



## Fatal four wheel drive crashes

This monograph examines the involvement of four wheel drive (4WD) vehicles in fatal crashes. It reports on the characteristics of fatal crashes involving 4WDs and compares them with the characteristics of crashes involving other passenger vehicles.

The popularity of 4WDs has increased significantly over the last decade. In 1990 4WDs made up 12 per cent of all new car sales and by 1998 this had increased to 17 per cent<sup>1</sup>. 4WDs are also starting to replace more traditional passenger cars on urban roads. This increase in popularity has given rise to an interest in the implications of 4WD safety in the road environment.

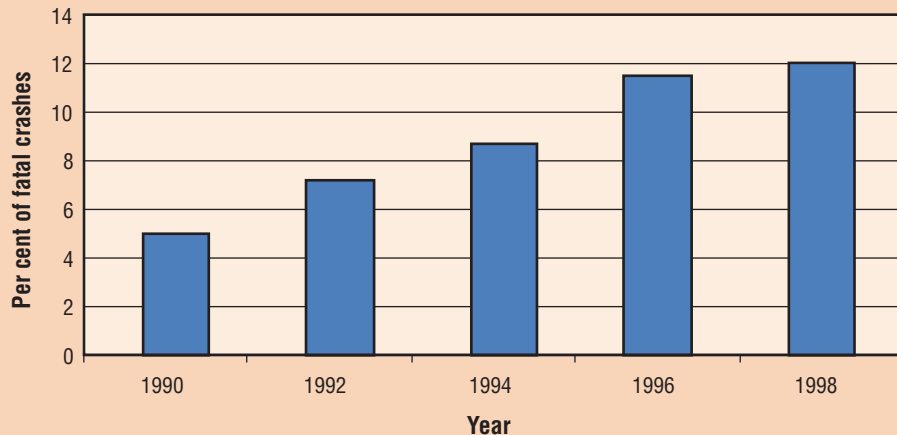
### Key findings

- ▶ The incidence of fatal 4WD crashes increased by 85 per cent between 1990 and 1998 (up 28 per cent between 1994 and 1998). By comparison, the incidence of all fatal crashes decreased by 25 per cent between 1990 and 1998 (down 10 per cent between 1994 and 1998).
- ▶ This increase in fatal 4WD crashes is likely to be due to the growing number of kilometres travelled by 4WDs, rather than any decrease in the safety of 4WDs. The number of kilometres travelled by 4WDs

almost doubled between 1995 and 1998. By comparison, the overall number of vehicle kilometres travelled increased by 4 per cent over the same time period.

- ▶ For those crashes where the 4WD driver contributed to the crash, road user impairment (for example fatigue, alcohol, other drugs, etc) was the most common contributory factor involved (54 per cent).
- ▶ The proportion of alcohol intoxication amongst 4WD drivers involved in fatal crashes (29 per cent) was higher than for all other types of vehicle operators (for example, 21 per cent of passenger car drivers involved in fatal crashes had blood alcohol concentrations over 0.05g/100ml).
- ▶ In all fatal crashes, a significantly higher proportion of 4WD vehicles rolled over compared with passenger cars (35 per cent and 13 per cent respectively).
- ▶ In 4WD crashes involving multiple vehicles, passenger car occupants accounted for the largest proportion of fatalities (64 per cent). 4WD occupants accounted for the second largest but a significantly lower proportion of fatalities (18 per cent).

**Figure 1: The percentage of all fatal crashes involving at least one 4WD, 1990 to 1998**



<sup>1</sup> Black and White Data Book. (1999). Melbourne: Glass's Guide Pty Ltd.

## General trends and fatal crash rates

### General trends

The number of fatal 4WD crashes increased significantly between 1990 and 1998. In 1990 there were 101 fatal crashes involving 4WDs while in 1998 there were 187 fatal crashes. This corresponds to an increase of 85 per cent. The proportion of all fatal crashes involving at least one 4WD also increased from five per cent in 1990 to 12 per cent in 1998 (see fig. 1). Over the same period the overall number of fatal crashes decreased by 25 per cent from 2,010 in 1990 to 1,511 in 1998.

Australian Bureau of Statistics (ABS) data suggest that this increase in fatal 4WD crashes may be due to an increase in 4WD activity, rather than to any decrease in vehicle safety. ABS data show that between 1995 and 1998 (the only years data were available) the number of kilometres travelled by 4WDs increased 88 per cent from 8,608 million kilometres to 16,209 million kilometres. By comparison, the number of kilometres travelled by all vehicles increased by four per cent over the same time period, from 166,514 million kilometres to 173,317 million kilometres. The number of kilometres travelled by 4WDs, as a proportion of all vehicle kilometres travelled, also increased from 5 per cent in 1995 to nine per cent in 1998.

### Fatal crash rates

Table 1 compares the rate of different vehicles involved in fatal crashes per 100 million vehicle kilometres travelled. It shows that when taking into account the level of activity, 4WDs had a lower involvement in fatal crashes than

motorcycles and heavy trucks. However, passenger cars and light trucks had slightly lower fatal crash involvement rates than 4WDs.

## Crash characteristics

### Crash type

Figure 2 also compares crash types for 4WD and passenger car crashes. The proportion of 4WD crashes involving pedestrians (11 per cent) was almost half the proportion of passenger car crashes involving pedestrians (20 per cent). However, 4WD and passenger cars had a similar level of involvement in single vehicle crashes (38 per cent and 41 per cent respectively).

The majority of 4WD crashes involved multiple vehicles (51 per cent). Of these crashes:

- Fifty-four per cent involved a collision between two vehicles travelling in opposite directions
- Twenty-eight per cent occurred at intersections
- Ten per cent involved a collision between two vehicles travelling in the same direction
- Eight per cent involved a vehicle overtaking or manoeuvring.

### Speed limit at crash site

Comparison of speed limits at 4WD and passenger car crash sites show that a higher proportion of 4WD crashes occurred in high speed zones (100km/h or over) compared with

**Table 1: The number and rate of vehicles involved in fatal crashes per 100 million kilometres travelled<sup>a</sup>, 1998**

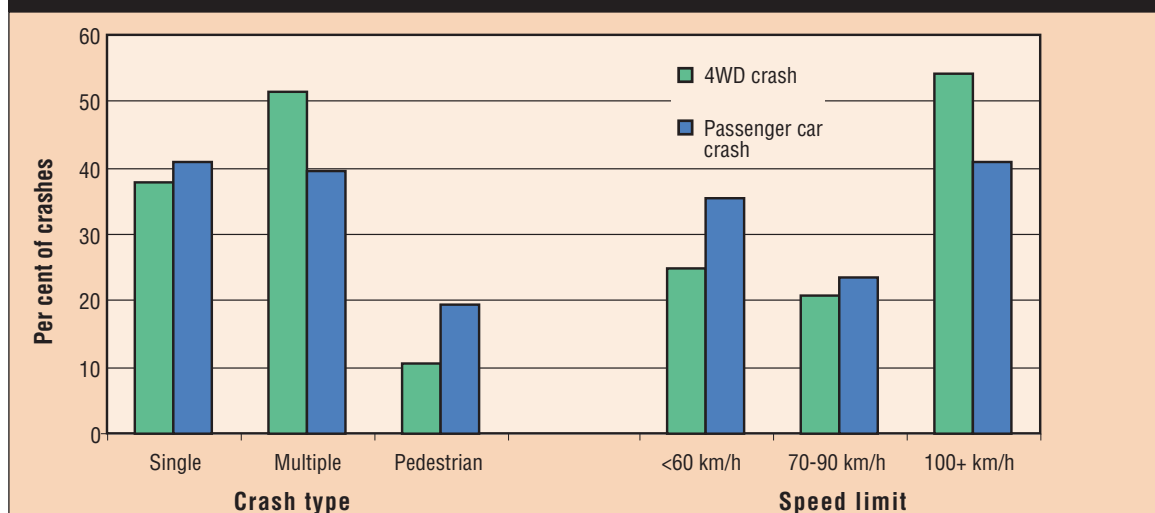
Vehicle type	Number of vehicles involved in fatal crashes	Rate per 100 million vehicle kilometres travelled
Motorcycles	184	13.6
Heavy trucks <sup>b</sup>	244	2.4
4WDs	191	1.2
Passenger cars	1281	1.0
Light trucks <sup>c</sup>	145	0.8

<sup>a</sup> 100 million vehicle kilometres travelled (1998). Unpublished ABS data.

<sup>b</sup> More than 4.5 tonne gross vehicle mass.

<sup>c</sup> Less than 4.5 tonne gross vehicle mass.

**Figure 2: Speed limit and crash type for 4WD and passenger car crashes, 1998**



passenger car crashes (54 per cent and 41 per cent respectively) (see fig. 2). By contrast, a higher proportion of passenger car crashes occurred in lower, urban speed zones (60km/h or under) compared with 4WD crashes (36 per cent and 25 per cent respectively).

#### Location

Even though 4WDs are becoming more popular on urban roads, the majority of 4WD crashes occur on rural roads and this number has been increasing. In 1990, 57 per cent of 4WD crashes occurred on rural roads and by 1998 this had increased to 68 per cent.

An almost even proportion of passenger car crashes occurred on rural and urban roads (51 per cent and 49 per cent respectively), and this ratio has remained fairly stable between 1990 and 1998.

#### Roll-overs

Previous research has concluded that 4WDs are more likely to roll-over than passenger cars as they have a higher centre of gravity relative to their wheel-base<sup>2</sup>. Table 2 supports this conclusion as it shows that a significantly higher proportion of 4WDs involved in fatal crashes rolled over compared with passenger cars (35 per cent and 13 per cent respectively).

Table 2 also shows that the proportion of 4WDs that rolled over without a previous collision was over three times the proportion for passenger cars (21 per cent and six per cent respectively). These crashes mostly involved single vehicles that had driven off a straight or curved road and rolled over. It is unlikely that the increased incidence of roll-overs can be fully explained by different terrain and roads used by 4WDs compared with other vehicles.

**Table 2: Roll overs in fatal crashes by vehicle type, 1998**

Roll-over status	4WD	Passenger car
<b>Vehicle rolled over</b>		
After major collision	12%	6%
After minor collision	2%	1%
Without previous collision	21%	6%
<b>Total</b>	<b>35%</b>	<b>13%</b>
<b>Vehicle did not roll-over</b>		
<b>Total</b>	<b>65%</b>	<b>87%</b>

<sup>2</sup> Fildes B, Kent S, Lane J, Lenard J, and Vulcan P. (1996). CR150 Vehicle Occupant Protection: Four-wheel-drives, utilities and vans. Canberra: FORS. p7.

## Driver characteristics

### Driver blood alcohol concentration

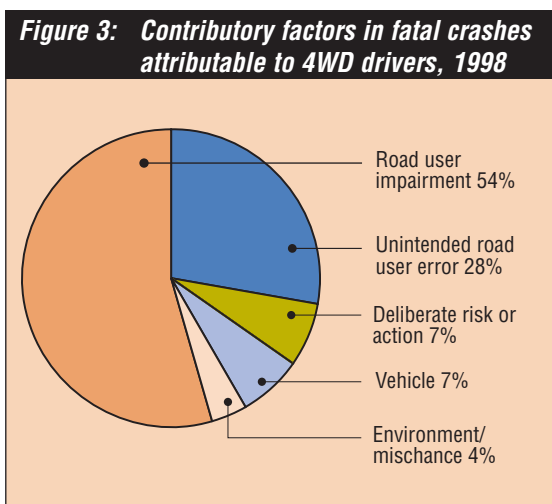
Where known/tested, 29 per cent of 4WD drivers involved in fatal crashes had a blood alcohol concentration (BAC) greater than 0.05g/100ml. This proportion was higher than for all other types of vehicle operators:

- Twenty-six per cent of motorcycle riders
- Twenty-one per cent passenger car drivers
- Nineteen per cent of light truck drivers, and
- Two per cent of heavy truck drivers

involved in fatal crashes had a BAC over 0.05g/100ml.

### Contributory factors

The most common causal factor attributable to 4WD drivers in fatal crashes was road user impairment (see fig. 3). Road user impairment can itself be broken down to include alcohol use (62 per cent), drug-and-alcohol use (13 per cent), fatigue (13 per cent), and other driver impairments (12 per cent).

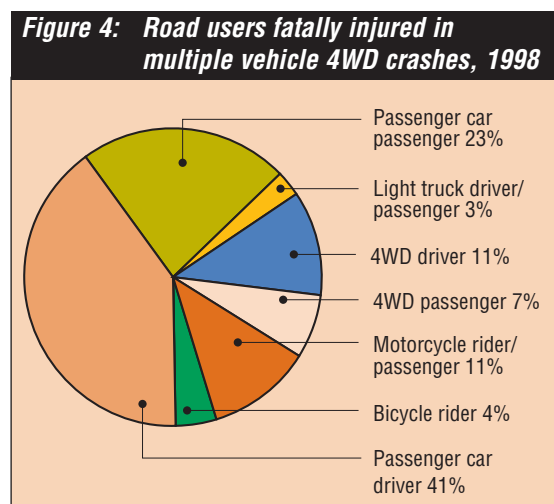


The second most common factor was unintended road user error. Half of these crashes included the driver failing to see another road user, signal or other road condition and one-third involved the driver misjudging another vehicle's speed or road condition.

## Fatalities

In crashes where the 4WD was the sole vehicle involved, 41 4WD drivers and 37 4WD passengers were fatally injured. In pedestrian-4WD crashes, 20 pedestrians were fatally injured.

In multiple vehicle crashes involving at least one 4WD, 114 road users were fatally injured with passenger car occupants accounting for the largest proportion of fatalities (64 per cent). 4WD occupants accounted for 18 per cent of all fatalities (11 per cent 4WD drivers and seven per cent 4WD passengers) (see fig. 4).



## Definitions and Data Source

In this monograph 4WDs are classified as vehicles not based on a car design. They include short and long wheel based vehicles such as the Suzuki Sierra and the Toyota Landcruiser as well as 4WD utilities such as the Mitsubishi Triton.

The data used in this monograph were extracted from the 1998 ATSB Fatality Crash Database and are the most recent data available. Australian Bureau of Statistics data were also used.