidents on public roads or at formal workplaces where vehicles struck other persons on the worksite.

Falling from a height, falling objects hitting persons and contact with electricity were common mechanisms across a number of different occupation and industry groups and clearly should be a focus of prevention programs, along with incidents involving vehicles.

5.17.8 PLACE

Given that the largest single mechanism resulting in the fatal injury of working persons was motor vehicle incidents, it is not surprising that the most common place for these fatal incidents to occur was public roads of some sort. However, it is interesting to note that vehicle incidents also commonly occurred on farms, trade areas and mines. Six

percent of the fatal workplace injuries occurred in houses, often involving tradesmen doing relatively minor renovations or maintenance tasks. Again, not surprisingly, the main fixed workplaces (farms, industrial or construction areas, mines and trade or service areas) were the most common place of the fatal incident in workplace deaths. The detailed description of the place variables illustrates the wide range of settings in which the fatal incidents occurred. This highlights the need for safe working procedures and control of hazards in all types of workplaces, regardless of whether they are temporary or permanent, formal or informal, industrial or office-based or in urban or rural areas.

The results show that work-related fatal injuries in persons from particular occupations or industries occur in many different places, so a single place such as a farm or a mine is not a very sensitive indicator of fatalities in specific occupations or industries such as farming or mining. However, some places are likely to have a high specificity for work-related fatalities. For example, the vast majority of non-suicide fatal injuries occurring on mines or farms are likely to be related to work, but many injuries occurring to farmers do not occur on farms, and many injuries to miners do not occur on mine sites[270, 271].

Consideration of the mechanisms of the fatal incidents that occurred in different places reinforces the fact that particular types of incidents are more common in particular types of places. For example, being hit by falling or moving objects was the mechanism involved in almost half of all deaths resulting from injuries that occurred in industrial or construction areas or mines. This mechanism was involved in only about a third of fatal injuries on farms, trade areas or public streets, and in very few fatal injuries that occurred in a home.

5.17.9 CAUSE OF DEATH

Knowledge of the cause of death is helpful when identifying opportunities for, and approaches to, prevention, but this information is best combined with other relevant information. For example, mechanical asphyxia accounted for 7.4% of all deaths and 7.9% of workplace deaths. However, it was the cause of death in 45% of deaths involving persons being trapped by machinery, 25% of deaths involving the rollover of mobile mechanical equipment and 17% of deaths involving persons being hit by falling objects. This is important because such incidents are potentially survivable if the person has not sustained severe injuries. In many of these incidents, the worker was working alone and it is possible that the worker may not have died if there was someone else nearby at the time of the incident who could have freed the injured worker. This has implications for the working procedures used in particular situations (eg whether persons are allowed to work alone) and in assessing the possible usefulness of systems for contacting someone in the event of an emergency.

5.17.10 ALCOHOL AND DRUGS

The results indicate that alcohol and drugs contribute to at least one in twenty fatal incidents involving the deaths of workers. Since alcohol and drug use in connection with work is potentially preventable through appropriate education and other programs, alcohol and drug use should be considered in OHS prevention programs. This is especially so considering that the alcohol had been consumed at work or at a work-sponsored social function in around 40% of working and commuting incidents where alcohol was found to have contributed to the incident occurring.

Stimulants were a problem only in the work-road deaths, and all of these involved long distance transport drivers. Given the suspected widespread use of stimulants in the long

distance transport industry, it is interesting amphetamines were only tested for in approximately 43% of the work-road deaths (54% of work-road deaths involving truck drivers). On the basis of the deaths with known drug levels and the lack of information in over half the work-road deaths, the contribution of stimulants to the occurrence of these work-road deaths is probably more in the order of 5% to 7%.

5.17.11 MULTIPLE INCIDENTS

The vast majority of workers were fatally injured in single death incidents. These incidents usually do not receive the same level of attention from OHS authorities or in the press that multiple death incidents receive. However, each death is equally tragic, whether it occurs alone or at the same time as several others, and each fatal incident is deserving of significant attention from authorities and the general public. The results identify areas which have the greatest potential for multiple deaths, such as in the fishing, defence and mining industries and in air crashes.

5.17.12 TIME AND DAY

The temporal pattern of peaks mid-morning and mid-afternoon was seen in most of those industries for which temporal data were cited from WRFS 1 (eg fishing[10], forestry[11] and mining[27]) and has been reported from a number of other studies. The cause of these temporal patterns is not clear but the findings are potentially important for the planning of work procedures. The peak times may be when more people are working, so that the risk to the individual worker is no higher than at other times. The trough between the two apparent peaks occurred between 1200 and 1400. This might just reflect the fact that less people are working between those times because many are at lunch. This is an appealing explanation. However, there is a five-hour gap between the two peaks and this suggests that the pattern is influenced by more than just the effect of workers stopping for lunch. For example, the peak times may be when the activities

are more complicated or interact more, when people are becoming fatigued several hours after the last break or meal, when people are anticipating a break, or some combination of these or other factors.

The time of the fatal incident for the transport industry deaths was more evenly spread across 24 hours. This presumably reflects the fact that the transport industry functions at a high level at most hours. However, it should be noted that there were a high number of deaths between 0100 and 0600, a period when it might be expected that there would be fewer vehicles (both working and private) on the roads. Bearing this in mind, the study results suggest that the risk for drivers might be much greater during these early morning hours, with fatigue and darkness plausible explanations for this.

5.18 CONCLUSIONS

Work-related fatal injury of workers was a significant cause of death in Australia in the four-year period 1989 to 1992. The risk of fatal injury decreased moderately over the four years, but varied considerably depending on industry and occupation. Consideration of the circumstances of the death identified many recurrent features.