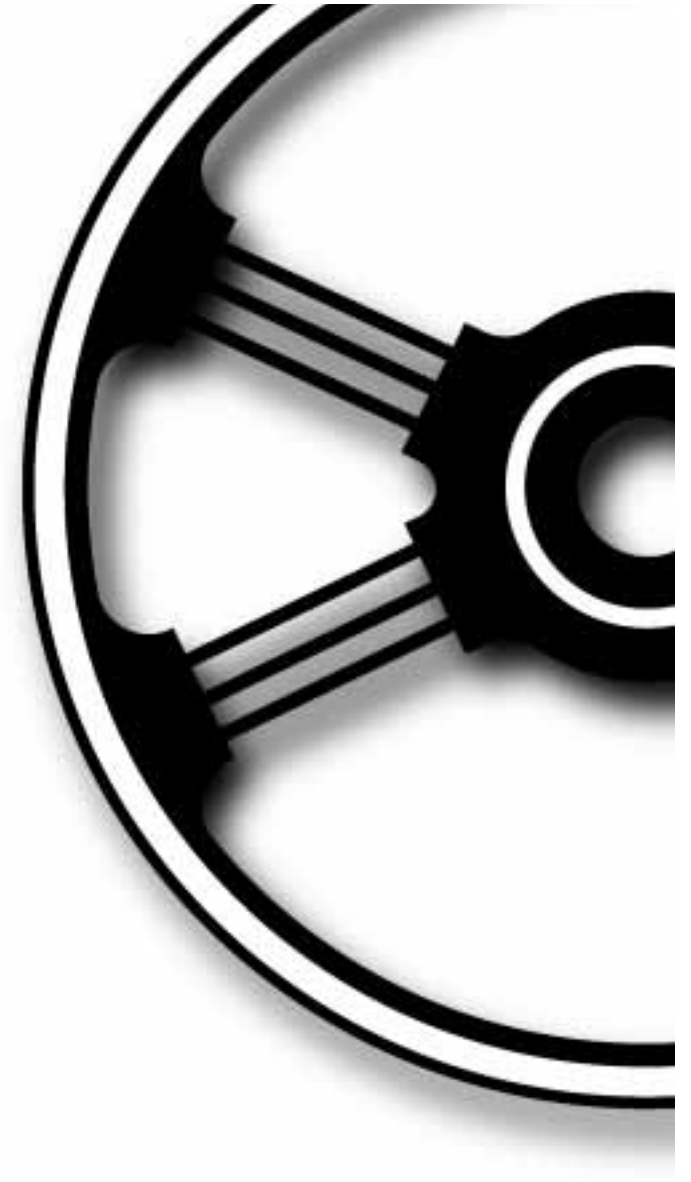
Federal Office of Road Safety

CR178

A Statistical Overview of
Road Crash Involvement

women

Behind the Wheel



CR178

A Statistical Overview of Road Crash Involvement

R Attewell

women

Behind the Wheel

ISBN 0 642 25525 3

Produced by Miller Street Studio, Canberra

Printed by Goanna Print.

Department of Transport and Regional Development
Federal Office of Road Safety
Document Retrieval Information

Report No.	Date	Pages	ISBN	ISSN
CR178	May 1998	28	0 642 25525 3	0810-770X

Title and Subtitle
Women behind the Wheel: A Statistical Overview of Road Crash Involvement

Author
R. Attewell

Performing Organisation
INTSTAT Australia Pty Ltd
13b Edgar Street
AINSLIE ACT 2602

Sponsored by/Available from
Federal Office of Road Safety
GPO Box 594
CANBERRA ACT 2601

Abstract
This report forms part of a series published by the Federal Office of Road Safety (FORS) on women and road safety. It presents national road crash statistics for women, and in particular, women drivers involved in fatal crashes and crashes resulting in hospitalisation.

There are two other reports in this series: a review of published female driver research and an analysis of attitudes and driving behaviours of young and middle-aged women obtained through a recent survey of women from across Australia.

Keywords
Female Drivers, Road Safety

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.

TABLE OF CONTENTS

1. SUMMARY

This report forms part of a series published by the Federal Office of Road Safety (FORS) on women and road safety. It presents national road crash statistics for women, and in particular, women drivers involved in fatal crashes and crashes resulting in hospitalisation. There are two other reports in this series: a review of published female driver research and an analysis of attitudes and driving behaviours of young and middle-aged women obtained through a recent survey of women from across Australia.

Even though the national road toll is decreasing, the number of women drivers killed and hospitalised is increasing. This is due an increase in the number of women obtaining drivers licences and an increase in the amount of travel they are undertaking. The presence of women as drivers is expected to continue to grow since the level of licensing and the amount of distance travelled is still below that of men. In 1995, 79% of women aged 17 years or over had driving or motor cycle licences compared to 96% of men, and, for every kilometre driven in cars by women, men drove 1.5 kilometres.

Despite the increases in travel by women, the rate of fatalities and the rate of hospitalisations per distance driven is continuing to decrease for both male and female drivers indicating that improvements in roads, car design and road safety campaigns are impacting on both male and female drivers. However, the rates at which the decreases are occurring are faster for men than women for both fatal and non-fatal injuries. Between 1976 and 1995 the fatality rate for female car drivers has decreased approximately 3.9% per year compared with a decrease of 4.9% per year for male car drivers. Similarly, between 1980 and 1995 the hospitalisation rate for female car drivers has decreased approximately 3.2% per year compared with 4.4% for male car drivers. Specifically targeting women drivers may address imbalances as well as ensuring further reductions.

In spite of the relative differences in the rates of change, men still have a considerably higher fatality rate than women. In 1995, the fatality rate for male car drivers (0.76 deaths per 100 million km) was 1.64 times higher than that for female car drivers (0.46). However, the differential between men and women decreases for less severe crashes. In fact, the rate of hospitalisation of female car drivers (8.35 per 100 million km driven) is 1.15 times higher than that for men (7.35 per 100 million km driven).

For both men and women, the rates of death and injury per distance travelled are highest for the youngest and oldest drivers. The most common age of female drivers killed or hospitalised in road crashes is 18 years. A total of 41% of both male and female drivers aged under 25 who are involved in hospitalisation crashes have learner's or provisional licences.

Typical crash scenarios differ according to age and gender in similar patterns. Hospitalisation crashes involving younger drivers and male drivers are more typically single vehicle or head-on crashes, occurring at night or on weekends, often involving alcohol, whereas crashes involving older drivers or female drivers are more typically crashes at intersections, in lower speed zones occurring during the day and on weekdays and not generally involving alcohol.

2. BACKGROUND

Women make up a large percentage of drivers on our roads. They also make up a sizeable proportion of the road toll and road casualties. However, since males have always outnumbered women in crude crash statistics, most research attention has been focussed on men. The targeting of traditional areas of road safety such as drink driving, fatigue and speeding may not have a great impact on crashes involving women drivers. Further success in reducing the road toll in the future may depend on specific research into other areas which may be of particular relevance to women.

The Federal Office of Road Safety maintains national databases with detailed unit record crash data. However, due to space considerations, the primary statistical series published by FORS do not contain detailed disaggregation by gender. For example, the monthly fatality reports and the quarterly injury reports give counts for male and female drivers, but not for male and female car drivers. The aim of this report is to utilise existing national data to monitor trends in crash and injury statistics for women drivers and present the data in a way which allows exploration of areas which may be of particular significance to women on Australia's roads.

3. METHODS

3.1 OVERVIEW

The data initially presented are the counts of women drivers who are killed and injured in road crashes, and the counts of women drivers who are involved in fatal and hospitalisation crashes, but not necessarily killed or injured. These raw counts are supplemented by calculations of the corresponding fatality, injury and crash involvement rates per population, per licensed drivers and per distance driven. These latter measures give a better indication of risk, especially in comparison with other groups (such as men) or over calendar time or across age groups, since an attempt is made to control for the varying opportunity for involvement in crashes.

Since the estimates of distance travelled and the national counts of licensed drivers are available for different age groups, age specific rates are also calculated.

The primary analyses are limited to drivers of passenger vehicles, since drivers are the focus of safety campaigns and the majority of women who drive, tend to drive passenger vehicles. The analyses are focussed on the most recent detailed national data available, but include some comparisons with earlier years and assessment of trends.

Although the national crash data base includes a range of information in addition to the age of the driver and the year of the crash, the analysis of the injury and crash involvement rates is restricted to considering age and calendar year. This is because there is no additional information available for the denominator of the rate. For example, even though we know how many crashes occurred at night and during the day and the speed limits at the crash sites, there are no corresponding estimates of the relative number of kilometres travelled during the day and night, or in different speed zones for male and female car drivers. An induced exposure methodology could not be employed since fault is not recorded on the national serious injury database.

Nevertheless, the relative counts of different crash and driver characteristics of female and male car drivers involved in hospitalisation crashes are presented in the final section of this report, since they give some indication of typical crash scenarios for these drivers.

3.2 DATA SOURCES

3.2.1 FATALITY AND INJURY COUNTS

The crash data are extracted from the FORS national serious injury database, which contains details of all fatal crashes and crashes resulting in hospitalisation occurring on public roads in Australia from 1990. Fatality and injury counts for years prior to 1990 come from the series of publications *Road traffic accidents involving casualties* (ABS Catalogue no. 9405). The most recent fatality counts for male and female drivers come from the FORS Monthly Bulletin, Road Fatalities Australia, December 1997.

Definitions of fatal and hospitalisation crashes

In road safety research, crashes are categorised according to the severity of injuries sustained by the persons involved. A crash is defined as *fatal* if at least one person dies of injuries sustained in the crash, within 30 days of the crash.

A crash is defined as a *hospitalisation* crash if at least one person is admitted to hospital, but no one dies within 30 days of the crash. The definition of hospitalisation used in the FORS database is based on police report only. This information is not validated by hospital admission data. This database may thus include cases in which the injured road user was not subsequently admitted. On the other hand, road accidents which are not reported to the police, but result in injury and subsequent hospitalisation are not in the database.

3.2.2 DENOMINATOR DATA

Population figures for 1995 were extracted from the ABS publication *Estimated Resident Population by Sex/Age* Catalogue No. 3201.0.

The counts of male and female licensed drivers and riders for 1995 were obtained from Road Facts 1996 published by AusRoads. These were compiled from State and Territory motor registries. Persons with motor cycle licences are included in these counts, but persons with learner's licences are not included.

The travel data come from the ABS *Survey of Motor Vehicle Use* (SMVU 1995 Catalogue No. 9202.0) and the associated and more detailed *Driver characteristics package*. This survey is based on responses of over 22 000 owners of registered vehicles. Approximately 3 000 of these vehicles are passenger vehicles.

It should be noted that the estimates are based on driver recall, not on specific odometer readings. The registered owner is required to estimate the total distance travelled by the vehicle in the 12 month period ending 30 September 1995, record the age and gender of up to 5 different persons who regularly drive the vehicle, and estimate the percentages of the total distance driven by the different drivers. Other published and unpublished data from the preceding ABS surveys in this series (1976, 1985, 1988 and 1991) are also used in the analyses.

3.3 STATISTICAL METHODS

The counts of fatalities, persons hospitalised and drivers involved in fatal and hospitalisation crashes are all assumed to be distributed as Poisson variables. Thus, the rates of death, hospitalisation and crash involvement per population, per drivers and per kilometres driven are compared across gender, age and calendar time using Poisson regression modelling. Ninety-five percent confidence intervals are computed for rate ratios across these groups.

Chi-square tests were used to compare the relative counts of drivers involved in crashes across different categories where no denominator data is available for these categorisations. The Mann-Whitney U test was used to compare the age distribution of male and female drivers involved in fatal and hospitalisation crashes. Statistically significant refers to 2-sided tests with statistical significance (p value) less than 0.05.

4. RESULTS

4.1 NUMBER OF WOMEN KILLED AND INJURED IN ROAD CRASHES

In 1995, 604 women were killed on Australia's roads and almost 15 times that many sustained injuries requiring hospitalisation (8 855). The total numbers of men killed and injured in road crashes are substantially higher than those for women (1 409 men were killed and 13 501 injured requiring hospitalisation in 1995) (Table 1).

Table 1. Number and rate of road fatalities and hospitalisations per population, per licensed drivers/riders and per kilometres travelled by passenger vehicle drivers for men and women, Australia 1995

	Fatalities			Hospitalisations		
Road user group	Male	Female	M/F 95% CI	Male	Female	M/F 95% CI
All road users	1409	604		13501	8855	
Rate per 100 000 population	15.67	6.66	2.35(2.14,2.59)	150.17	97.70	1.54(1.50,1.58)
All licensed drivers/riders*	747	224		7305	4100	
Rate per 10 000 licensed drivers/riders	1.23	0.43	2.86(2.46,3.32)	12.00	7.87	1.53(1.47,1.59)
Passenger vehicle drivers	566	226		5409	4085	
Rate per 100 million km travelled by drivers	0.76	0.46	1.64(1.41,1.92)	7.25	8.35	0.87(0.83,0.90)

* Includes licensed motor cycle riders, excludes persons with learners' permits, excludes persons under 17 years of age or with unknown age

4.2 RATES PER POPULATION

Dividing these crude counts by general population figures gives the fatality and hospitalisation rates per population. The female fatality rate is 7 deaths per 100 000 population and the male rate is over twice as high (16 deaths per 100 000 population) (Table 1).

The crude male hospitalisation rate is 150 injuries requiring hospitalisation per 100 000 population per year. This is 1.5 times the corresponding figure for females (98 injured per 100 000 population) (Table 1).

4.3 RATES PER NUMBER OF LICENSED DRIVERS/RIDERS

In order to address road safety policy for women, it is necessary to use measures which better reflect the growing presence of women on Australia's roads as drivers. In 1995, 96% of men and 79% of women aged 17 or over were licensed drivers. Although the proportion of women with licences continues to increase with time, a differential between men and women still exists at all ages. The smallest gap is in the 20 to 24 age group with 85% of men and 82% of women holding a driver's licence.

In 1995, the crude fatality rate for female drivers and motor cycle riders aged 17 or over is 0.43 fatalities per 10 000 licensed drivers/riders. The hospitalisation rate for female drivers/riders is 7.87 per
10 000 licensed drivers/riders per year. As with the rates for all road users, the fatality rates for male drivers are over two times greater than those for women drivers and the hospitalisation rates are 1.5 times those for women drivers (Table 1).

4.4 RATES PER KILOMETRES TRAVELLED BY CAR DRIVERS

The analyses are further restricted to drivers of passenger vehicles[†], since the majority of the vehicles on our roads are passenger vehicles and only a minority of women drive other types of vehicles. Passenger vehicles represent 79% of all vehicles registered for road use and account for 74% of total distance travelled in Australia (SMVU 1995). A total of 96% of women drivers who were killed or injured in 1995 were driving passenger vehicles at the time of the crash. The corresponding percentage for men was only 67%.

4.4.1 KILOMETRES TRAVELLED, 1995

The total number of kilometres travelled annually by male and female car drivers is estimated from ABS Survey of Motor Vehicle Use (SMVU). The estimate for women in 1995 is 48 942 million kilometres with a relative standard error of 5% (2 447 million km). The corresponding estimate for men is 74 617 million km with relative standard error of 4% (2 985 million km). Thus, men drive approximately 1.5 times more distance in cars than women.

4.4.2 FATALITY AND HOSPITALISATION RATES PER DISTANCE DRIVEN IN CARS, 1995

Dividing the total number of car drivers fatally injured in one year by the estimate of the total number kilometres travelled by car drivers in one year, gives the fatality rate per distance travelled. For female car drivers, the estimated fatality rate is 0.46 per 100 million kilometres driven. The corresponding hospitalisation rate is 8.35 per 100 million kilometres driven. This is interpreted as approximately 8 women car drivers hospitalised as a result of road crashes in Australia per year for every 100 million kilometres driven.

Even though the fatality rate for male car drivers (0.76) is 1.64 times higher than that for women (0.46), the hospitalisation rate for female car drivers (8.35 hospitalisations per 100 million kilometres driven) is *higher* than that for male drivers of cars (7.25) (Table 1). The female rate is 1.15 times higher than that for males.

[†] In the FORS database, passenger vehicles include sedans, station wagons, passenger vans and all other vehicles not separately classified as motor cycles, rigid trucks, articulated trucks or buses.

Table 2. Number of drivers and rate of fatal and hospitalisation crash involvement per licensed drivers/riders and per kilometres travelled by passenger vehicle drivers for men and women, Australia 1995

	Involved in fatal crashes			Involved in hospitalisation crashes		
Road user group	**Male**	**Female**	**M/F 95% CI**	**Male**	**Female**	**M/F 95% CI**
All licensed drivers/riders*	1906	553		16798	7803	
Rate per 10 000 licensed drivers/riders	3.13	1.06	2.95(2.69,3.25)	27.60	14.97	1.84(1.80,1.89)
Passenger vehicle drivers	1409	561		13551	7744	
Rate per 100 million km travelled	1.89	1.15	1.65(1.49,1.82)	18.16	15.82	1.15(1.12,1.18)

* Includes licensed motor cycle riders, excludes persons with learners' permits, excludes persons under 17 years of age or with unknown age

4.5 FATAL AND HOSPITALISATION CRASH INVOLVEMENT RATES

The results quoted so far pertain to the rate of fatality or injury. The numerators in the rates include only those drivers who are actually killed or injured in a road crash. Though not available for the earlier years, the serious injury data base 1990-1995 does contain some information on drivers who are involved in crashes, but who are not necessarily injured or killed[†]. It is argued that these drivers should also be included in the calculations of rates and in summary statistics on crashes, since the characteristics of these drivers and the characteristics of these crashes may be important in understanding why the crash occurred. These rates then measure the rate of fatal crash involvement and the rate of hospitalisation crash involvement for drivers.

For example, in Australia in 1995, 226 women car drivers were killed, but over twice this number of drivers (561) were involved in fatal crashes. Similarly 4 085 women car drivers were hospitalised as a result of injuries sustained in crashes, but a total of 7 744 drivers were involved in crashes which resulted in the hospitalisation of themselves, their passengers, a pedestrian or occupants of another vehicle involved in the crash.

Table 2 shows the fatal and hospitalisation crash *involvement* rates per licensed drivers and per distance driven by car drivers. For example, these figures show that 15 women drivers per 10 000 are involved in crashes resulting in hospitalisation, annually. The relative pattern of male and female crash involvement rates (Table 2) is generally similar to the pattern of fatality and hospitalisation rates (Table 1). The differential between male and female rates is smaller for car drivers and smaller for the non-fatal crashes. The main difference compared to the injury rates is that female car drivers are involved in hospitalisation crashes at a lower rate than males.

† The sex and age of the driver is recorded for 97% of all cars involved in hospitalisation crashes.

4.6 CHANGES OVER TIME

The road toll has essentially been halved since its peak in the early seventies. Almost all of the reduction occurred before the early 1990s. The pattern is similar for men and women, but differs for male and female drivers (Figure 1). Even though the number of male driver fatalities has fallen over the past 25 years, there has been an *increase* in the number of women drivers killed from 148 in 1971 to 227 in 1997.

The increase is due to the greater presence of women on the road as drivers. There has been a steady increase in the estimates of the total annual kilometres driven by women in passenger vehicles over the past two decades (Figure 3). Of particular importance is the continued increase in the latter period compared with a levelling out of the estimates of the distance driven by men. Between 1985 and 1995 the estimate of the total kilometres driven by women in passenger vehicles increased by 43% compared with an increase of only 7% for male drivers.

The greater numbers of kilometres driven by women is due to both an increase in the number of women drivers and an increase in the average distance driven (Figure 4).

It is thus interesting to see that, adjusting for the relative changes in the amount of travel by men and women, the rate of fatalities per distance travelled has *decreased* in the last 20 years for *both* male and female car drivers (Figure 5). This indicates the importance of adjusting for exposure in interpreting changes in the road toll.

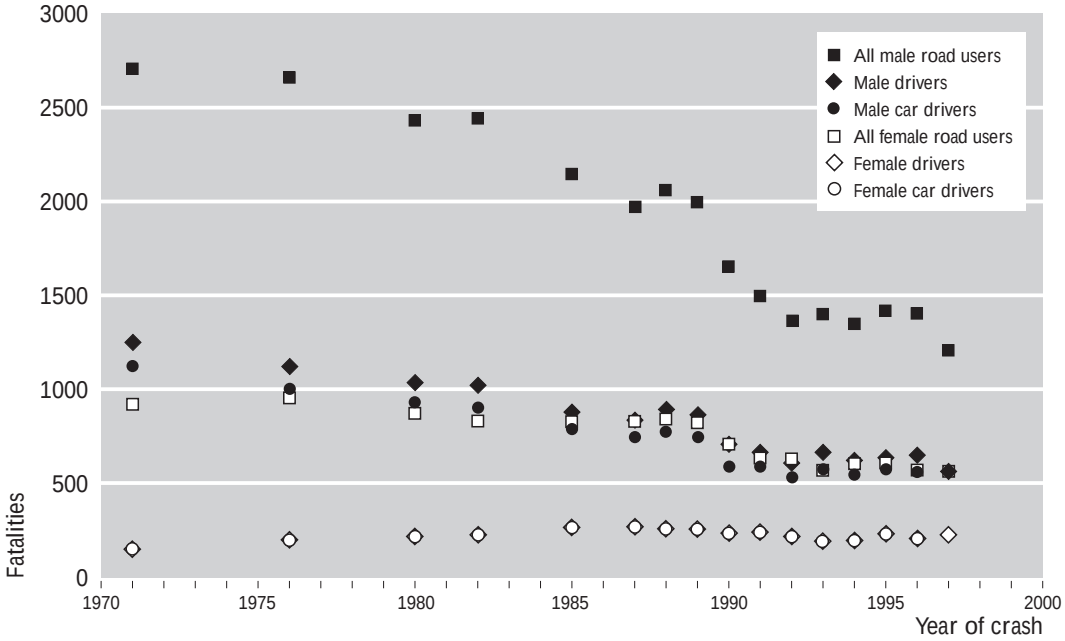
The trends in the counts of hospitalisations are similar to fatalities, with a decrease in the1980s and plateauing in the 1990s (Figure 2). Also, the downward trend in the rates of hospitalisations for both male and female car drivers is similar to that for fatalities (Figure 5).

From 1980 to 1995, the hospitalisation rate for female car drivers has decreased from 13.74 to 8.35 injuries per 100 million km (Figure 5). This corresponds to an approximate annual improvement of 3.2% per year. The improvement in the fatality rate over the period 1976 to 1995 is 3.9% per year. Both of these changes are statistically significant from zero ($p<.001$)

The decreases for male car drivers are slightly larger than those for women, with corresponding improvements of 4.4% per year for hospitalisations and 4.9% per year for fatalities. Both the changes over time for men, and the differences relative to women are statistically significant.

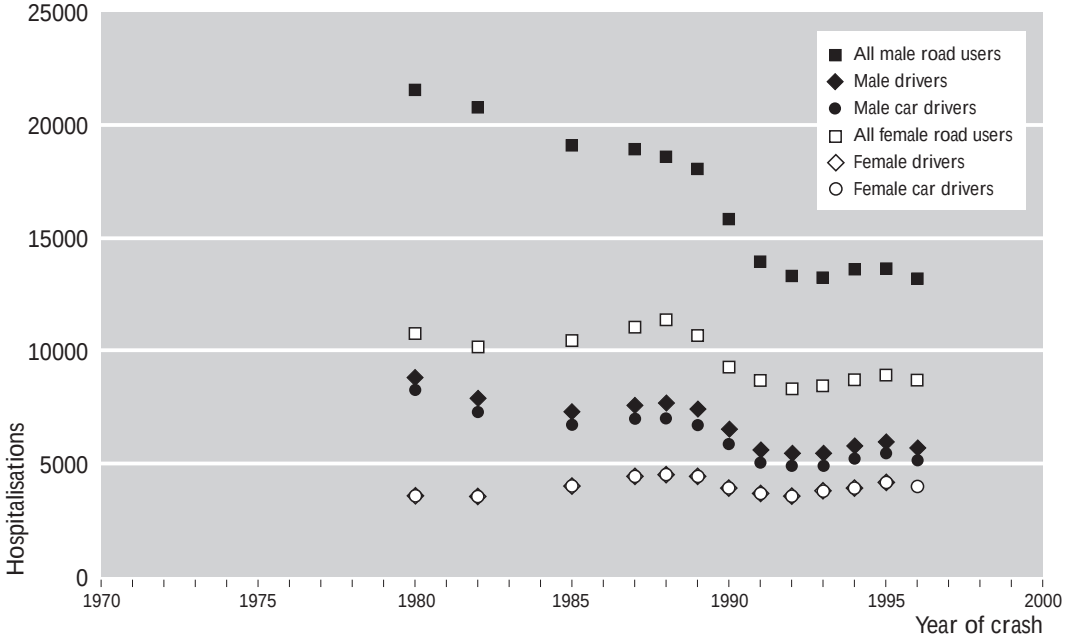
Apart from the downward trend in the rates for both male and female drivers with time, the other major feature in Figure 5 is the relative size of the rates for male and female drivers. The pattern observed for the 1995 figures is consistent with that in earlier years; ie that fatality rates are higher for male drivers, whereas the opposite is the case for hospitalisation rates.

Figure 1. Male and female road fatalities, Australia 1971-1997



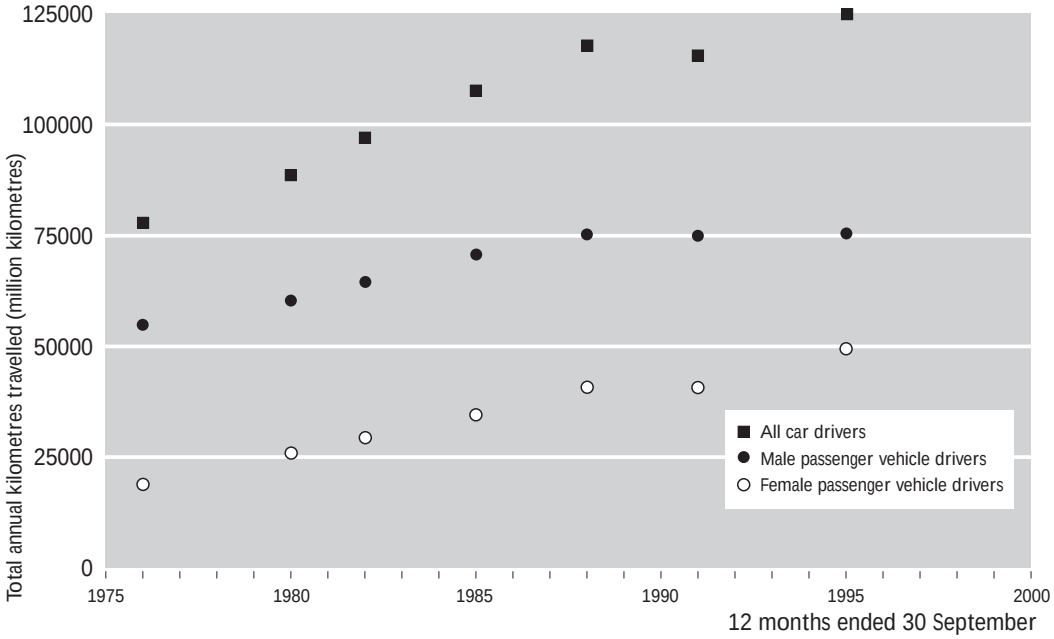
Sources: 1971-1988 ABS catalogue 9405; 1990-1996 FORS SIDB; 1997 FORS Road Fatalities Australia, Monthly Bulletin, December 1997

Figure 2. Males and females hospitalised as a result of road crashes, Australia 1980-1996



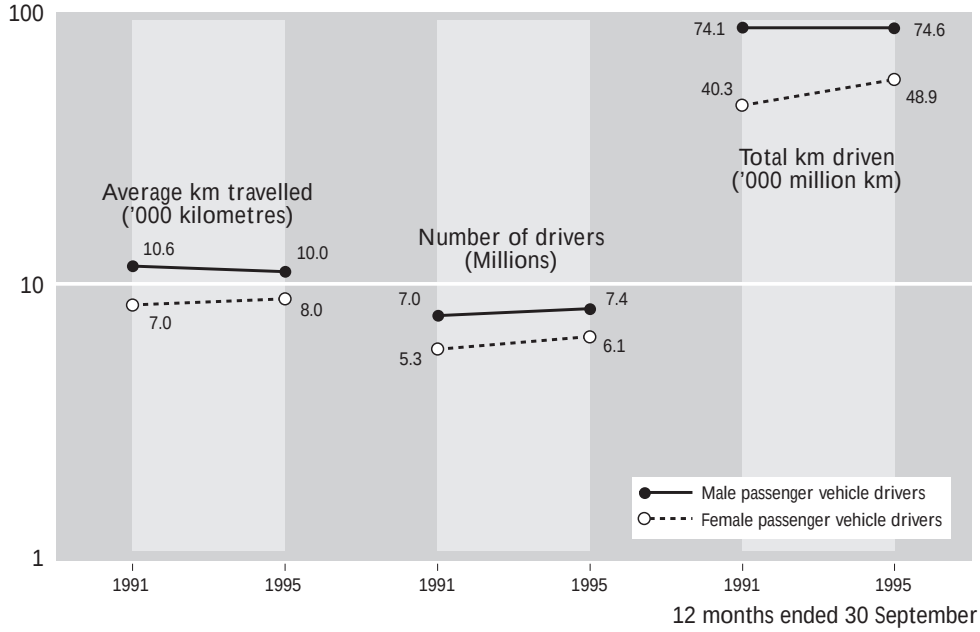
Sources: 1980-1988 ABS catalogue 9405; 1990-1996 FORS SIDB

Figure 3. Estimated total annual kilometres travelled by passenger vehicle* drivers, Australia 1976-1995



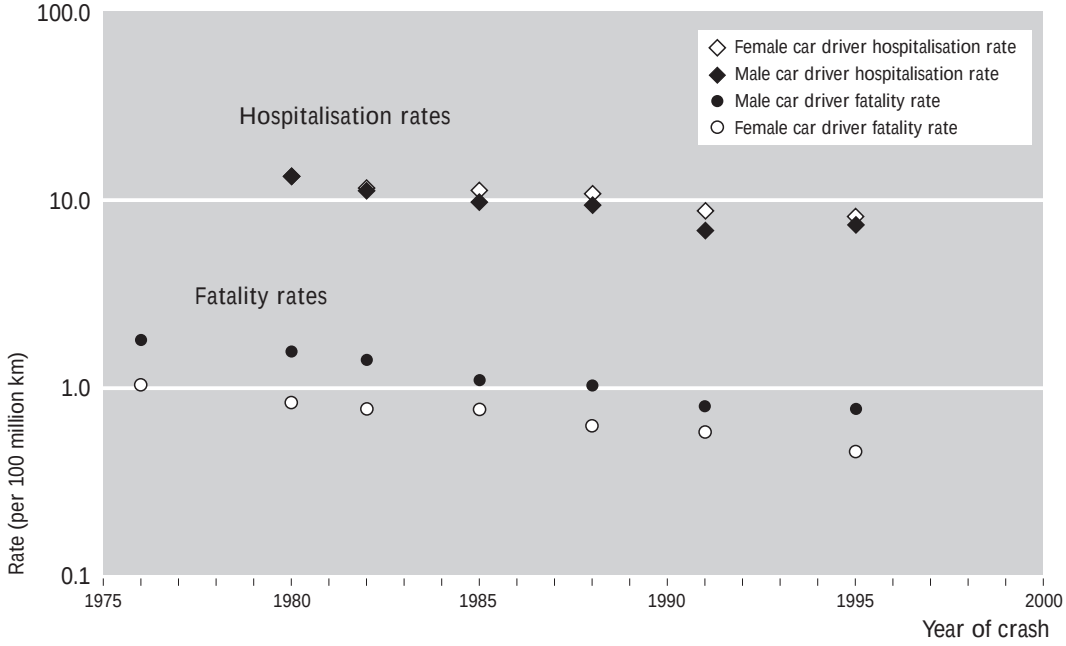
Source: Published and unpublished data from ABS Surveys of Motor Vehicle Usage 1976, 1982, 1985, 1988, 1991 and 1995
Values for males and females for 1980 and 1982 obtained by interpolation
*Passenger vehicles include cars & station wagons (1976-1985) and additionally 4WD passenger vehicles, passenger vans and campervans (1988-1995)

Figure 4. Estimates of the average distance travelled, the number of drivers and the total distance travelled by male and female drivers of passenger vehicles* in Australia in 1991 and 1995



Source: ABS Surveys of Motor Vehicle Usage, 1991 and 1995
* Passenger vehicles include cars, station wagons, 4WD passenger vehicles, passenger vans & campervans

Figure 5. Hospitalisation and fatality rates per kilometres travelled by male and female car drivers, Australia 1976-1995



Source: Fatalities and injuries: 1971-1988 ABS Catalogue 9405; 1990-1995 FORS SIDB;
Kilometres travelled: ABS published and unpublished data from surveys of motor vehicle usage 1976, 1982, 1985, 1988, 1991 and 1995
Interpolated figures used for 1980

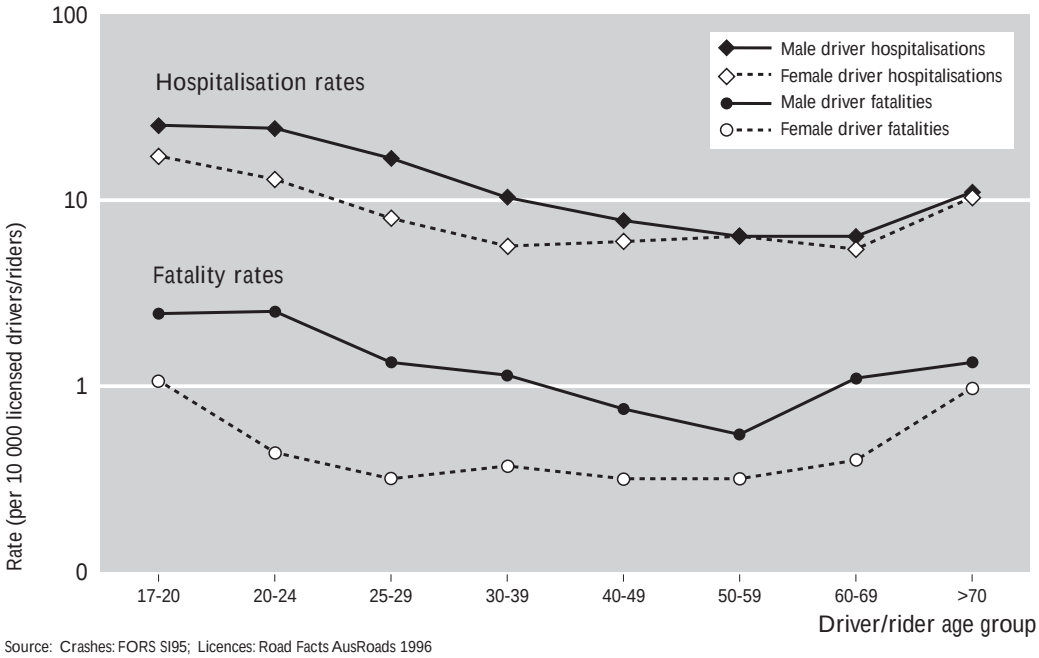
4.7 RELATIVE RATES BY AGE GROUP 1995

4.7.1 RATES PER NUMBER OF LICENSED DRIVERS/RIDERS BY AGE GROUP

Both fatality and injury rates vary with age. The highest rates are observed in the youngest and oldest drivers (Figure 6). The decrease in the fatality rate with age for women drivers is faster than the decrease in the hospitalisation rate for women drivers and faster than either rate for male drivers. The differentials between men and women are largest for the younger age groups. Beyond age 50, male and female drivers/riders have similar hospitalisation rates.

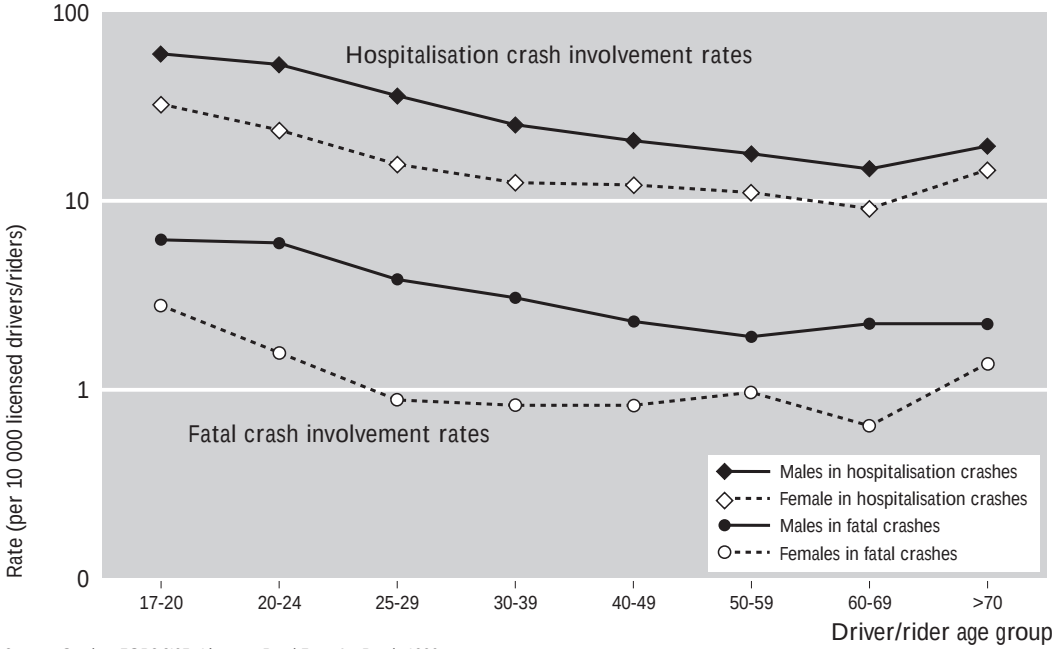
The same general patterns with age are observed for the corresponding crash involvement rates (Figure 7). The only difference is that male non-fatal crash involvement rates remain higher than female crash involvement rates in all age groups.

Figure 6. Age and sex specific fatality and hospitalisation rates per licensed drivers and riders, Australia 1995



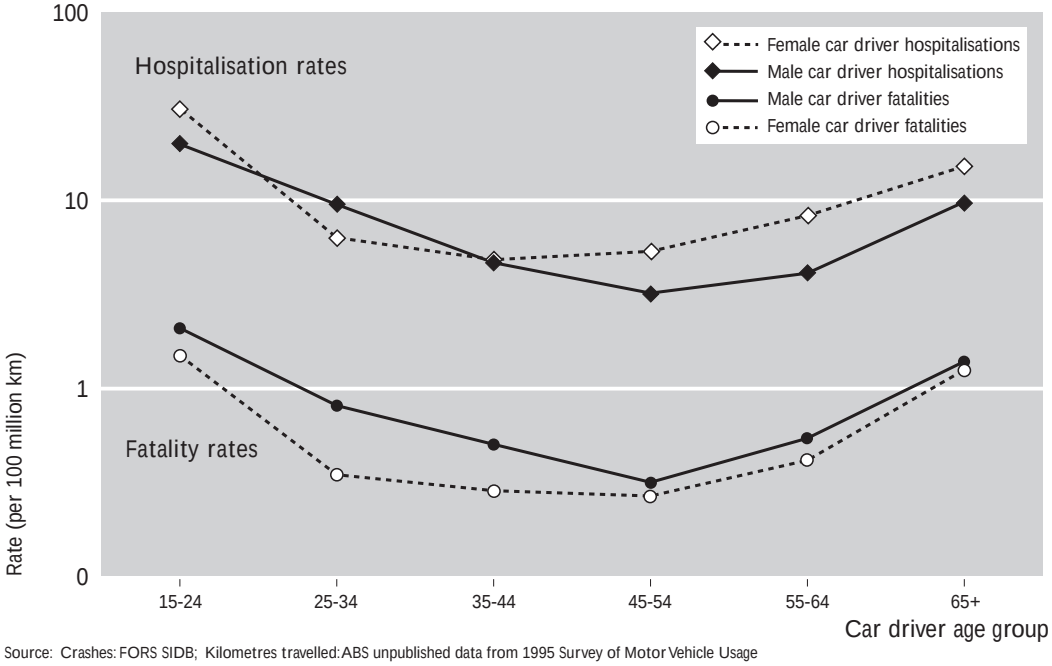
Source: Crashes: FORS SI95; Licences: Road Facts AusRoads 1996

Figure 7. Age and sex specific fatal and hospitalisation crash involvement rates per licensed drivers and riders, Australia 1995



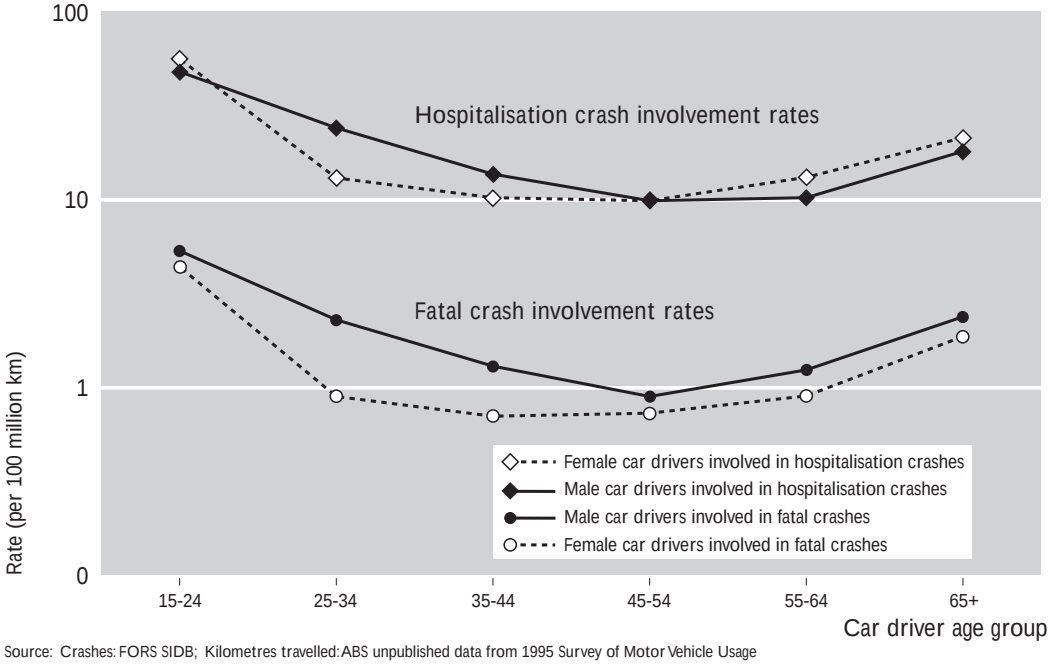
Source: Crashes: FORS SI95; Licences: Road Facts AusRoads 1996

Figure 8. Age and sex specific fatality and hospitalisation rates per kilometres travelled by car drivers, Australia 1995



Source: Crashes: FORS SIDB; Kilometres travelled: ABS unpublished data from 1995 Survey of Motor Vehicle Usage

Figure 9. Age and sex specific fatal and hospitalisation crash involvement rates per kilometres travelled by car drivers, Australia 1995



Source: Crashes: FORS SIDB; Kilometres travelled: ABS unpublished data from 1995 Survey of Motor Vehicle Usage

4.7.2 RATES PER DISTANCE DRIVEN BY AGE GROUP

The age specific fatality and hospitalisation rates are now presented for car drivers adjusted by estimates of the amount of driving by each age group (Figure 8). There is a clear U shaped pattern in the rates with age. The lowest rates of injury are observed in the middle age groups and the patterns are similar for males and females and for fatal and non-fatal injuries.

Female hospitalisation rates are higher than male injury rates for the youngest age group (15-24), lower than males for 25 to 34 year olds, comparable in the next group and then exceed that for males for all ages above 45 years (Figure 8). These differences are statistically significant. In fact, the hospitalisation rate for female car drivers under 25 years of age is 31 per 100 million kilometres driven, which is 1.56 times higher than the corresponding rate for young male car drivers (20 hospitalisations per 100 million kilometres driven).

Female fatality rates are lower than male fatality rates for all age groups, but it is only in the youngest age groups (15-24, 25-34, 35-44) that the female rate is statistically significantly less than the male rate. The largest difference between the rates is for the 25-34 age group.

Figure 9 shows the 1995 fatal and injury crash involvement rates for male and female car drivers by age group. The patterns generally mirror those of Figure 8. Crash involvement, regardless of severity is greatest for the youngest drivers. Men are more likely than women to be involved in fatal crashes regardless of age. The youngest and oldest women have greater hospitalisation crash involvement than their male peers.

4.8 CRASHES INVOLVING FEMALE DRIVERS (DRIVER AND CRASH CHARACTERISTICS)

The following results are intended to present an overview of the characteristics of women drivers involved in crashes, as well as the overall crash setting. The results are based on counts of car drivers involved in all hospitalisation crashes in Australia in 1995. The counts are broken down by age of the driver. The corresponding distributions for male car drivers are also given as a comparison.

4.8.1 AGE OF DRIVERS INVOLVED

The median age of female car drivers involved in hospitalisation crashes in 1995 was 33 with an interquartile range[†] of 23 to 46 years (Table 3). The distribution is skewed with proportionally more drivers in the younger age groups. The mean age is 36 years, but the modal age is only 18 years. This means that the most common age for involvement in a hospitalisation crash for female car drivers is 18 years.

[†] The interquartile range is defined as the 25th to the 75th percentile. By definition, half of the observations fall within this range.

Table 3. **Age of male and female passenger vehicle drivers involved in hospitalisation and fatal crashes in Australia (FORS Serious injury database 1995)**

Severity of crash	Gender	No. of drivers	Age in years of drivers involved				
			Mode	Mean	Median	Interquartile range 25th percentile	Interquartile range 75th percentile
Hospitalisation	Female	7657	18	36	33	23	46
Hospitalisation	Male	13406	18	36	31	22	46
Fatal	Female	560	18	37	33	23	48
Fatal	Male	1405	20	37	31	22	48

The age distribution for female drivers involved in fatal crashes is similar to that for hospitalisation crashes (Table 3).

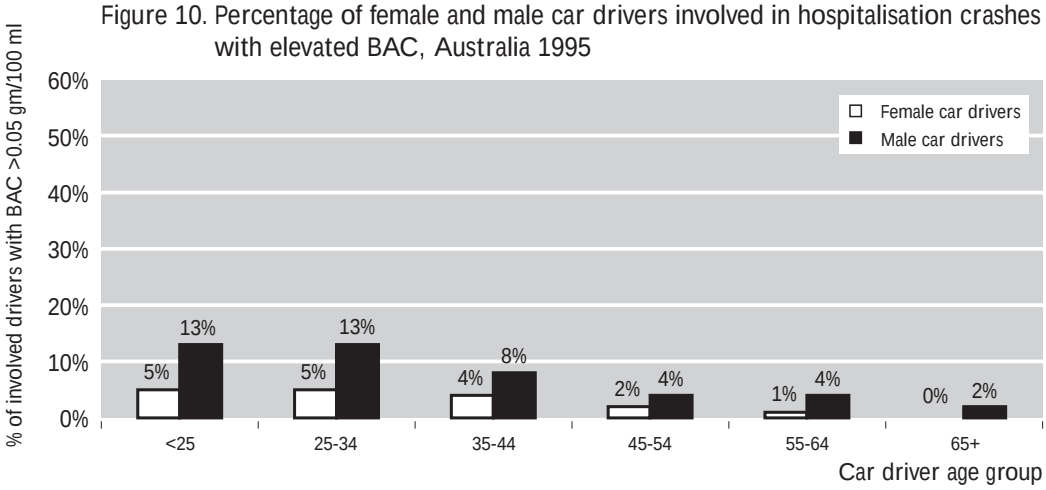
The age distribution for male car drivers involved in hospitalisation crashes is slightly younger (median age 31) than that for female car drivers ($p < 0.001$). The age distribution for male and female car drivers involved in fatal crashes is similar.

4.8.2 BLOOD ALCOHOL CONTENT (BAC)

Only 4% of female car drivers involved in hospitalisation crashes had elevated blood alcohol readings (Table 4). However, for 59% of women BAC details were not available.

The incidence of high BAC levels was greatest for the youngest drivers and decreased with age. At all ages the percentage of women drivers with high BAC was lower than the corresponding percentage for men (Table 5, Figure 10). Overall, 10% of male car drivers involved in hospitalisation crashes had elevated BAC. For 55% of male drivers involved in hospitalisation crashes BAC levels were unknown (Table 5).

Figure 10. Percentage of female and male car drivers involved in hospitalisation crashes with elevated BAC, Australia 1995



Source: FORS Serious Injury data base, 1995

4.8.3 LICENCE TYPE

Fourteen percent of female car drivers involved in hospitalisation crashes had only learners or provisional licences. In the under 25 age group, 41% of women and 41% of men had only L or P plate licences. The only difference with the male drivers was the higher percentage of male drivers who had no licence.

4.8.4 TYPE OF CRASH

Two thirds (66%) of female car drivers were involved in multiple vehicle crashes, 24% were involved in single vehicle crashes and 10% involved pedestrians. The crash distribution varied with driver age. The highest percentage of single vehicle crashes (31%) was observed for the youngest age group (under 25 years of age). This general pattern was the same for men, but the relative proportion of single vehicle crashes was higher for men in the youngest age groups.

Multiple vehicle crashes were divided into four different types (head on, rear end, angular and other). The most common form of multiple vehicle crash was an angular crash (64%). The relative proportions of these crashes varied with the age of the driver. Angular crashes were proportionally more common for the oldest drivers (55 years and over), whereas the highest percentages of head on crashes (13% - 15%) were observed for the younger drivers (less than 55 years of age). Rear end crashes accounted for approximately 20% of multiple vehicle crashes for all except for the oldest drivers for whom the percentage was only 12%.

The general distribution of the different types of multiple vehicle crashes by age was similar for men. However, the major difference was the higher proportion of head on crashes that the youngest male drivers were involved in compared with the youngest female drivers (18% vs 13%).

Table 4. Female passenger vehicle drivers involved in hospitalisation crashes in Australia in 1995 by age group, blood alcohol content, licence type and crash scenario (FORS Serious injury database 1995)

Car driver and crash characteristics	Female car driver age group							Total drivers
	<25	25-34	35-44	45-54	55-64	65+		
Blood alcohol content	2284	1783	1465	1027	539	559		7657
Unknown	57%	59%	60%	61%	61%	58%		59%
<.05 gm/100 ml	39%	36%	36%	37%	38%	42%		37%
.05+ gm/100 ml	5%	5%	4%	2%	1%	0%	↓	4%
Licence type	2202	1700	1408	987	527	537		7361
Learner/provisional	41%	5%	2%	1%	1%	0%	↓	14%
Full licence	56%	93%	97%	98%	98%	99%	↑	84%
No licence	3%	2%	1%	1%	1%	1%	↓	2%
Crash type	2284	1783	1465	1027	539	559		7657
Single vehicle	31%	22%	19%	21%	20%	24%	↓	24%
Multiple vehicle	59%	67%	70%	71%	73%	70%	↑	66%
Pedestrian crash	11%	11%	11%	8%	7%	6%	↓	10%
Multiple vehicle crash	1343	1203	1030	730	391	392		5089
Head on	13%	12%	15%	13%	7%	7%	↓	12%
Rear end	19%	22%	21%	24%	20%	12%		20%
Angular	64%	62%	60%	59%	70%	78%		64%
Other/unknown	4%	5%	4%	4%	3%	3%		4%
Intersection crash	2283	1783	1463	1027	538	559		7653
Yes	48%	53%	52%	52%	58%	59%	↑	52%
No	52%	47%	48%	48%	42%	41%	↓	48%
Capital city metropolitan	2284	1783	1465	1027	539	559		7657
Yes	55%	59%	56%	62%	53%	50%		56%
No	45%	41%	44%	38%	47%	50%		44%
Speed limit	2230	1747	1412	988	528	544		7449
<=60 kph	61%	63%	66%	64%	61%	66%		63%
65-90 kph	16%	17%	16%	17%	17%	15%		16%
100+ kph	23%	21%	18%	19%	22%	19%	↓	20%
Time of crash	2276	1782	1463	1023	539	556		7639
5am-10am	19%	23%	25%	26%	26%	22%	↑	23%
11am-4pm	34%	40%	42%	43%	49%	58%	↑	41%
5pm-10pm	36%	29%	29%	27%	22%	19%	↓	29%
11pm-4am	12%	8%	5%	4%	3%	1%	↓	7%
Day of the week	2284	1783	1465	1027	539	559		7657
Monday to Friday	68%	75%	75%	77%	76%	78%	↑	73%
Saturday/Sunday	32%	25%	25%	23%	24%	22%	↓	27%
Weekday/weekend	2282	1783	1465	1027	539	559		7655
Weekday	59%	68%	69%	71%	72%	76%	↑	67%
Weekend (incl Fri pm)	41%	32%	31%	29%	28%	24%	↓	33%

Shading indicates statistically significantly higher percentages for female drivers compared with male drivers (Table 5) ($p<0.05$ chi-squared tests)

↓↑ indicates statistically significant differences between female drivers in different age groups ($p<0.05$ chi-squared tests). Up arrows indicate increasing percentages with age. Down arrows indicate decreasing percentages with age.

Table 5. Male passenger vehicle drivers involved in hospitalisation crashes in Australia in 1995 by age group, blood alcohol content, licence type and crash scenario(FORS Serious injury database 1995)

Car driver and crash	Male car driver age group							Total
characteristics	<25	25-34	35-44	45-54	55-64	65+		drivers
Blood alcohol content	4493	3120	2119	1501	990	1183		13406
Unknown	51%	55%	57%	60%	58%	58%		55%
<.05 gm/100ml	36%	32%	35%	36%	38%	40%	↑	35%
.05+ gm/100ml	13%	13%	8%	4%	4%	2%	↓	10%
Licence type	4286	2979	2033	1446	959	1144		12847
Learner/provisional	41%	5%	3%	1%	1%	0%	↓	16%
Full licence	53%	90%	95%	97%	98%	99%	↑	81%
No licence	6%	4%	3%	1%	1%	1%	↓	4%
Crash type	4493	3120	2119	1501	990	1183		13406
Single vehicle	38%	28%	24%	18%	21%	21%	↓	28%
Multiple vehicle	52%	61%	65%	70%	68%	71%	↑	61%
Pedestrian crash	10%	11%	11%	11%	10%	8%	↓	10%
Multiple vehicle crash	2342	1907	1383	1058	676	835		8201
Head on	18%	18%	16%	16%	16%	9%	↓	16%
Rear end	17%	21%	23%	19%	19%	16%		19%
Angular	61%	56%	57%	62%	59%	71%	↑	60%
Other/unknown	4%	5%	4%	4%	5%	4%		5%
Intersection crash	4479	3117	2114	1497	989	1182		13378
Yes	43%	46%	48%	48%	51%	57%	↑	47%
No	57%	54%	52%	52%	49%	43%	↓	53%
Capital city metropolitan	4491	3117	2119	1498	988	1182		13395
Yes	56%	59%	57%	61%	55%	50%		57%
No	44%	41%	43%	39%	45%	50%		43%
Speed limit	4395	3046	2063	1465	974	1161		13104
<=60 kph	62%	61%	60%	58%	58%	62%		61%
65-90 kph	17%	16%	17%	19%	18%	15%		17%
100+ kph	22%	22%	23%	23%	24%	22%		22%
Time of crash	4483	3104	2111	1499	986	1181		13364
5am-10am	16%	20%	23%	23%	24%	25%	↑	20%
11am-4pm	27%	31%	35%	38%	44%	53%	↑	34%
5pm-10pm	36%	35%	33%	31%	26%	21%	↓	32%
11pm-4am	21%	14%	10%	8%	6%	2%	↓	13%
Day of the week	4493	3120	2119	1501	990	1183		13406
Monday to Friday	62%	69%	70%	71%	73%	75%	↑	68%
Saturday/Sunday	38%	31%	30%	29%	27%	25%	↓	32%
Weekday/weekend	4491	3114	2117	1501	989	1183		13395
Weekday	53%	60%	62%	65%	68%	73%	↑	60%
Weekend (incl Fri pm)	47%	40%	38%	35%	32%	27%	↓	40%

↓↑ indicates statistically significant differences between male drivers in different age groups ($p<0.05$).
Up arrows indicate increasing percentages with age. Down arrows indicate decreasing percentages with age.

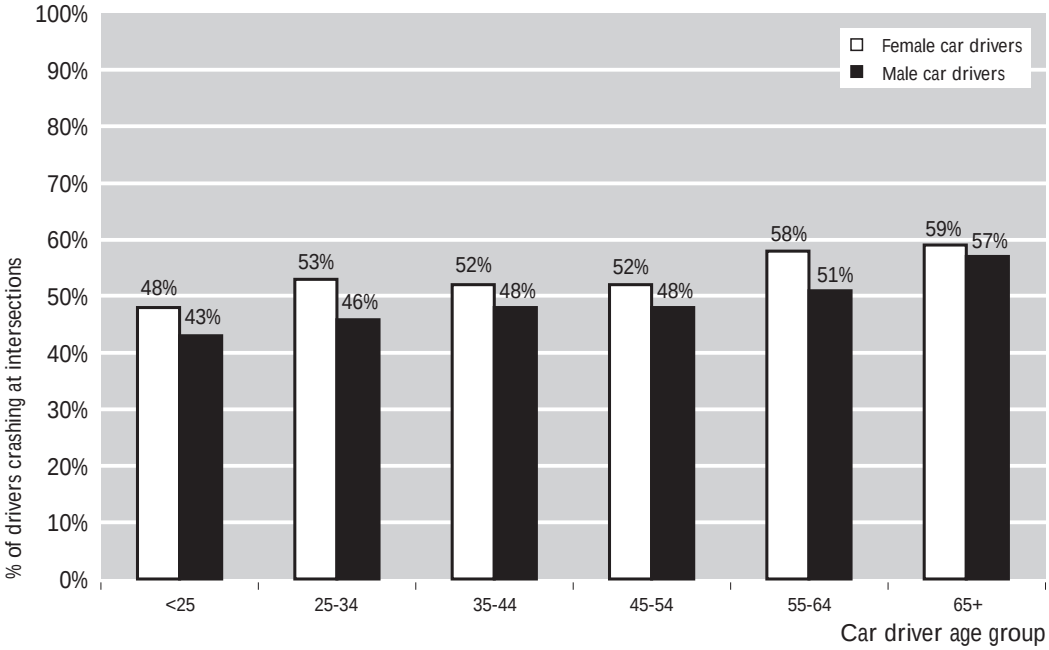
4.8.5 LOCATION OF CRASH

Approximately equal numbers of women were involved in crashes at intersections compared to other locations. However, the relative number of intersection crashes increased with age (Figure 11). The percentage of intersection crashes was greater for women than men for all age groups (Figure 11).

The percentage of women drivers involved in crashes resulting in hospitalisation in metropolitan regions of capital cities was 56%. This breakdown was based on the LGA of the crash location. The distribution was almost identical for male drivers.

The distribution by speed limit at the crash site provides more detail on the driving conditions at the time of the crash. A total of 63% of women drivers crashed in 60 kph speed zones, 16% in intermediate speed zones (<100 kph) and 20% on roads with speed limits of at least 100 kph. This distribution varied with the age of the driver. The younger the driver, the higher the percentage of crashes in the higher speed zones. This variation with age was not observed for male drivers, approximately 22% of whom had crashes in 100+ kph speed zones, regardless of age.

Figure 11. Percentage of female and male car drivers involved in hospitalisation crashes at intersections, Australia 1995



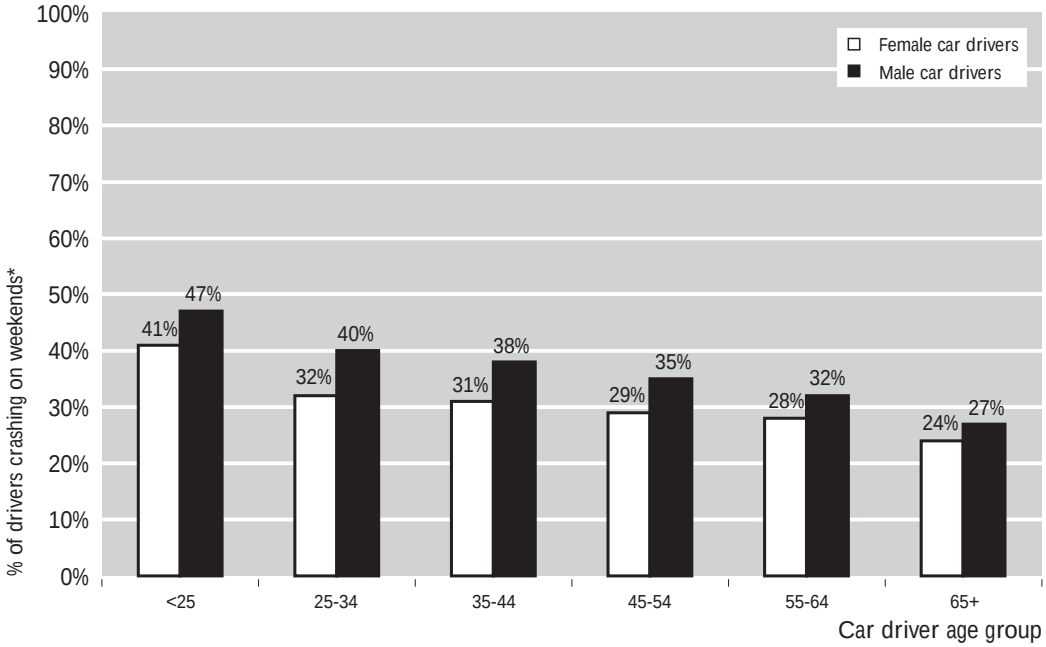
Source: FORS Serious Injury data base, 1995

4.8.6 WHEN THE CRASH OCCURRED

Relatively few injury crashes involving women drivers occurred late at night (7% between 11 pm and 5am). The time distribution of crashes varied with age, with smaller percentages of evening and night crashes for the older drivers. The same general pattern was observed for men, but, within each age group, men had proportionally more night-time crashes than women.

With respect to the day of the week, the proportion of drivers involved in crashes on weekends decreased with age (Table 4). Almost one third (32%) of crashes involving women drivers under the age of 25 occurred on Saturday and Sunday. If the definition of weekend is expanded to include Friday night and early Monday morning, 41% of hospitalisation crashes involving younger female drivers occurred on the weekend. The pattern was similar for men, but even higher percentages were observed on weekends as opposed to weekdays (Table 5, Figure 12).

Figure 12. Percentage of female and male car drivers involved in hospitalisation crashes during the weekend, Australia 1995



Source: FORS Serious Injury data base, 1995
*Weekends include Friday evening and early Monday morning

5. DISCUSSION

The results presented in this report are based on the most recent, complete and consistent national data on road crash casualties and road travel. The fatality information is considered to be valid since the reporting mechanism and definitions involved for determining road fatalities have been in place for a considerable time. On the other hand, the details for the less severe crashes are based only on police report, not on confirmed hospital admissions, so there is under reporting in terms of delayed admissions and over counting in terms of persons who go to hospital, but are not admitted. Although the degree to which these factors play a role probably varies by State, it is not considered that these differences will lead to particular biases in terms of comparing male and female car driver casualty counts.

The importance of considering rates and not just counts of fatalities and injuries has been illustrated in these results and was also highlighted in the separate literature review CR177, of this series. However, it must be noted that there is an unfortunate trade-off between the relevance of the exposure data and its accuracy. The three measures of exposure considered in this report were population, the numbers of licensed drivers/riders and the total kilometres travelled by car drivers. The last of these is clearly the most relevant for assessing the risks for women drivers, since it is a measure which takes into account the number of drivers, the distance driven and relates to the most common vehicles driven by women. However, whereas population and licence counts are relatively complete national enumerations, the distance travelled data are only estimates obtained from a sample survey of registered car owners, and even then, only based on their recollections of distance travelled in the preceding twelve months.

It is interesting to compare the ABS estimates of average annual distance driven for female drivers in 1995 with the estimates obtained in the Women's Road Safety Survey conducted in 1997 by Women's Health Australia (WHA). (See the accompanying report in this Women Behind the Wheel series). In the WHA survey, women were asked to estimate roughly the number of kilometres they personally drive in an average week. Responses were obtained from 1230 young women and 1588 middle aged women. The ABS estimates are considerably less for both young women (6.0 thousand km ABS vs 12 thousand km WHA) and middle aged women (6.7 thousand km ABS vs 11 thousand km WHA). Part of the differential may be explained by the increasing amount of travel over time displayed in Figures 3 and 4. However, it is likely that the method of obtaining the information contributes to a large extent to the difference. Even though both methods rely on estimation and recall, it is possible that the ABS SMVU underestimates the distance travelled, particularly for younger and older women, by sampling registered owners and relying on their specification of the amount of driving undertaken by other drivers in the household.

Thus comparisons of the male and female rates per distance travelled should be interpreted with caution since the female rates may be overestimated.

The national road toll is continuing to decrease. However, of particular importance for women, is the fact that the number of women drivers killed and hospitalised each year is increasing. The presence of women as drivers is expected to continue to grow since the level of licensing and the amount of distance travelled is still below that of men. Despite these increases in travel by women, the rate of fatalities and the rate of hospitalisations per distance driven is continuing to decrease for

both male and female drivers indicating that improvements in roads, car design and road safety campaigns are impacting on both male and female drivers. However, the rates at which the decreases are occurring are faster for men than women for both fatal and non-fatal injuries. Specifically targeting women drivers may address imbalances as well as ensuring reductions in the future.

In spite of the relative differences in the rates of change, men still have a considerably higher fatality rate than women. In 1995, the fatality rate for male car drivers was 1.64 times higher than that for female car drivers. Of major interest is the observation that the differential between men and women is smaller for less severe crashes. In fact, the rate of hospitalisation of female car drivers was 1.15 times higher than that for men.

For both men and women, the rates of death and injury per distance travelled are highest for the youngest and oldest drivers. The most common age of female drivers killed or hospitalised in road crashes is 18 years. A total of 41% of male and female drivers aged under 25 who are involved in hospitalisation crashes have learner's or provisional licences.

Although the youngest and the oldest drivers have the highest crash risks, the typical crash scenarios for these drivers differ. The relative numbers of single vehicle crashes and head-on crashes on roads with high speed limits are greater for the younger drivers, whereas the older drivers have a higher percentage of crashes at intersections and in lower speed zones. Additionally, a higher percentage of the crashes involving younger drivers occur at night and during the weekends, in contrast to the older drivers who have higher percentages of crashes during the day and on weekdays. The percentage of drivers with elevated BAC decreases with age.

These differences in hospitalisation crashes probably reflect the different driving patterns, as well as the different degrees of risk taking behaviour and physical attributes such as frailty and reaction times of younger and older drivers. These differences are also consistent with differences for (generally) less severe crashes reported by young and middle-aged women drivers responding to the WHA survey.

What is interesting is that the differences between crashes involving male and female car drivers mirror those between younger and older drivers. What is more common for men is also more common among younger drivers. For example alcohol involvement is highest for young male drivers involved in fatal crashes (13%) followed by young female drivers (5%), then older male drivers (4% 55-64 years) and is lowest for older female drivers (1%). For example, in all but the oldest age group, the percentage of women drivers involved in single vehicle crashes is less than that for men. The percentage of intersection crashes, the percentage of day time and the percentage of weekday crashes are all higher for women compared with men within each age group.

Part of this similarity is probably due to similar driving patterns. For example, the smaller relative numbers of crashes late at night is probably a result of fewer women and fewer older drivers driving at these times. Additionally, part of the similarity is probably due to a more conservative driving behaviour of women and older persons.

The fact that the fatality rate remains substantially higher for men compared with women in all but the oldest age groups, suggests that males are more often the deliberate risk takers compared with their female peers. On the other hand the higher rate of female hospitalisations compared with male hospitalisations observed for the youngest drivers (under 25) and for drivers at least 45 years of age may indicate that conservative driving behaviour in a risky situation puts the driver at risk of hospitalisation.