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## Fatal road crashes in Australia in the 1990s and 2000s: crash types and major factors

This information sheet aims to provide some statistical snapshots of the characteristics of fatal road crashes in Australia in the last two decades, 1990 to 2009, and complements the road safety statistical summary produced by BITRE each year which presents other key time series. It includes some insights into the types of crashes prevalent during this period, the major factors and the road user groups most frequently involved.

### At a glance

1. The numbers of fatal crashes, vehicles involved in fatal crashes and persons killed all decreased from 1990 to 2009, as did the numbers and proportions of fatal crashes with more than one person killed and more than one vehicle involved (Section 1, Table 1).
2. Differences in the size and mass of vehicles on the road were exacerbated by increases in the prevalence of both heavy and light vehicles. Motorcyclists appear to have been the worst affected by these changes (Section 2, Changes in the vehicle fleet and patterns of road use).
3. The proportion of vehicles with only one occupant among all vehicles that were involved in a fatal road crash rose gradually from 58 per cent in 1990 to 71 per cent in 2006 (Section 3, Vehicle occupancy).
4. There was an increase in the proportion of fatal crashes classified as 'non-collision, vehicle ran off road into object' from 27 per cent in 1990 to 37 per cent in 2006 (Section 4, Changes in crash type).
5. Unintended driver error, excessive speed and alcohol or drugs remained the three most frequently recorded major factors in fatal crashes throughout both decades (Section 5, Major factors).

# I General trends in road safety

Various measures indicate that improvements in road safety occurred in the 1990s and 2000s in Australia (Table 1).

## TI Road safety in Australia 1990–2009, selected indicators

	1990	1994	1998	2002	2006	2009
Number of fatal crashes	2 050	1 702	1 573	1 525	1 455	1 356
Number of persons killed	2 331	1 928	1 755	1 715	1 602	1 499
Number of fatal crashes with more than one person killed	223	166	146	141	114	113
Number of fatal crashes in which a pedestrian was killed	415	363	313	246	221	191
Number of vehicles involved in fatal crashes	3 117	2 583	2 368	2 292	2 224	2 021
Number of fatal crashes with only one vehicle involved	1 170	975	924	902	857	816
Number of fatal crashes with more than one vehicle involved	880	727	649	623	598	540
Proportion of fatal crashes with more than one vehicle involved (per cent)	43	43	41	41	41	40
Proportion of fatal crashes with more than one person killed (per cent)	11	10	9	9	8	8
Number of persons killed per 10 000 registered vehicles	2.3	1.8	1.5	1.3	1.1	1.0
Number of persons killed per 100 000 population	13.7	10.8	9.4	8.7	7.7	6.8

Source: Compiled by BITRE, using the Australian Road Deaths Database, the ABS *Motor Vehicle Census* and ABS *Australian Demographic Statistics*.

In the 2000s, in serious road crashes, defined as those involving death or serious injury, the likelihood of survival of those involved increased over the decade. However, many of those who survived sustained serious or life-threatening injury. Drivers of motor vehicles, motorcyclists and pedal cyclists all recorded significant increases in age-standardised rates of life-threatening injury in the 2000s (Australian Institute of Health and Welfare 2011).

## 2 Changes in the vehicle fleet and patterns of road use

Diversity in size and mass among vehicles on the road, sometimes called 'vehicle incompatibility', can affect road safety outcomes. Various trends affecting vehicle fleet diversity were evident from 1990 to 2009:

- Vehicle kilometres travelled by trucks and light commercial vehicles increased substantially from the early 1990s to 2009 while at the other end of the size and mass scale, vehicle kilometres travelled by motorcycles increased substantially from 2000 (Table 2).

## T2 Vehicle kilometres travelled, Australia, 1990–2009: vehicle type by year

	1990	1994	1998	2002	2006	2009	Per cent change 1990–2009
<i>vehicle kilometres travelled in billion kilometres</i>							
Cars	124.01	134.91	144.51	153.63	164.85	165.24	33.2
Light commercial vehicles	23.90	25.76	29.94	32.94	36.28	38.82	62.4
Articulated trucks	4.13	4.53	5.40	5.81	6.46	6.85	65.9
Rigid and other trucks	6.84	6.02	7.24	7.44	8.39	8.64	26.3
Buses	1.55	1.55	1.69	1.82	1.95	2.08	34.2
Motorcycles	1.80	1.59	1.46	1.55	1.88	2.44	36.1
All vehicles	162.23	174.35	190.24	203.18	219.81	224.06	38.1

Source: Unpublished BITRE data series.

- Sales of sports utility vehicles (large four-wheel drive vehicles) represented between 7 and 15 per cent of total new vehicle sales each month in the 1990s but sales increased to between 12 and 22 per cent each month in the 2000s (Australian Bureau of Statistics, *Sales of New Motor Vehicles*).
- The number of motorcycles registered for on-road use more than doubled between 1990 and 2009, from 304 000 in 1990 to 624 000 in 2009 (Australian Bureau of Statistics, *Motor Vehicle Census*).

National targets for reductions in road crash fatality rates proved difficult to achieve. The National Road Safety Strategy 2001–10 aimed to reduce road deaths from 9.3 per 100 000 population in 1999 to no more than 5.6 in 2010. In 2010 the rate was 6.1 road crash deaths per 100 000 population.

The increased use of motorcycles was clearly one of the reasons that reductions in deaths were less than expected. The number of deaths of motorcyclists in road crashes increased while the numbers of deaths of other road users either declined or remained the same. More detailed discussion of death and injury of motorcyclists from the late 1990s into the 2000s can be found in Johnston (2008) and Australian Institute of Health and Welfare (2011).

The effect of the increased presence on the roads of heavier vehicles is less clear. The number of persons killed in crashes involving at least one larger or heavier vehicle decreased between 1990 and 2006 and it is unclear whether the reduction would have been greater were it not for the increased presence on the roads of such vehicles (Table 3).

### T3 Persons killed in road crashes involving large, heavy vehicles, Australia

	1990	1994	1998	2002	2006
Known	921	766	705	693	585
Upper estimate (includes unknowns)	948	790	738	768	736

Notes: 'Large, heavy' vehicles includes vans, utes, 4WDs, buses and trucks. The upper estimate assumes all crashes in which it was unknown whether a large, heavy vehicle was involved did in fact involve such a vehicle. This is unlikely. The figure is provided simply to indicate the degree of uncertainty in the estimates.

Source: BITRE, using the national Fatal Road Crash Database.

Persons killed in crashes involving at least one larger or heavier vehicle accounted for a similar proportion of total road deaths between 1990 and 2006, though the greater number of crashes in the 2000s in which it was unknown whether a large, heavy vehicle was involved makes this a tentative conclusion (Table 4).

### T4 Persons killed in road crashes involving large, heavy vehicles as a proportion of total road deaths, Australia 1990–2006

	1990	1994	1998	2002	2006
			<i>per cent</i>		
Estimate excluding unknowns	40	40	41	42	40
Lower estimate including unknowns	40	40	40	40	37
Upper estimate including unknowns	41	41	42	45	46

Notes: 'Estimate excluding unknowns' means persons killed in road crashes known to have involved a large, heavy vehicle divided by total of road deaths minus those persons killed in crashes in which it was unknown whether a large, heavy vehicle was involved. 'Lower estimate including unknowns' means persons killed in road crashes known to have involved a large, heavy vehicle divided by total road deaths. 'Upper estimate including unknowns' means persons killed in road crashes known to have involved a large, heavy vehicle added to persons killed in road crashes in which it was unknown whether a large, heavy vehicle then divided by total road deaths.

Source: BITRE, using the national Fatal Road Crash Database.

## 3 Vehicle occupancy

Car occupancy rates published by Austroads for morning, afternoon and off-peak travel times in four States show little change since 1998–99 (Table 5).

### T5 Car occupancy rates, Australia, selected States, all day rates

	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09
	<i>average number of persons per car per hour</i>										
NSW	1.27	1.28	1.26	1.24	1.27	1.25	1.26	1.26	1.26	1.26	1.26
VIC	1.26	1.26	1.24	1.25	1.24	1.26	1.23	1.22	1.2	1.22	1.21
QLD	1.26	1.23	–	–	1.25	–	–	1.25	–	1.25	1.25
SA	1.24	1.24	1.27	1.26	1.24	1.26	1.26	1.26	1.23	1.22	1.26

Source: National Performance Indicators, [www.austroads.com.au](http://www.austroads.com.au) These car occupancy rates measure the average number of persons per car per hour during the whole day on a representative sample of arterial roads and freeways in the urban metropolitan area.

Occupancy surveys tend to focus on urban areas and it is possible that vehicle occupancy rates have changed in certain areas beyond the surveyed parts of the road network. Whatever the actual trend in vehicle occupancy across the whole road network, the proportion of vehicles with only one occupant among all vehicles involved in a fatal road crash rose gradually from 58 per cent in 1990 to 71 per cent in 2006. From the late 1990s, single occupant vehicles involved in rural crashes accounted for the highest proportion of all vehicles involved in fatal road crashes, though the proportion of single occupant vehicles increased in both urban and rural fatal crashes (Tables 7.1, 7.2 and 7.3).

The proportion of drivers among all road users killed rose from 40 per cent in 1990 to 47 per cent in 2009 (Table 6) and the proportion of these who died in a crash where their vehicle was the only vehicle involved and they were the only occupant increased gradually from 33 per cent in 1990 to 46 per cent in 2006 (Table 7.1).

The proportion of motorcycle riders among all road users killed rose from 10 per cent in 1990 to 15 per cent in 2009 (Table 6) and the proportion of these who died in a crash where their vehicle was the only vehicle involved and they were the only occupant rose gradually from 36 per cent in 1990 to 48 per cent in 2006 (Table 7.1).

## **T6 Proportion of road crash deaths in each road user group, Australia 1990 to 2009**

	1990	1994	1998	2002	2006	2009
	<i>per cent</i>					
Driver	40	42	42	46	47	48
Passenger	27	26	27	25	21	22
Pedestrian	18	19	18	15	14	13
Motor cycle rider	10	9	10	13	14	15
Motor cycle pillion passenger	1	1	1	1	1	1
Bicyclist	3	3	3	2	2	2
Total	100	100	100	100	100	100
Total road crash deaths	2 331	1 928	1 755	1 715	1 602	1 499

Source: Compiled by BITRE, using the Australian Road Deaths Database.

## **T7.1 Vehicle occupancy in fatal road crashes, Australia, 1990 to 2006: selected proportions**

	1990	1994	1998	2002	2006
	<i>per cent</i>				
Vehicles with only one occupant as a proportion of all vehicles involved in fatal road crashes	58	59	62	66	71
Drivers killed, sole occupant, single vehicle, as a proportion of all drivers killed in fatal road crashes	33	30	38	40	46
Motorcyclists killed, sole occupant, single vehicle, as a proportion of all motorcyclists killed in fatal road crashes	36	40	38	42	48

## **T7.2 Proportion of vehicles with only one occupant among all vehicles involved in fatal road crashes, Australia, 1990 to 2006: year by location of crash**

Vehicles	1990	1994	1998	2002	2006
	<i>per cent</i>				
Urban—single occupant	35	30	30	28	35
Urban—more than 1 occupant	20	16	15	13	11
Rural—single occupant	23	28	32	38	36
Rural—more than 1 occupant	22	25	23	21	17
Total vehicles	100	100	100	100	100

## **T7.3 Proportion of vehicles with only one occupant in urban fatal crashes compared with proportion of vehicles with only one occupant in rural fatal crashes, Australia, 1990 to 2006**

Vehicles	1990	1994	1998	2002	2006
	<i>per cent</i>				
Urban—single occupant	63	65	66	68	75
Urban—more than 1 occupant	37	35	34	32	25
Total vehicles in urban crashes	100	100	100	100	100
Rural—single occupant	51	53	59	64	68
Rural—more than 1 occupant	49	47	41	36	32
Total vehicles in rural crashes	100	100	100	100	100

Note: Urban and rural are classified in accordance with the definition used by the Australian Bureau of Statistics, i.e. 'urban' areas are the 'major urban' and 'other urban' categories in the Section of State classification, 'rural' areas are the 'bounded locality' and 'rural balance' categories.

Source: BITRE, using the national Fatal Road Crash Database.

For single-vehicle fatal crashes where the driver was killed and was the sole vehicle occupant, alcohol and/or drugs and excessive speed were the major factors most frequently recorded (Table 8).

### T8 Crashes in which a driver was killed, sole occupant, single vehicle: major factors by year

Proportion of these crashes in which a major factor was:	1990	1994	1998	2002	2006
	<i>per cent</i>				
Alcohol and/or drugs	53	45	50	49	52
Excessive speed	30	35	42	44	39
Alcohol and/or drugs + Excessive speed	19	20	24	25	21
	<i>number of crashes</i>				
Total of these crashes with known major factor (proportions above are based on these numbers)	298	237	264	231	228
Major factor unknown	0	0	8	78	115
Total crashes of this kind	298	237	272	309	343

Note: A crash can have several major factors. 'A major factor' means one among others and not necessarily 'the major factor' or the single most important factor. In other words, major factors are not mutually exclusive and the percentages above do not add to 100.

Source: BITRE, using the national Fatal Road Crash Database.

For single-vehicle fatal crashes where a motorcycle rider was killed and was the sole vehicle occupant, alcohol and/or drugs and excessive speed were the major factors most frequently recorded, with excessive speed figuring more prominently in the 2000s (Table 9).

### T9 Crashes in which a motorcyclist was killed, sole occupant, single vehicle: major factors by year

Proportion of these crashes in which a major factor was:	1990	1994	1998	2002	2006
	<i>per cent</i>				
Alcohol and/or drugs	58	54	52	40	37
Excessive speed	51	49	60	65	63
Alcohol and/or drugs + Excessive speed	34	28	37	32	23
	<i>number of crashes</i>				
Total of these crashes with known major factor (proportions above are based on these numbers)	86	72	62	72	75
Major factor unknown	0	0	0	15	38
Total crashes of this kind	86	72	62	87	113

Source: BITRE, using the national Fatal Road Crash Database.

## 4 Changes in crash type

There was an increase in the proportion of fatal crashes classified as 'non-collision, vehicle ran off road into object' from 27 per cent in 1990 to 37 per cent in 2006 (Table 10).

### T10 Proportion of fatal road crashes in each crash type each year, Australia 1990 to 2006

	1990	1994	1998	2002	2006
	<i>per cent</i>				
Non-collision, vehicle ran off road into object	27	27	27	35	37
Vehicle hit pedestrian	20	21	19	15	16
Head on collision between two vehicles	18	19	17	18	14
Vehicles collided at intersection	9	7	9	8	6
One vehicle hit another from behind	5	3	3	3	3
Other crash type	21	23	25	21	23
Total fatal crashes of known crash type	100	100	100	100	100
	<i>per cent range for non-collision crashes only</i>				
Non-collision (vehicle ran off road into object) assuming none of the crashes of unknown crash type were non-collision	26	26	26	33	31
Non-collision (vehicle ran off road into object) assuming all of the crashes of unknown crash type were non-collision	28	28	30	39	47
	<i>number of fatal crashes</i>				
Total crashes of known crash type	2 009	1 680	1 512	1 435	1 227
Number of crashes of unknown crash type	41	22	61	90	228
Total number of fatal road crashes	2 050	1 702	1 573	1 525	1 455

Note: The crash types in this table are defined using Australian Road Research Board 1994, *Model guideline for road accident data and accident types*, ATM No. 29, version 2.1, ARRB, Melbourne. Percentages for non-collision crashes in 2002 are in the range 33 to 39 per cent and in 2006 in the range 31 to 47 per cent if the unknowns are taken into account.

Source: BITRE, using the national Fatal Road Crash Database.

## 5 Major factors

The major factors in fatal road crashes can be broadly categorised as adverse weather or road conditions, a malfunction or defect in one of the vehicles involved, alcohol and/or drugs, fatigue, unintended driver error or accidental driver distraction or driver impairment (for example, sun in eyes), excessive speed and other risk-taking activity such as using a mobile phone, skylarking or tail-gating. These are not causal factors so much as risk factors. Causal analysis for each and every crash is not undertaken. Instead, factors known or thought to increase the risk of a fatal crash are recorded when observed as part of the circumstances of a fatal crash and called 'major factors'. A crash can have several major factors. 'A major factor' means one among others and not necessarily 'the major factor' or the single most important factor or 'cause'. The prevalence of these factors in fatal crashes remained roughly the same from year to year, although excessive speed was assigned as a major factor more frequently in the 2000s than in the 1990s. Driver error, distraction or impairment (unintended) was the factor most often assigned to fatal crashes (39 per cent of crashes on average), followed by alcohol and/or drugs (34 per cent of crashes on average), excessive speed (28 per cent of crashes on average but 33 per cent in 2006), other risk-taking, fatigue and adverse weather or road conditions (all 8 per cent of crashes on average) and finally by vehicle malfunction or defect—5 per cent of crashes on average (Table 11).

### Table 11 Fatal road crashes in Australia, 1990 to 2006: major factors by year

Proportion of fatal crashes in which a major factor was:	1990	1994	1998	2002	2006
	<i>per cent</i>				
Adverse weather or road conditions	7	9	7	6	10
Vehicle malfunction or defect	4	5	6	5	5
Alcohol and/or drugs	32	30	36	35	35
Fatigue	6	8	9	8	9
Driver error, distraction or impairment (unintended)	22	35	52	45	39
Excessive speed	19	24	29	35	33
Other risk taking	5	7	10	8	10
	<i>number of crashes</i>				
Total of fatal crashes with known major factor (proportions above are based on these numbers)	2 010	1 681	1 453	1 182	1 066
Major factor unknown	40	21	120	343	389
Total fatal crashes	2 050	1 702	1 573	1 525	1 455

Note: Low percentages for 'driver error' and 'other risk-taking' in 1990 and 1994 are due to data coding differences for those years. Insufficient codes in those years meant another code called 'other major factor' was used more than in later years.

Source: BITRE, using the national Fatal Road Crash Database.

## Explanatory notes

One of the sources used in this report is the national Fatal Road Crash Database. This database is produced using information from the National Coroners Information System (NCIS), a national resource maintained by the Victorian Institute of Forensic Medicine (see [http://www.vifm.org/in\\_ncis.html](http://www.vifm.org/in_ncis.html)). The coronial processes and the information compilation and coding required to produce the database mean a delay of a few years is inevitable before data for any given year are entered in the database. Consequently, data in this report based on this source are not currently available for years after 2006. Data for the 1990s was based on inspection of the full paper coronial file. Data for the 2000s was based on the NCIS, which represents a sub-set of the details on the full paper coronial file. Consequently, there are more unknowns in data for the 2000s.

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