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Trends in road crash fatality rates summary report: Australia 1970-1990

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Abstract

Australia has seen a substantial and sustained reduction in road crash fatality rates between 1970 and 1990. This report describes and analyses the changes in road fatality rates in Australia.

Annual time trends are examined by road user type (all fatalities, drivers, passengers, pedestrians, motor cyclists and bicyclists), gender, age and time of week. The trends for each road user type are compared with those in other countries.

This report summarises the results of two more detailed reports, CR 113 and CR 114.

Keywords

Fatality rate, international comparisons, crash fatality trends, statistics

Notes:

- (1) FORS Research reports are disseminated in the interests of information exchange.
- (2) The views expressed are those of the author(s) and do not necessarily represent those of the Commonwealth Government.



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Australia 1970-1990

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April 1993

Trends in road crash fatality rates summary report:
Australia 1970-1990

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Trends in road crash fatality rates summary report: Australia 1970-1990

SUMMARY

Australia has seen a substantial and sustained reduction in road crash fatality rates (expressed as deaths per person per year) between 1970 and 1990. **This report** summarises two reports:

- CR113, which analyses annual time trends in fatality rates by road user type, State/Territory, gender, age, time of week and month
- CR114, which compares annual time trends in fatality rates for Australia and other countries

The data

In so far as data were available, State and Territory authorities provided data for each fatality between 1970 and 1990. **These data included the date and time of the crash and the gender, age and road user type of the person.** Data on the number of persons, registered vehicles and the amount of travel were provided by the Australian Bureau of Statistics. International data were obtained from Transport Canada and from the International Road Traffic and Accident Database.

Trends in Australian fatality rates

Fatality rates, expressed as the annual number of road crash deaths per person, have decreased by an average of 3.3% annually between 1970 and 1990. **Of the five road user categories, passengers and pedestrians had the greatest average annual percentage decreases (3.9% and 4.0%, respectively).** The average annual percentage decrease in the fatality rate for drivers was just below the average (3.0%), while that for bicyclists was much lower (1.0%). Unlike the other four road user types, the trend in the population fatality rate for motor cyclists could not be adequately described by an average annual percentage decrease. This was because there was an irregular pattern of motor cycle use between 1970 and 1990.

While the average annual percentage decrease was greater for males than for females for each type of road user, the only large difference was for drivers. Male drivers had an average annual decrease of 3.8% in their fatality rate, while female drivers had an **increase** of 0.5%.

The average annual percentage decrease for drivers was similar for all age groups. For adults aged 30 years and older, passengers had a greater decrease compared with drivers. Passengers and pedestrians had similar average annual percentage decreases in their fatality rates for children (16 years and younger) and for adults aged 30 or older. **For young adults, pedestrian and bicyclist rates changed little or even increased, while the passenger rate showed a decrease.** Bicyclist fatality rates for school children (5 to 16 years) decreased by about 2% annually.

The average annual percentage decrease in fatality rate varied with time of week. The largest average annual percentage decreases were mostly for evenings, particularly during the weekend. There were lesser decreases during the night, and the least decreases during the day. The pattern of decreases was similar for each mode of travel.

International comparisons

Overall, Australia's rate of decrease in fatality rates (annual deaths per person) has been slightly better than that for other countries for driver/passenger fatalities, but worse for pedestrian and bicyclist fatalities.

1. Australia

This chapter describes and analyses temporal changes between 1970 and 1990 in road fatality rates in Australia. Annual time trends are examined by road user type, gender, age and time of week.

For most analyses, fatality rates are defined as the number of road crash deaths per year per person in the Australian population. For other analyses, the fatality rate is the annual number of deaths per registered vehicle or per kilometre of travel.

Report CR113 (Anderson, Adena and Montesin, 1993a) provides more detailed analyses of these data, including the results of Poisson regression analyses.

1.1 Data sources

Road crash fatalities

Road crash data are collected by States and Territory authorities. Details of road crashes were sought for the period 1970 to 1990, although not all States and Territories could supply data for the whole period. For each fatality in Australia between 1970 and 1990, the requested data were date and time of the crash, State or Territory where the crash occurred, and the gender, age and road user type of the person. These data were collated, assessed for face validity and internal consistency and checked against published data.

For each jurisdiction, the years for which this level of detail had been recorded were:

New South Wales	1970 - 1990
Victoria	1970 - 1990; drivers, motor cyclists and cyclists missing in 1970, 1971 & 1973
Queensland	1975 - 1990
South Australia	1970 - 1989; missing 1977, 1987 & 1988
Western Australia	1976 - 1990
Tasmania	1970 - 1990; time of week missing in 1970 - 1975
Northern Territory	1979 - 1990
Australian Capital Territory	1985 - 1989

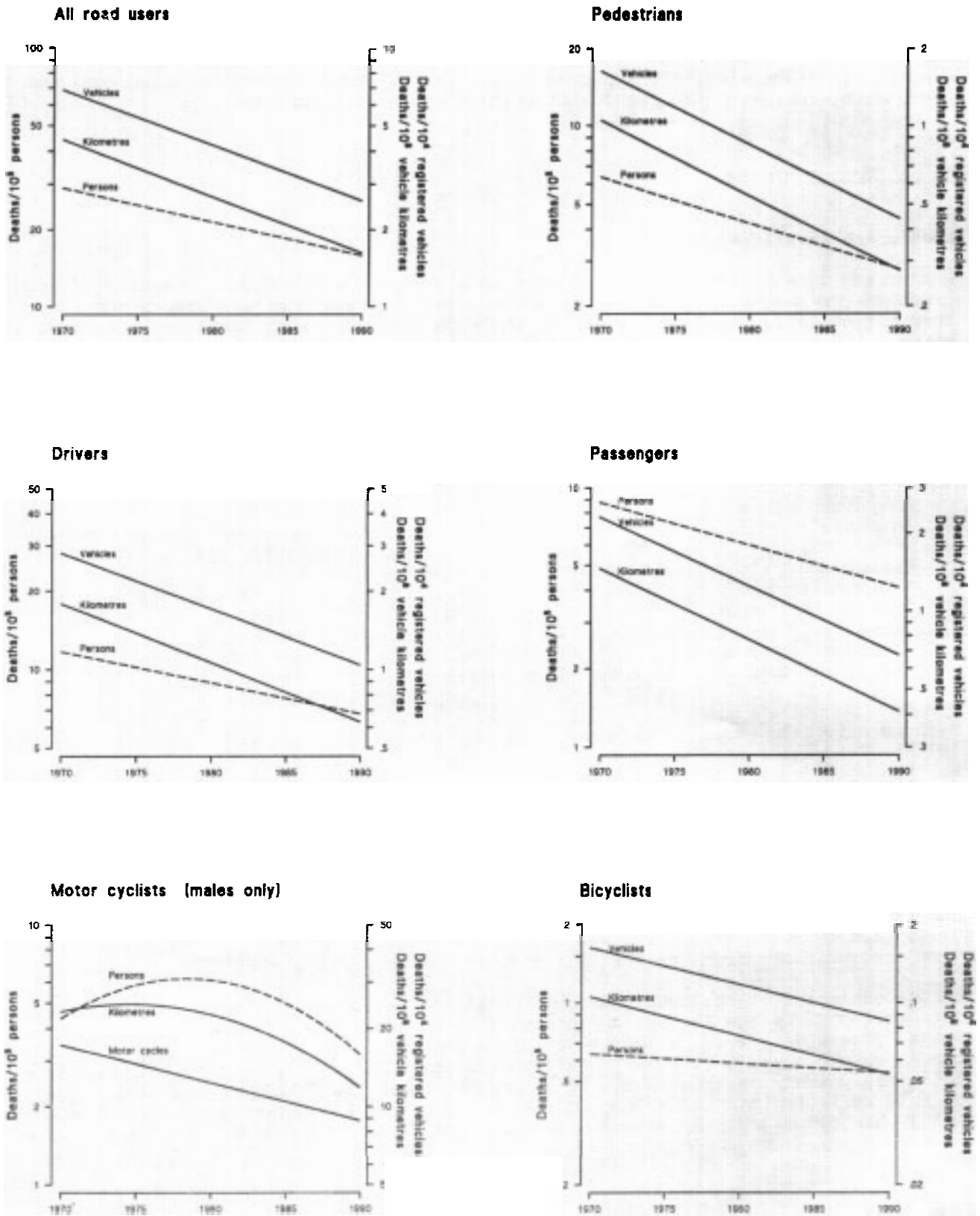
Because only five years of data were available for the ACT, trends over the period 1970 to 1990 could not be assessed. This was also not always possible for the Northern Territory, partly because data for the first nine years were unavailable, and partly because the low population base results in relatively few road fatalities.

Other data

Population data, classified by State/Territory, gender, age group and year, was obtained from the Australian Bureau of Statistics. The number of registered vehicles, classified by State/Territory, vehicle type (motor cycles, other vehicles) and year, were also obtained from the Australian Bureau of Statistics.

Annual estimates of the total amount of vehicle travel were linearly interpolated from data collected by the Australian Bureau of Statistics in its survey of motor vehicle usage. These data were classified by State/Territory, vehicle type (motor cycle, other vehicles) and survey year (1971 (preliminary data), 1976, 1979, 1982, 1985 and 1988 (preliminary data)). While it is possible that the data from the 1971 survey may be less reliable than those from the later years, the estimates of fatality rates using this denominator appeared to be consistent with the pattern observed for later years.

Figure 1.1 Fitted trends in road crash fatality rates in Australia 1970–1990, by type of fatality rate and road user type



1.2 Annual trends in fatality rates

Each figure in this section shows the trend in road crash rates between 1970 and 1990. Six sub-figures give these trends for all fatalities and for pedestrians, drivers, passengers, motor cyclists and bicyclists. The underlying data are tabulated and plotted in CR113.

Annual fatality rates have been plotted on a logarithmic scale. This enables fatality rates differing by up to several orders of magnitude to be plotted on the same graph. This also means that a constant percentage change over time results in a straight line on the graph. Any departures from a constant percentage change, either in the short term (which frequently occurs) or in the long term can easily be seen in figures which include the data (as in Anderson, Adena and Montesin 1993a).

Where the data can be reasonably summarised as a constant annual percentage change, the trends are plotted as straight lines. Annual percentage decreases of more than 5.0% are shown as solid lines, those between 2.5 and 5.0% are shown as long dashed lines, those between 0.0% and 2.5% as short dashed lines and increases as dotted lines. For motor cyclists, some fatality rates showed a curvilinear (quadratic) relationship, and are plotted using a dotted line.

The ratio of the maximum to minimum values on each y-axis are the same for all sub-figures on a page. This means that any lines representing the same annual percentage change will have the same slope.

Overall fatality rates

Figure 1.1 shows the trend in road crash fatality rates between 1970 and 1990. Each sub-figure shows the death rate calculated using three denominators: persons (using the left hand scale), registered vehicles (using the right hand scale) and travel (also using the right hand scale).

Except for motor cyclists, these fatality rates are well described as having a constant average percentage change between 1970 and 1990. For motor cyclists, this was so only for fatality rates per registered vehicle: this reflects that motor cycle ownership increased between 1970 and the early 1980s and then decreased.

The most striking aspect of Figure 1.1 is that, except for motor cyclists, the fatality rates have generally decreased between 1970 and 1990. The percentage decreases in vehicle and travel based rates are similar and are greater than those expressed as deaths per person. This reflects that vehicle registrations have grown faster than the population, but that the amount of travel per vehicle has not changed much over the period.

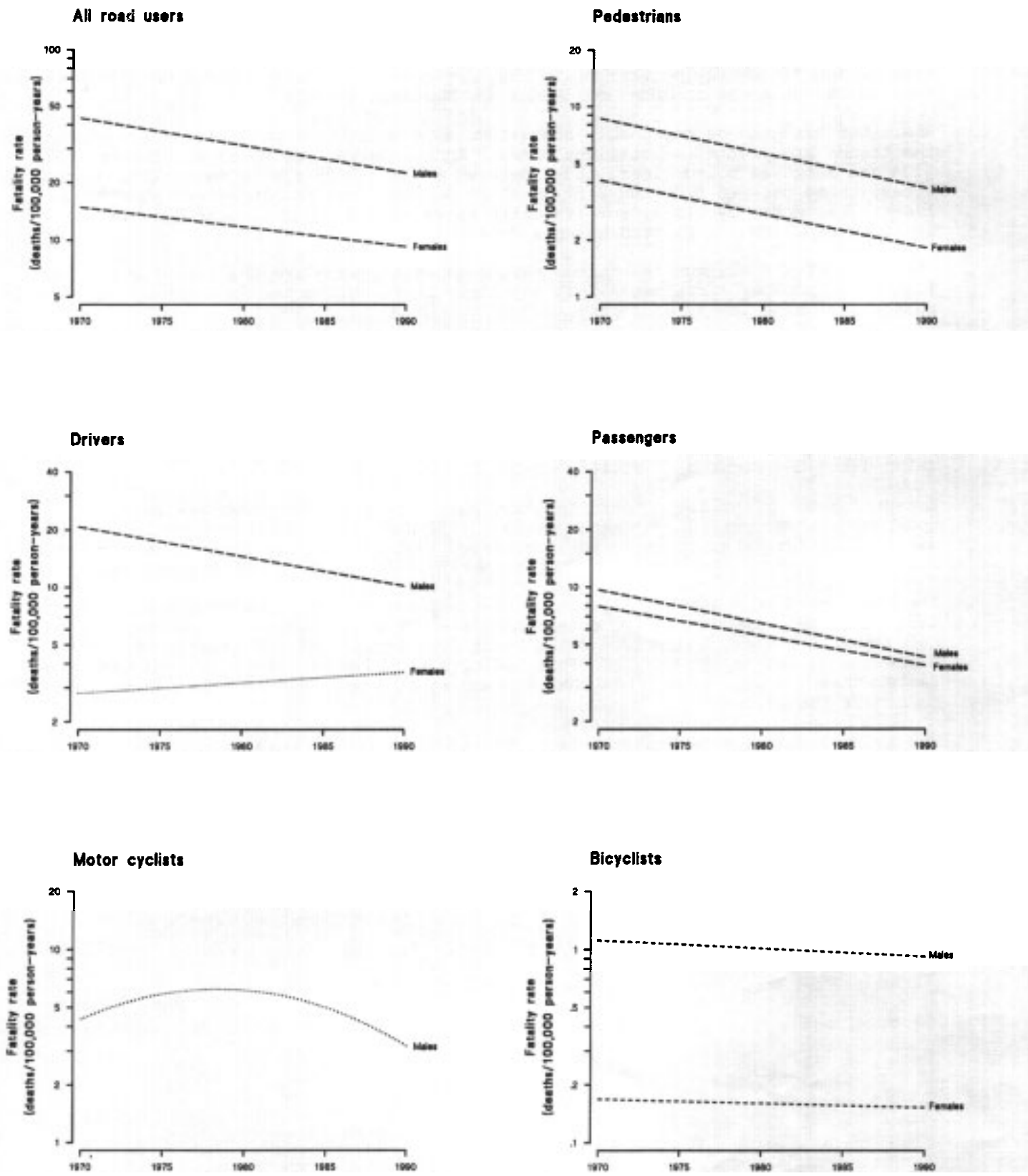
The average annual % decrease in fatality rate per 100,000 persons for all fatalities was 3.3% between 1970 and 1990. Of the five road user categories, passengers and pedestrians had the greatest average annual percentage decreases (3.9% and 4.0%, respectively). The average annual percentage decrease in the fatality rate for drivers was just below the average (3.0%), while that for bicyclists was much lower (1.0%):

Denominator	All	Drivers	Passengers	Pedestrians	Motor cyclists	Bicyclists
Persons	3.3	3.0	3.9	4.0	-	1.0
Vehicles	4.8	4.9	6.0	6.3	4.2	3.4
Travel	4.9	5.1	6.1	6.4	-	-

('-' means that these average percentage decreases are not available.)

For other analyses in this chapter, only fatality rates per person have been analysed.

Figure 1.2 Fitted trends in road crash fatality rates in Australia 1970–1990, by gender and road user type



Gender

Figure 1.2 shows fatality rates separately for males and females for each road user category. For motor cyclists, only male rates are shown because only 6% of fatalities of motor cyclists were female.

For each road user category, males have greater fatality rates than females. This difference is least for passenger fatalities.

The average annual percentage decrease in fatalities per person was greater for males than for females and this was true for each mode:

Gender	All	Drivers	Passengers	Pedestrians	Bicyclists
Males	3.6	3.8	4.2	4.2	1.1
Females	2.6	+0.5	3.5	3.8	0.8

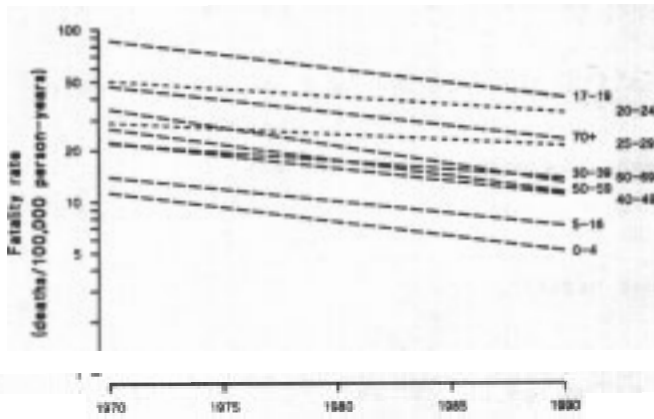
(All percentage changes are decreases, except those marked '+'.)

The only large difference was for drivers. Male drivers had an average annual decrease of 3.8% in their fatality rate, while females an **increase** of 0.5%. Thus, male drivers had a decrease similar in magnitude to passengers and pedestrians.

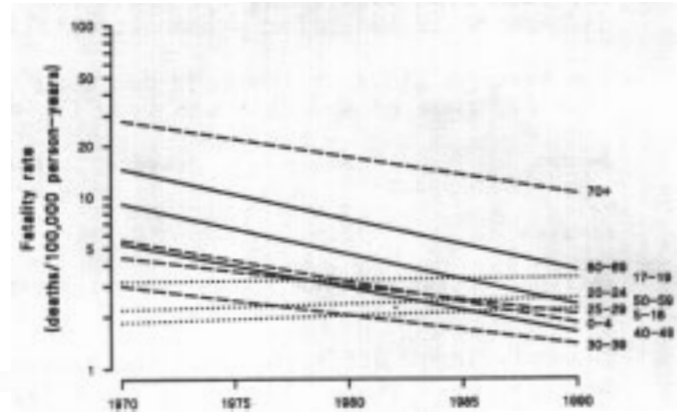
The difference between males and females was much smaller for passengers, bicyclists and pedestrians, and was statistically significant for only passengers.

Figure 1.3 Fitted trends in road crash fatality rates in Australia 1970–1990, by age group and road user type

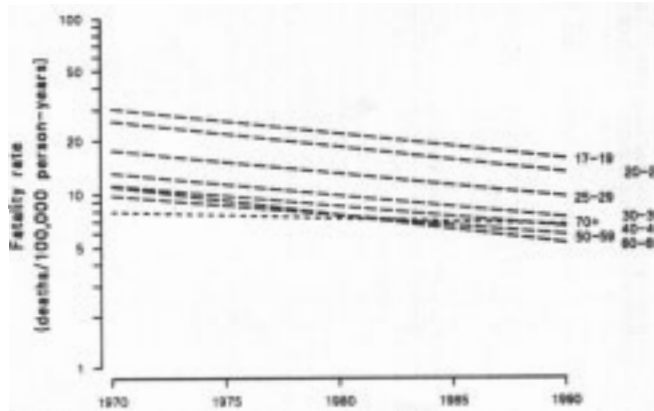
All road users



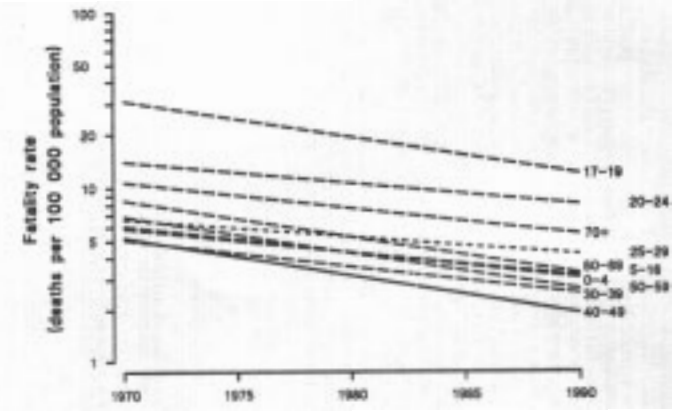
Pedestrians



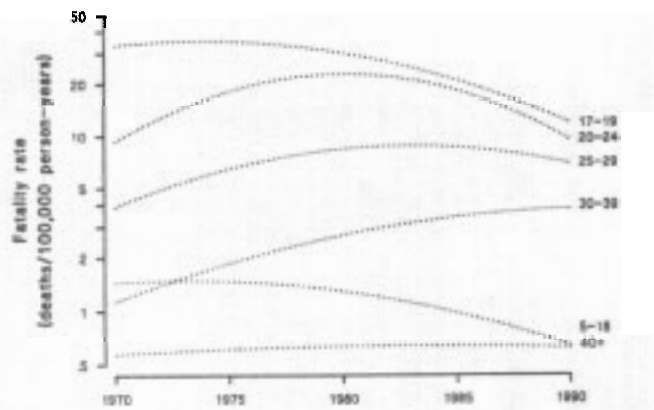
Drivers



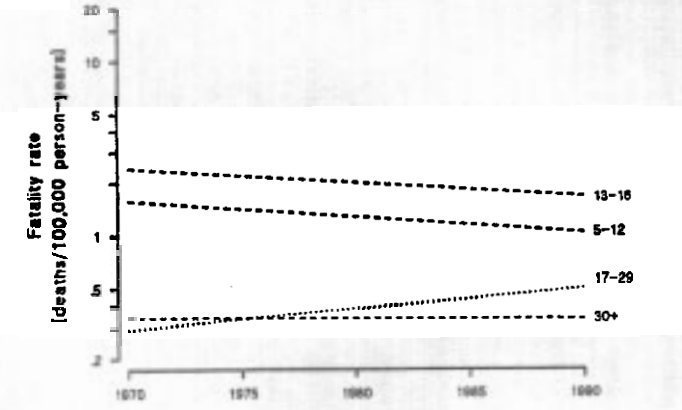
Passengers



Motor cyclists



Bicyclists



Age group

Figure 1.3 shows fatality rates for several age groups for each road user category.

Fatality rates are generally less for older drivers than for younger drivers. However, the decrease in fatality rates per person between 1970 and 1990 was similar (about 3.0% annually) for all age groups, except for drivers aged 70 years or older. In 1970, drivers aged 70 years or older had the lowest fatality rate, but this decreased by only an average of 1.4% annually, so that, by 1990, drivers in this age group had a fatality rate similar to those in their forties.

Fatality rates of passengers are highest for passengers aged 17 to 24 years followed by those 70 years and older, and lowest for those aged 30 to 49 years. For adults aged 30 to 69 years, passengers had a greater decrease (about 4.5% annually) in the fatality rate than drivers. For younger adults, the average annual percentage decrease was less (3.1% annually), similar to that of drivers. For children, the percentage decrease was 3.7% annually.

For pedestrians, the pattern of fatality rates with age has changed between 1970 and 1990. For example, young adults aged 17 to 29 had low rates relative to other age groups in 1970, but by 1990 they had relatively high rates. Indeed, the fatality rates increased between 1970 and 1990 for this age group. Pedestrians had fatality rate decreases similar to those of passengers for children and for adults aged 30 or older.

School age children have the highest bicyclist fatality rate, but this has decreased by about 2% annually. The rate for young adults has increased between 1970 and 1990.

Average annual percentage decreases in the fatality rate per person for each road user category for four broad age groups are:

Age group	All	Drivers	Passengers	Pedestrians	Bicyclists
5-16	3.2	-	3.7	3.4	2.2
17-29	2.6	3.2	3.1	+1.3	+1.4
30-69	3.9	3.0	4.5	5.2	0.3
70+	3.4	1.4	3.2	4.2	-

(All percentage changes are decreases, except those marked '+'.)

Time of week

Figure 1.4 shows fatality rates for up to five time periods during the week (Sunday 8pm to Friday 8pm), while Figure 1.5 is for the weekend (Friday 8pm to Sunday 8pm).

The average annual percentage decrease in fatality rate varied with time of week. The pattern of decreases was similar for each mode of travel:

Time of week	All	Drivers	Passengers	Pedestrians	Bicyclists
Week day					
Day	1.1	0.6	1.8	1.5	+1.2
Evening	4.0	3.6	4.4	5.4	2.2
Night	2.2	2.4	2.0	2.2	na
Weekend					
Day	2.4	2.2	3.0	3.0	1.7
Evening	5.7	5.5	6.2	6.7	5.4
Night	3.3	3.5	4.4	0.3	na

(All percentage changes are decreases, except those marked '+'.)

The largest average annual percentage decreases were mostly for evenings (4pm to midnight), particularly during the weekend. There were lesser decreases during the night (midnight to 6am), and the least decreases during the day (6am to 4pm).

Figure 1.4 Fitted trends in road crash fatality rates in Australia 1970-1990, by time of day during the week and road user type

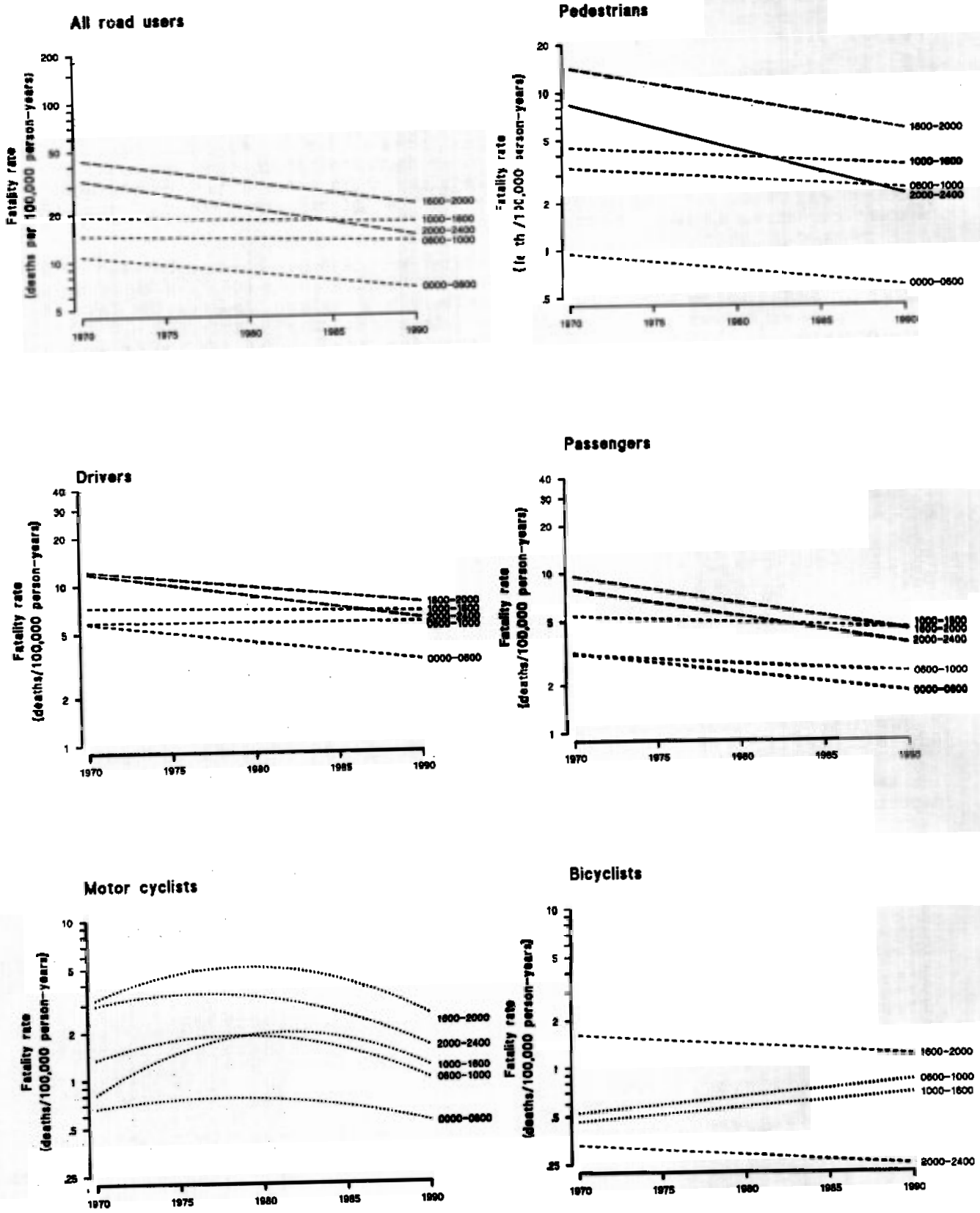
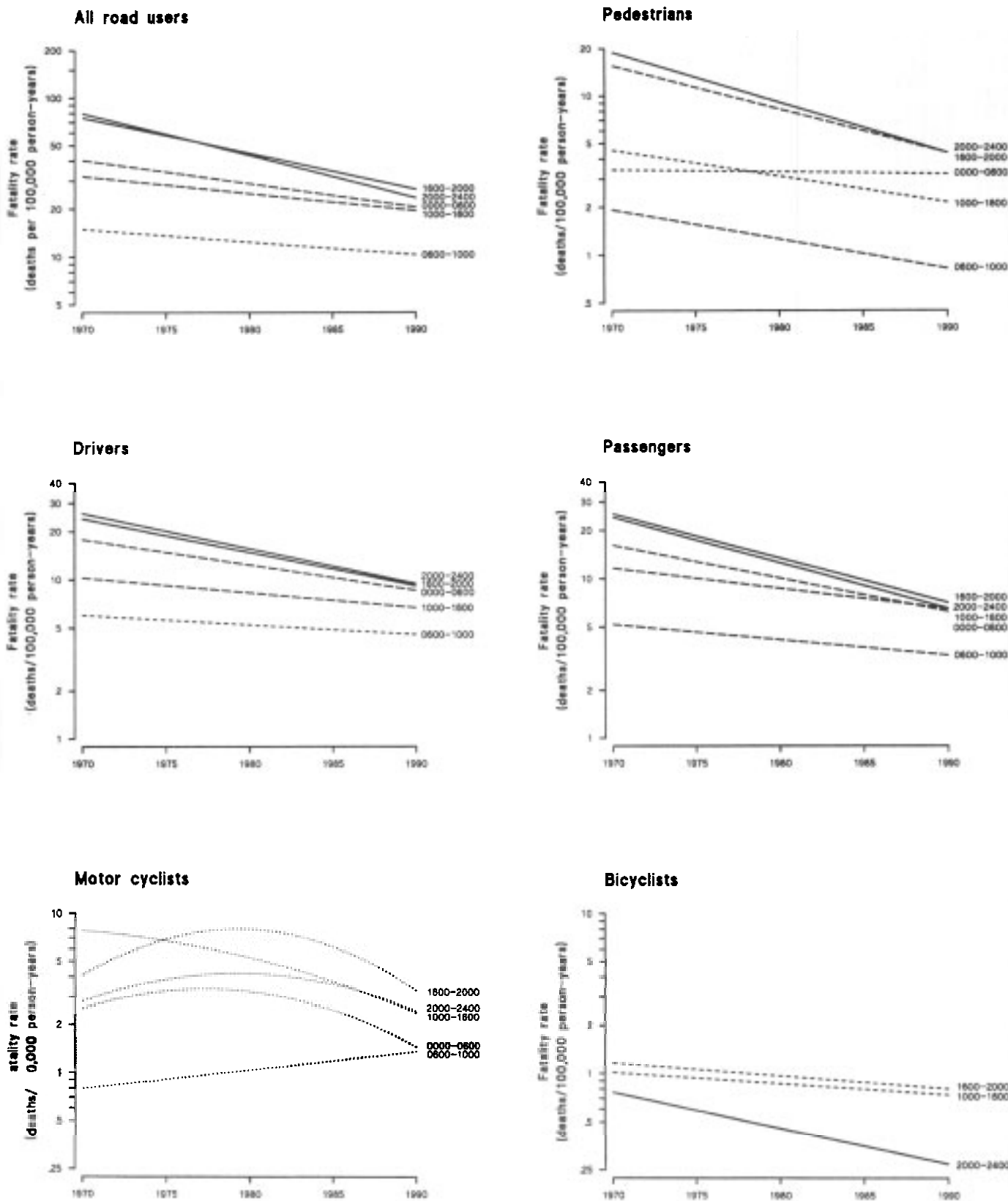


Figure 1.5 Fitted trends in road crash fatality rates in Australia 1970–1990, by time of day during the weekend and road user type



2. International comparisons

Australia has seen a substantial and sustained reduction in road crash fatality rates between 1970 and 1990. This chapter compares this reduction with that seen elsewhere.

2.1 Data sources

The data for Australia were obtained as described in Section 1.1. These data have been used for the analyses reported in Chapter 1 and in CR113 and CR114 (Anderson, Adena and Montesin, 1993a, b). Chapter 1 and CR113 contain the results of more detailed analyses than those reported here, and the set of data that was available at that level of detail is not precisely the same as that available for this chapter and CR114. Therefore, estimates of average annual % decreases for Australia may differ slightly from those given in Chapter 1, but can be fairly compared with those for other countries.

Transport Canada provided the numbers of fatalities for each year between 1970 and 1990 for each road user type in Canada. The data for 1970 appeared to be inconsistent with those for later years, so the data for 1970 were not used for the analyses in this report. Denominator data (population and registered vehicles) were also obtained.

The source of data for other countries was IRTAD, the International Road Traffic and Accident Database. It holds data for 25 countries. The database is nominally for the period 1970 to 1990, with some data also for 1965. However, many countries have missing or incomplete data, there is no separate classification by gender and drivers and passengers are combined.

In this chapter, comparative data for only the USA, UK, West Germany, New Zealand and Japan have been plotted. CR114 includes plots for twelve other countries.

2.2 Comparisons with Australia

Fatality rates for all road users

Of the 20 countries with reasonably complete data, Australia has the fifth highest average total road fatality rate per person between 1970 and 1990, after Portugal, France, Belgium and Austria. However, Australia's high rate of vehicle ownership results in its fatality rate per vehicle being the sixth lowest.

Australia's estimated average annual percentage decrease in the fatality rate per person was 3.2%, slightly better than the median decrease of 2.9%. Ten countries had an annual percentage decrease within 0.5 percentage points of that for Australia. Australia's low rate of increase in vehicle ownership means that the decrease in the fatality rate per vehicle is less than that for most countries.

Figure 2.1 shows that Australia has had fatality rates similar to those for the USA, Canada and West Germany, but that the annual percentage decrease has been greater, approximately the same and less, respectively. Australia's fatality rates are much greater than those in the UK, and the annual percentage decrease has been greater. Overall fatality rates appear to have increased in New Zealand, while the pattern for Japan was a marked decrease in the early 1970s with little change since then.

Driver and passenger fatality rates

Driver and passenger fatalities comprise 66% of all Australian road deaths. This percentage ranges from 27% (for Portugal) to 72% (for Canada). For most countries, this percentage has increased between 1970 and 1990.

Figure 2.1 Population fatality rate of all road users between 1970 and 1990 for Australia and selected countries
(Annual rates are shown with fitted trend, where appropriate)

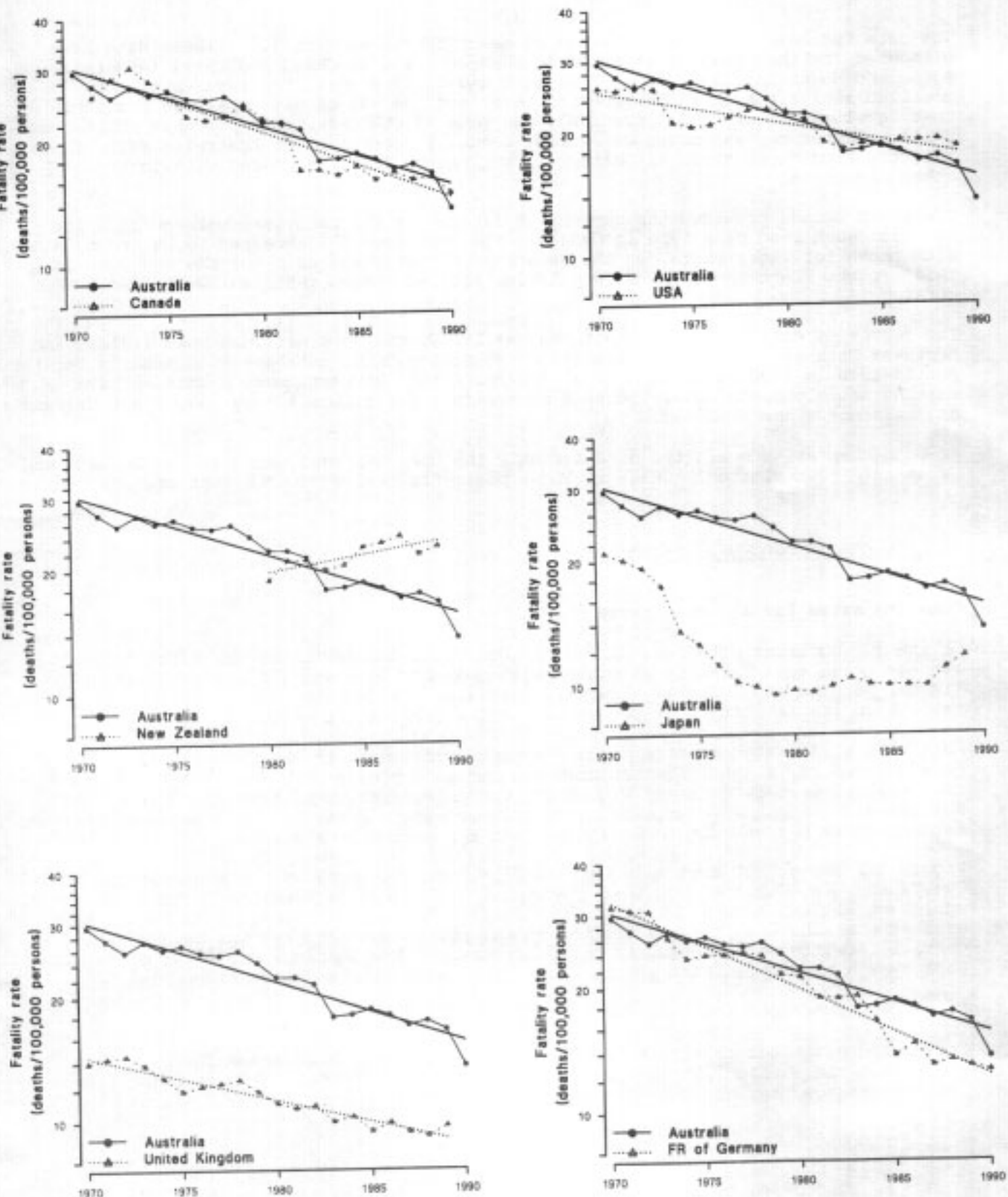


Figure 2.2 Population fatality rate of drivers and passengers between 1970 and 1990 for Australia and selected countries (Annual rates are shown with fitted trend, where appropriate)

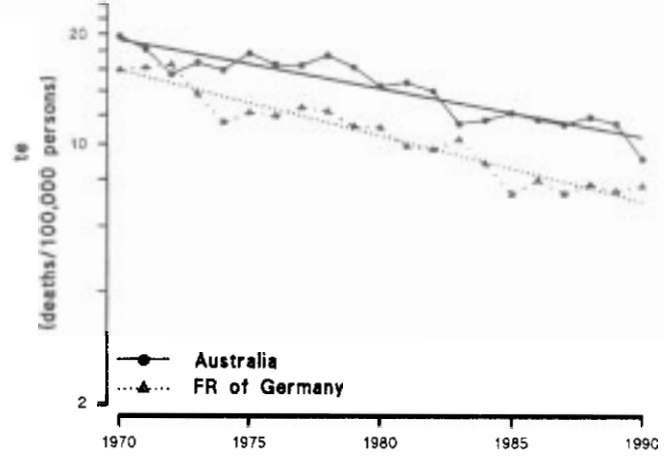
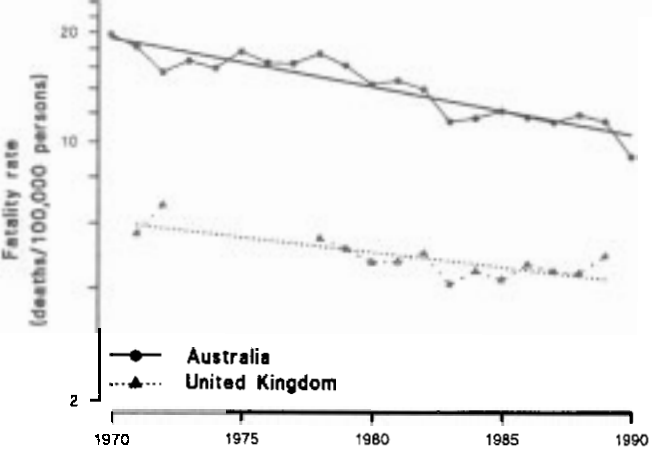
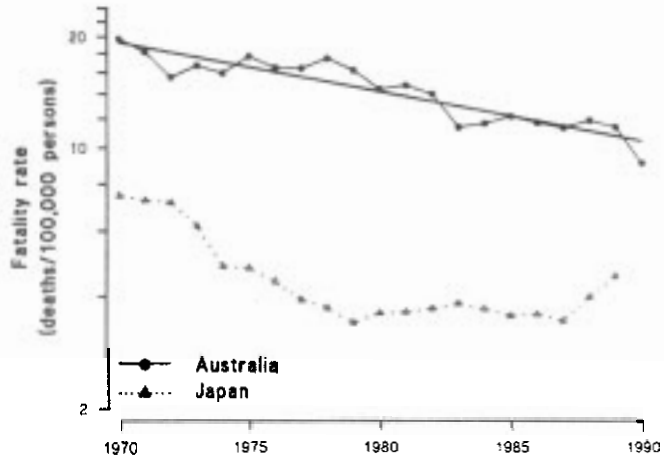
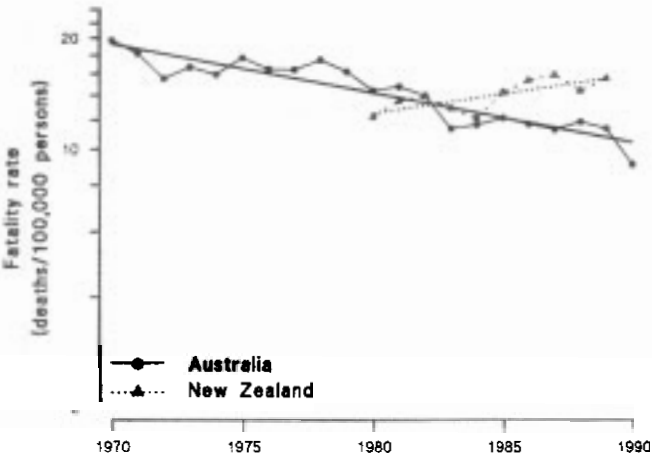
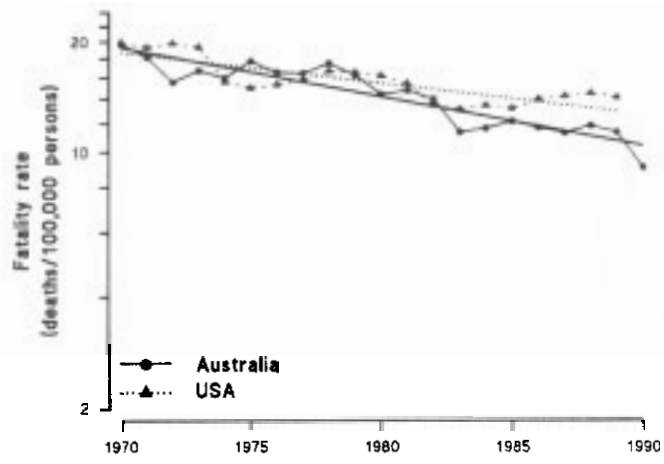
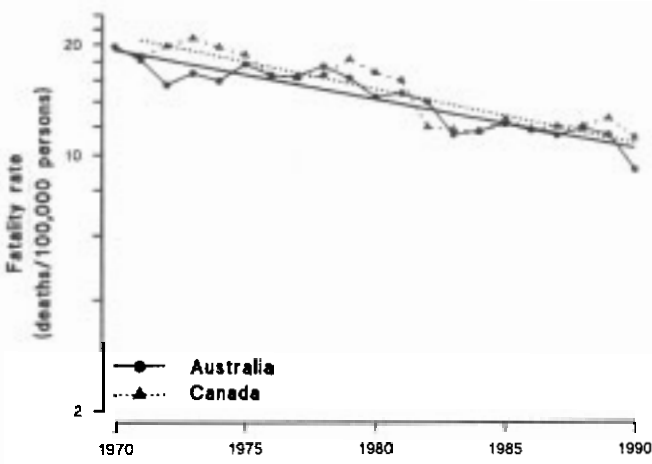
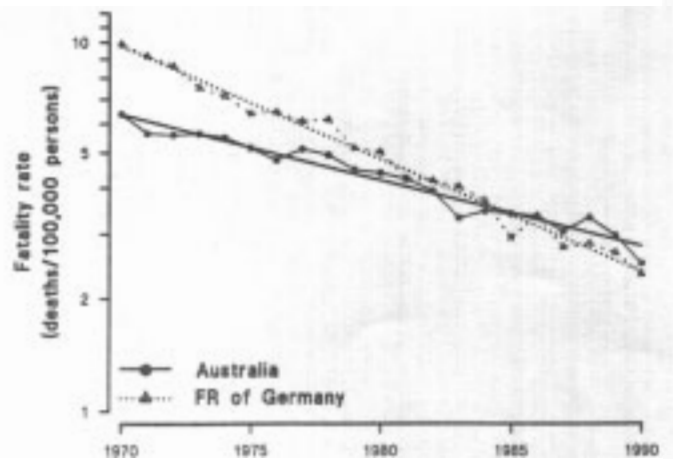
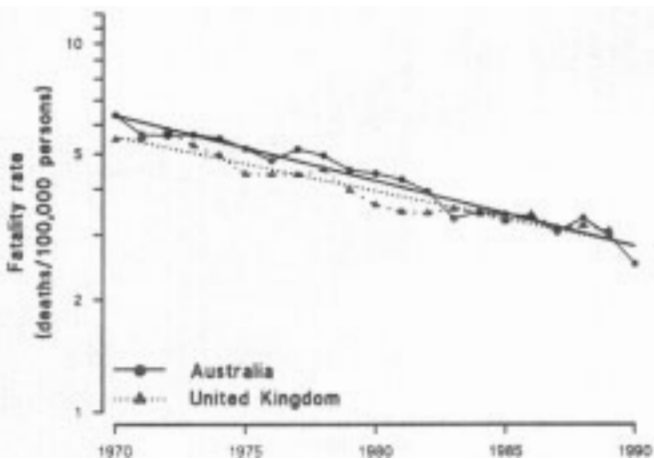
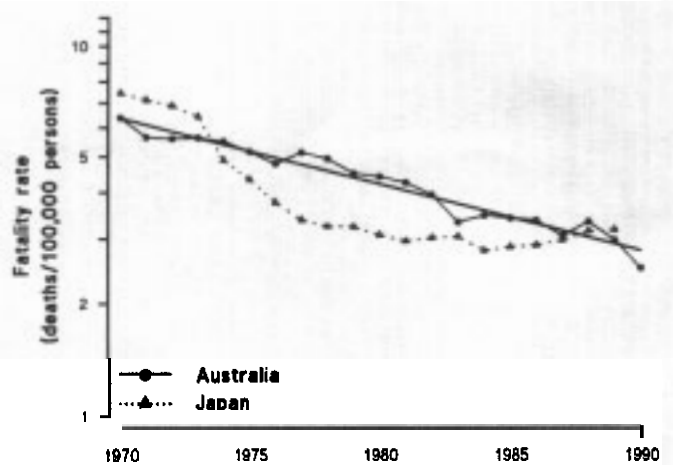
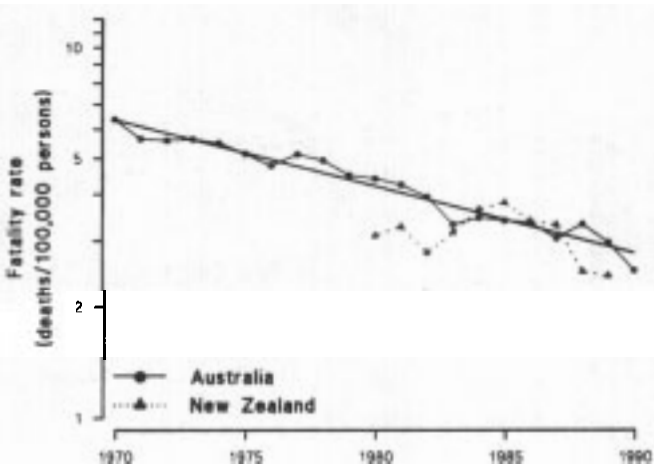
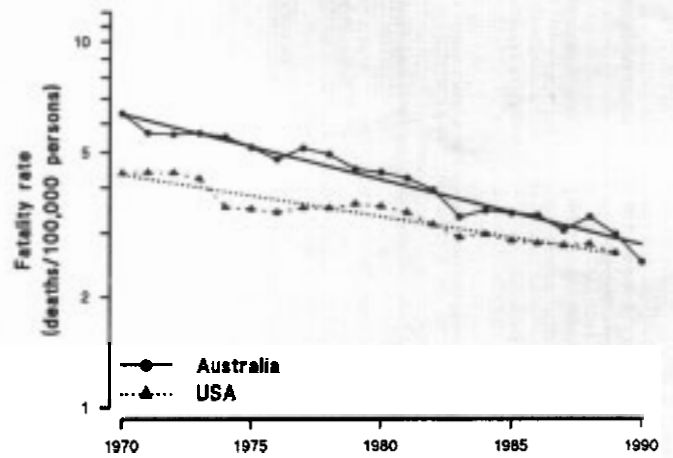
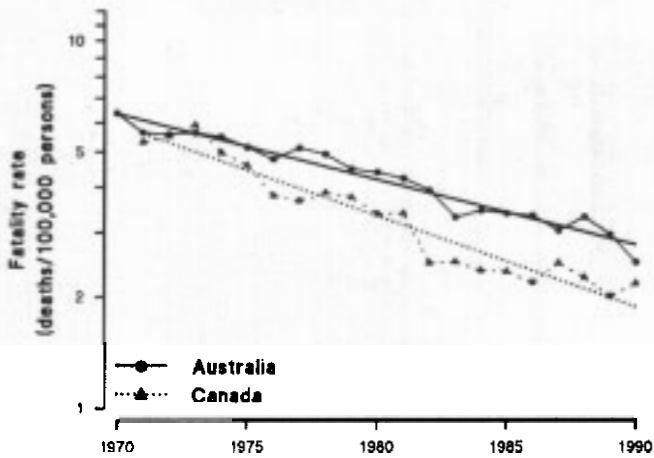


Figure 2.3 Population fatality rate of pedestrians between 1970 and 1990 for Australia and selected countries
(Annual rates are shown with fitted trend, where appropriate)



Only four countries - Netherlands, West Germany, Canada and Japan - had a greater average annual percentage decrease for driver/passenger fatalities than Australia. In 1970, Australia had the highest driver/passenger fatality rate of all countries for which there are data. By 1990, France, Spain, Belgium and Austria had higher fatality rates and the gap between Australia and most other countries had narrowed. Australia's relatively low rate of increase in vehicle registrations means that the average annual percentage decrease in the vehicle based rate is closer to the mean change for all countries than the population based rate.

Figure 2.2 shows similar results hold for drivers/passengers as for all fatalities.

Pedestrian fatality rates

In Australia, pedestrians account for about 19% of fatalities, lower than for most countries. For the Netherlands, this percentage fell from 19% in 1970 to 10% in 1990. Other countries also experienced a decrease, but to a lesser extent.

The average annual percentage decrease in fatality rate of pedestrians in Australia was greater than for any other mode of road user. However, it was less than the median decrease for all countries.

Figure 2.3 shows that the average annual percentage decrease in Australia (4.0%) was greater than that for the USA (2.6%) and the UK (3.5%), but less than that for West Germany (6.8%) and Canada (5.7%). Meaningful average annual percentage changes between 1970 and 1990 could not be calculated for New Zealand and Japan.

Motor cyclist fatality rates

Motor cycle usage differs considerably between countries, as does the percentage of fatalities. Australia has a low percentage of fatalities (about 11%). Australia also has a relatively small average annual percentage decrease in the population based fatality rate, although there has been a steeper decrease since 1986.

Figure 2.4 shows that the pattern of fatality rates for motor cyclists is similar for Australia, Canada, the USA, UK and West Germany.

Bicyclist fatality rates

Only 3% of road fatalities in Australia are of bicyclists. For many other countries this percentage is much higher. The Netherlands has the highest proportion (20%). This is noteworthy because the Netherlands has the largest decreases overall for the other types of road user, but this did not occur for bicyclists.

Italy, which did not have high decreases for other modes, had the highest decrease in bicyclist fatality rates per person (5.5%). Germany, Austria, Japan and Canada all had decreases of over 4%. Most other European countries had decreases between 2% and 4%. Australia had one of the lowest decreases (1.2% annually), along with the UK and the USA (Figure 2.5).

Summary

The average annual percentage decrease in fatality rates per person between 1970 and 1990 for each road user type were:

Country	All	Drivers/ passengers	Pedestrians	Bicyclists
West Germany	4.6	4.1	6.8	4.6
Canada	3.7	3.4	5.7	4.2
Australia	3.2	3.1	4.0	1.2
UK	2.4	1.9	3.5	1.7
USA	1.8	2.0	2.6	1.3
Median (20 countries)	2.9	1.9	4.9	3.5

The median decrease for Australia, Canada and the countries in the IRTAD database for which adequate data exist is also shown.

Figure 2.4 Population fatality rate of motor cyclists between 1970 and 1990 for Australia and selected countries
 (Annual rates are shown with fitted trend, where appropriate)

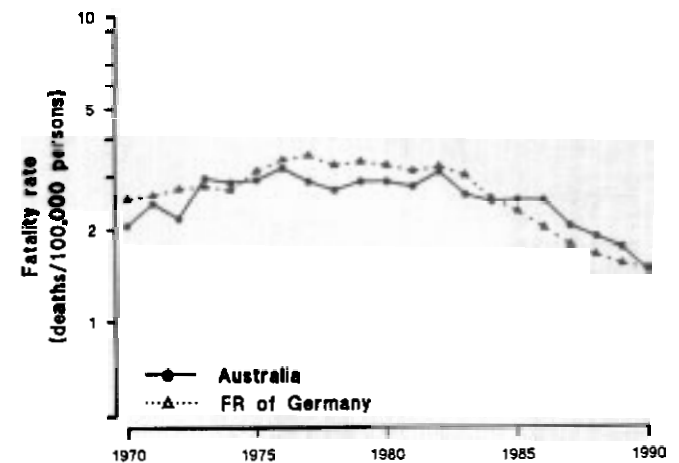
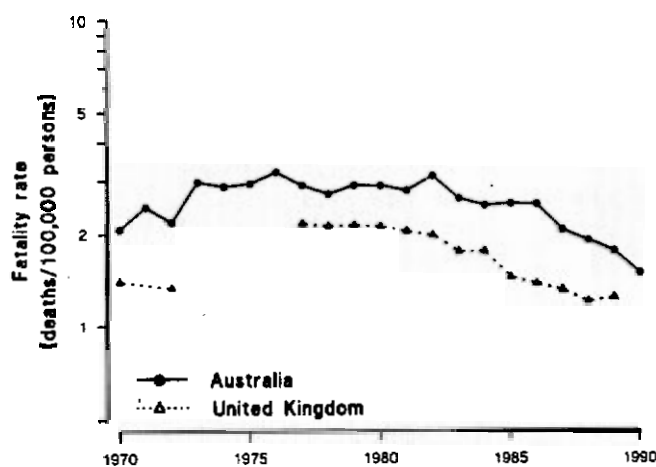
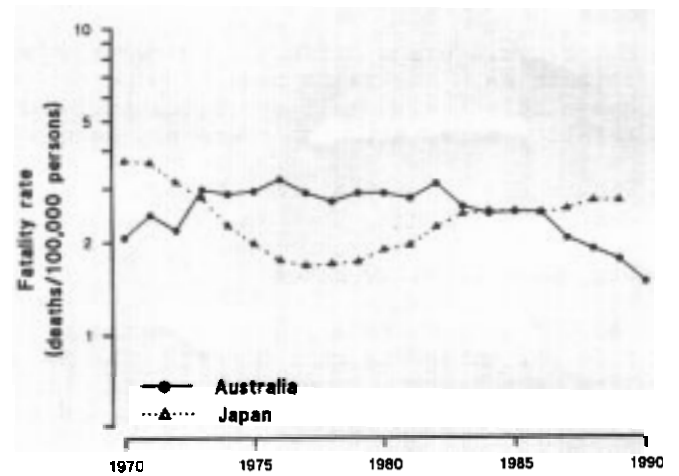
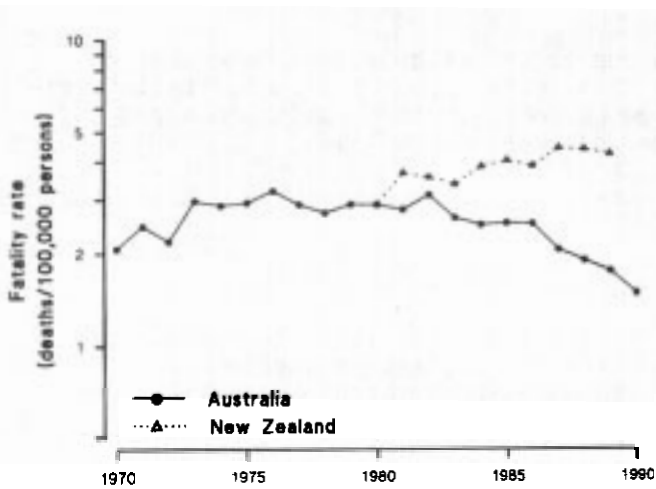
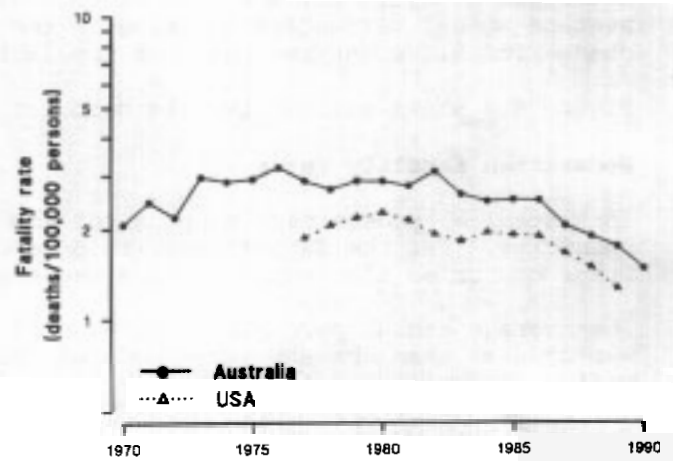
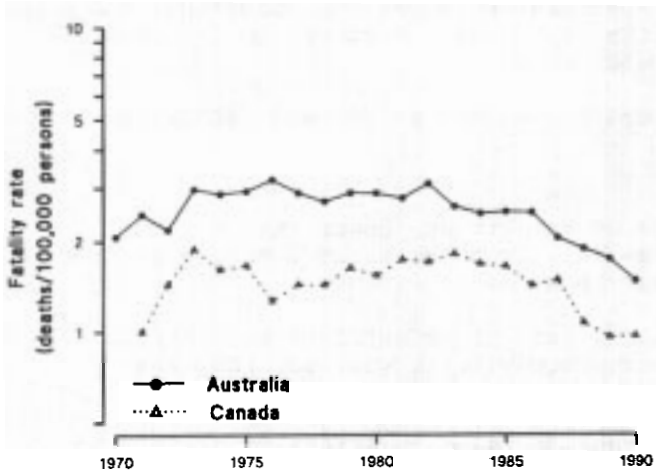
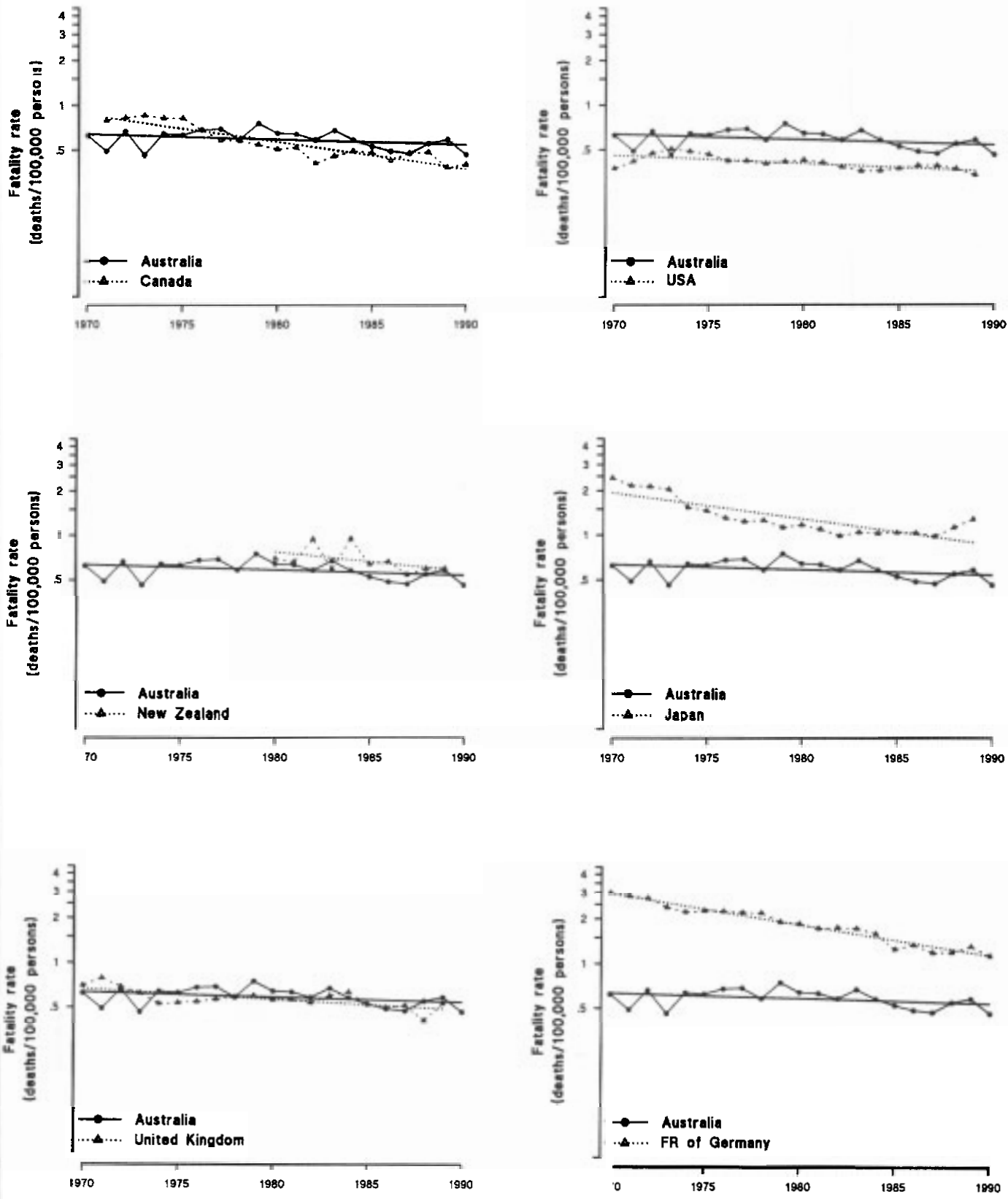


Figure 2.5 Population fatality rate of bicyclists between 1970 and 1990 for Australia and selected countries
 (Annual rates are shown with fitted trend, where appropriate)



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