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Annual performance indicators of enforced driver behaviours in South Australia, 2004

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TITLE

Annual performance indicators of enforced driver behaviours in South Australia, 2004

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ABSTRACT

The Centre for Automotive Safety Research at the University of Adelaide was commissioned by the Department for Transport, Energy and Infrastructure to produce a report quantifying performance indicators for selected enforced driver behaviours (drink driving, speeding, restraint use) in South Australia for the calendar year 2004. The level of random breath testing (RBT) in South Australia in 2004 was higher than all previous years except 2002. An increase in the proportion of all tests conducted using mobile RBT led to an increase in the overall detection rate but interstate comparisons suggest the proportion of testing using mobile RBT should be increased. The abolition of the requirement for mobile RBT to be conducted only during 'prescribed periods' should aid this aim. There was a marked increase in the number of drivers detected speeding compared to 2003, which was due to the introduction of dual purpose red light/speed cameras. However, decreasing utilisation of conventional speed cameras in the metropolitan area meant that speed detections were still far fewer than those in 2000-02. No urban speed surveys were conducted in 2004 but rural surveys revealed that reductions in speeds on 60 km/h roads in 2003 were maintained in 2004. The number of restraint offences in 2004 was 15 percent lower than the number in 2003. The amount of publicity supporting restraint use was also lower than in 2003, although the budget was sufficient to support a mass media campaign in both metropolitan and rural areas.

KEYWORDS

Law enforcement, Performance indicators, Driver behaviour, Drink driving, Restraint usage, Speeding.

Summary

The Centre for Automotive Safety Research at the University of Adelaide was commissioned by the Department for Transport, Energy and Infrastructure to produce a report quantifying the performance indicators for selected enforced driver behaviours (drink driving, speeding and restraint use) in South Australia for the calendar year 2004.

For each of the driver behaviours, information was collected on: the current levels of police enforcement operations, current levels of the involvement of the specific driver behaviour in fatal and serious casualty crashes, and the extent of any publicity and advertising during the year. Additionally, any information available from on-road surveys was examined.

The establishment of consistent performance indicators for drink driving, speeding and restraint use enforcement practices will assist in optimising enforcement operations and related publicity, and may consequently further reduce road trauma on South Australian roads. Providing a consistent framework to collect and evaluate this information will help in achieving these aims.

The main findings from performance indicators for each enforced behaviour in 2004 are summarised below.

DRINK DRIVING

In 2004, random breath testing levels increased slightly from those in 2003, to reach a number of tests higher than all previous years except 2002. This was an encouraging change after the decrease in 2003 and helped maintain a level of testing greater than the recommendation of Baldock and White (1997) that one in two licensed drivers be tested.

Mobile RBT comprised seven percent of total tests in 2004, compared to two percent in 2003. The mobile method of testing was still restricted in 2004 by the requirement that it could only be conducted during 'prescribed periods'. The abolition of this requirement in 2005 will enable an increase in the proportion of tests conducted using mobile RBT and an increased likelihood of detecting drink drivers. Detection rates with mobile RBT were much higher than those associated with static RBT, thus producing an increase in the overall detection rate to a level higher than those in all years since 1998.

Interstate comparisons revealed that detection rates were higher in states with a high number of overall tests and a high proportion of all tests conducted using mobile testing. South Australia, comparatively speaking, had a low number of tests (per capita) and a low proportion of tests conducted with mobile testing (due to it being the only state in which mobile RBT had to be conducted only during prescribed periods), and, thus, a low detection rate. In order to be on par with other jurisdictions in Australia, South Australia would need to increase its level of testing and increase the proportion of tests conducted using mobile RBT.

There was an increase in the involvement of alcohol in fatal crashes in 2004 but the BAC of drivers was unknown for a sizeable percentage (38%) of serious injury crashes, as has been the case in previous years, which makes it difficult to draw conclusions about the level of alcohol involvement in crashes in South Australia. Improving the matching process of blood samples with the TARS database would create a more complete and reliable database, and make it simpler to determine whether current enforcement methods are having the desired effect on drink driving behaviour.

In 2004, expenditure on anti-drink driving publicity decreased by 14 percent from the figure in 2003. However, 2003 spending was substantially greater (by 37%) that that in 2002. The campaigns encompassed both metropolitan and rural regions and used a variety of media.

SPEEDING

The number of hours spent on speed enforcement in South Australia in 2004 was similar to the level in 2003 but less than levels in 2000-02. However, this does not include hours of operation of dual

purpose red light/speed cameras. If these were included, the total hours of speed enforcement in 2004 would far exceed the level in 2003.

Speed detection hours are concentrated during the daytime and are balanced across the week. This provides a good balance between operation during high traffic periods (weekdays) and high speeding days (weekends). However, enforcement practices should be altered to prevent the drop in speed camera detection hours during the lunch period (12-2pm).

After a much lower number of speed detections in 2003 than in previous years, the number increased markedly in 2004 due to the additional enforcement using dual purpose red light/speed cameras. These cameras yielded over 50,000 speeding detections (just under a quarter of all detections). This addition of red light cameras to the methods available for speed limit enforcement is therefore likely to prove useful in promoting specific deterrence.

Excluding dual purpose red light/speed cameras, the detection rate per hour for speeding offences in 2004 was the lowest for all the years since 2000. This was likely to be due to decreases in metropolitan speed camera enforcement (associated with the highest detection rates) and increases in rural non-camera device enforcement (associated with the lowest detection rates).

As was the case for previous years, 'excessive speed' was seriously underestimated as an apparent driver error in the TARS database. Consequently, meaningful analysis of serious injury and fatal crashes was limited due to under-reporting bias.

On-road travel speed surveys are not conducted in a systematic manner in urban areas and no such surveys were conducted in 2004. A survey of urban travel speeds will be conducted in 2005 in order to assess whether the reductions in travel speeds observed in 2003 have been maintained. One positive finding from rural speed surveys was that the small decreases in travel speeds that were observed on rural 60 km/h roads in 2003 were maintained in 2004.

During 2004, expenditure on speed-related publicity increased marginally (6.5%) from 2003 which, in turn, was characterised by markedly greater expenditure (up 39%) than 2002. These increases in spending were necessary, given the need for continued publicising of the recent (2003) reductions in speed limits.

RESTRAINT USE

Determining the effectiveness of restraint use enforcement was very difficult because no specific restraint enforcement campaigns were undertaken in 2004. The number of restraint offences provides some indication of the level of enforcement. The number of offences in 2004 was 15 percent lower than the number in 2003.

Unfortunately, there were no observational surveys in 2004 to provide data that could be used to determine the effectiveness of restraint use enforcement. Wearing rates for vehicle occupants involved in crashes are difficult to interpret because of the confounding nature of the relationship between crash injury and wearing rates in crashes (wearing restraints reduces injury). Furthermore, better records of restraint use for all vehicle occupants in serious and fatal crashes need to be kept to improve database reliability and accuracy.

Although overall restraint usage rates in 2004 are unknown, the higher likelihood of males being charged with restraint offences and of being unrestrained in fatal and serious injury crashes indicates that males remain an important target for restraint enforcement. Publicity designed to promote restraint use should also be aimed at males.

The amount of money spent on publicity in 2004 was significantly less than that in 2003. However, the expenditure in 2003 was much higher than that of previous years. The budget in 2004 still supported a mass media campaign incorporating both the metropolitan and rural areas. As in 2003, the campaign focused on the consequences of not using restraints rather than on enforcement.

Contents

1 Introduction

Performance indicators assist in the identification of driver behaviour trends and enable the assessment of the effectiveness of enforcement measures. The Centre for Automotive Safety Research at the University of Adelaide was commissioned by the Department for Transport, Energy and Infrastructure to examine the annual performance indicators of selected enforced driver behaviours in South Australia.

The specific aim of this study was to assess performance indicators related to drink driving, speeding and restraint use in South Australia for the calendar year 2004. The findings from this report are important for the evaluation and planning of future enforcement operations concerned with drink driving, speeding and restraint use.

For each of the driver behaviours, information was collected on: the current levels of police enforcement operations, current levels of the involvement of the specific driver behaviour in fatal and serious casualty crashes, and the extent of any publicity and advertising during the year. Additionally, any information available from on-road surveys was examined.

Section 2 of the report, examining drink driving, continues on from other regular annual reports detailing the operations and effectiveness of RBT (Baldock & White, 1997; Hubbard, 1999; Wundersitz & McLean, 2002; Wundersitz & McLean, 2004; Wundersitz, Baldock, Woolley & McLean, 2006). In this report, data are presented from 1993 to 2004. The two other major enforceable behaviours covered in this report are speeding and restraint use. Data are included for the years 2000 to 2004 to analyse short-term trends.

2 Drink driving and random breath testing

This Section describes the operation and effectiveness of random breath testing (RBT) in South Australia for the calendar year 2004 in terms of the number of tests, the percentage of licensed drivers tested, detection rates, and alcohol involvement in serious and fatal road crashes. For the first time in a report in this series, RBT figures from a number of other Australian states are provided, enabling a comparison between South Australian practices and those of the police in other Australian jurisdictions. In addition, anti-drink driving publicity during 2004 is reviewed.

2.1 RBT practices and methods of operation

Random breath testing is primarily an enforcement strategy designed to deter drivers from driving with an illegal blood alcohol concentration (BAC) (i.e. general deterrence). A secondary aim is the detection of drink drivers (i.e. specific deterrence). Homel (1990) argued that, for RBT to be successful, it must increase a driver's perceived likelihood of detection when drinking and driving, the perceived certainty of punishment if detected, and the perceived speed of punishment once detected. Based on general behaviour modification principles and Homel's (1990) deterrence model, the effectiveness of RBT can be improved by high visibility, strategic enforcement, sustained high levels of testing, sufficiently severe penalties and supportive publicity.

Information about the police operation of RBT has been provided by the Traffic Intelligence Section of the SA Police. In South Australia, amendments to legislation in June 1981 first enabled RBT to operate. RBT operations are conducted using the block testing method or by single car operations. When block testing, many vehicles are pulled over at a time and the drivers tested. Single vehicle operations involve one police car and two police officers per RBT site, enabling the testing of up to two drivers at one time.

All general patrol and traffic vehicles are equipped with a preliminary breath testing device (919 available in 2004). Drivers who register a blood alcohol level over the prescribed limit on the screening test are required to submit to a further test on more accurate apparatus to determine an 'evidentiary' BAC level to be used in prosecution. This must be completed within two hours of the last known time of driving. Those found to be over the prescribed limit in the evidentiary test are officially recorded as having exceeded the prescribed concentration of alcohol. There were 97 evidentiary breath testing instruments available for use in South Australia in 2004.

In South Australia, the prescribed BAC limit has been 0.05 g/100mL since July 1991. If apprehended with a BAC level of 0.05 to 0.079, the fully licensed driver incurs a Traffic Infringement Notice (TIN), an expiation fee, and a penalty of three demerit points. If detained with a BAC level of 0.08 or higher, the driver incurs an expiation fee, is required to make a court appearance and incurs a licence suspension. The amount of the fine and length of licence disqualification is dependent on the actual BAC level and previous offences, if any. In December 2003, penalties for exceeding the prescribed BAC limit increased. Drivers detected with a BAC level between 0.05 and 0.079, and convicted of a second or subsequent drink driving offence, received a licence suspension for a minimum of three months. Fines were also increased.

The coordination of RBT activities was decentralised in 2000. Drink drive detection is now the responsibility of the 14 Local Service Areas (LSAs) in South Australia (5 metropolitan, 9 rural). Each LSA Commander has the responsibility of ensuring targets are met and that the operations are efficient and effective.

In most states in Australia, RBT operations may either be 'static', whereby an RBT station is set up on a road, or 'mobile', which allows the driver of any mobile police vehicle to stop vehicles at random and breath test the driver. Mobile RBT was first introduced in New South Wales in late 1987 and has subsequently been introduced into all Australian states.

South Australian Parliament passed a Bill in June 2003 legislating the use of mobile testing during 'prescribed periods'. The 'prescribed periods' included long weekends, school holidays and four other periods during the year that did not exceed 48 hours. The additional 48 hour periods were determined by the Minister for Police and had to be advertised to the public at least two days prior to the commencement of each period. The intention of this amendment was to widen the powers of police to require drivers to submit to a breath test during holiday periods when there was increased traffic and a potential increase in the risk of crashes. South Australia was the only Australian jurisdiction to restrict mobile testing to 'prescribed periods'. Actual mobile RBT testing commenced in South Australia in September 2003. Legislation passed through State parliament in mid-2005 enabling mobile random breath testing to be conducted on a full-time basis rather than only during prescribed periods. However, the time period covered by the present report (2004) involved the operation of mobile RBT during prescribed periods only.

2.1.1 Number of tests performed

The following data represent a combination of both static and mobile testing to give a complete picture of the operation and effectiveness of RBT in South Australia. Table 2.1 and Figure 2.1 summarise the changes in the number of random breath tests conducted from 1993 to 2004 for the metropolitan and rural areas. Rural testing refers to testing conducted outside the Adelaide metropolitan area and includes regional cities such as Mount Gambier and Port Augusta.

Table 2.1
Number of random breath tests in South Australia, 1993-2004

Year	Metro	Rural	Total	% difference from previous year
1993	188,266	51,966	240,232	-9.7
1994	192,079	49,748	241,827	0.7
1995	176,038	43,993	220,031	-9.0
1996	241,732	81,484	323,216	46.9
1997	431,784	185,721	617,505	91.1
1998	369,882	211,044	580,933*	-5.9
1999	357,556	204,490	562,046	-3.3
2000	326,168	208,405	534,573	-4.9
2001	290,853	250,282	541,115	1.2
2002	387,867	294,664	682,531	26.1
2003	334,338	274,331	608,649	-10.8
2004	364,856	288,477	653,333	7.3

*NB: The total for 1998 does not equal the sum of metro and rural random breath tests as there were some unknown locations which contribute to the total but can not be identified as metro or rural.

A consultancy report in 1996 recommended that the South Australian 1995 RBT numbers be doubled (Vulcan, Cameron, Mullan & Dyte, 1996). Funding was then increased to enable the police to purchase more equipment, and increase police overtime hours to operate additional RBT activities. In addition, a testing target of 500,000 breath tests per year in South Australia was set by SAPOL in 1997. As a result, in 1997, the number of tests increased by 91 per cent over the previous year and exceeded the target level. The testing target was increased to 600,000 tests per year in 1999 and remains unchanged. This current testing target is intended to test an average of one in every two licensed drivers in South Australia.

The total number of tests (653,333) performed in 2004 exceeded the target of 600,000. This level of testing was seven percent higher than the level in 2003 but marginally lower than the record number of tests conducted in 2002. The increase in testing from 2003 was similar in metropolitan and rural regions.

This level of 653,333 tests was comprised of 607,303 tests conducted using static RBT (93.0%) and 46,030 tests using mobile RBT (7.0%). The 608,649 tests in 2003 were comprised of 595,458 static RBT tests (97.8%) and 13,191 mobile RBT tests (2.2%). This increase in the proportion of tests conducted in the mobile mode would be due to mobile RBT operating for the full 12 months in 2004, whilst, in 2003, mobile RBT only operated from September.

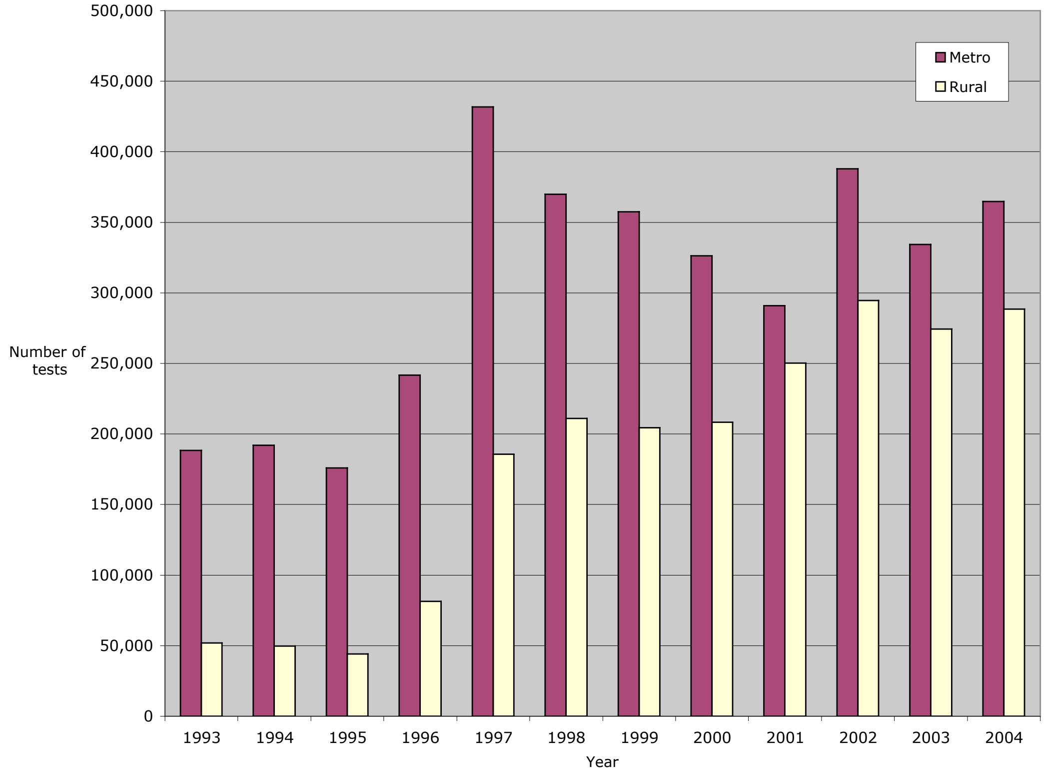

Figure 2.1
Number of random breath tests in South Australia, 1993-2004

DAY OF WEEK

Table 2.2 shows the number of random breath tests performed on each day of the week, as a percentage of all tests in a year, for the years 1993 to 2004. Similar to previous years, the greatest percentage of tests was conducted on Fridays, Saturdays and Sundays, with fewer tests conducted on Tuesdays and Wednesdays.

Table 2.2
Random breath tests performed by day of week, 1993-2004
(expressed as a percentage of total tests each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1993	16.9	13.7	12.6	13.2	16.1	16.5	11.0
1994	16.8	12.8	12.6	13.1	15.4	18.2	11.2
1995	13.9	13.3	13.3	12.8	20.4	15.6	10.7
1996	11.8	11.9	10.4	9.9	33.9	13.4	8.7
1997	8.9	8.4	11.1	8.9	28.4	19.1	15.2
1998	9.8	6.8	8.8	17.0	27.1	15.9	14.5
1999	12.8	8.9	8.3	11.4	26.0	16.6	16.0
2000	13.0	9.1	7.4	10.1	23.4	18.8	18.1
2001	12.8	7.0	7.8	12.6	22.7	19.1	17.9
2002	12.0	9.8	9.1	12.4	20.1	19.1	17.6
2003	13.9	8.2	12.3	13.4	18.3	16.6	17.4
2004	12.6	7.5	7.5	14.6	21.2	18.4	18.2

Table 2.3 shows the day of week data for 2004 split into its static and mobile RBT components. The day of week of testing by the two methods was similar except that mobile RBT was over-represented on Saturdays. This could have been the result of 'prescribed periods' for mobile RBT being more likely to include weekends.

Table 2.3
Random breath tests performed by day of week in 2004
(expressed as a percentage of total tests each year) for static and mobile RBT

Testing type	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Static	12.7	7.6	7.6	14.9	21.3	17.8	18.1
Mobile	11.9	6.1	5.8	9.6	20.2	26.7	19.6

TIME OF DAY

The percentage of tests performed from 1993 to 2004 by time of day is summarised in Table 2.4. In general, the percentage of tests by time of day in 2004 followed a similar pattern to previous years. RBT was conducted most commonly between 2pm and midnight, with the greatest percentage of tests within a two hour period being conducted between 8 and 10pm (22%). There were relatively low levels of testing between midnight and 2pm. However, the percentage of tests conducted between 6am and 2pm was more than double the levels in years prior to 1999.

Table 2.4
Random breath tests performed by time of day, 1993-2004
(expressed as a percentage of total tests each year)

Year	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
1993	9.4	1.9	0.6	1.2	1.1	14.6	14.6	38.5	18.1
1994	11.5	2.4	0.7	1.6	1.0	12.9	14.6	36.3	18.9
1995	11.4	4.7	2.3	1.2	0.9	13.9	14.3	31.8	19.7
1996	10.7	3.5	1.6	6.7	2.1	12.2	10.6	38.6	13.9
1997	19.9	3.0	9.8	5.9	2.7	11.7	9.8	28.2	9.0
1998	9.1	2.5	5.8	9.4	4.9	10.5	12.5	33.4	11.9
1999	4.8	3.8	3.4	16.6	9.2	14.7	12.5	24.9	10.1
2000	3.9	3.1	1.8	18.9	9.9	13.9	13.1	24.9	10.5
2001	3.8	6.4	1.5	17.4	10.7	13.9	10.8	22.4	13.1
2002	4.0	2.5	2.2	20.6	11.4	15.0	11.3	22.2	10.8
2003	5.5	2.3	1.5	21.2	11.1	14.3	12.6	20.5	10.9
2004	4.2	2.3	1.9	20.6	12.0	12.0	12.5	21.7	12.9

Table 2.5 shows the time of day data for 2004, separately for static and mobile RBT. It can be seen that mobile RBT was over-represented during the hours from midnight to 4am, while static RBT was over-represented in the hours of the afternoon from 2 to 6pm.

Table 2.5
Random breath tests performed by time of day in 2004
(expressed as a percentage of total tests in the year) for static and mobile RBT

Type	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
Static	3.7	2.2	2.0	20.7	12.3	12.3	12.3	21.8	12.8
Mobile	10.4	3.4	1.5	18.4	8.1	8.8	14.7	19.9	14.6

Data for random breath tests per month for static and mobile testing were only available for 2004. Table 2.6 shows the percentage of tests per month, by testing method and location. The uneven distribution of mobile RBT would be due to the legislative requirement for testing only during ‘prescribed periods’. The data for static RBT by month shows low levels of testing during the winter months, probably due to the effects of wet weather, while there are clear high levels of testing associated with Easter (April) and Christmas (December).

Table 2.6
Random breath tests by month in 2004 (expressed as a percentage of total tests in the year)
by location and method of testing

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	8.5	10.0	9.1	14.8	15.3	15.2
Feb	7.6	6.2	7.0	0.0	0.0	0.0
Mar	9.7	6.8	8.5	2.1	2.3	2.3
Apr	7.9	18.5	12.4	16.2	18.1	17.6
May	5.8	5.4	5.6	5.6	6.3	6.2
Jun	5.6	3.9	4.9	5.5	5.2	5.3
Jul	4.9	4.9	4.9	16.5	16.5	16.5
Aug	6.8	5.6	6.3	1.0	0.9	0.9
Sep	7.6	8.6	8.0	5.2	5.7	5.6
Oct	10.7	9.1	10.0	4.8	8.8	7.7
Nov	8.4	6.2	7.5	3.0	3.6	3.4
Dec	16.5	14.9	15.8	25.2	17.2	19.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

2.1.2 Percentage of licensed drivers tested

The number of licensed drivers and percentage of licensed drivers tested in South Australia for the years 1993 to 2004 can be seen in Table 2.7 and in Figure 2.2. The testing target level of 1 in 2 drivers has been exceeded since its inception in 1997 (Baldock and White, 1997). The percentage of licensed drivers tested in 2004 (60.9%) was one of the highest that has been recorded, with only the percentages in 2002 and 1997 being higher.

Table 2.7
Number and percentage of licensed drivers tested in South Australia, 1993-2004

Year	Number of tests	Number of licensed drivers	% of licensed drivers tested
1993	240,232	947,134	25.4
1994	241,827	963,976	25.1
1995	220,031	974,756	22.6
1996	323,216	989,718	32.7
1997	617,505	994,719	62.1
1998	580,933	992,459	58.5
1999	562,046	1,043,581	53.9
2000	534,573	1,028,083	52.0
2001	541,115	1,045,077	51.8
2002	682,531	1,046,878	65.2
2003	608,649	1,052,030	57.9
2004	653,333	1,072,374	60.9

Source: Driver's Database, Registration and Licensing Section, Transport SA
NB: Licence information could only be extracted for the financial year to June 30.

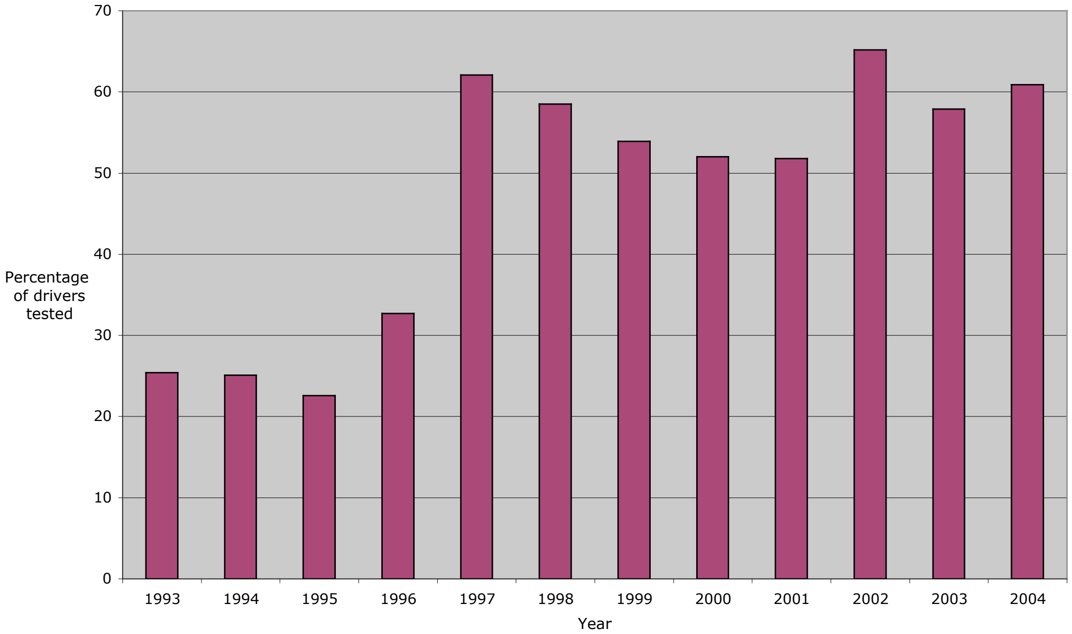

Figure 2.2
Percentage of licensed drivers tested, 1993-2004

2.1.3 Interstate comparisons

In order to establish standards against which South Australian practices may be compared, it was thought useful to determine the levels of RBT conducted in other Australian jurisdictions. The levels of overall RBT in six Australian jurisdictions, including South Australia, are provided in Table 2.8, with total numbers expressed, where possible, in terms of the relative contributions of mobile and static testing methods. It can be seen that the highest levels of RBT in 2004 were conducted in New South Wales and Victoria, followed by Queensland. It can also be seen that the proportion of all RBT that was conducted using mobile testing methods was much higher in all other jurisdictions than in South Australia.

Table 2.8
Number of random breath tests conducted in six Australian jurisdictions in 2004, by testing method

Jurisdiction	Static	Mobile	Total	% Mobile
South Australia	607,303	46,030	653,333	7.0
New South Wales	2,406,442[a]	658,610	3,065,052	21.5
Northern Territory	UK	UK	5,476	UK
Queensland	1,964,291 [b]	814,908	2,779,199	29.3
Tasmania	99,883	365,526	465,409	78.5
Victoria	2,393,830[c]	1,264,364	3,658,194	34.6
Western Australia	UK	UK	850,562[d]	UK

[a] Total includes 200,507 tests conducted from RBT 'bus units'
[b] Total includes 250,179 tests conducted using RBT 'booze bus units'
[c] Total includes 1,463,047 tests conducted from RBT 'booze buses'
[d] Total includes 349,833 tests conducted from RBT 'booze bus units'
NB UK = unknown

A more appropriate measure of RBT levels in different jurisdictions can be gained by adjusting RBT numbers for the number of drivers in each jurisdiction. In order to avoid any difficulties associated with differences in licensing conditions across jurisdictions, it was decided that a simpler measure would be breath tests per head of population. As population here refers to total population, and not driving age population, the figures in Table 2.9 will not be of great value beyond the context of the Table. That is, they only provide a means by which to compare jurisdictions. When RBT levels are expressed as rates per head of population (Table 2.9), the highest rates of RBT were reported for Tasmania, followed by Victoria and Queensland. South Australia's level of RBT was comparable with that in Western Australia and New South Wales.

Table 2.9
Number of random breath tests conducted in six Australian jurisdictions in 2004, as a percentage of population

Jurisdiction	Total	Pop 2004*	% of Pop
South Australia	653,333	1,532,727	42.6
New South Wales	3,065,052	6,720,791	45.6
Northern Territory	5,476	199,384	2.7
Queensland	2,779,199	3,888,077	71.5
Tasmania	465,409	482,236	96.5
Victoria	3,658,194	4,962,970	73.7
Western Australia	850,562	1,978,079	43.0

* Source: June, 2004 data from Australian Bureau of Statistics (2005) *Population by Age and Sex: Australian States and Territories.* Catalogue No 3201.0,

2.2 Levels of drink driving

2.2.1 Drink driving detections

The number of drink driving detections for the years 2000 to 2004 are shown in Table 2.10. It can be seen that the number of drink driving detections has risen each year since 2000, with 6,058 detections in 2004 being the highest number recorded during this period. Note that this refers to drink driving detections by *all* methods, including detections subsequent to crash involvement and traffic offences. The number of drink drivers detected using RBT was 3,503, with 2,364 of these detected in the metropolitan region and 1,139 detected in rural regions.

Table 2.10
Drink driving detections in South Australia 2000-2004

Year	Drink Driving Detections	Percent change from previous year
2000	4,037	NA
2001	4,787	18.6
2002	5,074	6.0
2003	5,802	14.3
2004	6,058	4.4

2.2.2 Interstate comparisons

Data concerned with drink driving detections by all methods were also obtained from a number of other Australian jurisdictions and are shown in Table 2.11. Again, for ease of comparison, these are expressed in terms of detections per head of population. It can be seen that in each of the three large eastern states, between 25 and 30,000 drink drivers were detected in 2004. When adjusted for population, Tasmania had the highest detection rate and South Australia and New South Wales had the lowest. Interestingly, a comparison of Tables 2.8, 2.9 and 2.11 reveals a trend for the jurisdictions with the highest testing rate per capita and the greatest proportion of testing done using mobile methods to have the highest detection rates, and vice versa. One anomaly in this trend was that Victoria's detection rate was lower than Queensland's despite a higher number of tests and greater proportion of mobile tests. This anomaly could be the result of the Victorian detection total not including detections following a road crash. Another was that South Australia's detection rate was similar to that in New South Wales despite a lower proportion of tests conducted with mobile testing. Overall, South Australia in 2004 had the lowest rate of testing per head of population, the lowest proportion of tests conducted using mobile methods, and the second lowest drink driving detection rate of the five jurisdictions (SA, NSW, Qld, Tas and Vic) for which data were available.

Table 2.11
Drink driving detections, by all methods, in 2004 in five Australian jurisdictions

Jurisdiction	Drink Driving Detections	% of Population
South Australia	6,058	0.40
New South Wales	26,265	0.39
Queensland	27,738	0.71
Tasmania	3,979	0.83
Victoria	27,546*	0.56*
Western Australia	11,968*	0.61*

* Does not include detections following a crash, RBT detections only

2.2.3 RBT detection rates

The detection rates in the following Section refer to detection by RBT only. There is no single sufficient measure of the effectiveness of RBT operations but RBT detection rates and the percentage of drivers with illegal BACs involved in serious and fatal crashes provide some estimate of the effectiveness of RBT. A lower detection rate may indicate greater effectiveness of RBT and other drink driving countermeasures, although it is very important to note that detection rates are also affected by operational factors such as the locations, times and types of RBT used.

The RBT detection rates for the metropolitan and rural areas for the years 1993 to 2004 are presented in Table 2.12 and Figure 2.3 in terms of the number of drivers found to be over the legal limit per thousand tested. In this case, drivers are only included if they recorded an illegal BAC using evidentiary testing. That is, drivers who tested over the limit on the initial screening test but who were under the limit on the evidentiary test are not included in Table 2.12.

Table 2.12
RBT detection rates, 1993-2004
(number of drivers detected with an Illegal BAC per thousand tested)

Year	Metro	Rural	Total
1993	6.7	6.5	6.7
1994	7.1	5.3	6.8
1995	7.1	6.3	7.0
1996	6.2	4.7	5.8
1997	9.5	5.2	8.2
1998	6.8	3.7	5.7
1999	4.5	2.8	3.9
2000	3.2	2.1	2.8
2001	5.4	1.8	3.7
2002	4.0	1.9	3.1
2003	5.8	2.9	4.5
2004	6.5	3.9	5.4

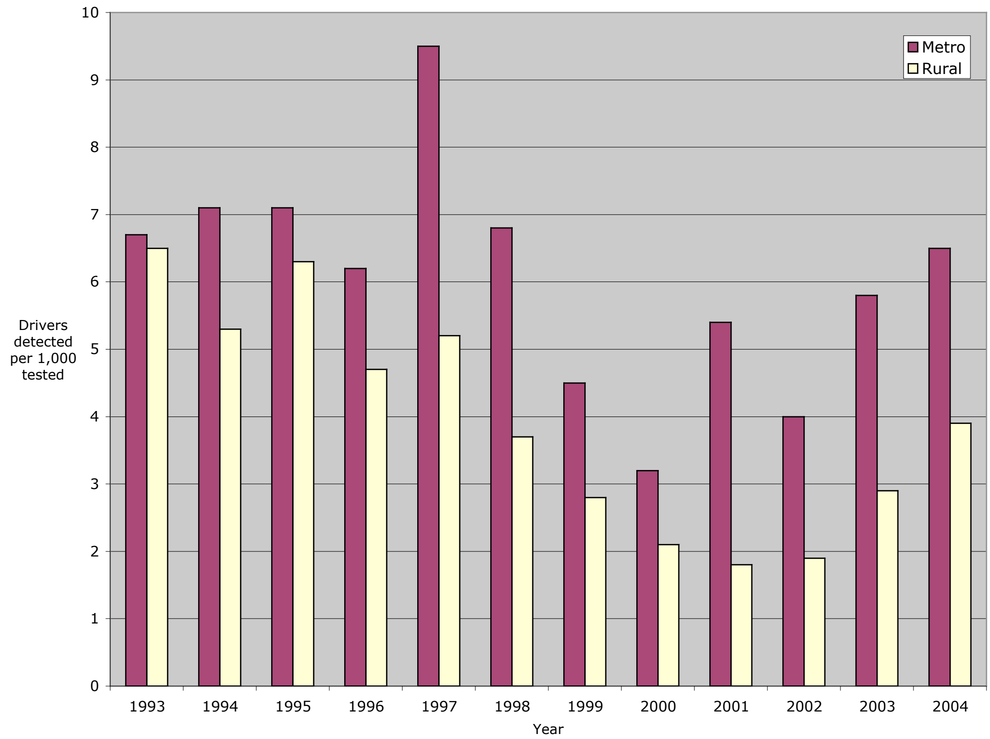

Figure 2.3
RBT detection rates per thousand tests, 1993-2004

The RBT detection rate in 2004 was higher than that in 2003 for both metropolitan and rural areas. The overall detection rate was the highest since 1998. One of the reasons for this increased detection rate in 2004 could have been the greater use of mobile RBT in 2004 (7.0% compared to 2.2% in 2003), which was expected to be a better means of detecting drink drivers, particularly those trying to avoid static RBT stations. The detection rates associated with static and mobile RBT in metropolitan and rural areas in 2003 and 2004 are shown in Table 2.13. Note, however, that the detection rates in Table 2.13 represent the percentage of drivers tested who were over the legal limit on the *screening* test, while the figures in Table 2.12 represent the percentages of drivers over the legal BAC limit on the *evidentiary* test. Evidentiary test numbers were not available for mobile and static RBT separately. Percentages of drivers detected over the limit on screening tests will exceed the number detected over the limit on later, evidentiary tests (i.e. the BAC of some drivers detected over the limit on a screening test will be lower, and could reduce to a legal level on a later evidentiary test). Table 2.13 clearly shows that mobile RBT detects a greater percentage of drink drivers than static RBT. It also shows a greater rate of detection with mobile RBT in 2003 than in 2004. This could be due to drivers in 2003 being less aware that mobile RBT was operational. Interestingly, static RBT detection rates were higher in 2004.

Table 2.13
RBT detection rates (screening test only), 2003 and 2004
(number of drivers detected with an illegal BAC per thousand tested)
for static and mobile RBT, by location

Year and location	Static	Mobile
2003		
Metro	5.2	51.7
Rural	1.8	34.5
Total	3.7	40.0
2004		
Metro	8.3	38.7
Rural	2.2	25.4
Total	5.7	29.0

TIME OF DAY

Table 2.14, showing RBT detection rates (evidentiary test results) by time of day, indicates that the highest detection rates in 2004, for both metropolitan and rural regions, were between 10pm and 6am. The general pattern of detection rates across both regions in 2004 was similar to that of 2003, except that, as reflected in the total detection rates shown in Figure 2.3, detection rates were higher in 2004.

Table 2.14
RBT detection rates by time of day, 2000-2004
(number of drivers detected with an Illegal BAC per thousand tested)

Year	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
2000									
Metro	18.77	13.35	19.76	1.58	3.11	0.26	0.28	0.75	2.05
Rural	6.37	13.41	2.71	0.69	0.87	0.48	0.55	0.36	1.05
Total	13.71	13.36	15.19	1.23	1.87	0.38	0.36	0.53	1.39
2001									
Metro	32.49	9.14	60.47	3.62	4.61	1.64	0.48	0.73	2.16
Rural	8.34	15.98	0.00	0.70	2.03	0.21	0.55	0.28	1.23
Total	21.65	9.56	45.24	2.11	3.11	0.45	0.51	0.45	1.50
2002									
Metro	22.41	15.05	16.75	1.82	3.62	0.73	0.27	0.46	2.41
Rural	7.48	17.03	0.43	0.57	1.23	0.73	0.18	0.46	1.06
Total	16.87	15.28	14.18	1.31	2.60	0.73	0.23	0.46	1.52
2003									
Metro	23.57	20.20	24.30	2.28	1.10	2.56	2.59	4.60	4.64
Rural	13.13	48.09	13.77	0.81	0.50	1.62	3.17	2.81	7.93
Total	20.46	24.39	22.37	1.56	0.71	1.94	2.84	3.95	5.51
2004									
Metro	37.72	28.97	36.67	2.95	0.85	4.06	2.41	3.52	4.87
Rural	21.19	71.65	16.72	0.71	0.89	1.65	2.89	3.88	10.85
Total	31.07	35.46	29.99	1.87	0.87	2.32	2.65	3.64	6.13

Detection rates by time of day for mobile and static RBT were calculated and are shown in Table 2.15. Again, note that these detection rates, unlike those in Table 2.14, are *not* for drivers detected with illegal BACs in evidentiary tests but are for drivers detected with illegal BACs in the initial screening test. Therefore, the figures in Table 2.15 will be higher than those in Table 2.14.

Table 2.15
RBT detection rates (screening test only) by time of day in 2004 (number of drivers detected with an Illegal BAC per thousand tested) by location and RBT method

Method	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
Static									
Metro	14.62	29.99	18.13	2.82	3.65	4.50	5.72	6.58	14.54
Rural	6.01	5.88	1.02	1.03	1.24	2.20	2.95	2.76	3.70
Total	11.88	27.82	12.52	1.98	2.35	2.85	4.40	5.39	12.76
Mobile									
Metro	91.10	127.4	74.87	15.23	16.85	18.40	41.55	32.93	43.65
Rural	49.50	75.69	103.1	6.14	12.39	16.97	21.62	19.73	36.71
Total	57.87	92.86	87.90	9.30	13.67	17.26	26.02	23.31	38.51
Total									
Metro	19.14	34.08	20.65	3.50	4.04	5.03	7.03	7.28	15.30
Rural	21.19	38.72	8.71	1.60	1.94	3.04	5.36	5.13	12.99
Total	19.96	34.78	16.65	2.61	2.89	3.59	6.19	6.55	14.82

Table 2.15 shows, as did Table 2.13, that mobile RBT detection rates were substantially higher than detection rates resulting from static RBT. In order to determine whether there were any combinations of location (metro or rural) and time of day in which mobile RBT was especially more likely than static RBT to detect drink drivers, the ratio, for each location and time of day combination, of mobile to static RBT detection rate was computed. The results are shown in Table 2.16, where it can be seen that, in terms of detection, mobile RBT has an advantage over static RBT that is consistent in strength over the course of the day. With regard to location, it provides a greater advantage for detecting drink drivers in rural areas.

Table 2.16
The ratio of mobile to static RBT detection rates in 2004, by location and time of day

Location	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
Metro	6.2	4.3	4.1	5.4	4.6	4.1	7.3	5.0	3.0
Rural	8.2	12.9	101.0	6.0	10.0	7.7	7.3	7.1	9.9
Total	4.9	3.4	7.0	4.7	5.8	6.1	5.9	4.3	3.0

DAY OF WEEK

Detection rates by day of week for static and mobile RBT, presented separately for metropolitan and rural testing, are provided in Table 2.17. Note, again, that detections here are for drivers testing positive on the screening test rather than on the evidentiary test. The detection rates on screening tests are higher than on the evidentiary tests. In general, detection rates were higher later in the week in both locations and for both types of testing.

Table 2.17
RBT detection rates (screening tests only) in 2004 (number of drivers detected per 1,000 tested) for static and mobile testing, by day of week and location

Testing	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Static							
Metro	4.2	5.2	7.5	8.6	8.8	9.4	10.0
Rural	0.9	1.9	1.8	2.5	2.3	2.8	2.3
Total	2.4	4.0	5.4	6.2	6.3	6.3	7.1
Mobile							
Metro	24.3	30.3	37.4	47.8	44.1	41.0	41.3
Rural	17.0	17.6	22.6	31.2	22.6	30.8	25.4
Total	19.4	22.3	28.4	35.9	27.6	33.2	29.5
Both							
Metro	5.2	6.0	8.6	9.5	9.8	10.9	11.0
Rural	2.2	3.4	3.6	4.9	4.8	7.2	5.5
Total	3.5	5.0	6.6	7.6	7.7	9.1	8.8

RBT DETECTION RATES BY MONTH

RBT detection rates by month were only available for 2004, and are shown in Table 2.18 for both metropolitan and rural areas. Note, again, that these detection rates refer to the results of screening tests, not evidentiary tests, and so present a higher detection rate than the overall rate presented in Table 2.12 and Figure 2.3. There are no clear patterns of results according to month of the year.

Table 2.18
RBT detection rates by month in 2004
(number of drivers detected with an Illegal BAC per thousand tested)
by location and method of testing

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	2.6	8.8	5.9	32.1	47.2	36.1
Feb	2.9	11.3	8.2	0.0	0.0	0.0
Mar	2.1	9.2	6.8	30.5	42.3	33.5
Apr	1.4	7.9	3.8	17.1	37.2	22.1
May	3.1	10.4	7.5	18.8	35.8	23.0
Jun	1.9	6.3	4.8	26.4	20.6	24.8
Jul	2.7	8.3	6.0	30.0	46.3	34.4
Aug	1.9	7.9	5.7	26.4	23.6	25.6
Sep	2.4	6.7	4.8	33.7	23.1	31.1
Oct	2.4	7.7	5.7	22.8	53.2	27.9
Nov	1.5	8.4	6.0	25.7	43.2	29.8
Dec	2.1	7.1	5.1	23.9	34.5	27.6
Total	2.2	8.2	5.7	25.4	38.7	29.0

RBT DETECTION RATES BY SEX

RBT detection rates by sex were not available for 2004. In general, the rate of drink driving detections per license driver for males is more than three times the rate for females (see Wundersitz, Baldock, Woolley & McLean, 2006).

RBT DETECTIONS BY BAC READING

The number of drink drivers detected by RBT in metropolitan and rural regions from 2000 to 2004 by BAC category is displayed in Table 2.19. Note that the Table includes all drivers detected on the screening test. A number of BAC readings were recorded in the range from zero to 0.049. These low readings may be attributed to drivers recording a higher BAC on the screening test and a lower evidentiary test reading after some time had elapsed. Additionally, some drivers have special licence conditions (i.e. truck, taxi, learner, provisional licence drivers) requiring a zero BAC. For these drivers, any positive BAC reading was regarded as illegal. In 2004, similar to previous years, drivers detected in rural regions were more likely to have a high BAC of 0.100 or above than those tested in the metropolitan area (49% vs. 32%). The data presented in Table 2.19 were not available separately for static and mobile RBT.

Table 2.19
Number of drivers detected by RBT by BAC category and region, 2000-2004

	RBT BAC readings (mg/L)								
Year	Zero	0.001-0.049	0.050-0.079	0.080-0.099	0.100-0.199	0.200-0.299	.300+	Refused	Total
2000									
Metro	0	46	422	217	345	16	1	0	1,047
Rural	0	26	155	83	167	17	0	0	448
2001									
Metro	2	83	596	328	522	29	0	0	1,560
Rural	2	34	139	85	166	16	0	0	442
2002									
Metro	8	115	624	306	472	16	4	8	1,553
Rural	7	50	176	112	187	17	1	6	555
2003									
Metro	11	182	817	339	521	34	0	28	1,932
Rural	8	57	218	154	296	33	3	24	793
2004									
Metro	13	216	946	550	786	40	1	30	2,582
Rural	15	91	294	210	542	58	1	27	1,238

Figure 2.4 shows that the proportion of all drivers in each BAC category remained reasonably consistent over the four year period. However, the mean BAC level recorded in 2004 (*M* = 0.111, *SD* = 0.053) was higher than the mean BAC in previous years (2003: *M* = 0.091, *SD* = 0.052, 2002: *M* = 0.091, *SD* = 0.045). Drivers refused to give a BAC sample in less than two percent of cases.

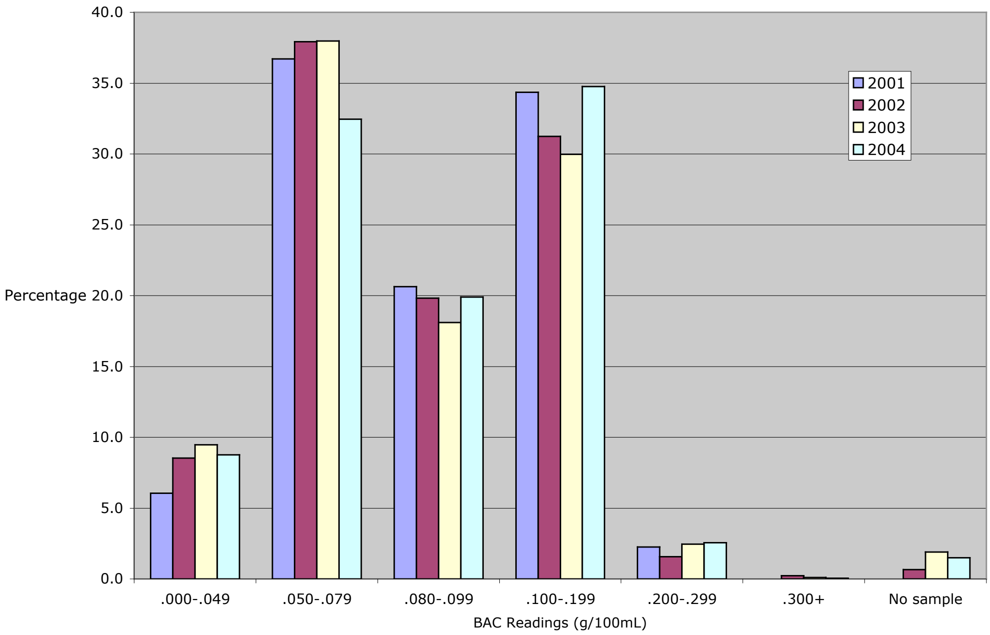

Figure 2.4
Percentage of drivers detected by RBT by BAC category, 2000-2004

2.2.4 Blood alcohol levels of seriously and fatally injured drivers/riders

The effectiveness of random breath testing can also be measured by the BAC levels of drivers and motorcycle riders involved in road crashes. If road users have been deterred from drink driving, then the percentage of seriously and fatally injured drivers with a zero BAC, or a BAC under .05 would be expected to increase and, conversely, the percentage of drivers/riders with higher BAC levels should decrease.

When calculating these percentages, only drivers/riders with a known BAC are considered. Limitations in the matching process for blood samples with the DTEI Traffic Accident Reporting System (TARS) database, and the infrequency with which police measurements are made and recorded for drivers who do not go to hospital, mean that not all driver/riders involved in a crash have a known BAC (Kloeden, McLean & Holubowycz, 1993).

Table 2.20 and Figure 2.5 show the BAC distributions of drivers/riders who were fatally injured in a road crash and for whom a BAC was recorded. The results for 2004 are indicative of a slightly higher level of alcohol involvement in fatal crashes than in 2003. The percentage of fatally injured drivers/riders with a BAC above 0.1 g/100ml was over 31 percent in 2004. This compares to 21 percent in 2003, and is the highest percentage for all years recorded in the Table except for 1993. However, it must be noted that the relatively small number of fatalities means that the results will fluctuate from year to year more than the results for serious injuries (see Table 2.21 and Figure 2.6 for the results for serious injuries).

Table 2.20
Percentage of drivers and motorcycle riders fatally injured in road crashes by known BAC category, 1993-2004

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
1993	45.63	0.97	0.97	0.00	28.16	23.30	0.97	53.40	103	91.96	112
1994	64.29	2.38	3.57	1.19	14.29	14.29	0.00	33.34	84	95.45	88
1995	69.57	2.17	2.17	1.09	10.87	13.04	1.09	28.26	92	95.83	96
1996	63.92	4.12	1.03	3.09	13.40	12.37	2.06	31.95	97	90.65	107
1997	61.84	6.58	0.00	0.00	18.42	11.84	1.32	31.58	76	95.00	80
1998	73.17	4.88	2.44	3.66	8.54	7.32	0.00	21.96	82	96.47	85
1999	67.95	5.13	2.56	1.28	12.82	10.26	0.00	26.92	78	88.64	88
2000	71.15	3.85	0.96	1.92	9.62	11.54	0.96	25.00	104	97.20	107
2001	66.27	3.61	1.20	2.41	13.25	12.05	1.20	30.11	83	94.32	88
2002	62.20	3.66	3.66	0.00	21.95	7.32	1.22	34.15	82	89.13	92
2003	70.37	3.70	3.70	1.23	14.81	4.94	1.23	25.91	81	91.01	89
2004	60.00	4.21	3.16	1.05	17.89	11.58	2.11	35.79	95	95.00	100

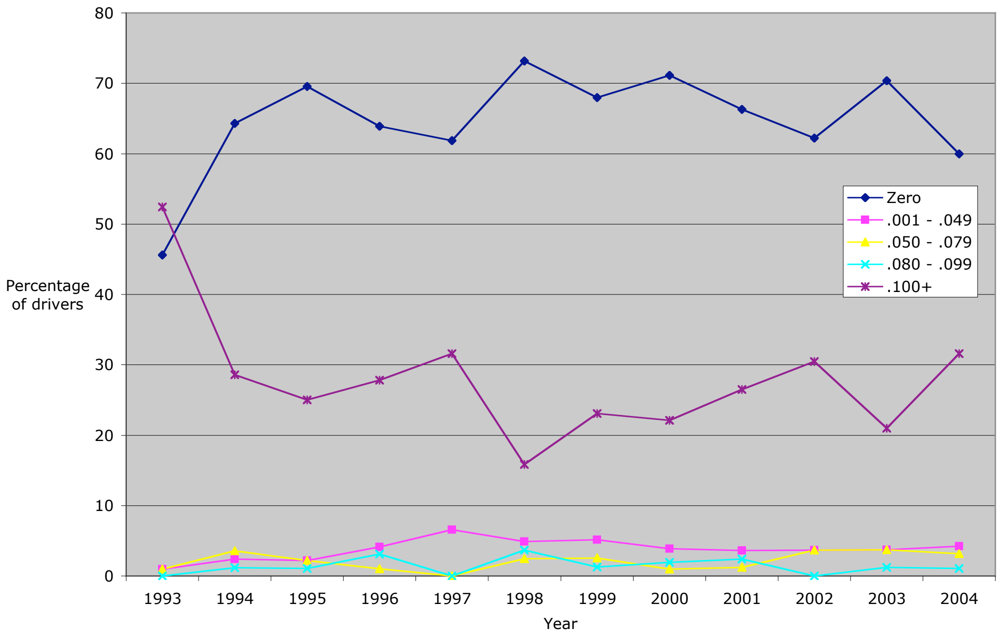

Figure 2.5
Percentage of drivers and motorcycle riders fatally injured by known BAC category, 1993-2004

The percentage of drivers/riders seriously injured by known BAC levels is shown in Table 2.21 and presented graphically in Figure 2.6. A seriously injured person is defined as ‘a person who sustains injuries and is admitted to hospital as a result of a road crash and who does not die as a result of those injuries within 30 days of the crash’ (Transport Information Management Section, Transport SA, 2001.) During 2004, approximately 20 percent of drivers/riders seriously injured in a crash had a BAC of .050 or greater, which was comparable with recent previous years. The percentage of drivers/riders with a BAC above 0.1 g/100ml in 2004 was 16.5, which was also comparable with previous years.

It is also worth noting that the percentage of seriously injured drivers with a BAC above 0.1 was considerably smaller than the percentage above this BAC level for fatally injured drivers only (31.6%, refer to Table 2.20). The percentage of known BAC levels in 2004 remained at a low level of two thirds of crash-involved drivers/riders.

Table 2.21
Percentage of drivers and motorcycle riders seriously injured in road crashes by known BAC category, 1993-2004

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
1993	70.67	4.63	2.92	2.23	13.21	6.00	0.34	24.70	583	70.92	822
1994	74.64	3.07	1.13	1.29	15.02	4.68	0.16	22.28	619	72.40	855
1995	73.20	3.45	2.19	2.04	13.79	5.02	0.31	23.35	638	79.65	801
1996	78.05	4.16	1.43	0.91	11.82	3.51	0.13	17.80	770	79.55	968
1997	80.20	2.15	1.32	0.99	10.07	4.95	0.33	17.66	606	70.79	856
1998	79.55	3.55	1.70	1.14	8.52	4.83	0.71	16.90	704	75.21	936
1999	77.74	2.51	2.51	1.08	12.21	3.59	0.36	19.75	557	63.73	874
2000	81.22	2.96	1.91	0.35	10.61	2.96	0.00	15.83	575	64.03	898
2001	73.94	3.91	2.44	2.12	12.05	5.21	0.33	22.15	614	63.43	968
2002	78.02	2.18	2.52	1.68	12.08	3.36	0.17	19.81	596	65.64	908
2003	77.44	2.74	1.71	1.37	12.65	4.10	0.00	19.83	585	63.24	925
2004	77.38	3.04	2.28	0.76	13.12	3.42	0.00	19.58	526	62.22	845

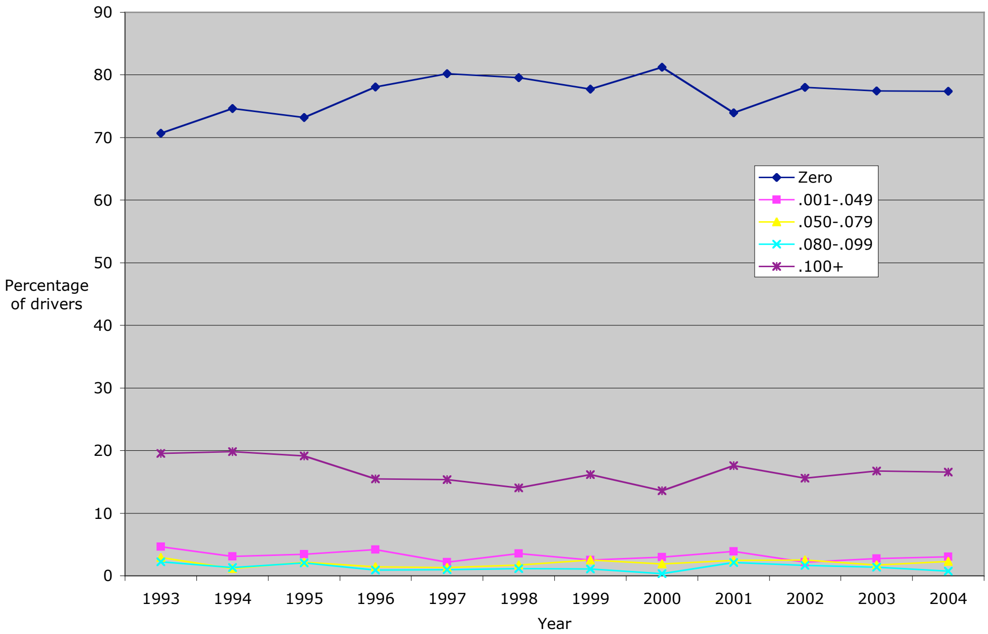

Figure 2.6
Percentage of drivers and motorcycle riders seriously injured by known BAC category, 1993-2004

2.2.5 Roadside drink driving surveys

Both roadside breath alcohol surveys and random breath testing operations provide a useful measure of the distribution of driver's BAC levels. However, roadside surveys are not accompanied by enforcement. No roadside drink driving surveys have been undertaken in South Australia since 1997 (see Kloeden & McLean, 1997).

2.3 Anti-drink driving publicity

During 2004, publicity campaigns have continued to target drink driving and support random breath testing operations. These campaigns were intended to highlight the potential consequences of drink driving and the risk of being detected by police. The primary audiences for the campaigns were drivers aged 18 to 29 but it was also expected that all drivers and riders of all forms of motorised vehicle would be receptive to the messages featured in the advertising.

In 2004, a publicity campaign previously used in May 2003 was aired again in the Adelaide metropolitan area and South Australian rural regions. The television commercial was titled "The Moment of Decision" and was aired during April (to coincide with Easter), and also in September. This advertisement served to highlight the decision to drive after drinking and the consequences of this decision.

Another anti-drink drive campaign used in 2004 was produced in December 2003 following the announcement of new drink drive initiatives introduced in the first phase of the State Government's road safety reform package. The 'Drink Drive Initiatives' campaign was designed to inform the community about changes to drink driving laws and penalties, communicate the benefits of the new initiatives, and highlight the risk of detection. The campaign used two complimentary television advertisements: "Booze Bus" (deterrence) and "Fill It Up" (consequences). The "Booze Bus" television commercial was used to inform the community that every police vehicle is now equipped with random breath testing technology and reinforce the risk of detection. '"Fill It Up" focused on the new penalty of automatic loss of licence for drivers convicted of a second or subsequent drink driving offence where detected with a blood alcohol level between 0.05 and 0.079. The potential consequence of serious injury was also emphasized. The campaign was supplemented by an integrated billboard advertisement, aimed to deter drink drivers, and radio commercials that dealt with the consequences of drink driving. The same campaign was adopted in the Adelaide metropolitan area and rural regions. It first ran between December 15, 2003 and January 4, 2004 and ran again in March, April, May, June, September and December of 2004.

Estimated media and planning (excluding production) costs for anti-drink driving advertising for the calendar year 2004 totalled $653,371. The breakdown of these costs is provided in Table 2.22.

Table 2.22
Media expenditure on anti-drink-driving advertising in 2004

Media	Costs ($)
Television metropolitan	323,225
Television regional	62,636
Radio metropolitan	108,124
Radio regional	52,765
Outdoor	104,095
Press	2,526
Total	653,371

An additional $122,000 was spent on the production of the 'Booze Bus' and 'Fill It Up' television advertisements. In total, $775,371 was invested in anti-drink driving publicity in 2004, a 14 percent decrease since the last reported campaign costs in 2003 (Wundersitz, Baldock, Woolley & McLean, 2006).

3 Speeding

This Section explores performance indicators for speed enforcement. Current speed enforcement methods of operations will be discussed, followed by an examination of the number of drivers being detected for speed offences. Finally, the two primary outcome measures for speed enforcement are investigated: changes in speed-related crashes and covertly measured on-road vehicle speed distributions.

3.1 Speed enforcement practices and levels of operation

Effective speed enforcement is required to create high levels of both specific deterrence, through high levels of apprehension and punishment, and general deterrence, through the belief in the high likelihood of encountering speed limit enforcement. Current theories of speed management in Australia contend that balanced methods of covert and overt, and static and mobile, enforcement are required to deter motorists, both specifically and generally (McInerney, Cairney, Toomath, Evans & Swadling, 2001; Wundersitz, Kloeden, McColl, Baldock & McLean, 2001, Zaal, 1994). Speed enforcement must also be prolonged and intensive to obtain maximum effect. Furthermore, speed enforcement needs to be supported by regular anti-speeding publicity (Elliot, 1993).

Speed cameras (including dual purpose red light cameras) and non-camera operations (laser devices, hand held radars and mobile radars in Police vehicles) are the two broad types of speed enforcement currently employed in South Australia. The Traffic Research and Intelligence Section of the SA Police has provided the following information about speed enforcement operations.

SPEED CAMERA OPERATIONS

Speed cameras were introduced into South Australia in June 1990. The Police Security Services Branch, a semi-independent body, currently operates the speed cameras. There are 37 staff and 17 speed cameras available for use. The speed cameras operate from unmarked vehicles to give some degree of anonymity to the operations but signs may be placed after the location to advise that a camera has been passed in an effort to enhance general deterrence effects.

It has been argued (e.g. Rothengatter, 1990) that automatic speed detection devices, such as speed cameras, provide no immediate punishment (the fine arrives in the mail), which reduces the potential deterrent effect of the enforcement. Homel (1988), however, argues that the most important aspect of punishment as a deterrent, is not *immediacy* of punishment, but *certainty* of punishment. Automatic devices that do not cease operating while a 'ticket' is being written better achieve this certainty of punishment.

A list of camera locations for each day is produced by a computer program, based on road crash statistics weighted for the involvement of speed in the crashes. The program can be adjusted to schedule locations that are the subject of complaints regarding speeding and locations that exhibit very high speeds or are known areas of speeding. The locations of some speed cameras (though not precise times of operations) are also provided in advance to a media outlet for publication/broadcasting in return for road safety publicity and support. Some major speed detection operations are also advertised in advance in order to raise the profile of speed enforcement practices.

Red light cameras also have the ability to record vehicle speeds in addition to recording the running of red lights at intersections. In dual purpose mode, red light cameras recorded speeding offences from 15 December, 2003. In 2004, there were 31 sites at which red light cameras could operate. Thirteen cameras were available for use at these sites.

NON-CAMERA OPERATIONS

During non-camera operations, the speeds of vehicles are measured and offending drivers are pulled over to the side of the road to be charged. Hand held radars are generally used more frequently on open roads and not in the metropolitan area. The numbers of non-camera speed detection devices used in the metropolitan and rural areas during 2004 are presented in Table 3.1. Currently, laser gun devices are the most common forms of non-camera speed detection in South Australia.

Table 3.1
Non-camera detection devices used in South Australia, 2004

Non-camera detection devices	Metro	Rural	Total
Lasers	85	73	158
Mobile Radars	45	46	91
Handheld Radars	9	25	34

The coordination of police operated speed detection is handled by Police Local Service Areas (LSAs). Each LSA Commander is given a target number of hours of speed detection to be performed with an expectation that, over a year, there will be, on average, a minimum of one hour of activity per laser per day. Police using non-camera devices for speed detection have discretionary power when determining speed limit tolerance levels.

The locations and times of non-camera speed detection activity are determined using the local knowledge of patrol officers supported by statistical information supplied by intelligence officers. These intelligence officers have access to information on road crashes and the amount of speed detection activity in an area as well as complaints about speeding motorists. A team of motorcycle officers involved in specialist task-force-style operations also spends a significant amount of time on speed detection activity.

3.1.1 Number of hours of speed detection

The total number of hours spent on speed detection in South Australia for both metropolitan and rural areas, using any means, from 2000 to 2004, is depicted in Figure 3.1. The location of the speed detection device determines whether speed detection hours are recorded as metropolitan or rural. The number of speed detection hours in South Australia in 2004 was very similar to the number of hours in 2003 for both metropolitan and rural areas. The total number of hours spent on speed detection in these past two years was marginally less than that of previous years, with the 2004 total being 8.6 percent lower than the peak year of 2002. Note that hours of operation of dual purpose red light cameras were unavailable and so are not included here.

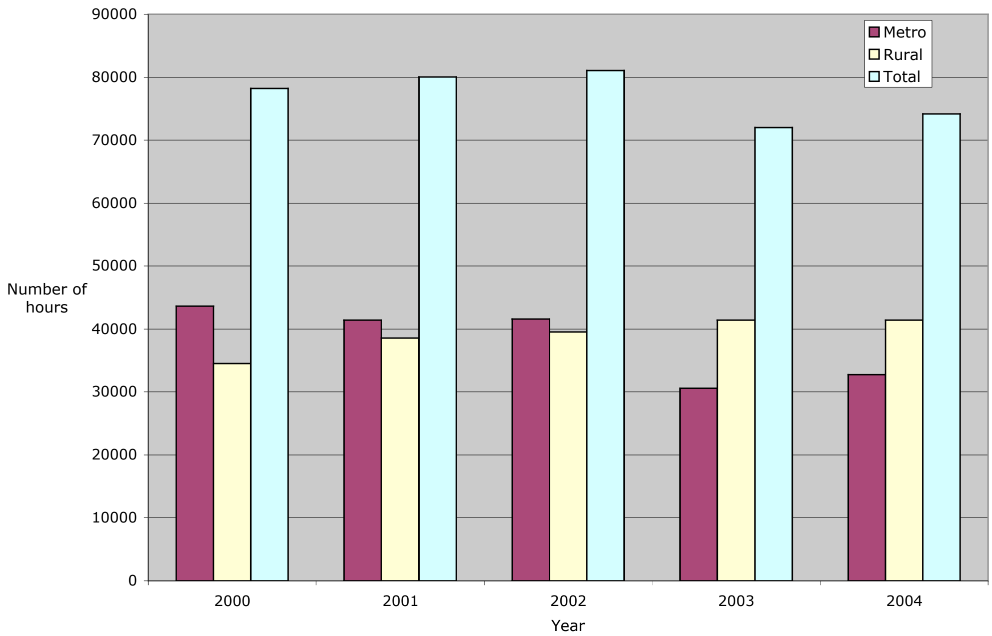

Figure 3.1
Number of speed detection hours in South Australia, 2000-2004

Table 3.2 summarises the hours spent on speed detection by speed cameras only (with the exclusion of dual purpose red light cameras), from 2000 to 2004 for metropolitan and rural areas. Speed cameras were used predominantly in the metropolitan areas. The number of hours utilised for speed camera operation decreased by almost 39 per cent from 2000 to 2003, with the greatest decrease occurring in 2003, but rose by 12 percent in 2004.

Table 3.2
Number of hours for speed detections by speed cameras in South Australia, 2000-2004

Year	Camera			% difference from previous year
	Metro	Rural	Total	
2000	31,928	4,017	35,945	
2001	30,456	4,959	35,415	-1.0
2002	28,972	4,646	33,628	-5.1
2003	18,444	3,551	21,995	-34.6
2004	20,455	4,145	24,600	11.8

In contrast to speed cameras, non-camera devices were used more widely in rural areas (see Table 3.3). Non-camera devices include laser guns, mobile radar and handheld radar. The total number of non-camera hours has increased by approximately five to six percent each year from 2000 to 2003 and remained steady in 2004.

Table 3.3
Number of hours for speed detections by non-camera devices in South Australia, 2000-2004

Year	Non-Camera			% difference from previous year
	Metro	Rural	Total	
2000	11,726	30,528	42,254	
2001	10,968	33,632	44,600	5.6
2002	12,602	34,861	47,463	6.4
2003	12,148	37,847	49,995	5.3
2004	12,271	37,267	49,539	-0.9

DAY OF WEEK

The number of hours spent on speed detection from 2000 to 2004 by day of week, in terms of the percentage of all tests performed in a year, is presented in Table 3.4 for speed cameras and in Table 3.5 for non-speed camera devices. For both methods of speed detection, the number of hours was spent evenly throughout the week and has varied little each year.

Table 3.4
Number of speed detection hours for speed cameras by day of week, 2000-2004
(expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	13.2	14.6	15.0	14.5	14.2	14.8	13.7
2001	13.5	14.2	15.1	14.3	14.6	15.0	13.4
2002	13.7	14.5	15.2	14.5	14.0	14.5	13.6
2003	14.0	13.8	15.2	15.1	14.0	14.5	13.5
2004	13.0	14.9	15.5	15.2	14.5	14.1	12.8

Table 3.5
Number of speed detection hours for non-camera devices by day of week, 2000-2004
(expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	14.2	13.8	12.6	14.3	16.9	15.0	13.4
2001	14.2	13.2	12.6	14.0	16.7	15.3	14.0
2002	13.7	13.1	13.5	14.5	16.4	15.7	13.1
2003	13.2	12.4	12.8	14.9	17.3	16.1	13.3
2004	14.4	12.7	13.0	14.2	15.9	15.6	14.2

TIME OF DAY

Figure 3.2 depicts the speed detection hours (expressed as a percentage of the total hours each year) for all speed detection devices by the time of day, from 2000 to 2004. There was little variation in the distribution of speed detection hours by time of day each year. The majority of speed detection was conducted from 6am to 8pm. Compared to other times of the day, there was a noticeable dip in the distribution of detection hours around lunchtime (12 - 2pm).

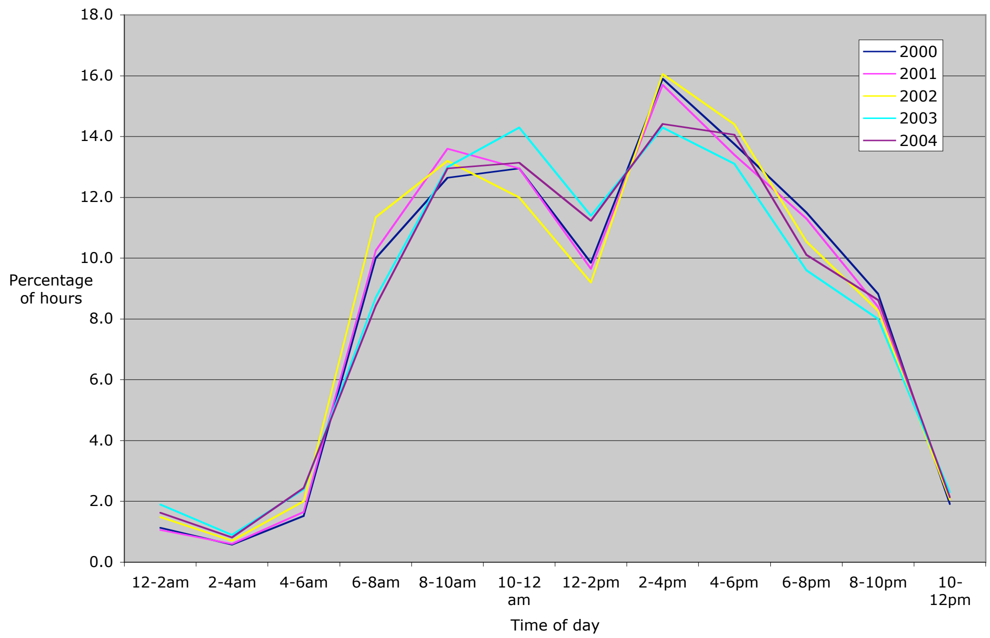

Figure 3.2
Hours spent on speed detection in South Australia by time of day, 2000-2004

The distribution of hours spent on speed detection by time of day is presented separately for speed cameras (Table 3.6) and for non-camera devices (Table 3.7). The distribution of speed camera hours by time of day in 2004 was similar to that of previous years. Speed cameras were operated least frequently between midnight and 6am. Less than one percent of speed camera detection hours were spent in these hours, with no cameras operating between midnight and 4am.

Table 3.6
Number of speed detection hours for speed cameras by time of day, 2000-2004
(expressed as a percentage of total hours each year)

Year	Midnight-6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4 -6 PM	6 -8 PM	8 PM - Midnight
2000	0.8	13.4	14.0	12.9	7.5	18.9	13.8	12.6	6.1
2001	0.1	16.1	14.2	12.7	5.7	18.6	13.1	13.1	6.4
2002	0.1	18.0	14.1	11.7	5.4	18.8	14.4	11.4	6.2
2003	0.2	18.5	13.3	12.5	5.0	18.3	14.8	11.3	6.0
2004	0.2	16.4	13.2	12.8	5.3	18.4	15.1	11.8	6.7

Non-camera devices were operated predominantly from 8am to 6pm. In 2003, a small increase in non-camera speed detection hours from 10am to 2pm was offset by a decrease from 8pm to midnight. This change was reversed in 2004, so that the pattern of non-camera speed detection hours again closely resembled the hours in the years 2000 to 2002. Compared to camera operations, non-camera devices were more frequently operated in the early hours of the morning (12-6am) but used less frequently between 6 and 8am. The dip in the percentage of hours spent on speed detection between 12 and 2pm, noted in Figure 3.2, was evident only for speed camera detection.

Table 3.7
Number of speed detection hours for non-camera devices by time of day, 2000-2004
(expressed as a percentage of total hours each year)

Year	Midnight -6 AM	6 -8 AM	8 -10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4-6 PM	6-8 PM	8 PM-Midnight
2000	5.3	6.6	11.3	13.0	12.2	12.9	13.7	10.4	14.7
2001	6.0	4.4	13.0	13.2	13.6	12.8	13.7	9.5	13.7
2002	7.2	4.7	12.3	12.3	13.0	13.3	14.4	9.7	13.2
2003	7.4	4.4	12.9	15.1	14.2	12.5	12.3	8.8	8.9
2004	7.2	4.5	12.8	13.3	14.2	12.5	13.5	9.3	12.7

3.2 Level of speeding

3.2.1 Number of speed detections

The number of licensed drivers and number of speed detections, by speed cameras and non-cameras, in South Australia for the years 2000 to 2004 can be seen in Table 3.8. The total number of detections in 2004 was greater than the level in 2003 (up by 29%) but still less than the total in the years 2000 to 2002. The number of speed camera detections has nearly halved since 2001. In contrast, the number of non-camera detections in 2004 was 18 percent greater than the number in 2000. Dual purpose red light cameras operated for the first time in 2004 and detected over 50,000 speeding drivers, more than non-camera devices.

As noted in Section 3.1, the number of hours of operation of non-camera devices was greater than the number of hours of operation of conventional speed cameras but the number of drivers detected by non-camera devices was less than half the number detected by speed cameras. The greater number of detections occurring with speed cameras is most likely attributable to the greater efficiency of cameras. Speed cameras check the speeds of all vehicles, not just those that the police officer chooses to check with non-camera devices. It must also be noted that non-camera devices are used more in rural areas, which are characterised by lower levels of traffic density.

Inspection of the number of speed detections divided by the number of licensed drivers in South Australia indicates that approximately 20 percent of licensed drivers were detected for a speeding offence in 2004. The percentage of licensed drivers detected has decreased from the years 2000 and 2001 when approximately 25 per cent of licensed drivers were detected.

Table 3.8
Number and percentage of licensed drivers detected speeding in South Australia, 2000-2004

Year	Number of speed camera detections	Number of red light speed camera detections	Number of non-camera detections	Total number of detections	Number of licensed drivers*	% of licensed drivers detected
2000	219,202		40,520	259,722	1,028,083	25.3
2001	226,879		41,105	267,984	1,045,077	25.6
2002	184,765		45,702	230,467	1,046,878	22.0
2003	118,280		50,039	168,319	1,052,030	16.0
2004	118,114	51,127	47,926	217,167	1,072,374	20.3

Source: Driver's Database, Registration and Licensing Section, Transport SA
* Number of licence holders at June 30.

3.2.2 Speeding detection rates

Speeding detection rates provide an indication of the current levels of compliance with speed limits. A lower detection rate may indicate the greater deterrent effectiveness of speed detection methods. However, detection rates may also be affected by speed enforcement operational practices and factors such as locations, volumes of traffic and type of speed detection, as well as exceptional factors such as changes in speed limits.

In this Section, speeding detection rates are defined as the number of drivers detected for speeding per hour of enforcement. Speeding detection rates for camera and non-camera devices are summarised in Table 3.9 for metropolitan and rural areas, for the years 2000 to 2004. The detection rates for dual purpose red light/speed cameras could not be calculated because data for the hours of operation of the cameras were unavailable. If the speeding detection rate is interpreted as the level of speeding behaviour, the results suggest that speeding has decreased since the year 2000 by over 30 percent, to an average level of 2.2 detections per hour in 2004.

However, a decrease in the detection rate (of 21%) since 2000 has only been observed in the camera detection data, while non-camera detections have remained stable in number over this period. It is possible, therefore, that drivers are getting better at avoiding detection by speed cameras, or that speeding is decreasing in the metropolitan area where cameras are the main method of enforcement but not in rural areas where non-camera devices are used more commonly.

It is also likely that the overall reduction in the speeding detection rate would be partly due to increases in the proportion of speed enforcement that is conducted using non-camera devices (see Tables 3.2 and 3.3). As these devices have lower detection rates than speed cameras (4.80 drivers per hour in 2004 compared with 0.97 for non-camera devices), this greater use of non-camera devices would have lowered the overall detection rate (the final column in Table 3.9). As noted previously, the main reason for this greater detection rate of speed cameras is most likely to be their greater efficiency. Speed cameras continuously check speeds of all vehicles and deliver automated punishment via the mail. In comparison, non-camera devices are not capable of checking the speeds of all passing vehicles and it takes time (at least 5 minutes) for police officers to pull over and charge speeding offenders when operating these devices.

The difference in detection rates between cameras and non-camera devices may also be partly attributable to the greater number of speed cameras in the metropolitan area where traffic volumes are much greater. This, in turn, means that the overall lower detection rate since 2000 may be the product of a decreasing proportion of speed enforcement being conducted in the metropolitan area.

The metropolitan areas reported higher detection rates than rural regions for both methods of detection. The greater volumes of traffic in metropolitan areas are probably responsible for the higher detection rate than a greater prevalence of speeding. Detection rates based on traffic volumes are examined in a later Section.

Table 3.9
Speeding detection rates, 2000-2004 (number of drivers detected speeding per hour)

Year	Camera			Non-Camera			Overall
	Metro	Rural	Total	Metro	Rural	Total	Total
2000	6.26	4.79	6.10	1.68	0.68	0.96	3.32
2001	6.67	4.79	6.41	1.67	0.68	0.92	3.35
2002	5.71	4.15	5.49	1.73	0.69	0.96	2.84
2003	5.69	3.77	5.38	1.95	0.70	1.00	2.34
2004	5.08	3.41	4.80	1.87	0.67	0.97	2.24

DAY OF WEEK

The following Tables examining detection rates per hour have been separated by detection method due to the differences in detection rates noted above. Table 3.10 indicates that speed camera detection rates were highest on weekends in 2004, consistent with previous years. Rates per day were lower in 2004 compared to 2003, reflecting the overall drop noted in Table 3.9.

Table 3.10
Speeding detection rates per hour for speed cameras by day of week, 2000-2004

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	5.66	5.25	6.03	5.42	6.02	7.01	7.32
2001	5.52	5.56	6.05	6.49	6.41	7.45	7.45
2002	6.04	4.73	4.99	4.82	5.19	6.65	6.14
2003	4.88	4.76	4.86	5.04	5.44	6.05	6.71
2004	4.31	4.84	4.22	4.36	4.90	5.69	5.38

Table 3.11 shows the detection rates for non-camera devices by day of the week from 2000 to 2004. As in most previous years, 2004 detection rates were consistent across the days of the week, with a small increase on Sunday.

Table 3.11
Speeding detection rates per hour for non-camera devices by day of week, 2000-2004

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	0.97	0.92	0.93	0.91	0.90	0.97	1.15
2001	0.90	0.87	0.86	0.92	0.94	0.92	1.04
2002	0.95	0.95	0.97	0.94	0.93	0.99	1.03
2003	1.00	1.12	1.18	0.88	0.92	0.93	1.06
2004	0.94	0.92	0.97	0.96	0.94	0.99	1.04

Table 3.12 shows the total detections for dual purpose red light/speed cameras by day of week in 2004 (detections per hour could not be calculated). Motorists were more likely to be detected speeding by red light cameras on the weekend than during weekdays. These data are difficult to interpret, however, without data for hours of operation.

Table 3.12
Speeding detections for red light/speed cameras by day of week in2004

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2004	6,650	6,061	6,380	6,359	7,312	9,335	9,030

TIME OF DAY

The speeding detection rates for speed cameras by the time of day from 2000 to 2004 are shown in Table 3.13. In 2004, speed detection rates for cameras were similar across the day, except for slightly lower rates in the evening between 6pm and midnight. The rate between midnight and 6am in 2004 was higher than in the previous two years.

Table 3.13
Speeding detection rates per hour for speed cameras by time of day, 2000-2004

Year	Midnight-6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4-6 PM	6-8 PM	8 PM-Midnight
2000	4.61	7.21	6.25	5.64	6.08	6.90	5.82	5.17	4.56
2001	3.67	7.16	7.42	7.27	6.61	7.76	6.04	3.41	3.34
2002	1.66	5.14	6.26	5.61	5.99	5.91	6.16	3.70	4.74
2003	1.16	5.40	5.70	6.14	5.49	6.56	5.15	3.70	3.16
2004	4.87	4.90	4.55	5.09	4.86	6.15	4.98	3.47	2.73

Speeding detection rates for non-camera devices by time of day for the years 2000 to 2004 are presented in Table 3.14. In 2004, as in previous years, detection rates with non-camera devices were generally lower from midnight to 6am but this may be due to lower traffic volumes rather than lower rates of speeding.

Table 3.14
Speeding detection rates per hour for non-camera devices by time of day, 2000-2004

Year	Midnight-6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4-6 PM	6-8 PM	8 PM-Midnight
2000	0.88	0.97	0.95	0.94	1.05	0.91	0.94	0.99	0.96
2001	0.55	1.08	0.95	0.94	0.91	0.79	1.08	1.04	0.88
2002	0.69	1.01	1.01	1.00	1.00	0.83	1.05	1.05	0.96
2003	0.71	1.17	1.13	0.94	0.91	1.06	1.14	1.00	0.97
2004	0.62	1.09	1.06	0.97	0.93	0.85	1.18	1.01	0.93

The number of speeding detections for red light cameras by time of day in 2004 are shown in Table 3.15. It can be seen that there were more detections between 6am and 6pm (mostly daylight) than between 6pm and 6am (mostly night-time). These data are difficult to interpret, however, without data for hours of operation.

Table 3.15
Speeding detections for red light/speed cameras by time of day in 2004

Year	Midnight-6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4-6 PM	6-8 PM	8 PM-Midnight
2004	8,713	4,948	4,612	4,810	5,298	4,714	4,843	5,288	7,901

DETECTION RATES BY SEX

Accurate sex and age data are not available for speed camera offences because the infringement notice is sent to the vehicle owner who may not have been the driver at the time of the offence. Table 3.16 shows the detection rates for males and females from 2000 to 2004 for non-camera devices. The ratio of male to female speeding detection rates in 2004 remained at a similar level to previous years, with males 2.6 times more likely to be detected than females. Clearly, speeding continues to be a greater problem among male drivers.

Table 3.16
Number and sex of licence holders, detected speeding by non-camera devices, 2000-2004

Year	Male			Female			Ratio of male to female detection rate
	Licence holders	Detected	Detection rate (per hundred licensed)	Licence holders	Detected	Detection rate (per hundred licensed)	
2000	542,811	39,783	7.33	480,120	13,123	2.73	2.68
2001	553,141	36,977	6.68	486,509	11,867	2.44	2.74
2002	552,451	41,118	7.44	488,723	14,000	2.86	2.60
2003	553,702	52,305	9.45	492,448	17,962	3.65	2.59
2004	563,389	44,498	7.90	502,828	15,084	3.00	2.63

NB: Refer to Table 3.8 for the overall rate per licensed driver of speeding detections.

3.2.3 Speed camera detection rates per 1,000 vehicles passing

Variations in speed detection rates per hour may be attributed to changes in traffic volume. Traffic volume is an important consideration, particularly when comparing the detection rates of high volume metropolitan streets with low volume rural roads. Speed cameras record the actual number of vehicles passing each camera detection point. In this Section, speed detection rates are calculated based on the number of speeding vehicles per 1,000 vehicles recorded passing the detection point, in order to determine whether the higher detection rates in metropolitan areas may be attributed to greater traffic volumes. Equivalent data were not available for either non-speed camera devices or for dual purpose red light/speed cameras.

Table 3.17 shows the speeding detection rates per 1,000 vehicles passing the speed camera for the years 2000 to 2004. It can be seen that detection rates per vehicle passing are higher in rural regions than in the metropolitan area, suggesting a greater prevalence of speeding in rural areas. This could be due to a number of factors, including the lower traffic volumes in rural areas allowing for a greater opportunity for drivers to freely choose their own travelling speed. However, in contrast to the metropolitan region, the detection rate per vehicles passing has decreased by approximately 20 percent in rural areas since 2000-01. These contrasting results could reflect the effects of increasing enforcement in rural regions relative to the metropolitan region.

Table 3.17
Number of vehicles passing speed cameras and speeding detection rates (per 1,000 vehicles passing), 2000-2004

Year	Metro		Rural		Total detection rate
	No. of vehicles	Detection rate	No. of vehicles	Detection rate	
2000	18,167,492	11.01	847,851	22.68	11.53
2001	17,048,361	11.91	1,017,770	23.35	12.56
2002	15,262,875	10.84	975,159	19.78	11.38
2003	9,354,235	11.21	751,501	17.80	11.70
2004	10,009,446	10.40	789,065	17.92	10.94

Tables 3.18 and 3.19 show speeding detection rates per 1,000 vehicles passing by day of week and time of day for speed cameras in the years 2001 to 2004. It can be seen that higher speeding detection rates were recorded on weekends and during daytime hours in 2004, generally consistent with previous years.

Table 3.18

Speeding detection rates for speed cameras (per 1,000 vehicles passing) by day of week, 2001-2004

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2001*	11.39	11.11	11.52	12.85	12.37	14.14	14.80
2002*	12.69	9.95	10.24	9.84	10.33	13.85	13.11
2003	11.18	9.88	10.43	10.21	11.68	14.10	15.20
2004	9.80	10.65	9.54	10.09	10.76	13.34	12.86

*Data unavailable but rates calculated using data for other variables

Table 3.19

Speeding detection rates for speed cameras (per 1,000 vehicles passing) by time of day, 2001-2004

Year	Midnight-6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4-6 PM	6-8 PM	8 PM-Midnight
2001*	9.25	14.21	14.26	11.75	13.59	13.16	11.70	9.50	8.88
2002*	15.80	11.13	13.29	9.93	11.79	10.18	12.10	10.85	11.56
2003	5.71	11.49	13.30	11.25	12.69	11.49	11.46	11.21	11.43
2004	7.47	11.75	11.46	10.11	10.04	11.66	11.00	10.14	8.87

*Data unavailable but rates calculated using data for other variables

Figure 3.3 shows speed detection rates per 1,000 vehicles passing by month of the year for the years 2003 and 2004. There is no consistent pattern across the two years, with 2004 being characterised by higher detection rates in autumn and lower ones in spring, while 2003 featured low rates in autumn and high rates in spring.

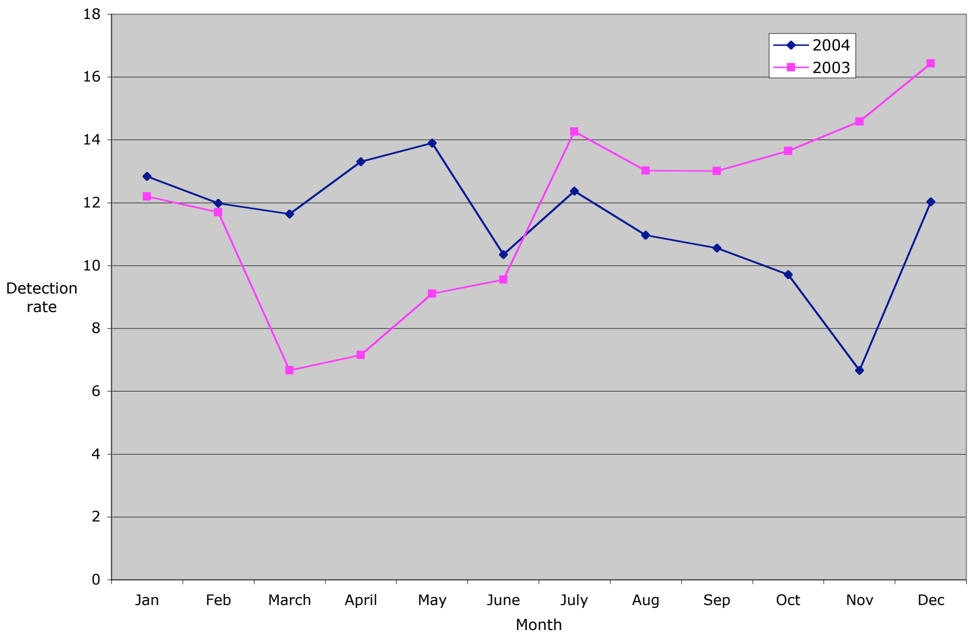

Figure 3.3

Speed camera detection rate (per 1,000 vehicles passing) in South Australia by month, 2003 and 2004

3.2.4 'Excessive speed' as the apparent error in serious and fatal crashes

The effectiveness of speed enforcement may be estimated by the involvement of 'excessive speed' in crashes. In the TARS database, one driver in each crash is assigned a single 'apparent error' indicating what the police reported as the primary error made by the driver. Only one driver in a multiple vehicle crash is assigned an apparent error. One of these possible apparent errors is 'excessive speed'. Obviously, drivers will not readily admit to police that they were travelling at an excessive speed at the time of the crash. This means that crash-involved vehicles will only get classified with an apparent error of 'excessive speed' when there are reliable witnesses to excessive speed or when excessive speed is clearly indicated by tyre marks or vehicle damage. Therefore, the apparent error of 'excessive speed' is an underestimate of speeding and probably represents only cases of very high speeding rather than speeding in general. Fatal crashes involving more than one vehicle are usually investigated by police to a greater extent but illegal speed is unlikely to be listed as the sole apparent error unless it is clearly excessive and considered to be more important than other factors.

Table 3.20 shows that there appears to have been relatively few speed-related fatal road crashes in 2004, although the small numbers of fatal crashes makes it difficult to draw conclusions. In any case, these are certainly under estimates of the percentage of speed related crashes for the reasons given above. Table 3.21 indicates that from 2000 to 2004, 'excessive speed' was listed as the major driver error in approximately three to four percent of serious injury crashes (defined as a person who sustains injuries and is admitted to hospital as a result of a road crash and who does not die as a result of those injuries within 30 days of the crash).

Table 3.20
'Excessive speed' as the apparent error in fatal crashes, 2000-2004

Year	'Excessive Speed'		Other apparent errors	Total crashes
	(N)	(%)		
2000	15	9.93	136	151
2001	21	15.44	115	136
2002	15	10.87	123	138
2003	17	12.59	118	135
2004	9	7.03	119	128

Table 3.21
'Excessive speed' as the apparent error in serious casualty crashes, 2000-2004

Year	'Excessive speed'		Other apparent errors	Total crashes
	(N)	(%)		
2000	37	3.01	1192	1229
2001	34	2.73	1213	1247
2002	48	4.00	1151	1199
2003	37	3.17	1149	1167
2004	39	3.65	1030	1069

Serious casualty crashes and fatal crashes are combined in Table 3.22 to show the distribution of crashes in which the apparent error was listed as 'excessive speed' in metropolitan and rural regions. The percentages of 'excessive speed' crashes in both metropolitan and rural areas in 2004 were consistent with those of previous years.

Table 3.22
'Excessive speed' as the apparent error in serious and fatal crashes by location of crash, 2000-2004

Year	Metro 'Excessive Speed'		Total metro crashes	Rural 'Excessive Speed'		Total rural crashes
	(N)	(%)	(N)	(N)	(%)	(N)
2000	30	4.03	744	22	3.46	636
2001	32	4.48	715	23	3.44	668
2002	31	4.62	671	32	4.80	666
2003	32	5.03	636	22	3.40	647
2004	29	4.54	639	19	3.41	558

Table 3.23 shows that the majority of serious and fatal crashes with an apparent error of 'excessive speed' involved male drivers. In 2004, males were twenty times more likely than females to be the at-fault driver in a speed-related serious or fatal crash.

Table 3.23
'Excessive speed' as the apparent error in serious and fatal crashes by sex of driver, 2000-2004

Year	Male		Female		Total 'excessive speed' crashes
	(N)	(%)	(N)	(%)	
2000[a]	44	88.00	6	12.00	52
2001	45	81.82	10	18.18	55
2002	60	95.24	3	4.76	63
2003	43	89.58	5	10.42	48
2004[b]	45	93.75	2	4.17	48

[a]2 cases sex unknown

[b]1 case sex unknown

3.2.5 On-road speed surveys

Speed monitoring independent of enforcement activities provides an indication of what travelling speeds motorists are adopting on the road network. This is of critical importance if we are to determine if our current approach to speed countermeasures is effective.

As mentioned in previous reports, the systematic monitoring of speeds is not widespread in Australia. McInerney et al. (2001) reported that regular speed information was collected in only New South Wales, Victoria and South Australia. The lack of comprehensive systematic speed monitoring was acknowledged in the 2003 and 2004 National Road Safety Action Plan which recommended road safety practitioners "undertake detailed monitoring of travel speeds (independent of enforcement action)" (Australian Transport Safety Bureau, 2002, p14).

This report summarises the outcomes from speed surveys, conducted by DTEI, throughout South Australia. The variables most relevant in the context of this report are:

- *Free speeds* – determined to be vehicles that have greater than a four second gap to the vehicle in front, implying that the driver is "free" to adopt a travel speed independent of influence from other traffic.
- The *mean free speed* represents the average speed of all vehicles with a gap of more than four seconds, passing a certain point on the road. Small changes in the mean free speed can reflect substantial changes to the whole speed distribution
- The *85th percentile* of free speeds is the speed below which 85 per cent of vehicles with a gap of more than four seconds are travelling. Conversely, 15 per

cent of drivers choose to travel over this speed. The 85th percentile is commonly used by engineers to set road design standards and treatments.

Whilst the speed of all vehicles is an important consideration in crash causation in general, free speeds are of interest in the context of this report as they better reflect drivers' choices of travelling speed.

URBAN ON-ROAD SPEED SURVEYS

In 2004, no speed surveys were conducted in the metropolitan area. An additional follow-up survey of the same 50 km/h sites, presented in the 2003 report, was being planned by DTEI for 2005. That survey will confirm if the initial reductions observed after the introduction of the 50 km/h default urban speed limit have been sustained over time.

RURAL SPEED ON-ROAD SPEED SURVEYS

Annual on-road speed surveys using traffic classifiers have been conducted by DTEI on an annual basis from 2000 throughout rural South Australia. The surveys are undertaken at 21 locations: six in country towns on 60 km/h or 50 km/h speed zoned roads, six on 100 km/h zoned roads, six on 110 km/h zoned roads and three on remote outback roads. The regions for each measurement site were chosen on a convenience basis but the road to be surveyed in each region was selected randomly. The surveys are usually conducted around the beginning of August because this month was found to most closely represent the annual average daily traffic (AADT). A minimum of one week's worth of speed and volume data were collected for traffic travelling in both directions. Data presented here represent all vehicle categories.

Table 3.24 shows the summary of the aggregated speed parameters and traffic volumes for all free speed vehicles in the rural speed surveys conducted from 2000 to 2004 in South Australia. The average of the mean and 85th percentile speeds for each speed limit group was weighted by free speed volume. An approximation for variation in speeds is provided by subtracting the mean from the 85th percentile speed. This provides an indication of the likely range of speeds of the majority of vehicles around the mean speed. Tables showing speeds for individual sites are included in Appendix A.

Table 3.24
Surveyed free speeds in rural areas for all vehicles by speed zones, 2000-2004

	Free Speeds (km/h)			Volumes (veh / week)	
	Mean	85th pc	Variation (Mean – 85th pc)	Free Speed Vehicles	All Vehicles
60 km/h					
2000	62.2	70.2	8.0	93,529	107,202
2001	62.0	69.6	7.7	94,394	110,131
2002	61.2	68.6	7.4	93,347	107,760
2003	58.7	66.2	7.4	59,801	68,254
2004	57.8	65.2	7.4	61,508	70,488
100 km/h					
2000	92.5	105.9	13.4	34,694	39,925
2001	90.8	103.3	12.5	35,035	41,270
2002	91.8	104.1	12.3	35,446	41,383
2003	92.6	105.2	12.6	40,522	48,075
2004	92.8	104.8	12.0	40,473	47,147
110 km/h					
2000	104.2	115.4	11.2	40,855	47,570
2001	102.0	113.3	11.2	42,243	49,287
2002	102.9	113.6	10.7	44,293	51,528
2003	104.2	114.3	10.1	41,152	48,205
2004	103.2	113.0	9.8	43,288	51,138

Speeds on the sampled 60 km/h roads continue to trend downward for both the mean and 85th percentile speeds. The large drop apparent in 2003 was sustained in 2004. The decrease in traffic volumes in 2003 and 2004 is due to the omission of two of the six measured roads that had their speed limits reduced to 50 km/h (see Appendix A). The variation in speeds also appears to have stabilised with an initial reduction from 2000 to 2002 sustained in 2003 and 2004.

Speeds on the sampled 100 km/h roads appear to remain relatively constant with no discernable long term downwards trend emerging. Traffic volumes on these roads increased in 2003 due to the addition of a new road into this group.

Speeds on the sampled 110km/h roads have showed an overall downwards trend in free and 85th percentile free speeds from 2000, although the differences are small. The variation in speeds has also decreased consistently on this sample of roads. The slight decrease in traffic volume in 2003 can be explained by the omission of one of the six roads which had its speed limit decreased to 100 km/h in 2003. However, an overall increase in volume was experienced in 2004.

Speeds on the two 50 km/h roads in the survey are shown in Table 3.25.

Table 3.25
Surveyed free speeds on rural 50 km/h roads 2003-2004

	Mean	85th pc	Variation	Free speed volume	Total volume
Freeling					
2003	52.5	61.1	8.6	8,144	8,554
2004	54.8	63.5	8.7	7,922	8,314
Nuriootpa					
2003	62.3	68.2	5.9	26,401	32,844
2004	64.0	70.5	6.5	26,703	32,910

Comparing the two measurement periods, both sites have experienced increases in measured travelling speeds across all the speed parameters. Volumes at each of these sites have remained relatively constant. The mean speed on the road in Nuriootpa is well above the 50 km/h speed limit.

Speeds from the outback locations are shown in Table 3.26.

Table 3.26
Surveyed free speeds in rural areas for all vehicles by speed zones, 2000-2004

	Mean	85th pc	Variation	Free speed volume	Total volume
Quorn (110 km/h)					
2000	104.9	118.3	13.4	3,030	3,214
2001	104.1	118.0	13.9	2,693	2,780
2002	107.6	121.4	13.8	2,219	2,288
2003	100.5	113.5	13.0	2,320	2,397
2004	101.8	114.1	12.3	2,208	2,292
Woomera (110 km/h)					
2000	104.1	119.8	15.7	2,337	2,422
2001	110.2	126.7	16.5	2,241	2,311
2002	110.2	127.4	17.2	2,558	2,643
2003	107.9	121.4	13.5	2,690	2,787
2004	110.5	127.6	17.1	2,737	2,800
Lynhurst (100 km/h) unsealed surface					
2000	81.9	95.5	13.6	1,080	1,101
2001	75.5	94.7	19.2	794	815
2002	79.7	100.7	21.0	740	765
2003	72.3	91.9	19.6	586	597
2004	77.0	95.6	18.6	651	661

Each site shows annual fluctuation with no discernable trends present in any of the speed parameters. This can be attributed in part to the lower volumes of traffic on these roads. Two of the three sites have experienced large declines in their volumes, and at Lynhurst the volume has almost halved since 2000.

3.3 Anti-speeding publicity

A major role of anti-speeding publicity is to support enforcement activities. A comprehensive study of the relationship between anti-speeding publicity and speed enforcement was conducted from 1998 to 2001 in the Adelaide metropolitan area to identify whether changes in on-road free speeds could be attributed to changes in advertising intensity (Woolley, Dyson & Taylor, 2001). Television advertising was shown to have an immediate effect on speed behaviour independent of enforcement. Although the reduction in mean free speed was small, it was statistically significant. Faster drivers were found to reduce their speed significantly after advertising, while small reductions in speed were found for the main body of drivers. It was concluded that anti-speeding television advertising at moderate intensity with supporting enforcement could reduce on-road speeds.

In 2004, anti-speeding publicity was planned around two separate campaigns. The first campaign was aimed at making motorists aware of developments in technology that were making it increasingly likely that speeding drivers would be detected. This campaign used two media strategies: “Caught by Technology” and “Ramp”. Caught by Technology involved television and radio commercials, and billboards, emphasising the administration of demerit points to drivers caught speeding and the introduction of red light cameras capable of detecting speeding drivers. Ramp involved a television commercial reminding motorists of the consequences of speeding, showing a young male driver in a wheelchair as a result of a speeding-related crash. This campaign ran in January, February, March, May and June.

A second campaign, which was new in 2004, was one called “Wipe Off 5”. It was designed to inform the community of the risks associated with speeding and that even small increases in speed can significantly increase the risk of crashing and the severity of those crashes. This campaign included a television commercial called “Slow Mo” that demonstrated the difference an extra 5 km/h in speed makes to stopping distance and crash impact. It also included billboard advertising and Australian Traffic Network (ATN) reports. The campaign ran throughout November and December in 2004.

Total media costs for road safety advertising in 2004 are shown in Table 3.27. The total of $587,298 was only marginally higher than expenditure in 2003 ($551,382).

Table 3.27
Media expenditure on anti-speeding advertising in 2004

Media	Costs ($)
Television metropolitan	384,613
Television regional	74,496
Radio metropolitan	78,886
Radio regional	49,303
Total	587,298

Note that Table 3.27 does not include production costs, which were $49,000 for “Slow Mo”, $105,000 for “Caught by Technology”, and $86,000 for “Ramp”, giving a total of $240,000. These costs were spread over both 2003 and 2004.

4 Restraint use

The following Section investigates the operations and effectiveness of restraint enforcement by examining restraint-related offences detected by Police, restraint use in fatal and serious casualty crashes, and publicity promoting restraint use.

4.1 Restraint enforcement practices and levels of operation

The use of vehicle occupant restraints or seat belts has been shown to be effective in reducing serious and fatal injuries as a consequence of a crash (ETSC, 1996). Restraint usage is strongly influenced by legal requirements and enforcement practices. Legislation for the compulsory use of restraints was introduced in South Australia in 1971.

Similar to drink driving and speeding behaviour, the effects of restraint use enforcement can be optimised when combined with information or publicity campaigns (Gundy, 1988). The most effective way of increasing restraint usage is through intensive, highly visible and well-publicised enforcement (ETSC, 1999). The so-called 'blitz' approach appears to be have long-term effects when involving high levels of enforcement over a short period of time, usually one to four weeks, that is repeated several times a year.

Restraint enforcement, like speeding enforcement, is regarded as an on-going activity throughout the year in South Australia. The detection of restraint non-wearing relies mainly on traffic patrol observations but the restraint use of vehicle occupants may also be checked when a driver has been detected for any traffic offence or when the vehicle has been involved in a road crash. In South Australia, drivers have legal responsibility for passenger restraint use, particularly for children under 16 years of age. The driver must ensure that seat belts are available and fit for use.

No information was available on the hours spent by police specifically targeting restraint use in 2004. Therefore, this Section will provide details of offences, restraint use among vehicle occupants involved in road crashes, and spending on advertising promoting the use of restraints.

4.2 Levels of restraint use

4.2.1 Restraint non-use offences

There are seven different types of restraint-related offences. The frequencies of these offences for the years 2001 to 2004 are listed in Table 4.1. It must be noted that the driver of the vehicle is held legally responsible for the last four offences listed. The total number of offences detected decreased by 15.7 percent in 2004. This decrease may be due to higher seatbelt wearing rates or to decreased police enforcement activity.

Consistently, the most common restraint offence involved the driver failing to wear a seat belt adjusted and fastened properly. Approximately 3.9 per cent of offences specifically involved failing to restrain children under the age of 16 years. It is likely that the true number of offences involving unrestrained children is higher, as some of the other restraint offence types may have included children. All types of restraint offences are aggregated in the subsequent Tables.

Table 4.1
Restraint offences and detections, 2001-2004

Restraint offences	2001		2002		2003		2004	
	(N)	(%)	(N)	(%)	(N)	(%)	(N)	(%)
Fail to wear seatbelt properly adjusted and fastened (driver)	8812	85.8	8671	85.6	9157	83.5	7916	85.7
Fail to wear seatbelt properly adjusted and fastened (passenger)	1060	10.3	1041	10.3	1211	11.0	923	10.0
Fail to occupy seat fitted with a seatbelt	30	0.3	14	0.1	6	0.1	15	0.2
Sit in front row of seat when not permitted	2	<0.1	1	<0.1	4	<0.1	0	0.0
Fail to ensure child under 1 year old restrained	26	0.3	32	0.3	39	0.4	49	0.5
Fail to ensure child under 16 wears seatbelt	264	2.6	283	2.8	366	3.3	315	3.4
Fail to ensure front row passenger properly restrained	79	0.8	85	0.8	180	1.6	19	0.2
Total	10273	100.0	10127	100.0	10963	100.0	9237	100.0

Table 4.2 shows restraint offences detected in metropolitan and rural areas from 2000 to 2004. The drop in seatbelt offences in 2004 was most pronounced in rural areas (23.6%), although the level in 2003 was likely to be the highest on record. (It cannot be stated with certainty because of the substantial number of offences in previous years for which a location was not recorded.) The number of metropolitan offences was over two and a half times the number of rural offences in 2004, consistent with previous years.

Table 4.2
Restraint offences detected by region, 2000-2004

Year	Metro		Rural		Unknown	Total restraint offences detected
	(N)	(%)	(N)	(%)	(N)	
2000	5,079	73.6	1,823	26.4	643	7,545
2001	6,624	70.8	2,739	29.2	910	10,273
2002	6,969	75.8	2,223	24.2	935	10,127
2003	7,660	69.9	3,303	30.1	-	10,963
2004	6,713	72.7	2,524	27.3		9,237

DAY OF WEEK

The distribution of restraint-related offences detected from 2000 to 2004 by day of week is presented in Table 4.3 in terms of the percentage of total offences detected each year. Restraint offences were detected evenly throughout the week, although the percentage of offences on Sundays was slightly lower.

Table 4.3
Number of restraint offences detected by day of week, 2000-2004
(expressed as a percentage of total offences detected each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	13.6	12.9	13.4	15.9	15.1	14.8	14.3
2001	13.9	13.9	15.3	15.5	14.0	13.9	13.9
2002	13.5	14.0	14.4	15.2	15.8	15.9	11.2
2003	14.5	14.5	15.2	14.1	13.4	15.3	13.0
2004	15.2	14.4	15.5	15.6	14.0	14.0	11.3

TIME OF DAY

Table 4.4 displays restraint offences detected by time of day in the five years from 2000 to 2004. In 2004, the distribution of restraint offence detections by time of day did not vary from the previous years. Restraint offences were detected most frequently during the day between 8am and 6pm. Restraint offence detections were much less common from midnight until 6am.

Table 4.4
Number of restraint offences detected by time of day, 2000-2004
(expressed as a percentage of total offences detected each year)

Year	Midnight -6 AM	6-8 AM	8-10 AM	10 AM-Noon	Noon-2 PM	2-4 PM	4 -6 PM	6 -8 PM	8 PM - Midnight
2000	1.9	2.6	11.1	18.1	17.3	15.3	17.0	8.9	7.8
2001	1.7	2.2	11.7	18.9	17.1	14.6	17.9	9.1	6.7
2002	1.7	2.3	11.2	17.4	17.6	15.7	20.0	7.7	6.4
2003	1.8	2.6	12.8	18.4	16.7	15.2	18.2	8.2	6.0
2004	1.6	2.5	11.5	19.4	18.5	15.1	16.9	8.0	6.3

SEX AND AGE

Detected restraint offences by sex and age for 2003 and 2004 are presented in Table 4.5. In both years, males were over three times more likely to have been detected for a restraint offence than females. No data were available for children aged under 16 years since the driver of the vehicle is legally responsible for the restraint offence.

Table 4.5
Number and percentage of restraint offences detected by sex and age, 2003-2004

	2003						2004					
	Male		Female		Total		Male		Female		Total	
Age	N	%	N	%	N	%	N	%	N	%	N	%
16-19 yrs	721	8.8	253	9.7	974	8.9	635	9.0	195	9.3	830	9.0
20-29 yrs	2817	34.2	935	35.7	3752	34.2	2450	34.8	765	36.3	3215	34.8
30-49 yrs	3246	39.4	1079	41.2	4325	39.5	2791	39.7	844	40.1	3635	39.4
50 yrs +	1445	17.5	350	13.4	1795	16.4	1157	16.4	301	14.3	1458	15.8
Unknown age	7	0.1	1	<0.1	8	0.1	2	<0.1	1	<0.1	3	<.01
Unknown sex					109	1.0					96	1.0
Total	8236	100.0	2618	100.0	10963	100.0	7035	100.0	2106	100.0	9237	100.0

Unknown age: Date of birth was not recorded or data entry error.
Unknown sex: Age and sex was not recorded or data entry error.

4.2.2 Restraint use by vehicle occupants in serious and fatal crashes

Restraint use by vehicle occupants involved in crashes is often difficult to determine conclusively. In some cases, if there is no physical evidence (i.e. injuries, scuff marks on seatbelt), police rely on self-report. Restraint use is only recorded in the TARS database if a vehicle occupant is injured. Seat belt status is categorised into six different groups in the database but they have been condensed into three groups for this report: restraint worn (includes child restraints), restraint not worn (includes child restraints and restraint not fitted) and unknown (restraint is fitted but unknown if worn). The following Tables give the number and percentage of restraint use for car occupants seriously or fatally injured in a crash. When calculating these percentages, only car occupants with known restraint use status were considered.

Table 4.6 shows the restraint usage for fatally injured vehicle occupants from 2000 to 2004. In 2004, restraint use in fatal crashes was 68 percent. The only year for which restraint use was higher was 2001 (81%). Restraint status was known for 83 percent of all fatally injured vehicle occupants in 2004.

Table 4.6
Restraint usage of fatally injured vehicle occupants, 2000-2004

Year	Restraint worn (N)	Restraint worn (%)	Number of known cases	Total occupant fatalities
2000	52	62.7	83	128
2001	59	80.8	73	107
2002	49	65.3	75	111
2003	53	55.7	95	121
2004	58	68.2	85	103

Restraint use for seriously injured vehicle occupants from 2000 to 2004 is presented in Table 4.7. A serious injury is defined as an injury requiring the person to be admitted to hospital but does not cause the person to die within 30 days of the crash. In 2004, the percentage known to be wearing restraints was 90 percent, which was comparable to 2003. The restraint status was reported for only 64 percent of seriously injured vehicle occupants in 2004. Each year, restraint use by injured occupants was higher in serious injury crashes than in fatal crashes.

Table 4.7
Restraint usage of seriously injured vehicle occupants, 2000-2004

Year	Restraint worn (N)	Restraint worn (%)	Number of known cases	Total occupants injured
2000	633	89.2	710	1230
2001	582	85.1	684	1232
2002	612	85.2	718	1188
2003	567	88.1	643	1126
2004	571	89.6	637	998

Restraint usage for fatally and seriously injured vehicle occupants is presented in Table 4.8 and Figure 4.1 according to the region where the crash occurred. Overall restraint use was at its highest recorded level in 2004, although still less than 90 percent. Injured vehicle occupant restraint wearing rates remained higher for crashes in the Adelaide metropolitan area than for crashes in rural regions.

Table 4.8
Restraint usage of fatally and seriously injured vehicle occupants by region, 2000-2004

Year	Metro Worn (N)	Metro Worn (%)*	Rural Worn (N)	Rural Worn (%)*	Total Worn (N)	Total Worn (%)*	Total Killed/ Injured
2000	303	87.0	382	85.7	685	86.4	1,358
2001	280	87.0	361	83.0	641	84.7	1,339
2002	287	84.9	374	82.2	661	83.4	1,299
2003	297	88.7	323	80.1	620	84.0	1,247
2004	293	90.2	336	84.6	629	87.1	1,101

* Percentage of known

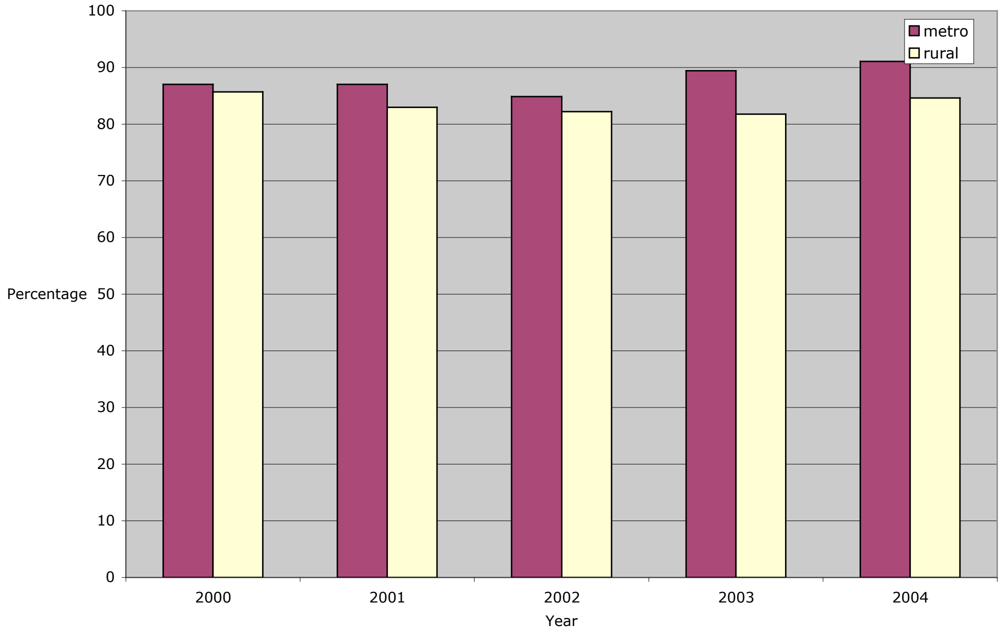

Figure 4.1
Restraint usage of fatally and seriously injured vehicle occupants, by location, 2000-2004

Table 4.9 and Figure 4.2 show the number and percentage of fatally and seriously injured vehicle occupants wearing restraints, by sex. Injured males had considerably lower restraint usage rates than injured females. In 2004, male restraint use was similar to previous years at approximately 81 percent, while restraint usage rates for females increased to a level of 95 per cent, which was the highest on record.

Table 4.9
Restraint usage of fatally and seriously injured vehicle occupants by sex, 2000-2004

Year	Male Worn		Female Worn		Total
	(N)	(%)*	(N)	(%)*	Killed/ Injured
2000	311	80.8	368	91.5	1,358
2001	317	80.9	321	88.7	1,339
2002	351	80.3	309	87.0	1,299
2003	315	81.8	300	89.3	1,247
2004	322	80.7	307	95.0	1,101

* Percentage of known

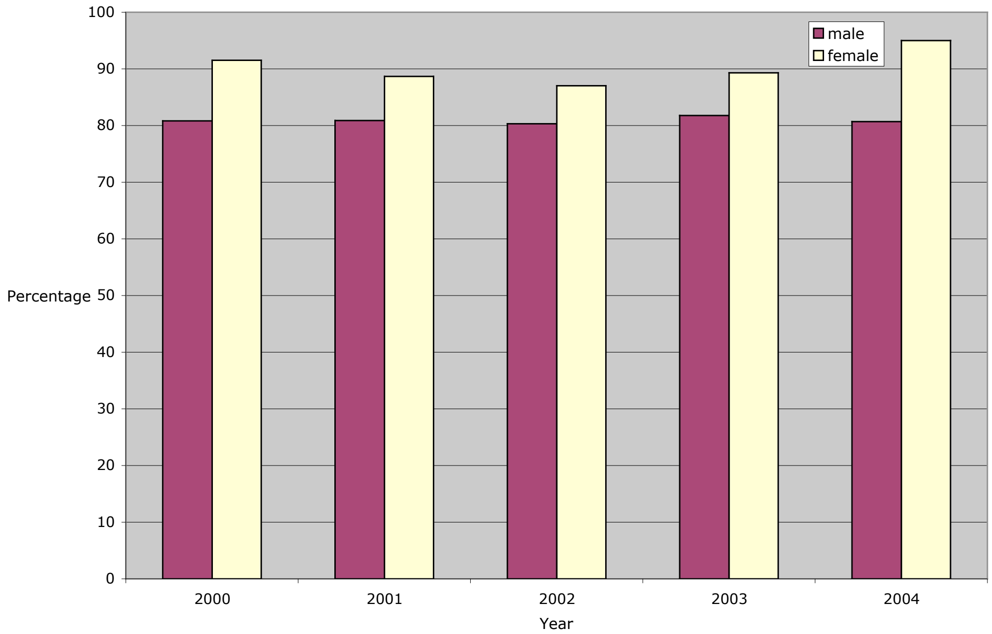

Figure 4.2
Restraint usage of fatally and seriously injured vehicle occupants, by sex, 2000-2004

4.2.3 On-road observational restraint use surveys

On-road observational surveys provide another means to measure the effectiveness of restraint enforcement. No observational studies of restraint use were conducted in 2004. Results from previous surveys are described in the 2002 report on annual performance indicators of enforced driver behaviours (Wundersitz & McLean, 2004).

4.3 Restraint publicity

In 2004, restraint publicity was based on a campaign that began in 2003. In previous years, publicity campaigns promoting restraint use primarily targeted parents of children in rural regions. In September 2003, a new media campaign was developed incorporating both metropolitan and rural regions. Similar to previous years, the restraint campaign in 2003 aimed to reach a primary target audience of parents with young children. However, in 2003 males aged 14 years and over were selected as a secondary target audience. The campaign was structured to inform road users about the strong relationship between the extent of injury and restraint usage, emphasize the risk of being detected when not wearing a restraint, and reinforce the potential consequences of not wearing a restraint. There was no main specific campaign slogan.

The campaign encouraging restraint use comprised of television and radio commercials aired in both the Adelaide metropolitan area and rural regions. The radio commercial was intended to warn parents about the possible consequences of their child being involved in a crash while unrestrained and the penalties incurred when detected with an unrestrained child passenger, specifically a $182 fine and three demerit points. The television commercial "Demonstration" depicted the possible consequences of not restraining children when involved in a crash. This advertisement was aired in January, April and October, 2004.

In 2004, the money invested in restraint-related advertising was $183,653 (down from $279,148 in 2003). Of this, $150,677 was spent on metropolitan television, $20,927 was spent on regional television, and $12,049 was spent on regional radio. There were no production costs in 2004, as all advertising materials used had been produced in 2003.

5 Discussion

Performance indicators of enforced driver behaviours are important for understanding the relationship between driver behaviour, enforcement activity and crash-related information. The European Transport Safety Council (ETSC, 2001) recognised the importance of systematic monitoring of driver behaviour by independent institutions to create road safety performance indicators. Following the recommendations of the ETSC, this annual report quantifies the effects of the enforcement of drink driving, speeding and non-wearing of restraints legislation in South Australia.

5.1 Drink-driving and random breath testing

In a review of the impact of random breath testing across Australia, Homel (1990) concluded that the success of RBT depends critically on the method of its enforcement. In particular, he found that only the 'boots and all' model of RBT had been unambiguously successful. This model includes high visibility of RBT stations in locations that are difficult to predict and evade, rigorous enforcement and extensive publicity. Both enforcement and publicity must be sustained in operation. Combined, these factors influence drink driving behaviour through general deterrence, by increasing the perceived likelihood of detection and emphasising the consequences of legal sanctions.

LEVELS OF TESTING

In 2004, random breath testing levels in South Australia increased slightly (7%) from 2003, with similar increases in metropolitan and rural areas. The number of tests conducted in 2004 was higher than all previous years except 2002. Just over 61 percent of licensed drivers were breath tested in 2004. Overall, this level of testing was greater than the recommendation of Baldock and White (1997) that one in two licensed drivers be tested.

Of the testing conducted in 2004, seven percent was mobile RBT and 93 percent static. In 2003, in which mobile RBT only began in September, mobile RBT only comprised two percent of total tests.

Interstate comparisons revealed that South Australia tested a comparable proportion of the population to New South Wales and Western Australia but a considerably smaller proportion than that tested in Tasmania, Victoria and Queensland. In Tasmania, RBT levels were nearly one test for every person in the state per year, compared to less than one in every two people in South Australia. The much smaller amount of testing, adjusted for population differences, done in South Australia compared with other states suggests that South Australia could justifiably increase its level of RBT.

With regard to mobile versus static RBT, mobile testing made up a much smaller proportion of total tests in South Australia than in other states. The proportion of total tests that were conducted using mobile methods was seven percent in South Australia. The state with the next smallest proportion of tests conducted using mobile RBT was New South Wales with 22, while the state with the highest was Tasmania with 79. The reason for the lower level of mobile RBT in South Australia was the requirement that such testing only be conducted during 'prescribed periods'. The elimination of this requirement in 2005 should enable a far greater proportion of RBT to be conducted using mobile methods.

VISIBILITY OF RBT

Homel (1990) suggests that to increase the perceived probability of detection, random breath testing should be conducted on days and at times when it is more likely to be seen by potential drink drivers. Homel maintains that experimentation is required to determine the balance of testing at times and places of high traffic volume when the incidence of drinking and driving is low, and when the incidence of drink driving rates is high but the traffic volume is low.

With regard to the day of week, the most recent late night surveys in metropolitan Adelaide indicated that drink driving rates were highest on Wednesday and Thursday nights, and after midnight (Kloeden & McLean, 1997). More recent roadside breath testing surveys conducted in Perth (Friday to Sunday, 10pm-3am) in 1999 found that drink driving rates were highest after midnight and on Friday nights (Ryan, 2000). In South Australia during 2004, the greatest percentage of breath tests continued to be performed on Fridays, Saturdays and Sundays. Mobile RBT was most commonly conducted on Saturdays. This would be due at least partly to the requirement for mobile RBT to only be conducted during 'prescribed periods', most of which would have been linked with weekends.

With regard to time of day, time series analysis of Tasmanian RBT data indicated that tests conducted before midnight were more important as a general deterrent than late night or day time testing. However, low numbers of crashes and tests after midnight precluded definitive conclusions (Henstridge, Homel & Mackay, 1997). Harrison (2001) suggested that enforcement taking place early in the chain of decisions leading to drink driving may be more effective in deterring drink driving than enforcement targeting decisions later on, particularly in rural areas.

In 2004, the greatest proportion of RBT was conducted between 2pm and midnight, similarly to previous years. However, static RBT was over-represented between 2 and 6pm, while mobile RBT was over-represented between midnight and 4am. Such a strategy allows for exposure of the greatest traffic (2-6pm) to highly visible static. RBT operations conducted in the early part of the evening would have been visible to potential drink drivers on their way to drinking venues and may have influenced subsequent alcohol consumption or the decision to drive. This satisfies the 'high visibility' component necessary for successful deterrent RBT operations recommended by Homel (1990). However, RBT is also needed at times when the highest drink drive rates occur to detect actual drink drivers. During 2004, the form of RBT most likely to detect drink drivers (mobile RBT) was used when drink driving rates are highest (after midnight).

Hendrie (2003) emphasizes the importance of adapting the type of RBT enforcement to the characteristics of the region where it is being implemented, rather than assuming a 'best practice' model fits every situation. Experimentation should be continued to maintain a balance between deterrence and detection.

EFFECTIVENESS

For specific deterrence, it is important to apprehend a large proportion of drink drivers. In 2004, the total number of detections in South Australia was the highest for all years from 2000 onwards. However, per head of population, the number of detections in SA was lower than those in the comparison states of Tasmania, Queensland, Victoria and Western Australia. South Australia's rate was 0.40 percent of the population, while the highest level was Tasmania's of 0.83 percent. Of particular interest is that there was a close match between the detection rate per head of population, and both the testing rate per head of population and the proportion of tests conducted with mobile RBT. Specifically, detection rates were higher in states where there were higher levels of testing and a higher proportion of testing conducted with mobile methods. This reinforces the idea that detection rates are mainly the result of enforcement practices rather than reflecting the level of drink driving. However, it was also the case that Victoria had higher levels of testing and a greater proportion of mobile tests than Queensland but a lower detection rate. This anomaly may be due to the non-inclusion in the Victorian data of drink driving detections after a road crash. South Australia also had a similar detection rate to New South Wales, despite a lower proportion of tests conducted using mobile RBT.

Detection rates (drink drivers detected per 1,000 drivers tested) in South Australia were the highest since 1998, while detection rates in rural areas were the highest since 1997. This was most likely to be due to the operation of mobile RBT for a full twelve months in South Australia for the first time. Although detection rates for mobile RBT were lower in 2004 than in 2003, the greater proportion of all tests conducted using mobile RBT would have increased the overall detection rate, as mobile RBT detection rates were much higher than the rates for static RBT. Few studies have evaluated mobile RBT methods and, in most studies, RBT data have been confounded with those of stationary RBT (Harrison, Newman, Baldock & McLean, 2003). The present report indicates that mobile RBT is associated with much higher detection rates than static RBT.

Of interest was the finding that the ratio of mobile to static RBT detection rates was the same across all periods of the day (mobile testing having four to five times the detection rate of static testing) but was much higher in rural regions. This latter finding indicates that mobile RBT is of particular benefit for detecting drink drivers in rural regions. This would be due to mobile RBT providing a solution to the limited police personnel available in rural regions and the 'grapevine effect' known to undermine the potential value of a highly visible static RBT station. Harrison (2001) investigated anti-drink driving enforcement strategies in rural communities in Victoria and South Australia and concluded that detection of drink drivers would be the most useful strategy in such communities and was best achieved through unpredictable, smaller, covert mobile operations.

There was also an increase in 2004 in the percentage of drivers involved in fatal crashes with an illegal BAC. The level of 31 percent above 0.1 g/100ml was the highest since 1993. However, the small number of fatalities means that there is much more fluctuation from year to year. Data for serious injury crashes do not show any increase in 2004. The larger number of serious injury crashes means that they are a more reliable indicator of alcohol involvement in crashes but the percentage of cases in which BACs for drivers were known was still low in 2004 (62%). Improving the matching process of blood samples with the TARS database would create a more complete and reliable database, enabling more accurate determination of this performance indicator for anti-drink driving enforcement.

The best indicator of levels of drink driving in the community, and thus of the effectiveness of RBT as a deterrent, is a roadside survey. Unfortunately, no such survey was conducted in 2004.

PUBLICITY

In 2004, expenditure on anti-drink driving publicity decreased by 14 percent from the figure in 2003. However, 2003 was a substantial increase (37%) on 2002. The campaigns encompassed both metropolitan and rural regions and used a variety of media.

Homel (1990) specified that publicity accompanying RBT activities should not simply be educational but have a deterrent value. The 2004 publicity campaign met this requirement by airing advertisements informing road users of greater RBT resources and reinforcing the associated increased risk of detection. Harrison (2001) suggested that publicity focusing on the early decisions in the chain of decision making relating to drink driving (i.e. how people get to drinking venues) may be more beneficial than targeting decisions later on (i.e. how to get home). This alternative strategy should be considered for future anti-drink driving campaigns.

5.2 Speeding

The success of speed enforcement depends on balanced methods of police enforcement to deter motorists, both specifically and generally. This enforcement needs to be supported by regular anti-speeding publicity that emphasises the high levels of speed enforcement taking place.

A notable change in speed enforcement in 2004 was the use of red light cameras to detect speeding motorists. These cameras were first made operational in late 2003.

LEVEL OF OPERATIONS

The number of hours spent on speed enforcement in South Australia in 2004 was similar to the level in 2003 but less than levels in 2000-02. However, this does not include hours of operation of dual purpose red light/speed cameras. If these were included, the total hours of enforcement in 2004 would have significantly exceeded the total in 2003. The increase in hours of speed enforcement is to be welcomed after a substantial decrease in 2003.

The number of speed camera hours was marginally higher in 2004 compared to 2003 in both metropolitan and rural areas but was still much lower than the number of hours of such enforcement in 2000-02. For non-camera devices (laser devices, hand-held radars and mobile radars), the hours of operation in 2004 were similar to 2003 and greater in number than in 2000-02.

VISIBILITY OF OPERATIONS

To increase general deterrence, the perceived likelihood of detection must be increased. Drivers' perceptions of the likelihood of detection are influenced by knowledge of the levels of enforcement conducted, and by direct observation of enforcement activities undertaken (Swadling, 1997). Therefore, to increase the perceived probability of detection, speed detection devices should be operated on days and at times when they are most likely to be seen by potential speeders (Homel, 1990). However, a mixture of covert and overt speed enforcement is necessary to optimise both general and specific deterrence (perceived high levels of apprehension and punishment).

Speed detection hours in South Australia, for both speed cameras and non-camera devices, were spread evenly throughout the week, the majority during daylight hours (6am-8pm). This pattern of speed detection operations has varied little from 2000 to 2004. Therefore, it appears that speed detection has been organised in order to produce a high level of general deterrence by operating at times when the majority of drivers are on the road.

For specific deterrence, it is important to also conduct speed enforcement during times when rates of speeding are higher. Speed camera data suggest higher speeding rates on weekends, both in terms of detections per hour and detections per vehicle passing. The balance in terms of hours of enforcement across all days of the week would appear to be a good balance between operation during high traffic periods (weekdays) and high speeding days (weekends). Data for time of day in 2004 indicate higher rates of speeding during the day time hours and so the concentration of speed detection during these hours is appropriate.

A noticeable reduction in speed camera operations was observed in the period from 12 to 2pm, around lunch time. This decrease may simply be related to speed camera operator's lunch break, or to this time period being a common time at which camera locations are changed. This time of day may be considered as 'lunch time peak hour' when many potential speeders are on the roads (high visibility). Staggering speed camera operators' lunch times or the times at which locations are changed may be an easy way to minimise this aberration in the timing of speed detection and increase the perceived likelihood of detection.

EFFECTIVENESS

The total number of detections for speeding offences in South Australia in 2004 was 29 percent greater than the level in 2003 but still less than the number in 2000-02. The percentage of licensed drivers tested in South Australia in 2004 was 20 percent, compared to 25 percent in 2000 and 2001.

The increase from 2003 was due entirely to the additional detections (approximately 50,000) made with the dual purpose red light/speed cameras. This addition of red light cameras to the methods available for speed enforcement is therefore likely to prove useful in promoting specific deterrence.

Over half of the detections were still made with conventional speed cameras despite the reduction in hours of their operation compared to non-camera devices. This is due to the greater efficiency of speed cameras. Speed cameras check the speeds of all vehicles, not just those that the police officer chooses to check with non-camera devices. It must also be noted that non-camera devices are used more in rural areas, which are characterised by lower levels of traffic density.

The overall detection rate in 2004 (detections per hour of enforcement, excluding red light cameras) was the lowest of all the years since 2000. This was likely to be due to decreases in speed camera (high efficiency) enforcement in the metropolitan area (high traffic volumes), when compared to enforcement using non-camera devices (low efficiency) in rural regions (low traffic volumes). The effect of traffic volumes is illustrated by the finding, for speed cameras, that the metropolitan area was associated with a higher detection rate per hour but a lower detection rate per passing vehicle. In rural regions, the detection rate per 1,000 vehicles passing was considerably lower in the past two years than in 2000-01. This may reflect the positive effects of maintenance of speed enforcement levels in rural regions, unlike the declines in speed camera use in the metropolitan area.

It can be argued that the incidence of speed-related crashes and the measurement of on-road vehicle speeds provide a better indication of speed distributions and changes in speeding behaviour than detection rates because they are not as heavily influenced by enforcement operations. However, a problem with crash data is the under-reporting of the involvement of speeding in crashes in the TARS database, leading to an under-estimation of the role of speeding in crashes in South Australia. Combining serious and fatal crashes, 4.5 percent of metropolitan, and 3.4 percent of rural, crashes were attributed to speed, which was consistent with previous years. Although the under-reporting of speeding in crashes makes it difficult to evaluate the effects of enforcement on speed-related crash occurrence, the finding that almost all speed-related crashes continue to involve male drivers emphasises the importance of deterring male drivers from speeding in order to reduce crashes. Males were also two and a half times as likely as females to have been detected speeding by non-camera devices (data by sex for camera detections are not able to be provided).

The measurement of on-road travel speeds in urban areas is not done in South Australia in a systematic manner, making it difficult to use on-road speed data to evaluate enforcement operations. On-road urban travel speed surveys were conducted in 2002 and 2003 to assess the effects of the change in the default urban speed limit in 2003 but no such surveys were conducted in 2004. They were planned, however, for 2005, in order to see whether decreases in travel speeds observed in 2003 had been maintained. The measurement of on-road travel speeds in rural areas is done on a more consistent basis than is the case for urban areas. The decreases in travel speeds observed in rural areas on 60 km/h roads in 2003 were maintained in 2004. Less positive was the finding that a survey of two 50 km/h roads in rural towns revealed increased mean travel speeds in 2004 relative to 2003. The small sample size must be noted, however. From 2000 to 2004, there does appear to have been a minor trend towards lower speeds on roads zoned at 110 km/h but no similar trend on roads zoned at 100 km/h. The low traffic volumes in rural areas makes it difficult to draw firm conclusions.

PUBLICITY

The use of media and publicity to support speed enforcement enhances the effect of the enforcement (Zaal, 1994). This practice has been followed in South Australia and should continue.

Publicity raises the perceived risk of detection and assists in the process of changing behaviour by providing public acceptance of enforcement (Elliot, 1993; Zaal, 1994). An evaluation of anti-speeding television advertising in the Adelaide metropolitan area reported slight but statistically significant decreases in mean free speeds (Woolley et al., 2001).

During 2004, expenditure on speed-related publicity increased marginally (6.5%) from 2003. In turn, spending on such publicity in 2003 had been much greater (by 39%) than in 2002. These increases in spending were necessary given the need for continued publicity of the recent (2003) reductions in speed limits. The reduction of the urban speed limit to 50 km/h has been demonstrated to have had a significant effect on crash numbers in South Australia (Kloeden, Woolley & McLean, 2004).

5.3 Restraint use

A lack of information on restraint enforcement operations, compared with the enforcement of speeding and drink driving, made it very difficult to assess its effectiveness. On-road observational surveys of restraint use provide the best indication of restraint use levels, but, no observational surveys were undertaken in 2004. In the absence of this information, the number of restraint offence detections (an indicator of enforcement activities), the level of restraint use for injured occupants in crashes, and publicity were examined to monitor trends in 2004.

LEVELS OF RESTRAINT ENFORCEMENT

The total number of restraint offences detected in South Australia decreased by 15 percent in 2004, although the number of offences in 2003 was high. The number of restraint offences provides only a rough estimate of the prevalence of restraint non-usage, and is heavily dependent on police enforcement strategies. Thus, the decrease in offences in 2004 may be attributed to either greater compliance with restraint laws or lower levels of enforcement.

Restraint usage can be increased through high levels of enforcement over short periods of time, when applied repeatedly (ETSC, 1999). To the best of our knowledge, in 2004 no 'blitz'-like restraint enforcement campaigns were conducted. There were also no other specific large-scale restraint enforcement campaigns, although few details were available regarding police enforcement operations. If the number of detected offences is used as an approximate guide to enforcement activities, it appears that restraint enforcement occurred predominantly during daylight hours (8am-6pm) and was spread relatively evenly throughout the week. This was consistent with previous years. The majority of offences were also detected in the metropolitan region. This could be due to greater enforcement in the metropolitan area or to this area's greater traffic volumes and, thus, its greater number of potential offenders. Males in 2004 were three times as likely as females to be charged with a restraint offence, which was also consistent with previous years.

LEVELS OF RESTRAINT USE AND EFFECTIVENESS

The percentage of injured vehicle occupants wearing restraints in serious injury crashes in South Australia was 90 percent in 2004, which was comparable to previous years, while the level of restraint use of 68 percent in fatal crashes was also broadly consistent with previous years, except for 2001 (an anomalously high level of 81%). Similar to previous years, in 2004 restraint wearing rates for injured vehicle occupants in serious and fatal crashes were somewhat lower in rural regions than in the metropolitan area, suggesting that attention needs to be given specifically to restraint use in rural areas.

Injured vehicle occupant restraint wearing rates were much lower in fatal crashes, than in serious casualty crashes (and are usually reported to be lower for crashes than the general driving population observed during on-road surveys – see Wundersitz & McLean, 2004). A possible reason for the finding of lower wearing rates in fatal, compared to serious injury, crashes is that police overestimate seat belt usage in less severe crashes. A US study compared the seat belt use reported by trained crash investigators (the benchmark) and police (Schiff & Cummings, 2004). Police were least likely to make errors on seat belt use for deceased vehicle occupants but were more likely to overestimate seat belt usage for occupants involved in non-injury or minor to moderate injury crashes. It is less likely, however, that such differences exist between judgements for fatal and serious injury crashes.

More likely is that restraint wearing rates were lower in fatal crashes because the higher severity of the injuries sustained were directly related to the vehicle occupant being unrestrained. Restraint use status was only reported for injured vehicle occupants. Thus, the confounding nature of the relationship between crash injury and restraint use may compromise crash data as an indicator of the actual level of restraint use.

Restraint use status was unknown for a large proportion of injured vehicle occupants in serious (17%) and fatal (36%) crashes. Although the percentage unknown has decreased for both sets of crashes, better records of restraint use need to be kept to improve database reliability and accuracy, and for the evaluation of restraint enforcement practices.

As there were no observational restraint use surveys, no information was available on restraint use by seating position in the vehicle. In 2002, seat belt usage in South Australia was at a high level (above 95%) but was observed to be lower for rear seat passengers than for drivers and front seat passengers. Males were also found to have slightly lower restraint use rates than females (Wundersitz & McLean, 2004). This is consistent with the finding in 2004 of males being more likely to be charged with restraint offences and to be unrestrained in fatal and serious injury crashes. The level of restraint use for females in serious injury crashes of 95 percent was the highest on record, while for males the level was 81 percent. Self-reported restraint use has also been found by researchers to be lower among males (Milano, McInturff & Nichols, 2004; Reinfurt, Williams, Wells & Rodgman, 1996). Therefore, males remain an important target for restraint enforcement.

Restraint offence rates provided the only indication of age differences in restraint use. In contrast to self-report survey findings that young drivers (aged 18-34 years) are associated with lower restraint use (Milano et al, 2004; Reinfurt et al, 1996), in the present study drivers aged 30 to 49 years incurred the most offences, similar to 2003. The higher offence rate of this age group may be partially attributed to incurring offences for unrestrained children.

PUBLICITY

Restraint enforcement is by nature more covert than other forms of enforcement such as random breath testing or overt speed detection. In order to increase the perceived risk of apprehension and general deterrence of the behaviour, high publicity of enforcement is recommended (Zaal, 1994).

After a very large increase (over 500%) in the money invested in restraint use publicity in South Australia in 2003, spending in 2004 decreased from 279 to 184 thousand dollars. Nonetheless, these funds were sufficient to support a mass media campaign incorporating both the metropolitan and rural areas. The campaign was based on the one that began in 2003.

The advertisement used in the campaign, 'Demonstration', concentrated on the consequences of not using restraints (potential injury, fines and demerit points) rather than publicising restraint enforcement to increase the perceived likelihood of being caught. Future restraint enforcement operations in South Australia would benefit from accompanying publicity concentrating on deterrence, particularly one or two weeks prior, and during an enforcement period (see Stefani, 2002).

Research indicates that the use of unintentional or unpaid publicity, that is, publicity not supported by the organisation(s) that disseminated the mass media campaign, is important for the outcome of a publicity campaign (Delaney, Lough, Whelan & Cameron, 2004; Elliot, 1993). Citing a national campaign to increase restraint use in the United States, Milano et al. (2004) reported that unpaid advertising was highly effective when used in conjunction with paid advertising and enforcement. However, they also noted that unpaid media was not effective by itself to reach high-risk groups (i.e. young males). The level of unpaid restraint use publicity for 2004 is unknown but should be encouraged to enhance future restraint use publicity campaigns and enforcement.

The publicity campaign encouraging restraint use targeted parents of young children and males. The targeting of males was supported by the restraint offence and crash data. Unfortunately, little data were available on child restraint use in 2004 to confirm whether parents of young children should remain a target of restraint use publicity campaigns. Restraint offence data for children are difficult to interpret as they most likely reflect enforcement practices rather than restraint use.

6 Conclusions

The establishment of consistent performance indicators for drink driving, speeding and restraint use enforcement practices will assist in optimising enforcement operations, related publicity and further reduce road trauma on South Australian roads. Providing a consistent framework to collect and evaluate this information will help in achieving these aims.

The main findings from the performance indicators for each enforced behaviour in South Australia in 2004 are summarised.

DRINK DRIVING

In 2004, random breath testing levels increased slightly from those in 2003, to reach a number of tests higher than all previous years except 2002. This was an encouraging change after the decrease in 2003 and helped maintain a level of testing greater than the recommendation of Baldock and White (1997) that one in two licensed drivers be tested.

Mobile RBT comprised seven percent of total tests in 2004, compared to two percent in 2003. The mobile method of testing was still restricted in 2004 by the requirement that it could only be conducted during 'prescribed periods'. The abolition of this requirement in 2005 will enable an increase in the proportion of tests conducted using mobile RBT and an increased likelihood of detecting drink drivers. Detection rates with mobile RBT were much higher than those associated with static RBT, thus causing an increase in the overall detection rate to a level higher than those in all years since 1998.

Interstate comparisons revealed that detection rates were higher in states with a high number of overall tests and a high proportion of all tests conducted using mobile testing. South Australia, comparatively speaking, had a low number of tests (per capita) and a low proportion of tests conducted with mobile testing (due to it being the only state in which mobile RBT had to be conducted only during prescribed periods) and thus, a low detection rate. In order to be on par with other jurisdictions in Australia, South Australia would need to increase its level of testing and increase the proportion of tests conducted using mobile RBT.

There was an increase in the involvement of alcohol in fatal crashes in 2004 but the BAC of drivers was unknown for a sizeable percentage (38%) of serious injury crashes, as has been the case in previous years, which makes it difficult to draw conclusions about the level of alcohol involvement in crashes in South Australia. Improving the matching process of blood samples with the TARS database would create a more complete and reliable database, and make it simpler to determine whether current enforcement methods are having the desired effect on drink driving behaviour.

In 2004, expenditure on anti-drink driving publicity decreased by 14 percent from the figure in 2003. However, 2003 spending was substantially greater (by 37%) that that in 2002. The campaigns encompassed both metropolitan and rural regions and used a variety of media.

SPEEDING

The number of hours spent on speed enforcement in South Australia in 2004 was similar to the level in 2003 but less than levels in 2000-02. However, this does not include hours of operation of dual purpose red light/speed cameras. If these were included, the total hours of speed enforcement in 2004 would far exceed the level in 2003.

Speed detection hours are concentrated during the daytime and are balanced across the week. This provides a good balance between operation during high traffic periods (weekdays) and high speeding days (weekends). However, enforcement practices should be altered to prevent the drop in speed camera detection hours during the lunch period (12-2pm).

After a much lower number of speed detections in 2003 than in previous years, the number increased markedly in 2004 due to the additional enforcement using dual purpose red light/speed cameras. These cameras yielded over 50,000 speeding detections (just under a quarter of all detections). This addition of red light cameras to the methods available for speed limit enforcement is therefore likely to prove useful in promoting specific deterrence.

Excluding dual purpose red light/speed cameras, the detection rate per hour for speeding offences in 2004 was the lowest for all the years since 2000. This was likely to be due to decreases in metropolitan speed camera enforcement (associated with the highest detection rates) and increases in rural non-camera device enforcement (associated with the lowest detection rates).

As was the case for previous years, 'excessive speed' was seriously underestimated as an apparent driver error in the TARS database. Consequently, meaningful analysis of serious injury and fatal crashes was limited due to under-reporting bias.

On-road travel speed surveys are not conducted in a systematic manner in urban areas and no such surveys were conducted in 2004. A survey of urban travel speeds will be conducted in 2005 in order to assess whether the reductions in travel speeds observed in 2003 have been maintained. One positive finding from rural speed surveys was that the small decreases in travel speeds that were observed on rural 60 km/h roads in 2003 were maintained in 2004.

During 2004, expenditure on speed-related publicity increased marginally (6.5%) from 2003 which, in turn, was characterised by markedly greater expenditure (up 39%) than 2002. These increases in spending were necessary, given the need for continued publicising of the recent (2003) reductions in speed limits.

RESTRAINT USE

Determining the effectiveness of restraint use enforcement was very difficult because no specific restraint enforcement campaigns were undertaken in 2004. The number of restraint offences provides some indication of the level of enforcement. The number of offences in 2004 was 15 percent lower than the number in 2003.

Unfortunately, there were no observational surveys in 2004 to provide data that could be used to determine the effectiveness of restraint use enforcement. Wearing rates for vehicle occupants involved in crashes are difficult to interpret because of the confounding nature of the relationship between crash injury and wearing rates in crashes (wearing restraints reduces injury). Furthermore, better records of restraint use for all vehicle occupants in serious and fatal crashes need to be kept to improve database reliability and accuracy.

Although overall restraint usage rates in 2004 are unknown, the higher likelihood of males being charged with restraint offences and of being unrestrained in fatal and serious injury crashes indicates that males remain an important target for restraint enforcement. Publicity designed to promote restraint use should also be aimed at males.

The amount of money spent on publicity in 2004 was significantly less than that in 2003. However, the expenditure in 2003 was much higher than that of previous years. The budget in 2004 still supported a mass media campaign incorporating both the metropolitan and rural areas. As in 2003, the campaign focused on the consequences of not using restraints rather than on enforcement.

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Appendix A

Table A1
Mean and 85th percentile free speeds on rural 60 km/h roads 2000-2004

	Freeling*	Nuriootpa*	Clare	Pt Lincoln	Naracoorte	Waikerie
Mean free speed (km/h)						
2000	57.9	66.0	63.0	64.3	55.0	61.1
2001	59.8	64.3	63.0	65.8	54.2	61.7
2002	58.1	65.1	60.8	64.9	55.4	59.6
2003			61.2	63.3	52.8	57.1
2004			59.8	62.7	53.2	55.4
85 pc speed (km/h)						
2000	68.1	73.1	69.8	74.2	63.8	68.6
2001	68.9	70.8	69.5	76.1	62.6	69.8
2002	67.1	71.5	66.9	75.0	63.9	66.8
2003			67.3	72.9	60.7	64.5
2004			66.2	72.8	60.8	62.4

* Speed limit changed from 60 to 50 km/h in 2003

Table A2
Free speed volumes and total traffic volumes on rural 60 km/h roads 2000-2004

	Freeling*	Nuriootpa*	Clare	Pt Lincoln	Naracoorte	Waikerie
Free speed volume						
2000	7,326	26,333	22,281	9,710	12,875	15,004
2001	7,967	26,591	22,285	9,613	13,103	14,835
2002	7,573	25,269	22,828	9,766	13,063	14,848
2003			22,607	9,795	12,885	14,514
2004			23,523	9,935	13,795	14,255
Total volume						
2000	7,677	32,913	27,568	10,304	13,736	15,004
2001	8,415	33,293	27,845	10,213	13,955	16,410
2002	7,910	30,857	28,312	10,358	13,848	16,475
2003			28,169	10,379	13,669	16,037
2004			29,344	10,607	14,721	15,816

* Speed limit changed from 60 to 50 km/h in 2003

Table A3
Mean and 85th percentile free speeds on rural 100 km/h roads 2000-2004

	Hart	Currency Creek	Belvidere	Lyndoch	Morgan	Kimba*	Yorketown#
Mean free speed (km/h)							
2000	104.4	86.7	93.2	96.4	98.1	109.3	
2001	106.5	86.9	92.7	92.9	96.2		
2002	104.3	85.5	93.6	99.0	95.7		
2003	105.4	87.1	93.1	97.3	98.3		97.9
2004	106.8	86.8	94.3	97.9	100.8		95.3
85 pc speed (km/h)							
2000	119.9	99.6	108.5	109.9	114.7	125.3	
2001	120.6	99.5	105.8	105.2	111.4		
2002	117.3	97.7	107.5	111.6	110.9		
2003	118.5	99.7	107.5	109.6	113.3		112.1
2004	118.9	98.8	107.9	109.3	115.3		110.3

* Speed limit changed from 100 to 110 km/h in 2001
# Speed limit changed from 110 to 100 km/h in 2003

Table A4
Free speed volumes and total traffic volumes on rural 100 km/h roads 2000-2004

	Hart	Currency Creek	Belvidere	Lyndoch	Morgan	Kimba*	Yorketown#
Free speed volume							
2000	1,228	15,620	4,815	10,241	1,393	1,397	
2001	1,766	16,815	5,049	10,045	1,360		
2002	1,690	17,206	5,216	10,015	1,319		
2003	1,669	18,108	5,328	11,759	1,137		2,521
2004	1,900	17,778	5,621	10,916	1,117		3,141
Total volume							
2000	1,237	18,954	5,196	11,658	1,425	1,455	
2001	1,803	20,840	5,488	11,749	1,390		
2002	1,720	21,344	5,638	11,336	1,345		
2003	1,698	22,746	5,782	14,049	1,162		2,638
2004	1,943	22,048	6,150	12,604	1,133		3,269

* Speed limit changed from 100 to 110 km/h in 2001
# Speed limit changed from 110 to 100 km/h in 2003

Table A5
Mean and 85th percentile free speeds on rural 110 km/h roads 2000-2004

	Kimba	Reedy Creek	Berri	Orroroo	Mosquito Creek	Yorketown#	Kimba*
Mean free speed (km/h)							
2000	104.8	110.0	103.6	97.0	106.4	100.0	
2001	101.8	108.3	98.9	98.2	106.9	97.9	110.4
2002	103.1	107.0	100.0	100.3	106.8	101.8	106.9
2003	103.4	107.3	102.1	99.8	107.9		107.5
2004	103.3	105.7	100.8	100.8	106.3		106.7
85 pc speed (km/h)							
2000	117.3	122.0	114.8	109.5	115.7	114.9	
2001	114.5	119.2	109.9	111.6	116.8	113.1	126.4
2002	114.9	117.1	111.0	114.3	115.4	116.0	119.8
2003	115.2	117.6	112.3	113.1	116.4		120.9
2004	114.7	115.9	110.8	113.5	114.7		117.5

* Speed limit changed from 100 to 110 km/h in 2001
# Speed limit changed from 110 to 100 km/h in 2003

Table A6
Free speed volumes and overall traffic volumes on rural 110 km/h roads 2000-2004

	Kimba	Reedy Creek	Berri	Orroroo	Mosquito Creek	Yorketown#	Kimba*
Free speed volume							
2000	3,439	3,894	17,226	3,574	9,999	2,723	
2001	3,498	3,725	17,819	3,335	10,124	2,715	1,027
2002	3,801	4,005	18,005	3,409	10,436	3,178	1,459
2003	3,838	4,203	17,719	3,660	10,760		972
2004	3,789	4,017	18,677	3,623	11,128		2,054
Total traffic volume							
2000	3,568	4,009	21,976	3,750	11,454	2,813	
2001	3,626	3,857	22,737	3,490	11,711	2,823	1,043
2002	3,948	4,159	22,990	3,592	12,023	3,304	1,512
2003	4,003	4,386	22,537	3,875	12,419		985
2004	3,955	4,183	24,034	3,813	13,002		2,151

* Speed limit changed from 100 to 110 km/h in 2001
# Speed limit changed from 110 to 100 km/h in 2003