Centre for
Automotive Safety Research

Annual performance indicators of enforced driver behaviours in South Australia, 2006

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CASR REPORT SERIES
CASR043
August 2008

THE UNIVERSITY
OF ADELAIDE
AUSTRALIA

Report documentation

REPORT NO.	DATE	PAGES	ISBN	ISSN
CASR043	August 2008	69	978 1 920947 47 7	1449-2237

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AVAILABLE FROM

Centre for Automotive Safety Research
http://casr.adelaide.edu.au/publications/researchreports

ABSTRACT

This report was produced to quantify performance indicators for selected enforced driver behaviours (drink driving, speeding and restraint use) in South Australia for the calendar year 2006. The level of random breath testing (RBT) in South Australia in 2006 increased by 7 per cent to its highest ever level. The detection rate based on evidentiary testing decreased in 2006 from the previous year but remained at a relatively high level, while the detection rate for screening tests increased to the highest level since recording commenced in 2003. There was an increase in the proportion of tests conducted using mobile RBT, which is due to the operation of unrestricted mobile RBT for the entire year for the first time. Detection rates in South Australia were comparable with those in other states.

There was an increase (7%) in the number of hours spent on speed detection in 2006 compared to 2005, partly due to three months of speed camera inactivity in 2005. Apart from an increase in speed camera detections, red light/speed camera detections also increased (by 30%) in 2006, most likely due to the expansion of the program. The detection rate (per hour of enforcement and per 1,000 vehicles passing speed cameras) increased for the first time since 2001 but remained at a relatively low level. No urban speed surveys were conducted in 2006 but rural surveys revealed a decrease in travel speeds on rural roads.

The number of restraint offences in 2006 was 13 per cent higher than the number in 2005. Males were charged with more restraint offences and were more likely to be unrestrained in fatal and serious injury crashes than females, indicating that males remain an important target for restraint enforcement. Publicity expenditure supporting restraint use decreased in 2006, most likely because an existing media campaign was used.

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 (DTEI) 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 2006.

For each of the driver behaviours, information was collected on the current levels and outcomes 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 assist in achieving these aims.

The main findings from the performance indicators for enforced behaviours in 2006 are summarised below.

DRINK DRIVING

In 2006, the level of random breath testing in South Australia increased slightly to its highest ever level. The increase from 2005 was concentrated in rural areas while the level of testing remained stable in the metropolitan area. There was also an increase in the proportion of tests conducted using mobile RBT, which was due to the operation of unrestricted mobile RBT for the entire year for the first time. The overall level of testing was greater than the recommended level of one in two licensed drivers and exceeded the set target.

Detection rates (drink drivers detected per 1,000 drivers tested) in South Australia based on evidentiary testing, decreased in 2006 but remained at a relatively high level. Contrary to this, the overall detection rate for screening tests increased in 2006 to the highest level since recording commenced in 2003. The detection rates for screening tests increased in both metropolitan and rural areas and for both static and mobile RBT. The contrasting findings for evidentiary and screening detection rates might be, at least partly, attributable to an increase in the number of drivers who recorded an illegal BAC on the screening test but then recorded a lower or negligible BAC on the evidentiary test after some time had elapsed.

Despite the increase in mobile testing, South Australia had the lowest proportion of testing conducted by mobile methods compared to six other Australian states. Nevertheless, South Australia had a much higher mobile screening detection rate per 1000 drivers tested than the two states (Victoria and Queensland) that provided comparative detection rates. Evidentiary detection rates in South Australia were similar to the evidentiary detection rates for comparison states Tasmania and New South Wales.

In contrast to previous years, in 2006 the ratio of mobile to static RBT detection rates were similar for metropolitan and rural areas, indicating that mobile RBT tests were equally efficient in detecting drink drivers in both environments. Consistent with previous years, static RBT was predominantly conducted at highly visible times (i.e. 4pm to 10pm) to enhance the deterrent effect of RBT while mobile RBT was conducted on days (later in the week) and at times (6pm – 2am) when detection rates were highest.

There was a substantial increase (40%) in the involvement of alcohol in fatal crashes in 2006 while data for serious injury crashes showed a similar level of alcohol involvement as the previous year. However, the BAC of drivers was unknown for a considerable percentage of serious injury crashes (37%) and fatal injury crashes (13%), as has been the case in previous

years. The high level of unknown BAC levels 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 2006, expenditure on anti-drink driving publicity decreased by 34 per cent. The decrease in spending was likely a result of lower production costs from the use of an existing campaign and that a considerable amount was spent on two new drug driving campaigns. The 2006 campaign encompassed both metropolitan and rural regions and used a variety of media. While the campaign focused on decision making, it tended to examine the decision to drive after drinking rather than earlier decisions such as how to get to the drinking venue.

SPEEDING

The number of hours spent on speed enforcement in South Australia in 2006 increased by 7 per cent to the highest recorded level. This total does not include hours of operation of dual purpose red light/speed cameras because this information was unavailable in 2006. Thus, the reported number of speed detection hours is an underestimate. Increases in speed detection hours were evident in both the metropolitan area and rural regions and for cameras but not non-camera devices.

Speed detection hours were concentrated during the daytime and were relatively evenly spread across the week. This provided a good balance between operation during high traffic periods (weekdays) and high speeding days (weekends) and increased general deterrence by operating during the day when most drivers are on the road. However, enforcement operations should also be altered to prevent the drop in speed camera detection hours during the lunch period (12-2pm).

After a lower number of speed detections in 2005 than in previous years (partly due to speed camera inactivity for three months), the number increased substantially in 2006. Apart from the increase in speed camera detections, red light/speed camera detections also increased by 30 per cent, most likely due to the expansion of the program. Around 24 per cent of licensed drivers in South Australia were detected for speeding, including speed detections from red light/speed cameras.

The overall detection rates in 2006 (excluding red light/speed camera detections), detections per hour of enforcement and per 1,000 vehicles passing speed cameras, increased for the first time since 2001, but remained at a relatively low level. Speed camera detection rates increased in both the metropolitan area and rural regions while detection rates remained similar to the previous year for non-camera devices.

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. Urban speed surveys were not conducted in 2006 but are expected to recommence in 2007. Data from regular rural speed surveys found that travel speeds on 50, 60, 100 and 110km/h zoned roads in rural areas decreased slightly in 2006.

During 2006, expenditure on speed-related publicity decreased significantly from 2005 because an existing campaign was used. While the timing of the publicity campaign coincided with speed enforcement operations, the campaign did not attempt to raise drivers’ perceived risk of detection.

RESTRAINT USE

Determining the effectiveness of restraint use enforcement was difficult because of the lack of information on specific hours of restraint enforcement undertaken in 2006. The number of restraint offences provides some indication of the level of enforcement. Restraint offences in 2006 increased by 13 per cent.

No observational surveys were undertaken in 2006 to provide data that could assist in determining 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 2006 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 use enforcement.

The amount of money spent on restraint use publicity in 2006 decreased by around 27 per cent, predominantly due to a reduction in production costs from using an existing campaign. Although the publicity campaign accompanied police enforcement operations, the campaign focused on the consequences of not using restraints rather than increasing the perceived risk of detection.

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 performance indicators of selected enforced driver behaviours in South Australia on an annual basis.

The specific aim of this report was to assess performance indicators related to drink driving, speeding and restraint use in South Australia for the calendar year 2006. The findings from this report are important for the evaluation and planning of future enforcement operations concerned with these driver behaviours.

For each of the driver behaviours, information was collected on the current levels of police enforcement operations and detections, 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 analysed. Note that there were considerable problems with data on police enforcement operations and detections in 2005 resulting in the unavailability of some 2005 data.

The first section of the report examining drink driving continues on from other annual reports discussing the operations and effectiveness of RBT (White & Baldock, 1997; Baldock & Bailey, 1998; Hubbard, 1999; Wundersitz & McLean, 2002). From 2002 onwards, the annual report also evaluated the two other major enforceable behaviours, speeding behaviour and restraint use (see Wundersitz & McLean, 2004; Wundersitz, Baldock, Woolley & McLean, 2007; Baldock, Woolley, Wundersitz & McLean, 2007; Wundersitz & Baldock, 2008). Consequently, in this report RBT data are presented from 1996 to 2006 while speeding and restraint use data are included for the years 2000 to 2006 to analyse short-term trends.

2 Drink driving and random breath testing

The first section of this report describes the operation and effectiveness of random breath testing (RBT) in South Australia for the calendar year 2006 in terms of the number of tests, the percentage of licensed drivers tested, detection rates, and alcohol involvement in serious and fatal road crashes. RBT statistics from a number of other Australian states are also provided, enabling a comparison between South Australian practices and those of the police in other Australian jurisdictions. In addition, anti-drink driving publicity during 2006 is reviewed.

2.1 RBT practices and methods of operation

Random breath testing (RBT) is a form of drink driving enforcement that was first introduced into Australia, in the state of Victoria, in 1976 (Harrison *et al.*, 2003). Other states introduced RBT in the 1980s, with South Australia first implementing RBT in 1981.

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.

The Traffic Intelligence Section of the South Australian Police (SAPOL) provided the following information about RBT operations. Note that this report provides a brief overview of drink driving practices and methods of operation in 2006. For a detailed analysis, see Wundersitz and Woolley (2008) In South Australia, RBT operations are conducted using either 'static' or 'mobile' methods. Traditional static or stationary RBT involves setting up checkpoints on the side of the road. Motorists passing these points are randomly selected to be pulled over to the side of the road where they must submit to a preliminary breath test.

Mobile RBT was first introduced in New South Wales in late 1987 and has subsequently been introduced into all Australian states. Mobile RBT allows police in any mobile vehicle (i.e., car or motorcycle) to stop vehicles at random and breath test the driver. An important part of RBT is that any driver may be pulled over and breath tested without any suspicion that the driver is impaired by alcohol. 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. South Australia was the only Australian jurisdiction to restrict mobile testing to 'prescribed periods'. Legislation passed through state parliament in June 2005 enabling mobile random breath testing to be conducted on a full-time basis rather than only during prescribed periods. Consequently, 2006 is the first year in which data for full-time mobile testing is available for the entire 12-month period.

All general patrol and traffic vehicles are equipped with a preliminary breath testing device (925 alco-testers were available in 2006). 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, used in prosecution. At static RBT sites, evidentiary testing is either conducted in special vans (16 vans available in 2006), a smaller version of the traditional booze bus, or at a suitably equipped police station. Drivers testing over the legal limit with mobile RBT are usually driven to the nearest police station or static RBT site.

Evidentiary testing must be completed within two hours of the last known time of driving. Those found to be over the prescribed limit for the evidentiary test are officially recorded as having exceeded the prescribed concentration of alcohol. There were 107 evidentiary breath testing instruments available for use in South Australia in 2006.

The coordination of RBT activities was decentralised in 2000. Drink drive enforcement is now the responsibility of the 14 Local Service Areas (LSAs) in South Australia of which six are located in the Adelaide metropolitan area and eight in rural regions. A Commander in each LSA has the responsibility of ensuring drink driving enforcement targets are met and that the operations are efficient and effective. SAPOL previously had a centrally controlled RBT unit that travelled out to LSAs and assisted in additional RBT activities. In late 2006 this unit was disbanded and a new drug-testing group absorbed the former structure.

A number of enforcement activities are targeted for various periods during the year by SAPOL. Drink driving was a target behaviour during January, April, September and December in 2006. In addition, a statewide operation targeting metropolitan drink driving "Operation Consequence" was undertaken in five parts throughout 2006 (February, March, August, September, and December). A schedule of targeted driver behaviours are published in an annual road safety enforcement calendar produced in conjunction with the Motor Accident Commission and the Government of South Australia.

In South Australia, the prescribed BAC limit has been 0.05g/100ml since July 1991. If apprehended with a BAC level of 0.05 to 0.079g/ml, the fully licensed driver incurs a Traffic Infringement Notice (TIN), an expiation fee, and a penalty of three demerit points. Drivers convicted of a second or subsequent offence at this BAC level also receive a licence suspension for a minimum of three months. If detained with a BAC level of 0.08g/ml 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. In December 2005, heavier penalties for drink driving were introduced: immediate loss of licence for six months for a BAC level of 0.08 – 0.149g/ml and immediate loss of licence for 12 months for a BAC level of 0.150g/ml or above.

2.1.1 Number of tests performed

The following sections examine RBT in terms of levels of testing and detections, based on data from SAPOL. Note that some 2005 data were not available due to problems with data migration and extraction from a new SAPOL data warehouse.

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 1996 to 2006 for 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, 1996-2006

Year	Metro	Rural	Total	% difference from previous year
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[a]	-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
2005[b]	399,612	247,246	646,858	-1.0
2006	399,967	290,920	690,891	6.8

[a] 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.

[b] Data for 2005 differs from the previous report due to recent improvements in data extraction.

In 1997, a testing target of 500,000 breath tests per year in South Australia was set by SAPOL. As a result, the number of tests in 1997 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 from 1999 to 2005. In 2006, the testing target was increased to 612,000 (combined static and mobile) with the intention that an average of one in every two licensed drivers is tested in South Australia.

The total number of tests (690,891) conducted in 2006 exceeded the target of 612,000. This level of testing was about 7 per cent higher than the previous year and the highest on record. RBT testing levels remained stable (0.1% increase) in the metropolitan area and increased notably, by 18 per cent, in rural areas.

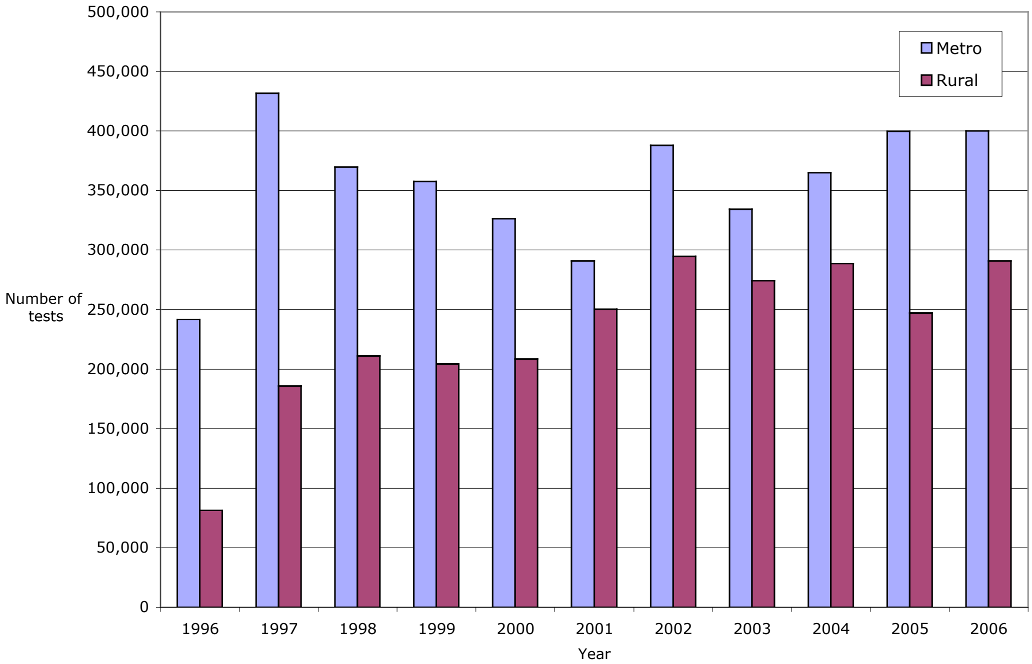

Figure 2.1
Number of random breath tests in South Australia, 1996-2006

Table 2.2 shows the number of random breath tests conducted from 2003 to 2006 by static and mobile testing methods. The low proportion of mobile RBT testing in 2003 would be due to mobile RBT commencing operation only in September of that year. In 2004, mobile RBT was operating for the full 12 months but only during prescribed periods. The proportion of mobile testing increased in 2005, most likely due to the extension of mobile RBT to full time in June 2005. The proportion of mobile testing increased further to almost 17 per cent in 2006, the first calendar year in which full time mobile RBT was operating for the whole period.

Table 2.2
Number of random breath tests conducted in South Australia by testing method, 2003-2006

Year	Static	Mobile	Total	% Mobile
2003	595,458	13,191	608,649	2.2
2004	607,303	46,030	653,333	7.0
2005 [a]	567,710	79,148	646,858	12.2
2006	576,261	114,630	690,891	16.6

[a] Data for 2005 differs from the previous report due to recent improvements in data extraction.

DAY OF WEEK

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 1996 to 2006 are presented in Table 2.3. Consistent with previous years, the greatest proportion of testing in 2006 was performed on Friday, Saturday and Sunday.

Table 2.3
Random breath tests performed by day of week, 1996-2006 (expressed as a percentage of total tests each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
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
2005	13.6	7.3	7.7	13.2	20.2	21.8	16.1
2006	10.1	10.1	8.3	10.4	20.3	24.0	16.7

Table 2.4 shows the day of week RBT data from 2004 to 2006 split into static and mobile RBT components. The day of week of testing by the two methods in 2006 was similar to previous years with testing conducted predominantly on Friday and Saturday. Static testing was slightly more common on Sundays than mobile testing.

Table 2.4
Random breath tests performed by day of week in 2004-2006 (expressed as a percentage of total tests each year) for static and mobile RBT

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2004							
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
2005							
Static	13.9	7.1	7.7	13.8	20.5	21.2	15.8
Mobile	11.0	8.8	7.6	9.1	18.7	26.4	18.5
2006							
Static	10.1	10.2	8.0	10.1	20.4	24.0	17.2
Mobile	10.5	9.1	9.7	11.7	20.1	24.3	14.6

TIME OF DAY

The percentage of tests performed from 1996 to 2006 by time of day is summarised in Table 2.5. RBT was conducted most commonly between 2pm and midnight, particularly between 6 and 10pm. There were relatively low levels of testing between midnight and 6am. These patterns are consistent with previous years.

Table 2.5
Random breath tests performed by time of day, 1996-2006 (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
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
2005	5.6	2.9	2.1	20.4	11.2	11.2	15.0	17.1	14.6
2006	4.2	3.1	2.4	22.4	10.0	11.6	17.4	17.1	11.8

Table 2.6 shows time of day data for 2004 to 2006, separately for static and mobile RBT. Similar to previous years, in 2006 static RBT was favoured by police during the hours from 4pm to 10pm while mobile RBT was favoured in the hours from 10pm to 2am.

Table 2.6
Random breath tests performed by time of day in 2004-2006 (expressed as a percentage of total tests in the year) for static and mobile RBT

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
2004									
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
2005									
Static	4.8	2.8	2.2	20.6	11.7	11.4	15.3	17.2	14.1
Mobile	11.1	3.6	1.8	18.9	7.8	9.3	13.0	16.4	18.0
2006									
Static	3.2	3.1	2.6	22.0	10.2	12.2	18.1	17.4	11.2
Mobile	9.0	3.2	1.4	24.1	9.1	8.9	13.7	15.8	14.8

The percentage of RBT tests per month, by location for static and mobile testing in 2006 are shown in Table 2.7. The data for static RBT by month shows slightly lower levels of testing during the winter months, probably due to the effects of wet weather. For both static and mobile testing, higher levels of testing are associated with Easter (April), Christmas and school holidays. Note that higher levels of testing were also evident in the months in which police specifically targeted drink driving: January (mobile only), April, September, and December.

Table 2.7
Random breath tests by month in 2006 (expressed as a percentage of total tests in the year), by location for static and mobile RBT

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	6.5	6.2	6.4	11.8	8.2	9.7
Feb	9.4	7.6	8.7	6.0	6.6	6.4
Mar	9.1	10.7	9.7	11.7	10.9	11.3
Apr	8.7	16.2	11.6	9.5	10.1	9.8
May	5.5	6.1	5.7	7.1	6.9	6.9
Jun	7.5	4.7	6.4	8.6	7.0	7.7
Jul	4.5	3.2	4.0	5.5	5.0	5.2
Aug	10.2	9.3	9.9	5.9	9.2	7.8
Sep	9.9	10.9	10.3	10.7	9.3	9.8
Oct	7.3	5.8	6.7	6.8	6.9	6.9
Nov	7.7	6.5	7.2	7.6	7.3	7.5
Dec	13.7	12.8	13.4	8.8	12.5	11.0
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 1996 to 2006 is presented in Table 2.8 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). Just over 66 per cent per cent of licensed drivers were tested in 2006. However, it is difficult to make comparisons with previous years as a new licensing database was used in 2006 to determine the number of licensed drivers.

Table 2.8
Number and percentage of licensed drivers tested in South Australia, 1996-2006

Year	Number of tests	Number of licensed drivers [a]	% of licensed drivers tested
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
2005	646,858	1,093,550	59.2
2006	690,891	1,042,774 [b]	66.3

Note. Licence information could only be extracted for the financial year to June 30.
[a] Source: DRIVERS database, Registration and Licensing Section, DTEI.
[b] Source: TRUMPS database, Registration and Licensing Section, DTEI.

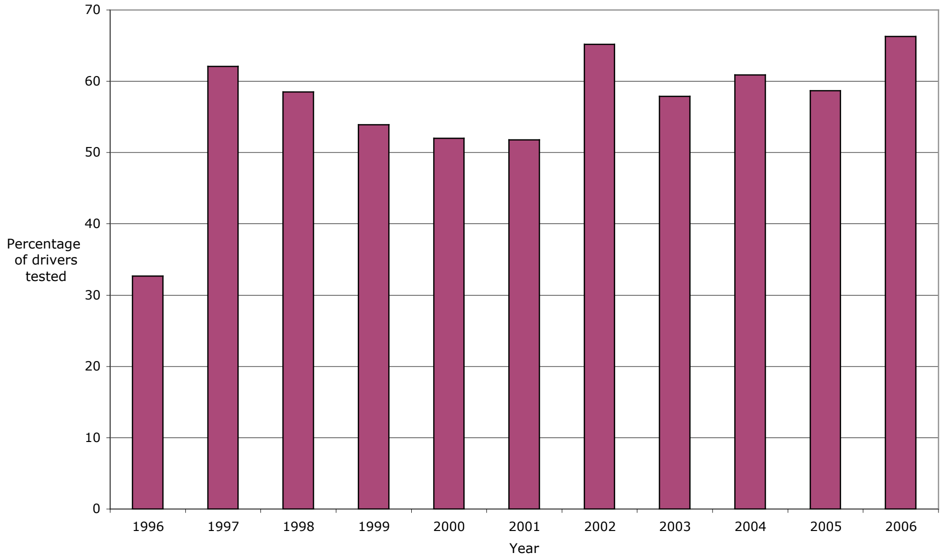

Figure 2.2
Percentage of licensed drivers tested, 1996-2006

2.1.3 Interstate comparisons

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. Table 2.9 shows the levels of overall RBT in seven Australian jurisdictions, including South Australia, with total numbers expressed, where possible, in terms of the relative contributions of mobile and static testing methods. In 2006, the highest levels of RBT were conducted in New South Wales and Victoria, followed by Queensland. Although full time mobile RBT operated for the entire 12-month period in South Australia, the proportion of all RBT that was conducted using mobile testing methods was much higher in all other jurisdictions than in South Australia.

Table 2.9
Number of random breath tests conducted in six Australian jurisdictions in 2006, by testing method

Jurisdiction	Static	Mobile	Total	% Mobile
South Australia	576,261	114,630	690,891	16.6
New South Wales	2,839,180[a]	700,401	3,539,581	19.8
Northern Territory	UK	UK	41,950	UK
Queensland	1,945,700[b]	977,737	2,923,437	33.4
Tasmania	207,605	471,035	678,640	69.4
Victoria	2,603,420[c]	842,472	3,445,892	24.4
Western Australia	UK	UK	766,238[d]	UK

[a] Total includes 198,089 tests conducted from RBT 'bus units'
[b] Total includes 224,100 tests conducted using RBT 'booze buses'.
[c] Total includes 1,365,520 tests conducted using RBT 'booze buses'.
[d] Total includes 270,561 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. To avoid any difficulties associated with differences in licensing conditions across jurisdictions, a simpler measure is breath tests per head of population. As population here refers to total population, and not driving age population, the figures in Table 2.10 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 2.10), the highest rates of RBT were reported for Tasmania, followed by Queensland and Victoria. South Australia's level of RBT was similar to the level reported in 2005 (42%), and higher than levels in the Northern Territory and Western Australia. The pattern of results in 2006 are very similar to those reported for 2005 (see Wundersitz & Baldock, 2008).

Table 2.10
Number of random breath tests conducted in six Australian jurisdictions in 2006, as a percentage of population

Jurisdiction	Total	Pop 2006 [a]	% of Pop
South Australia	690,891	1,575,700	43.9
New South Wales	3,539,581	6,854,800	51.6
Northern Territory	41,950	212,600	19.7
Queensland	2,923,437	4,132,000	70.8
Tasmania	678,640	491,700	138.0
Victoria	3,445,892	5,165,400	66.7
Western Australia	766,238	2,081,000	36.8

[a] Source: Estimated resident population data from Australian Bureau of Statistics (2007) *Australian Demographic Statistics, December 2006*. Catalogue No 3101.0.

2.2 Levels of drink driving

2.2.1 RBT detections

The number of RBT detections, for the years 2000 to 2006, is shown in Table 2.11. Note that RBT detections in this table refer only to drivers who 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 2.11. The number of RBT detections has risen each year from 2000 to 2005. In 2006, the number of detections decreased for the first time (by 11%) to a level of 4,419 detections.

Table 2.11
Number of RBT detections in South Australia, 2000-2006

Year	Number of RBT detections	Per cent change from previous year
2000	1,495	NA
2001	2,002	33.9
2002	2,108	5.3
2003	2,725	29.3
2004	3,503	28.6
2005	4,973	42.0
2006	4,419	-11.1

2.2.2 RBT detection rates

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 remember that detection rates are also affected by operational factors such as the locations, times and types of RBT enforcement used.

The RBT detection rates for the metropolitan and rural areas for the years 1996 to 2006 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. The overall RBT detection rate in 2006 was lower than in 2005, but remained at a relatively high level in comparison to previous years. Likewise, the detection rate in both metropolitan and rural areas was lower than the previous year but remained at a relatively high level.

Table 2.12
RBT detection rates, 1996-2006 (number of drivers detected with an Illegal BAC per thousand tested)

Year	Metro	Rural	Total
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
2005	8.3	6.7	7.7
2006	7.1	5.5	6.4

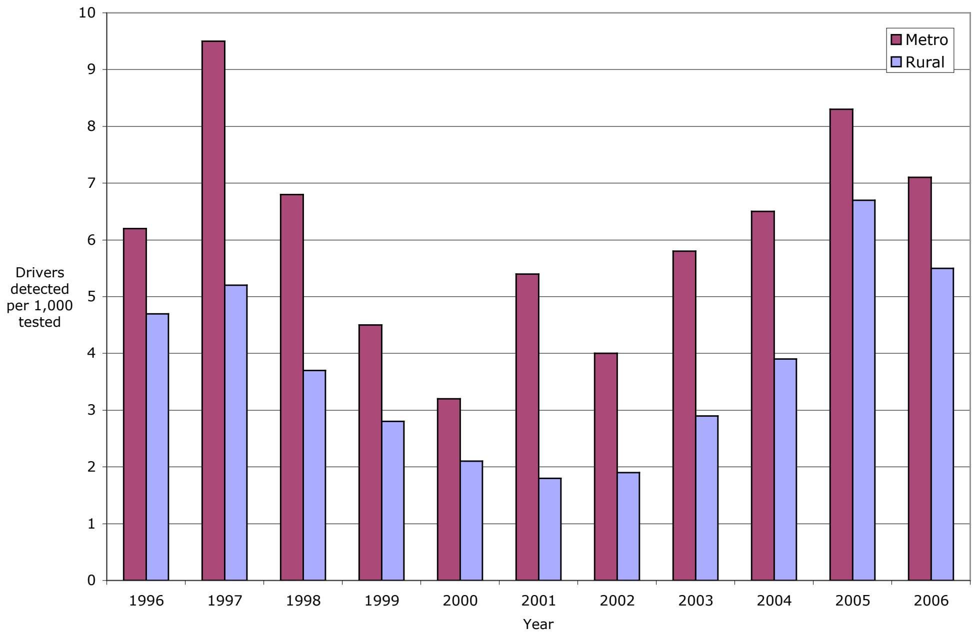

Figure 2.3
RBT detection rates per thousand tests, 1996-2006

The detection rates associated with static and mobile RBT in metropolitan and rural areas from 2003 to 2006 are shown in Table 2.13. Note 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 may be lower, and could reduce to a legal level on a later evidentiary test).

Table 2.13 clearly shows that mobile RBT continues to detect a greater percentage of drink drivers than static RBT. Contrary to the detection rate based on evidentiary testing, the overall detection rate based on screening tests has increased from 9.3 per cent in 2005 to 14.3 per cent in 2006. Static and mobile detection rates in both metropolitan and rural areas are at the highest levels recorded.

In previous years, the ratio of mobile to static RBT detection rates has shown that mobile RBT is consistently more effective in rural areas. However, during 2006 the ratios were similar in metropolitan and rural areas.

Table 2.13
RBT detection rates (screening test only), 2003-2006 (number of drivers detected with an Illegal BAC per thousand tested) for static and mobile RBT, by location

Year and location	Static	Mobile	Ratio of mobile to static
2003			
Metro	5.2	51.7	9.9
Rural	1.8	34.5	19.2
Total	3.7	40.0	10.8
2004			
Metro	8.3	38.7	4.7
Rural	2.2	25.4	11.5
Total	5.7	29.0	5.1
2005			
Metro	8.6	32.4	3.8
Rural	2.9	27.4	9.4
Total	6.6	29.3	4.4
2006			
Metro	9.9	57.4	5.8
Rural	6.1	34.0	5.6
Total	8.4	43.5	5.2

TIME OF DAY

Table 2.14, showing RBT detection rates (evidentiary test results) by time of day, indicates that the highest detection rates in 2006, for both metropolitan and rural areas, were between midnight and 6am.

Table 2.14
RBT detection rates by time of day, 2000-2006
(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
2005									
Metro	Data not available								
Rural	Data not available								
Total	Data not available								
2006									
Metro	38.45	27.12	31.80	14.16	1.50	3.80	2.38	5.74	5.03
Rural	34.26	92.48	23.32	8.41	0.97	2.10	4.20	5.72	8.60
Total	36.79	35.64	29.57	11.68	1.16	2.70	2.95	5.73	5.99

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. Similar to evidentiary testing data, higher RBT detection rates were observed at night, from 10pm to 6am in 2006. This trend was evident in both the metropolitan area and rural regions. Static detection rates were highest from 10pm to 6am while mobile detection rates were also generally highest from 10pm to 6am but also from 6am to 2pm.

Table 2.15
RBT detection rates (screening test only) in 2006
(number of drivers detected with an Illegal BAC per thousand tested) by time of day and location

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
Static									
Metro	22.9	21.0	11.4	4.5	3.0	5.2	6.5	6.9	23.3
Rural	15.5	8.1	3.2	2.2	2.5	3.3	6.6	8.8	35.1
Total	21.0	20.2	9.3	3.5	2.7	4.0	6.6	7.5	25.5
Mobile									
Metro	99.5	70.9	66.4	107.7	19.5	41.6	25.0	29.6	162.2
Rural	45.0	51.1	46.5	39.9	18.9	38.1	37.3	27.5	75.3
Total	63.7	61.7	59.8	63.7	19.1	39.5	32.7	28.6	112.7
Both									
Metro	38.4	26.3	16.4	7.5	5.5	10.3	7.9	9.6	40.3
Rural	32.9	34.2	8.5	4.1	5.0	7.4	14.6	12.8	53.0
Total	36.2	27.3	14.3	5.9	5.1	8.4	10.0	10.7	43.7

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 calculated. The results, shown in Table 2.16, indicate that in terms of detection, mobile RBT is generally more effective during the day from 4am to 6pm. In addition to these times, mobile RBT also appears to be advantageous in detecting drink drivers in metropolitan areas at night from 10pm to midnight. Mobile RBT appears to have a similar beneficial effect in metropolitan and rural areas.

Table 2.16
The ratio of mobile to static RBT detection rates in 2006, 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	4.3	3.4	5.8	23.8	6.6	8.0	3.8	4.3	7.0
Rural	2.9	6.3	14.7	17.8	7.6	11.6	5.6	3.1	2.1
Total	3.0	3.0	6.4	18.1	7.2	10.0	5.0	3.8	4.4

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. For both static and mobile testing, 2006 detection rates were higher later during the week in metropolitan and rural areas. Of interest, mobile detection rates, particularly in the metropolitan area, were also high on Monday. This is most likely due to many public holidays occurring on a Monday.

Table 2.17
RBT detection rates (screening tests only) in 2006
(number of drivers detected per 1,000 tested) by day of week and location

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Static							
Metro	4.9	3.4	10.5	6.3	12.2	15.7	8.1
Rural	2.0	2.3	3.1	5.6	6.0	9.4	7.8
Total	3.6	3.1	7.9	6.0	9.8	13.1	8.0
Mobile							
Metro	97.6	36.7	28.9	39.6	54.7	63.4	67.9
Rural	24.6	18.9	27.8	41.6	35.5	41.9	31.2
Total	58.9	26.6	28.3	40.7	42.7	50.2	45.6
Both							
Metro	18.5	6.8	13.1	11.2	16.7	21.3	13.8
Rural	6.5	6.3	10.0	14.0	13.2	16.9	12.9
Total	13.1	6.6	11.9	12.5	15.2	19.3	13.4

RBT DETECTION RATES BY MONTH

Static and mobile RBT detection rates by month are shown in Table 2.18 for both metropolitan and rural areas for 2006. Note, again, that these detection rates refer to the results of screening tests, not evidentiary tests. For both static and mobile testing, detection rates were higher during the first few months of the year, especially in January.

Table 2.18
RBT detection rates by month in 2006
(number of drivers detected with an Illegal BAC per thousand tested), by location

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	25.2	10.0	19.5	209.2	46.3	127.2
Feb	20.3	11.1	17.2	44.5	65.6	57.5
Mar	14.8	13.4	14.2	15.5	40.1	29.6
Apr	5.2	5.8	5.5	40.0	38.2	38.9
May	10.3	6.3	8.7	52.9	38.5	44.5
Jun	7.9	7.9	7.9	43.4	32.9	37.7
Jul	5.6	6.5	5.8	26.6	23.7	25.0
Aug	7.7	3.3	6.1	53.6	23.1	32.4
Sep	6.2	3.8	5.2	25.3	23.0	24.0
Oct	4.9	2.6	4.1	49.4	21.7	32.9
Nov	4.1	3.1	3.8	30.3	45.4	39.1
Dec	7.6	2.1	5.5	44.8	18.9	27.3
Total	9.9	6.1	8.4	57.4	34.0	43.5

RBT DETECTION RATES BY SEX

Table 2.19 shows the detection rates for males and females from 1996 to 2006, based on evidentiary testing data and the number of licensed drivers of each gender. The detection rate was expressed in terms of the number of licence holders because police do not record the sex of drivers tested who do not have an illegal BAC. It should be noted that the sum of the number of male and female licence holders differs from the number of licence holders in Table 2.8 because there were 7752 cases for which sex was unknown. However, the difference does not affect the pattern of drink driving activities evident in the data.

Table 2.19
Number of licence holders, RBT detection rate and comparative ratio of detection rate by sex, 1996-2006

Year	Male			Female			
	Licence holders	Detected by RBT	RBT detection rate (per thousand licensed)	Licence holders	Detected by RBT	RBT detection rate (per thousand licensed)	Ratio of male to female RBT detection rate
1996	532,486	1,207	2.27	458,138	318	0.69	3.29
1997	543,017	3,254	5.99	467,155	1,051	2.25	2.66
1998	553,878	2,121	3.83	475,667	603	1.27	3.02
1999	556,399	1,740	3.13	482,038	464	0.96	3.26
2000	542,811	1,197	2.21	480,120	299	0.62	3.56
2001	553,141	1,561	2.82	486,509	441	0.91	3.10
2002	552,451	1,665	3.01	488,723	443	0.91	3.31
2003	553,702	2,170	3.92	492,448	555	1.13	3.47
2004	563,389	Data not available		502,828	Data not available		
2005	574,093	Data not available		512,926	Data not available		
2006	535,440	3,485	6.51	501,470	934	1.86	3.50

Note. The number of licence holders was obtained from the DRIVERS database from 1996-2005. 2006 data was obtained from TRUMPS, Registration and Licensing Section, DTEI.

The ratio of male to female drink drive detection rates in 2006 indicated that, on average, males were 3.5 times more likely to be detected than females. This reinforces the notion that drink driving continues to be a problem among male drivers.

RBT DETECTIONS BY BAC READING

The number of drink drivers detected by RBT in metropolitan and rural regions by BAC category is displayed in Table 2.20. The table includes all drivers detected during evidentiary testing because BACs are not recorded for the screening test. Thus, BAC readings are not available separately for static and mobile RBT. Note that the BAC categories have changed in 2006. A number of BAC readings were recorded in the range from zero to 0.049. These low readings may be attributed to some drivers having 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. Overall, 17 per cent recorded a high BAC level, that is, a BAC of 0.150 and above. Rural regions recorded a greater proportion of drivers with a high BAC level (22%) than the metropolitan area (14%).

Table 2.20
Number of drivers detected by RBT by BAC category and region, 2000-2006

	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
2005									
Metro	Data not available								
Rural	Data not available								
Year	Zero	0.001-0.049	0.050-0.079	0.080-0.149	0.150+			Refused	Total
2006									
Metro	0	285	827	1,321	388			0	2821
Rural	0	145	360	742	351			0	1598

2.2.3 Interstate comparisons

Data concerned with RBT detections were obtained from a number of Australian jurisdictions and are shown in Table 2.21. Again, for ease of comparison, these are expressed in terms of detections per head of population. Some jurisdictions provided screening test data and others provided evidentiary test data. Consequently, Table 2.21 is split into screening and evidentiary testing detections to allow meaningful comparisons. South Australian RBT detections are given for both screening and evidentiary testing.

The screening test data shows that two of the eastern states, for which data are available, had the highest number of RBT detections in 2006. When adjusted for population, Queensland and Western Australia had a higher detection rate than South Australia while Victoria reported a lower rate. Concerning evidentiary testing, the detection rate for South Australia was similar to New South Wales but lower than Tasmania. Note that the number of detections in New South Wales during 2006 is much less than in 2005 (see Wundersitz & Baldock, 2008) because detections from crashes were previously included in this total.

Table 2.21
RBT detections in 2006 in six Australian jurisdictions

	Jurisdiction	RBT Detections	% of Population [a]
Screening	South Australia	9,846	0.62
	Queensland	31,313	0.76
	Western Australia [b]	14,837	0.71
	Victoria [c]	25,309	0.49
Evidentiary	South Australia	4,419	0.28
	New South Wales	19,820	0.29
	Tasmania	4,331	0.88

[a] Source: Estimated resident population data from Australian Bureau of Statistics(2007) *Australian Demographic Statistics, December 2006.* Catalogue No 3101.0.

[b] Includes 4,212 detections conducted at a booze bus (evidentiary testing).

[c] Includes 5,543 detections conducted at a booze bus (evidentiary testing).

Detection rates taking into account the number of drivers tested, are a better indicator of the effectiveness of RBT enforcement than rates per head of population. Data were available to calculate RBT detection rates per thousand drivers tested in six Australian jurisdictions, including South Australia. South Australian detection rates are compared to rates in these jurisdictions for static and mobile methods, in 2006, in Table 2.22. Once again, to make meaningful comparisons, detection rates are given separately for screening and evidentiary testing. South Australia had a detection rate per thousand tested on screening devices that was higher than Queensland and Victoria but slightly lower than Western Australia. South Australia recorded the highest static (8%) and mobile (44%) detection rate for screening test data of these jurisdictions. With respect to evidentiary testing, South Australia's detection rate was similar to both Tasmania and New South Wales.

Table 2.22
RBT detection rates, 2006, (number of drivers detected with an illegal BAC per thousand tested) for selected Australian jurisdictions for static and mobile

Testing	Jurisdiction	Static	Mobile	Total
Screening	South Australia	8.4	43.5	14.3
	Queensland	7.7	16.8	10.7
	Western Australia [a]	UK	UK	19.4
	Victoria [b]	3.0	20.7	7.3
Evidentiary	South Australia	UK	UK	6.4
	New South Wales	2.0	20.2	5.6
	Tasmania	2.7	8.0	6.4

[a] Includes 4,212 detections conducted at a booze bus (evidentiary testing).

[b] Includes 5,543 detections conducted at a booze bus (evidentiary testing).

Overall, in 2006, South Australia had the third lowest rate of testing per head of population (out of 7 jurisdictions for which data were available), the lowest proportion of tests conducted using mobile methods (out of five), but comparable drink driving detection rates per capita and per thousand tested.

2.2.4 Blood alcohol levels of seriously and fatally injured drivers

The BAC levels of drivers and motorcycle riders involved in road crashes can also be used to measure the effectiveness of random breath testing. 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 with higher BAC levels should decrease.

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

Table 2.23 and Figure 2.4 show the BAC distributions of drivers who were fatally injured in a road crash and for whom a BAC was recorded. The results for 2006 are indicative of slightly higher levels of alcohol involvement in fatal crashes than in the previous year. The percentage of fatally injured drivers with a BAC above 0.05 increased to 40 per cent in 2006, the highest level for the period recorded in the table. The percentage of drivers with a BAC level above 0.100 increased slightly from 31.1 per cent in 2005, to 34.3 per cent in 2006. However, 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 2.24 and Figure 2.5 for the results for serious injuries). Although, the proportion of known BAC levels increased in 2006 to around 87 per cent, the level is relatively low compared to the years prior to 2005. The low proportion of known cases is of considerable concern because BAC data for deceased drivers should be routinely acquired from autopsy toxicology reports.

Table 2.23
Percentage of drivers and motorcycle riders fatally injured in road crashes by known BAC category, 1996-2006

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
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
2005	55.41	10.81	1.35	1.35	10.81	20.27	0.00	33.78	74	80.43	92
2006	54.29	5.71	4.29	1.43	20.00	11.43	2.86	40.00	70	87.50	80

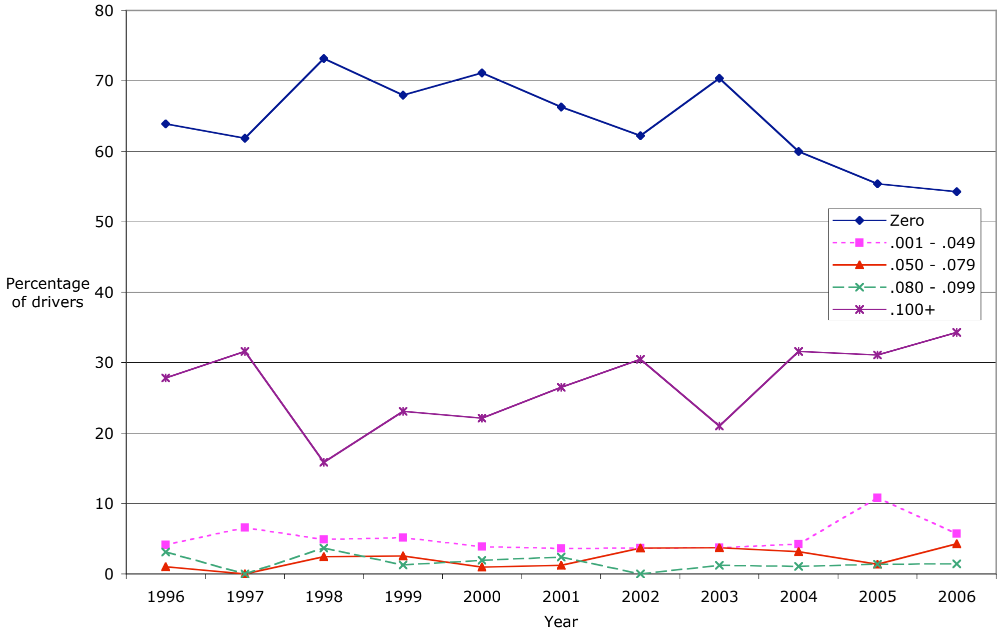

Figure 2.4
Percentage of drivers and motorcycle riders fatally injured by known BAC category, 1996-2006

The percentage of drivers seriously injured by known BAC levels is presented in Table 2.24 and shown graphically in Figure 2.5. 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 2006, approximately 22 per cent of drivers seriously injured in a crash had a BAC of .050 or greater, which was similar to the previous year. The percentage of drivers with a BAC above 0.100 in 2006 was 17.8 per cent, comparable to previous years. Note that the percentage of seriously injured drivers with a BAC above 0.100 was considerably lower than the percentage above this BAC level for fatally injured drivers (34.3%, refer to Table 2.23). The percentage of known BAC levels for seriously injured drivers in 2006 decreased slightly to a relatively low level of 63 per cent.

In summary, these results are indicative of a slightly higher level of alcohol involvement in fatal injury crashes and similar levels of alcohol involvement for serious injury crashes during 2006 compared to previous years.

Table 2.24
Percentage of drivers and motorcycle riders seriously injured in road crashes by known BAC category, 1996-2006

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
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
2005	75.15	2.74	1.76	1.57	14.09	4.11	0.59	22.11	511	66.36	770
2006	74.02	3.74	2.43	2.06	14.02	3.74	0.00	22.24	535	63.02	849

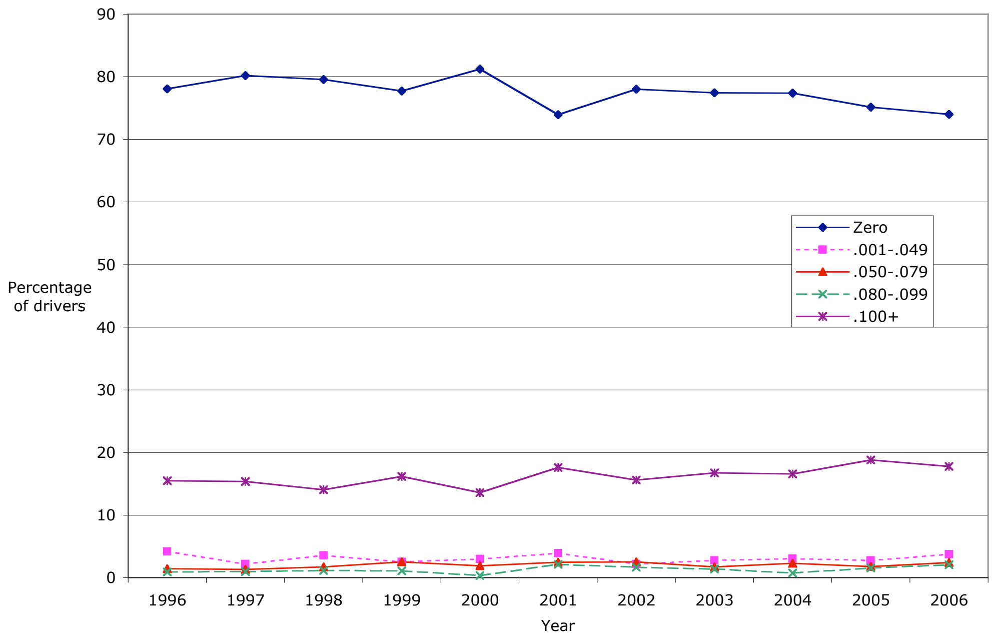

Figure 2.5
Percentage of drivers and motorcycle riders seriously injured by known BAC category, 1996-2006

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 drivers' 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 2006, publicity campaigns continued to target drink driving and support random breath testing operations. The publicity campaign previously used in 2005, "0.05. The Point of No Return", continued throughout 2006 in the Adelaide metropolitan area and South Australian rural regions. The campaign intended to provide drivers with an incentive to comply with drink driving laws by highlighting the potential risks and consequences of drink driving such as causing injury/death to others or themselves and the risk of being caught by police and losing their licence. The fact that these consequences may be experienced when only slightly over the 0.05 BAC legal limit after having "just a few drinks" was an important focus of the campaign. This campaign also aimed to reinforce the importance and responsibility of designated drivers. The main target audience was young drivers, particularly males aged 16 to 39 years, with an emphasis on those in rural areas.

The campaign included two television commercials. One featured a central male character "Twin Boy", and the other featured a central female character "Twin Girl". These commercials depicted the consequences of what happens if a driver is just a bit over the legal limit. For example, a driver may be able to steer a vehicle but their ability to make decisions is impaired.

The television campaign was aired in three phases: April to accompany the Easter period, September to coincide with football finals, and in December to tie in with Christmas. The timing closely coincides with SAPOL enforcement operations. The campaign was accompanied by Internet advertising on the official Australian Football League websites of the Adelaide Crows and Port Power, convenience advertising (posters and urinal stickers "Aim below 0.05"), and drink drive messages on radio delivered by RADD (Recording Artists, Athletes and Actors Against Drink Driving). Throughout the year, plastic beer cups with anti-drink driving messages were distributed during major sporting events at Adelaide Oval, AAMI Stadium, Hindmarsh Stadium and clubs participating in the Good Sports program. Many of these media were also used to discourage drink driving during schoolies week.

Estimated costs for anti-drink driving advertising for the calendar year 2006 totalled $548,290, a 34 per cent decrease since the last reported campaign costs in 2005 ($824,875, see Wundersitz & Baldock, 2008). However, note that the overall advertising budget decreased by 18 per cent in 2006 and a considerable amount was spent on developing two new drug driving campaigns ($396,364). In addition, the use of an existing campaign meant 2006 production costs were relatively low ($72,863). A total of $475,427 was spent on media and planning.

3 Speeding

This section explores performance indicators for speed enforcement. Current speed enforcement methods of operation are discussed, followed by an examination of the number of drivers being detected for speed offences. Next, the two primary outcome measures for speed enforcement are investigated: changes in speed-related crashes and covertly measured on-road vehicle speed distributions. Finally, a description of anti-speeding campaigns operating in 2006 is provided.

3.1 Speed enforcement practices and levels of operation

Effective speed enforcement is required to create high levels of specific deterrence, through high levels of apprehension and punishment, and general deterrence, through fostering a belief in the high likelihood of encountering enforcement. Current theories of speed management in Australia contend that balanced methods of covert and overt, and fixed/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).

The effectiveness of different speed enforcement programs can vary with the road environment in which they operate. Research evidence suggests that the covert operation of mobile speed cameras reduces casualty crash frequency on arterial roads in metropolitan areas and country towns, and to a lesser extent, on highways in rural areas (Cameron & Delaney, 2006). Hand-held laser guns have been found to reduce casualty crash frequency (but not crash severity) on arterial roads in metropolitan Melbourne (Fitzharris *et al.*, 1999) while mobile radar devices have been found to reduce casualty crashes on rural roads (Goldenbeld & Van Schagen, 2005). Fixed speed cameras have been shown to reduce casualty crashes in black spot areas (e.g. Gains *et al.*, 2003).

Speed cameras (including dual purpose red light cameras) and non-camera operations (i.e., 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 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 were 18 cameras available for use in 2006 and they were expected to operate for a target of 3,060 hours per month. The speed cameras operate from unmarked vehicles to give some degree of anonymity and covertness 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 (i.e., the fine arrives in the mail), which reduces the potential deterrent effect of the enforcement. However, the literature suggests that the most important aspect of punishment as a deterrent is the *certainty* of detection, rather than severity or immediacy of sanctions (Homel, 1988; Pogarsky, 2002). Automatic devices that do not cease operating while a 'ticket' is being written better achieve this certainty of punishment.

Each day, a list of camera locations 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 speeding-related complaints and locations that are known for high levels 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 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. DTEI records indicate that in 2006 there were 44 sites at which dual purpose red light/speed cameras could operate and 31 cameras were available for use at these sites. The number of sites and cameras has increased substantially from 2005 (28 sites, 17 cameras).

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 issued a fine. Hand held radars are used more frequently on open roads, with few operating in the metropolitan area. The numbers of non-camera detection devices used in metropolitan and rural areas during 2006 are presented in Table 3.1. Laser gun devices, and to a lesser extent, handheld radars, are the most common form of non-camera speed detection in South Australia.

Table 3.1
Non-camera detection devices used in South Australia, 2006

Non-camera detection devices	Metro	Rural	Total
Lasers	29	118	147
Mobile Radars	0	34	34
Handheld Radars	0	125	125

The coordination of police operated speed detection is managed by SAPOL 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 instrument, per shift. The State Coordination Group Traffic sets speed detection targets. 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 by the local knowledge of patrol officers and 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 2006, is depicted in Figure 3.1. The location of the speed detection device determines whether speed detection hours are recorded as metropolitan or rural.

In 2006, the total number of speed detection hours for South Australia increased by approximately 7 per cent to the highest recorded level during this time period. The increase in speed detection hours was observed predominantly in rural regions where the number of hours increased by almost 12 per cent (0.6% increase in the metropolitan area). Note that the hours of operation of dual purpose red light cameras were unavailable and so are not included here, or in any of the following tables.

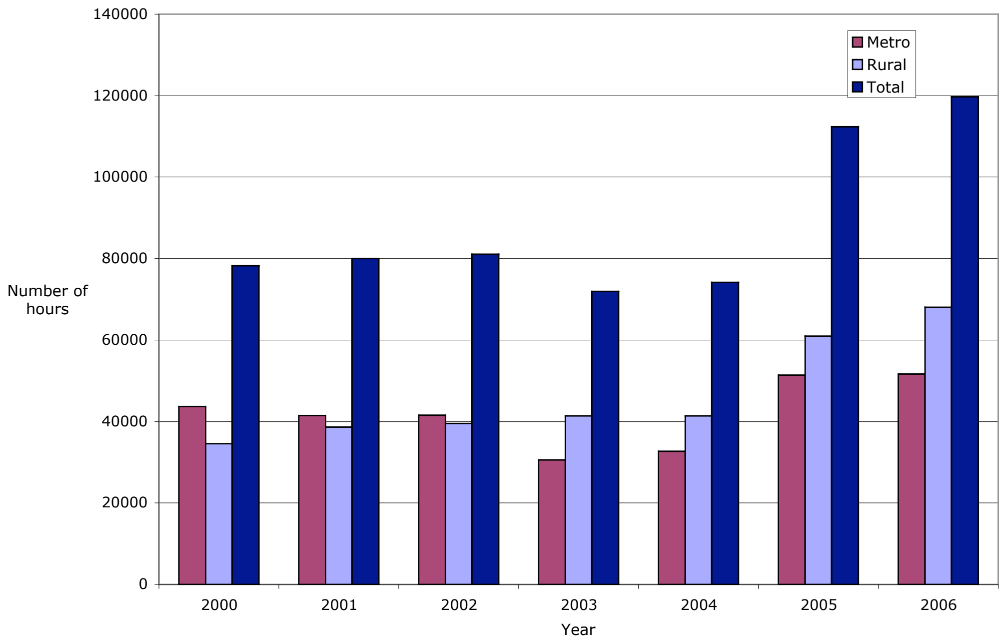

Figure 3.1
Number of speed detection hours in South Australia, 2000-2006

Table 3.2 summarises the hours spent on speed detection by speed cameras only, from 2000 to 2006 for metropolitan and rural areas. Speed cameras were used predominantly in the metropolitan area. The numbers of hours for speed camera operation have steadily increased in recent years. In 2006, the number of hours rose by 33 per cent to the highest level recorded in the table. This total exceeds the target number of speed camera detection hours (36,720). A greater increase was recorded in rural regions (85%) than in the metropolitan area (23%).

Table 3.2
Number of hours for speed detections by speed cameras in South Australia, 2000-2006

Year	Camera			% difference from previous year
	Metro	Rural	Total	
2000	31,928	4,017	35,945	NA
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
2005	25,353	4,680	30,030	22.0
2006	31,103	8,674	39,777	32.5

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. In 2006, the total number of non-camera hours decreased slightly (3%), but remained at a relatively high level. A decrease in hours was reported in the metropolitan area (21%) while a slight increase was reported in rural regions (6%).

Table 3.3
Number of hours for speed detections by non-camera devices in South Australia, 2000-2006

Year	Non-Camera			% difference from previous year
	Metro	Rural	Total	
2000	11,726	30,528	42,254	NA
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
2005	26,021	56,261	82,282	66.1
2006	20,556	59,373	79,929	-2.9

DAY OF WEEK

The number of hours spent on speed detection from 2000 to 2006 by day of week is presented in Table 3.4 for speed cameras and in Table 3.5 for non-speed camera devices. Speed detection hours are given in terms of the percentage of all hours performed in a year. For both methods of speed detection, the number of hours was spent evenly throughout the week and was relatively consistent from year to year.

Table 3.4
Number of speed detection hours for speed cameras by day of week, 2000-2006
(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
2005	14.1	14.7	14.6	14.8	14.3	14.8	12.7
2006	13.6	14.1	14.6	15.2	15.0	14.2	13.2

Table 3.5
Number of speed detection hours for non-camera devices by day of week, 2000-2006
(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
2005	14.4	12.4	11.8	14.4	15.5	16.2	15.2
2006	14.1	14.0	13.5	14.8	15.7	14.4	13.5

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 2006. 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 is a noticeable dip in the distribution of detection hours around lunchtime (12 – 2pm). In 2006, there was also a small dip in detection hours from 4 to 6pm.

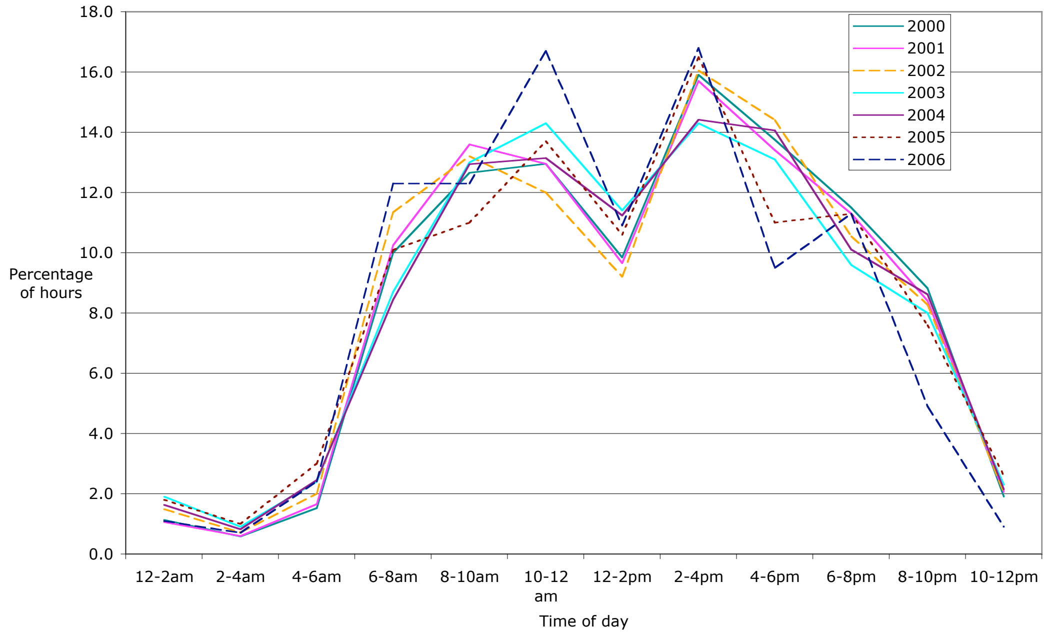

Figure 3.2
Hours spent on speed detection in South Australia by time of day, 2000-2006

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). In 2006, the distribution of speed camera hours by time of day was comparable to that in 2005. Speed cameras were operated most frequently during the hours before and after school (i.e. 6 – 8am and 2 – 4am) and from 6 to 8 pm. They were operated least frequently at night and in the early hours of the morning (8pm – 6am).

Table 3.6
Number of speed detection hours for speed cameras by time of day, 2000-2006
(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
2005	0.4	21.5	9.4	15.0	3.1	24.4	7.9	16.1	2.1
2006	0.1	24.2	6.8	17.7	2.2	25.0	4.3	19.0	0.6

Non-camera devices were operated predominantly from 8am to 6pm. The pattern of non-camera speed detection hours resembled that of previous years with the exception of fewer detection hours at night from 8pm to midnight. Compared to camera operations, non-camera devices were more frequently operated at night and in the early hours of the morning (8pm-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, consistent with previous years.

Table 3.7
Number of speed detection hours for non-camera devices by time of day, 2000-2006
(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
2005	7.2	5.5	13.1	14.7	14.4	11.9	12.4	8.7	12.1
2006	6.3	6.4	15.1	16.3	15.2	12.7	12.0	7.5	8.4

DETECTION HOURS BY MONTH

Table 3.8 shows the distribution of speed detection hours by month for speed camera and non-camera devices in 2005 and 2006. Both speed camera and non-camera devices were operated relatively evenly throughout the year in 2006. Given that speeding was the SAPOL focus of the month in April 2006, it is not surprising that speed detection hours were slightly higher at this time. Note that the target of 3,060 hours of detection per month for speed cameras was exceeded each month with the exceptions of February, August and September. The very low levels of speed camera operation from July to September 2005 can be attributed to industrial action taken by speed camera operators. Most speed cameras were inactive during this three-month period.

Table 3.8
Number of speed detection hours by month for speed cameras and non-camera devices in 2005 and 2006 (expressed as a percentage of total hours each year)

Month	2005			2006		
	Camera	Non-cam	Total	Camera	Non-cam	Total
Jan	14.5	8.5	10.1	8.4	9.6	9.2
Feb	9.2	7.5	8.0	7.0	8.9	8.3
Mar	7.1	9.1	8.6	8.0	11.4	10.3
Apr	14.1	8.7	10.1	8.2	10.8	10.0
May	14.5	8.3	10.0	8.2	8.3	8.3
Jun	12.2	7.3	8.6	8.8	6.9	7.5
Jul	0.0	7.8	5.8	7.7	6.1	6.6
Aug	0.1	8.9	6.5	7.3	8.3	8.0
Sep	0.2	9.1	6.7	7.3	8.0	7.7
Oct	11.3	7.6	8.6	9.7	7.0	7.9
Nov	5.9	7.5	7.1	10.1	7.0	8.0
Dec	10.7	9.7	10.0	9.4	7.8	8.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

3.2 Levels of speeding

3.2.1 Number of speed detections

The number of speed detections, by speed cameras and non-cameras, in South Australia for the years 2000 to 2006 can be seen in Table 3.9. Inspection of the number of speed detections divided by the number of licensed drivers in South Australia indicates that approximately 24 per cent of licensed drivers were detected for a speeding offence in 2006. Note that a new database was used to extract the number of licensed drivers in 2006. Consequently, the percentage of detected licensed drivers in 2006 is not directly comparable with previous years.

Dual purpose red light/speed cameras operated for the first time in 2004. Data from the dual purpose cameras in 2006 indicates that the number of speed detections increased by over 30 per cent to 67,255 detections. The total number of detections (excluding red light speed camera detections) increased by 39 per cent in 2006. Speed camera detections increased substantially (62%) but this increase is partly due to the limited operation of speed cameras during a three-month period in 2005. Non-camera detections decreased slightly in 2006, by 3 per cent.

As noted in Section 3.1.1, 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 passing vehicles whereas the operator of non-camera devices selects which vehicles' speeds will be checked. Note also that non-camera devices are used more in rural areas, which are characterised by lower levels of traffic density.

Table 3.9
Number and percentage of licensed drivers detected speeding in South Australia, 2000-2006

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 [a]	% 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
2005	84,565	51,038	48,171	183,774	1,093,550	16.8
2006	137,370	67,255	46,966	251,591	1,042,774 [b]	24.1

Note. Licence information could only be extracted for the financial year to June 30.
[a] Source: DRIVERS database, Registration and Licensing Section, DTEI
[b] Source: TRUMPS database, Registration and Licensing Section, DTEI

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 3.10 for metropolitan and rural areas, for the years 2000 to 2006. If the speeding detection rate is interpreted as the level of speeding behaviour, the results suggest that speeding has decreased (by 54%) since the year 2000, to an average level of 1.5 detections per hour in 2006. Although the detection rate increased by approximately 31 per cent from 2005, the detection rate remained at a relatively low level in comparison to previous years.

The increase in the detection rate from 2005 is attributable to an increase in speed camera detections, by 22 per cent. Both metropolitan and rural areas experienced an increase in the speed camera detection rate (24% and 33%, respectively). The non-speed camera detection rate remained stable at a relatively low level.

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 five minutes) for police officers to pull over and charge speeding offenders when operating these devices.

The metropolitan area reported higher detection rates than rural regions for both methods of detection. The greater volume of traffic in the metropolitan area is probably responsible for the higher detection rate rather than a greater prevalence of speeding. Detection rates based on traffic volumes are examined in a later section. Note that the overall 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.

Table 3.10
Speeding detection rates, 2000-2006 (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
2005	2.99	1.88	2.82	0.93	0.43	0.59	1.18
2006	3.72	2.50	3.45	1.11	0.41	0.59	1.54

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. In most previous years, detection rates were at their highest on weekends. Table 3.11 indicates that in 2006 speed camera detection rates were at their highest on Saturdays and their lowest on Sundays. Rates per day were higher in 2006 compared to 2005, reflecting the overall increase noted in Table 3.10.

Table 3.11
Speeding detection rates per hour for speed cameras by day of week, 2000-2006

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
2005	2.73	2.58	2.33	2.73	2.86	3.10	3.46
2006	3.24	3.37	3.27	3.53	3.63	3.93	3.15

Table 3.12 gives the detection rates for non-camera devices by day of the week from 2000 to 2006. Similar to previous years, 2006 detection rates were very consistent across the days of the week.

Table 3.12
Speeding detection rates per hour for non-camera devices by day of week, 2000-2006

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
2005	0.58	0.59	0.57	0.58	0.57	0.57	0.63
2006	0.60	0.57	0.58	0.57	0.56	0.60	0.64

Table 3.13 shows the total detections for dual purpose red light/speed cameras by day of week from 2004 to 2006 (detections per hour could not be calculated). Motorists were much more likely to be detected speeding by red light cameras on weekdays than during the weekend. However, there were a large number of detections for which day of week was unknown and the detection data are difficult to interpret without data for hours of operation.

Table 3.13
Speeding detections for red light/speed cameras by day of week, 2004-2006

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2004	6,650	6,061	6,380	6,359	7,312	9,335	9,030
2005	7,691	7,974	8,024	8,339	7,467	756	18
2006[a]	10,879	10,675	10,661	10,959	9,521	942	33

[a] Day of week was unknown for 10,769 red light/speed detections

TIME OF DAY

The speeding detection rates for speed cameras by the time of day from 2000 to 2006 are presented in Table 3.14. Similar to 2005, speed detection rates for cameras during 2006 were relatively consistent across the day and much lower at night time between 6pm and 6am. The detection rate was highest in the afternoon from 2pm to 4pm.

Table 3.14
Speeding detection rates per hour for speed cameras by time of day, 2000-2006

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
2005	1.26	3.08	3.30	2.99	2.54	3.37	2.84	1.47	1.26
2006	1.41	3.42	3.21	3.40	3.27	4.82	3.11	2.00	1.64

Table 3.15 shows the speeding detection rates for non-camera devices by time of day for the years 2000 to 2006. In 2006, as in previous years, detection rates with non-camera devices were generally lower from midnight to 6am but this is likely to be due to lower traffic volumes rather than lower rates of speeding. Detection rates were highest between 4 and 6pm, most likely due to higher traffic volumes at this time.

Table 3.15
Speeding detection rates per hour for non-camera devices by time of day, 2000-2006

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
2005	0.35	0.66	0.67	0.59	0.57	0.52	0.72	0.58	0.54
2006	0.35	0.59	0.61	0.59	0.54	0.56	0.73	0.62	0.62

The numbers of speeding detections for red light cameras by time of day from 2004 to 2006 are shown in Table 3.16. It can be seen that there were more detections between 6am and 8pm (mostly daylight) than between 8pm and 6am (mostly night-time). These data are difficult to interpret, however, without data for hours of operation.

Table 3.16
Speeding detections for red light/speed cameras by time of day, 2004-2006

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
2005	7,308	4,974	5,099	5,492	5,831	5,782	5,018	5,043	6,491
2006	7,540	5,860	7,022	8,470	9,038	8,343	7,065	6,344	7,567

DETECTION RATES BY MONTH

The speeding detection rates by month for speed cameras and non-camera devices for 2005 and 2006 are presented in Table 3.17. During 2006, detection rates for non-camera devices were reasonably constant throughout the year. Detection rates for speed cameras were also relatively consistent during the year but slightly higher in November and December. In contrast, speed camera detection rates were very low in November and December in 2005 (also low from July to September 2005 when most speed cameras were inactive).

Table 3.17
Speeding detection rates per hour by month
for speed cameras and non-camera devices, 2005 and 2006

Month	2005			2006		
	Camera	Non-cam	Total	Camera	Non-cam	Total
Jan	3.26	0.57	1.60	2.28	0.56	1.08
Feb	3.10	0.63	1.39	3.69	0.61	1.47
Mar	3.05	0.61	1.15	3.63	0.63	1.40
Apr	3.94	0.59	1.84	2.78	0.60	1.19
May	3.46	0.55	1.68	3.07	0.55	1.38
Jun	3.84	0.57	1.80	3.74	0.58	1.80
Jul	0.28	0.61	0.61	3.49	0.62	1.74
Aug	0.28	0.57	0.57	3.26	0.58	1.40
Sep	0.49	0.62	0.62	3.46	0.58	1.48
Oct	2.72	0.57	1.33	3.39	0.57	1.73
Nov	0.02	0.54	0.42	4.02	0.61	2.03
Dec	0.03	0.59	0.43	4.41	0.57	2.01
Total	2.82	0.59	1.18	3.45	0.59	1.54

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 3.18 shows the detection rates for males and females from 2000 to 2006 for non-camera devices. Data were not available in 2006. In previous years, the ratio of male to female speeding detection rates has consistently shown that males are around 2.6 times more likely to be detected than females. Clearly, speeding is a greater problem among male drivers.

Table 3.18
Number and sex of licence holders, detected speeding by non-camera devices, 2000-2006

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
2005	574,093	45,822	7.98	512,926	15,489	3.02	2.64
2006	Data not available						

NB: Refer to Table 3.9 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, to determine whether the higher detection rates in metropolitan areas may be attributed to greater traffic volumes. Equivalent data were not available for non-speed camera devices.

Table 3.19 shows the speeding detection rates per 1,000 vehicles passing a speed camera for the years 2000 to 2006. Consistent with detection rates per hour of speed enforcement, detection rates per vehicle passing also increased in 2006 (by 29%), but did not exceed levels prior to 2005. Together, these findings suggest that the level of speeding increased in 2006 but remained at a slightly lower level in comparison to levels recorded before 2005.

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. The substantial decrease in the rural detection rate per vehicles passing observed in 2005 was reversed to some degree in 2006 (45% increase). A similar trend, although not to the same extent, was observed for the metropolitan area (24% increase).

Table 3.19
Number of vehicles passing speed cameras and speeding detection rates (per 1,000 vehicles passing), 2000-2006

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
2005	9,847,889	7.69	792,058	11.13	7.95
2006	12,094,519	9.57	1,342,133	16.14	10.22

Table 3.20 and Table 3.21 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 2006. It is evident that higher speeding detection rates were recorded on weekends in 2006, a finding generally consistent with previous years. With respect to the time of day, there was no discernable pattern. In contrast to previous years, detection rates were highest from midday to 2pm and lowest at night from midnight to 6am.

Table 3.20
Speeding detection rates for speed cameras (per 1,000 vehicles passing) by day of week, 2001-2006

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
2005	7.63	6.94	6.65	7.72	7.49	9.07	10.84
2006	9.60	9.33	9.54	9.57	9.90	12.95	11.48

*Data unavailable but rates calculated using data for other variables

Table 3.21
Speeding detection rates for speed cameras (per 1,000 vehicles passing) by time of day, 2001-2006

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
2005	10.27	8.99	10.15	7.50	8.60	7.59	7.65	6.12	6.52
2006	6.97	10.21	12.21	9.40	15.38	10.66	9.92	9.03	9.57

*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 to 2006. There is no consistent pattern across the four years. In 2006, the detection rate was relatively consistent across the whole year, but slightly higher in December. This trend is relatively consistent with that for detection rates per hour. Note that speeding was the SAPOL target behaviour during April and an anti-speeding advertising campaign featured during March, (see Section 3.3).

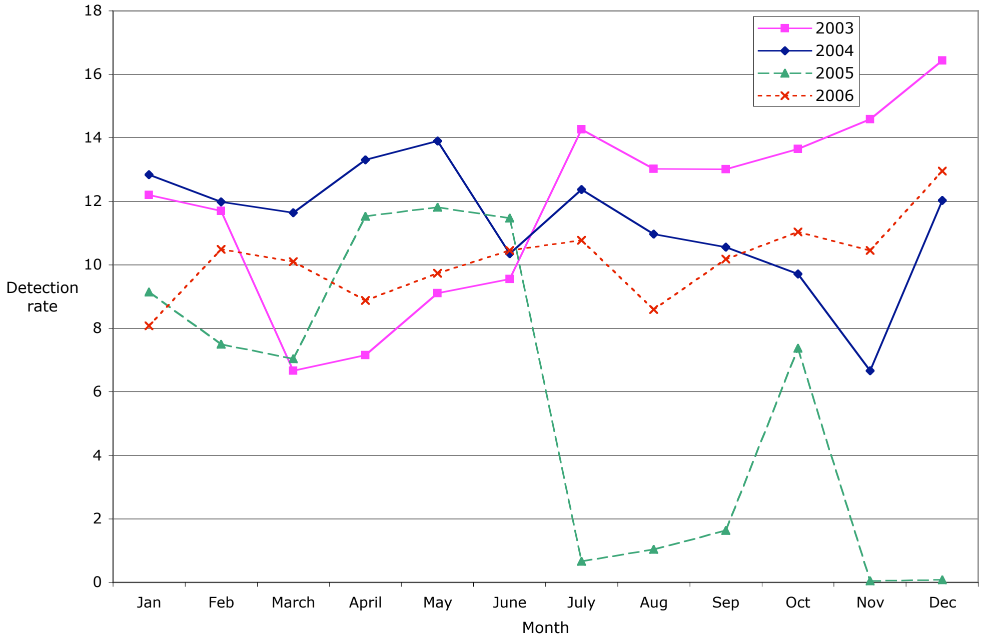

Figure 3.3
Speed camera detection rate (per 1,000 vehicles passing) in South Australia by month, 2003–2006

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 be 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 than less severe crashes 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.

The number of fatal crashes categorised as 'excessive speed' from 2000 to 2006 is shown in Table 3.22. There were relatively few speed-related fatal road crashes in 2006. The small number of fatal crashes makes it difficult to draw conclusions. In any case, these are certainly underestimates of the percentage of speed related crashes for the reasons given above. Table 3.23 shows that, from 2000 to 2006, 'excessive speed' was listed as the major driver error in approximately three to four per cent 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 3.22
'Excessive speed' as the apparent error in fatal crashes, 2000-2006

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
2005	11	8.73	115	126
2006	6	5.77	98	104

Table 3.23
'Excessive speed' as the apparent error in serious casualty crashes, 2000-2006

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
2005	43	4.33	949	992
2006	30	2.75	1062	1092

Serious and fatal crashes are combined in Table 3.24 to show the distribution of crashes in which the apparent error was listed as 'excessive speed' in metropolitan and rural regions. The percentage of 'excessive speed' crashes in the metropolitan area in 2006 was relatively consistent with those of previous years. In rural regions, the proportion of 'excessive speed' crashes increased in 2005 to the highest level for all years represented in the table, but then decreased in 2006 to the lowest recorded level.

Table 3.24
'Excessive speed' as the apparent error in serious and fatal crashes by location of crash, 2000-2006

Year	Metro 'Excessive Speed'		Total metro crashes (N)	Rural 'Excessive Speed'		Total rural crashes (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
2005	26	4.66	558	28	5.00	560
2006	28	4.19	669	8	1.52	527

Table 3.25 shows that the majority of serious and fatal crashes with an apparent error of 'excessive speed' have typically involved male drivers. In 2006, the proportion of male drivers deemed to have been responsible for speed-related crashes decreased from 100 per cent to 83 per cent.

Table 3.25
'Excessive speed' as the apparent error in serious and fatal crashes by sex of driver, 2000-2006

Year	Male		Female		Total 'excessive speed' crashes
	(N)	(% of known)	(N)	(% of known)	
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	95.74	2	4.26	48
2005[c]	46	100.00	0	0.00	54
2006	30	83.33	6	16.67	36

[a] 2 cases sex unknown
[b] 1 case sex unknown
[c] 8 cases 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.

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.

While 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

There are no systematic on-road speed surveys conducted in the Adelaide metropolitan area. Occasionally, speed surveys are undertaken for other purposes, usually on a needs basis but they do not constitute a reliable source of data for determining historical trends. No urban speed surveys were conducted in 2006. However, it is anticipated that speed surveys will recommence in 2007. The last urban speed survey was conducted in 2005. This survey was a follow-up survey to evaluate the change in the default urban speed limit from 60 to 50 km/h on local roads and most collector roads in March 2003 (for results see Kloeden *et al.*, 2004).

RURAL SPEED ON-ROAD SPEED SURVEYS

Annual on-road speed surveys using traffic classifiers have been conducted by DTEI on an annual basis from the year 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. 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 3.26 shows a summary of the aggregated speed parameters and traffic volumes for all free speed vehicles in the rural speed surveys conducted from 2000 to 2006 in South Australia. The average of the mean and 85th percentile speeds for each speed limit group was weighted by free speed volume. Subtracting the mean from the 85th percentile speed provides an approximation of the variation in speeds. 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 3.26
Surveyed free speeds in rural areas for all vehicles by speed zones, 2000-2006

Speed zone/year	Free Speeds (km/h)		Variation (Mean – 85th pc)	Volumes (veh./week)	
	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
2005	59.2	66.6	7.3	61,545	70,533
2006	57.2	64.0	6.7	56,421	64,318
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
2005	93.2	104.5	11.3	42,231	50,013
2006	92.6	103.3	10.7	39,863	47,187
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
2005	104.4	114.5	10.2	42,818	50,772
2006	102.8	112.5	9.7	37,953	44,435

In 2006, speeds on the sampled 60 km/h roads remained below levels experienced before the large drop in 2003 for both the mean and 85th percentile speeds. The variation in speeds also decreased during 2006. The decrease in traffic volumes in 2003 and 2004 was 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 mean speed on the sampled 100 km/h roads appears to trend slightly upward from 2001 to 2005 but decreased in 2006. The 85th percentile speeds remain relatively constant. Traffic volumes on these roads increased in 2003 due to the addition of a new road into this group.

Free speeds and 85th percentile free speeds on the sampled 110 km/h roads have fluctuated from year to year since 2000, with a small decrease occurring in 2006. The slight decrease in traffic volume in 2003 can be explained by the omission of one of the six roads that had its speed limit decreased to 100 km/h in 2003. The traffic volumes notably decreased in 2006 for unknown reasons.

Speeds on the two 50 km/h roads in the survey are presented in Table 3.27. There was a decrease in measured travelling speeds for the mean and 85th percentile in 2006 for both locations. Despite the decrease, the mean speed in Nuriootpa remained well above the 50 km/h speed limit. Traffic volumes at each of these sites have remained relatively constant, although there was a decrease in Freeling in 2006.

Table 3.27
Surveyed free speeds on rural 50 km/h roads 2003-2006

Area/year	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
2005	54.3	62.7	8.4	8,406	8,817
2006	52.8	61.3	8.5	7,476	7,830
Nuriootpa					
2003	62.3	68.2	5.9	26,401	32,844
2004	64.0	70.5	6.5	26,703	32,910
2005	61.0	66.8	5.8	28,085	34,709
2006	58.4	65.8	7.4	27,927	34,535

Speeds from the remote locations are shown in Table 3.28. Each site shows annual fluctuation with no discernable trends present in any of the speed parameters. Annual fluctuations and relatively high speed variation 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. At Lyndhurst, the volume has halved since 2000.

Table 3.28
Surveyed free speeds in remote areas for all vehicles by speed zones, 2000-2006

Area/year	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
2005	102.5	115.0	12.5	2,344	2,450
2006	103.7	116.6	12.9	1,953	2,019
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
2005	104.4	117.9	13.5	2,906	3,012
2006	109.9	122.2	12.3	3,328	3,443
Lyndhurst (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
2005	82.3	96.2	13.9	553	562
2006	83.5	103.0	19.5	498	505

3.3 Anti-speeding publicity

A major role of anti-speeding publicity is to support enforcement activities. Research suggests that anti-speeding television advertising at moderate intensity with supporting enforcement can reduce on-road speeds (e.g. Woolley, Dyson & Taylor, 2001).

The "Speeding. What's Your Excuse? Stop. Think." anti-speeding campaign, developed in 2005, continued in 2006. The slogan was revised to "Speeding. There's no excuse". The main target audiences of this campaign were young drivers (particularly males) and passengers aged 16 to 24 years, and motorcyclists. The campaign was designed to generate awareness of the risks and consequences of speeding even with small increases in speed, reinforce the value of speed limits, and alter speeding-related community attitudes and driving behaviours.

The television commercial titled "Speeding. What's your Excuse?" explained the consequences of speeding and stated that there was no excuse for speeding at any level. A variety of media strategies was employed to supplement television, including radio commercials, bus shelter posters, regional banners and speed feedback/variable message sign trailers displayed in conjunction with SAPOL enforcement activities.

The anti-speeding campaign was comprised of three phases. The television commercial was aired during the first phase in March while other media activities featured during March, April and November/December. These months were chosen to coincide with police enforcement operations that focused on speeding, and with the start of the Christmas season.

In total, $395,791 was invested in anti-speeding advertising in 2006. This was less than half of the expenditure in 2005 ($843,261, Wundersitz & Baldock, 2008). The reduction in costs can be partly attributed to the use of an existing campaign (i.e., reduced production costs). Of the total advertising costs in 2006, $373,994 was spent on media planning and $21,797 on production. All publicity campaigns in 2006 were adopted in the Adelaide metropolitan area and rural regions.

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 in the event 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). Long-term effects were observed when this so-called 'blitz' approach incorporated high levels of enforcement over a short period, usually one to four weeks, 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 are legally responsible for ensuring that passengers aged under 16 years are restrained. The driver must ensure that seat belts are available and fit for use.

Restraint use was the SAPOL target behaviour of the month in February and October during 2006. However, similar to previous years, no information was available on the actual hours spent by police specifically targeting restraint use. Consequently, this section will provide details of restraint 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 2006 are listed in Table 4.1. Note that the driver of the vehicle is held legally responsible for the last two offences listed. The total number of offences detected increased by 12.6 per cent in 2006, reaching a high level similar to that in 2003. This increase in 2006 may be due to lower seatbelt wearing rates or to increased police enforcement activity.

Consistently, the most common restraint offence involved the driver failing to wear a seat belt adjusted and fastened properly. Approximately four 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, 2001-2006

Year	Fail to wear seatbelt properly adjusted & fastened (driver)	Fail to wear seatbelt properly adjusted & fastened (passenger)	Fail to occupy seat fitted with a seatbelt	Sit in front row of seat when not permitted	Fail to ensure front row passenger properly restrained	Fail to ensure child under 1 year restrained	Fail to ensure child under 16 wears seatbelt	Total
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(N)
2001	85.8	10.3	0.3	<0.1	0.8	0.3	2.6	10,273
2002	85.6	10.3	0.1	<0.1	0.8	0.3	2.8	10,127
2003	83.5	11.0	0.1	<0.1	1.6	0.4	3.3	10,963
2004	85.7	10.0	0.2	<0.1	0.2	0.5	3.4	9,237
2005	85.4	9.7	0.1	0.0	0.8	0.6	3.4	9,555
2006	85.6	9.8	0.1	<0.1	0.5	0.5	3.5	10,758

Table 4.2 shows restraint offences detected in metropolitan and rural areas from 2000 to 2006. Note that there are an exceptionally large number of unknowns. This is because the data cleansing software is not able to read the suburb and, thus, unable to determine the location of the offence. It should not be assumed that unknowns are evenly spread between metropolitan and rural areas. Consequently, the large number of unknowns makes it difficult to meaningfully compare 2006 data to previous years. Nevertheless, even if all the unknowns are rural, the majority of offences were detected in the metropolitan area in 2006.

Table 4.2
Restraint offences detected by region, 2000-2006

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
2005	5,915	61.9	3,640	38.1	-	9,555
2006	6,514	73.8	2,307	26.2	1937	10,758

DAY OF WEEK

Table 4.3 displays restraint offences detected by day of week for the six years from 2000 to 2006, in terms of the percentage of total offences detected each year. Restraint offences were detected relatively evenly on weekdays, but the percentage of offences detected on weekends was slightly lower.

Table 4.3
Number of restraint offences detected by day of week, 2000-2006
(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
2005	12.4	15.0	14.8	13.4	15.0	15.1	14.1
2006	15.4	15.8	15.5	15.7	13.9	12.9	10.8

TIME OF DAY

Restraint-related offences detected from 2000 to 2006 by time of day are presented in Table 4.4. In 2006, the distribution of restraint offence detections by time of day was similar to that in previous years for which data was available. 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, 2000-2006 (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
2005	Data not available								
2006	1.3	2.4	12.5	20.6	19.3	15.4	17.0	6.8	4.7

RESTRAINT OFFENCES BY MONTH

Restraint offences are shown in Table 4.5 for both metropolitan and rural areas, in terms of the percentage of total offences detected each year. If offence rates reflect levels of enforcement, overall, restraint enforcement was greater in March and June. In the metropolitan area, restraint enforcement was greater in June while in rural areas restraint enforcement was greater in February and March.

Table 4.5
Number of restraint offences detected by month in 2006
(expressed as a percentage of total offences detected each year)

Month	Metro	Rural	Total
January	9.4	7.2	9.0
February	8.6	10.4	9.1
March	9.4	18.2	11.7
April	6.9	9.6	7.6
May	5.9	8.7	6.6
June	15.2	8.0	12.9
July	6.0	4.8	5.6
August	7.9	4.8	7.1
September	7.0	4.7	6.4
October	7.9	9.1	8.3
November	7.6	8.7	8.0
December	8.3	5.8	7.7

SEX AND AGE

Detected restraint offences by sex and age for 2005 and 2006 are presented in Table 4.6. Vehicle occupants aged 20 to 29 years recorded the greatest proportion of restraint offences of all age groups during 2005 and 2006. Note that age was unknown for a large proportion (45%) of restraint offences in 2005 due to data extraction problems. For both years, males were over three times more likely to be detected for a restraint offence than females. Few data were available for children aged less than 16 years as the driver of the vehicle is legally responsible for these restraint offences.

Table 4.6
Number and percentage of restraint offences detected by sex and age, 2005-2006

	2005						2006					
	Male		Female		Total		Male		Female		Total	
Age	N	%	N	%	N	%	N	%	N	%	N	%
0-15 yrs	0	0.0	0	0.0	0	0.0	2	0.1	1	<0.1	3	<0.1
16-19 yrs	356	5.0	101	4.4	457	4.8	643	8.0	266	10.2	909	8.4
20-29 yrs	1148	16.1	279	12.1	1427	14.9	2307	28.7	826	31.8	3133	29.1
30-39 yrs	855	12.0	237	10.2	1092	11.4	1748	21.7	548	21.1	2296	21.3
40-49 yrs	834	11.7	243	10.5	1077	11.3	1521	18.9	486	18.7	2007	18.7
50-59 yrs	566	7.9	138	6.0	704	7.4	1059	13.2	293	11.3	1352	12.6
60+ yrs	366	5.1	70	3.0	436	4.6	764	9.5	177	6.8	941	8.7
Unknown age	3012	42.2	1247	53.9	4259	44.6	0	0.0	1	<0.1	1	<0.1
Unknown sex	-	-	-	-	103	1.1	-	-	-	-	116	1.1
Total	7137	100.0	2315	100.0	9555	100.0	8044	100.0	2598	100.0	10758	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. Restraint status is categorised into six different groups in the database but these 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 provide 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 included.

Restraint use for fatally injured vehicle occupants from 2000 to 2006 is presented in Table 4.7. In 2006, 65 per cent of vehicle occupants in fatal crashes were wearing restraints. Restraint status was known for 77 per cent of all fatally injured vehicle occupants in 2006.

Table 4.7
Restraint usage of fatally injured vehicle occupants, 2000-2006

Year	Restraint worn		Number of known cases	Total occupant fatalities
	(N)	(%)		
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
2005	58	65.9	88	113
2006	39	65.0	60	78

Table 4.8 shows the restraint usage for seriously injured vehicle occupants from 2000 to 2006. A serious injury is defined as an injury requiring the person to be admitted to hospital but which does not cause the person to die within 30 days of the crash. During 2006, the percentage known to be wearing restraints was 89 per cent but restraint status was reported for only 63 per cent of seriously injured vehicle occupants. Note that in each year restraint use is higher for seriously injured occupants than for fatally injured occupants.

Table 4.8
Restraint usage of seriously injured vehicle occupants, 2000-2006

Year	Restraint worn		Number of known cases	Total occupants injured
	(N)	(%)		
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
2005	542	86.2	629	986
2006	548	89.3	614	973

Restraint usage for fatally and seriously injured vehicle occupants is presented in Table 4.9 and Figure 4.1 according to the region where the crash occurred. Overall, restraint use increased to 87 per cent in 2006, similar to the highest level reported in 2004. Injured vehicle occupant restraint wearing rates remained higher for crashes in the Adelaide metropolitan area (90%) than for crashes in rural regions (85%).

Table 4.9
Restraint usage of fatally and seriously injured vehicle occupants by region, 2000-2006

Year	Metro Worn		Rural Worn		Total Worn		Total Killed/ Injured
	(N)	(%)*	(N)	(%)*	(N)	(%)*	
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
2005	252	86.6	348	82.1	600	83.9	1,099
2006	287	89.7	300	85.2	587	87.4	1,051

* Percentage of known

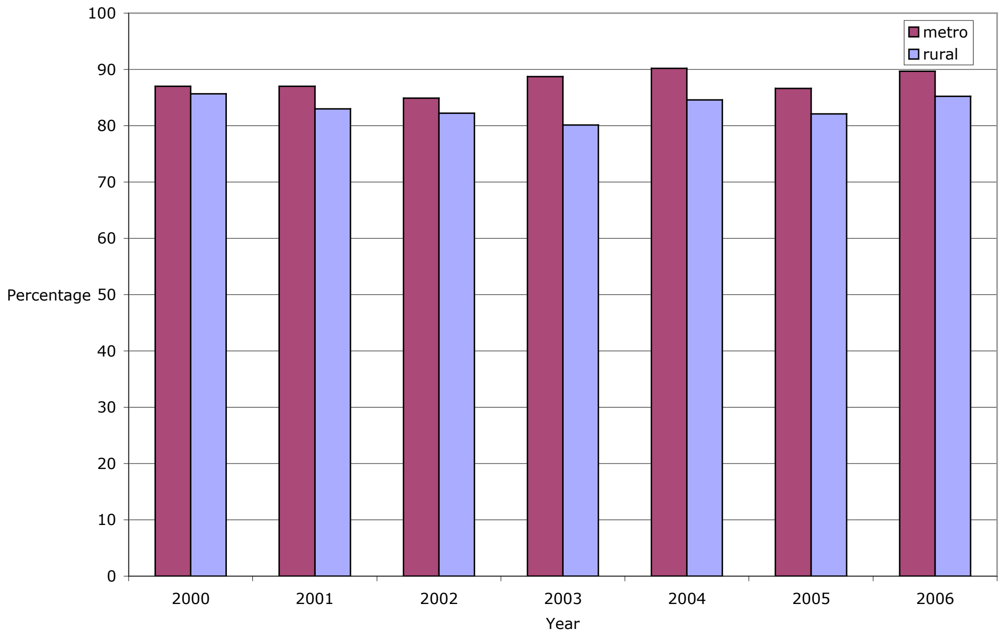

Figure 4.1
Restraint usage of fatally and seriously injured vehicle occupants, by location, 2000-2006

Table 4.10 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 2006, male restraint use increased to the highest level recorded in the table, approximately 83 per cent. Female restraint use also increased to a level of 92 per cent.

Table 4.10
Restraint usage of fatally and seriously injured vehicle occupants by sex, 2000-2006

Year	Male Worn		Female Worn		Total Killed/ Injured
	(N)	(%)*	(N)	(%)*	
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
2005	318	79.9	282	89.0	1,099
2006	301	83.2	286	92.3	1,051

* Percentage of known

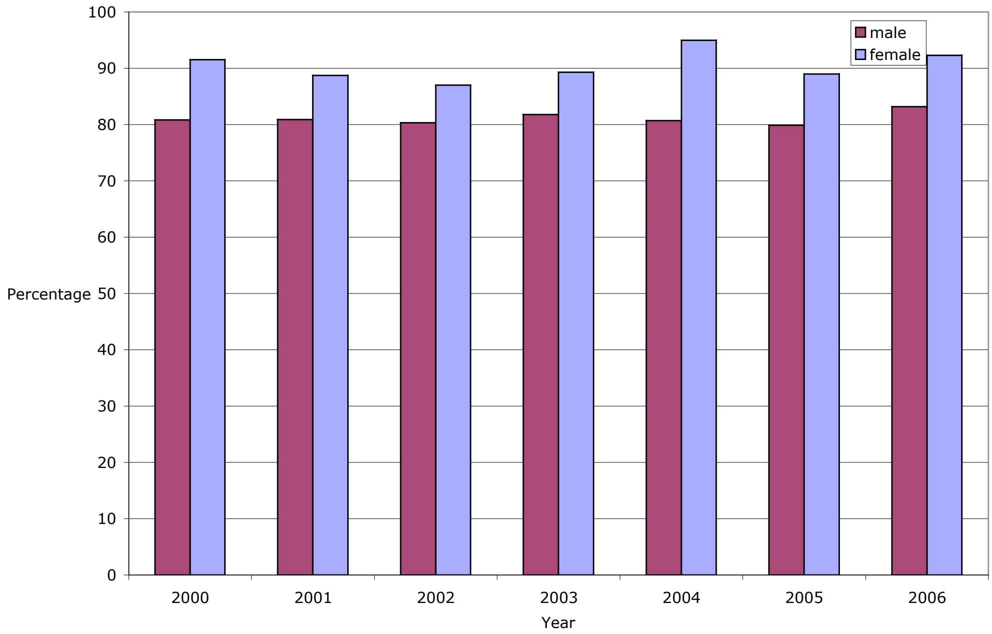

Figure 4.2
Restraint usage of fatally and seriously injured vehicle occupants, by sex, 2000-2006

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 2006. 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 2006, restraint publicity was based on the "No trip's too short for a seatbelt" campaign developed and implemented in 2005 for metropolitan and rural areas. The primary target audience included young drivers and passengers aged 16 to 24 years (particularly male drivers), parents/carers of children, and vehicle occupants in rural areas. The campaign was developed to reinforce the risks and consequences of not wearing a restraint, even on short trips. It was anticipated that such consequences would provide an incentive for vehicle occupants to comply with restraint laws. The campaign also served to portray not wearing a seat belt as an anti-social behaviour and remind vehicle occupants of the penalties incurred for non-restraint use ($180 expiation fee and three demerit points).

An integral part of the campaign was a television commercial "Written all over their face". It was designed to convey the consequences of not wearing a restraint, even when driving for a short distance (i.e., to the video store). Radio, regional banners, advertising in Caltex street directories, and variable message signs accompanied the television commercial and reinforced the campaign slogan.

The restraint use campaign encompassed four phases. Radio commercials were aired in the metropolitan and rural areas during the first phase in February. Television and radio commercials were aired during the second phase in May while regional banners were used in the third and fourth phases from July to October. The campaign timing was developed to coincide with the SAPOL target behaviour of the month, "restraints", in February and October.

In 2006, a total of $169,224 was invested in restraint-related advertising, a decrease in spending from the last reported campaign costs in 2005 of $232,384 (see Wundersitz & Baldock, 2008). Despite the decrease in total spending, the amount spent on media buying increased to $144,876, in comparison to $112,704 spent in 2005. Production/creative costs ($24,348) were much lower than the previous year because an existing campaign was used ($119,680 in 2005).

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 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.

An important change to drink driving enforcement in South Australia occurred in June 2005. Legislation enabled mobile RBT to be conducted on a full time basis rather than only during 'prescribed periods'. Consequently, 2006 was the first calendar year in which full time mobile RBT data was available for the entire 12-month period.

LEVELS OF TESTING

In 2006, the level of random breath testing level in South Australia increased by 7 per cent to its highest ever level. The increase from 2005 was concentrated in rural areas while the level of testing remained stable in the metropolitan area. Around 66 per cent of licensed drivers were breath tested in 2006, an overall level of testing that was greater than the recommendation of White and Baldock (1997) that one in two licensed drivers be tested, and exceeded the target of 612,000 tests per year.

Comparisons with other Australian jurisdictions revealed that South Australia tested a greater proportion of the population than the Northern Territory and Western Australia but a smaller proportion than the remaining states. This trend is consistent with previous years. In Tasmania, RBT levels were well over one test for every person in the state per year, compared to less than one in every two people in South Australia.

Of the testing conducted in 2006, 17 per cent was mobile RBT, an increase from the level of 12 per cent in 2005. The increase in mobile testing is most likely due to full time mobile RBT operating for the entire 12-month period. Even though the level of mobile testing increased in South Australia, comparisons with other states showed that mobile testing made up a much smaller proportion of total tests in South Australia. The state with the next smallest proportion of tests conducted using mobile RBT was New South Wales with 20 per cent, while the state with the highest was Tasmania with 69 per cent.

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. Alternatively, to detect drink drivers, random breath testing needs to be at times when most drink driving occurs. Homel (1990) 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.

Harrison (2001) suggested that enforcement taking place early in the decision making process leading to drink driving may be more effective in deterring drink driving than enforcement targeting decisions later on, particularly in rural areas. Consequently, highly visible RBT methods should operate in the early part of the evening (i.e. 6pm to 10pm) so that potential drink drivers see drink driving enforcement on their way to drinking venues. This may deter drink driving behaviour by influencing subsequent alcohol consumption or the decision to drive.

Night time surveys of drink driving provide information about times when the incidence of drink driving is greatest. With regard to the day of week, the last late night surveys conducted in metropolitan Adelaide indicated that drink driving rates were highest on Wednesday and Thursday nights, and after midnight (Kloeden & McLean, 1997). However, these surveys were conducted over ten years ago. Slightly 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 terms of the 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). Thus, to detect drink drivers, RBT is needed later in the evening (after midnight) and on days when the highest drink driving rates occur.

During 2006, the greatest percentage of static and mobile breath tests continued to be performed from Friday to Sunday, with the greatest proportion on Saturdays. Thus, higher levels of testing occurred on days when drink driving rates are typically higher. With respect to time of day, highly visible static RBT operations were favoured by police in the early part of the evening (i.e. 4pm to 10pm) when potential drink drivers would see them on their way to drinking venues, consequently increasing their perceived risk of detection and general deterrence. Mobile RBT, the form of RBT most likely to detect drink drivers, was favoured more when drink driving rates are highest (i.e. 10pm to 2am). These practices are consistent with current theories of best practice for operation of RBT.

EFFECTIVENESS

For specific deterrence, it is important to apprehend a large proportion of drink drivers. In 2006, the total number of RBT detections (evidentiary) in South Australia decreased for the first time since the year 2000, but remained at a relatively high level. Generally, a high number of detections are interpreted as indicating a higher level of drink driving activity, or, reflecting enforcement practices that concentrate largely on detection rather than deterrence. In comparison to other states providing evidentiary RBT detection information, the number of detections per head of population in South Australia was similar to that of New South Wales but lower than Tasmania.

Detection rates (drink drivers detected per 1,000 drivers tested) provide a means of estimating the effectiveness of RBT. Detection rates in South Australia based on evidentiary testing decreased in 2006 but remained at a relatively high level in comparison to previous years. A decrease was recorded in both metropolitan and rural areas. The overall detection rate in South Australia for evidentiary tests was similar to comparison states, Tasmania and New South Wales.

Contrary to the findings based on evidentiary testing, the overall detection rate for screening tests increased in 2006 to the highest level recorded since 2003. High detection rates were recorded for both static and mobile testing and in metropolitan and rural areas. The overall detection rate was higher than that in Victoria and Queensland but lower than Western Australia.

The contrasting findings for evidentiary and screening detection rates are difficult to explain. They might be, at least partly, attributable to an increase in the number of drivers who record an illegal BAC on the screening test but then record a lower or negligible BAC on the evidentiary test after some time has elapsed. This possibility could not be confirmed, as BAC levels are not recorded for screening tests.

Despite the increase in mobile testing in 2006, South Australia had the lowest proportion of testing conducted by mobile methods in comparison to six other Australian states. Nevertheless, South Australia had a much higher mobile RBT detection rate per 1000 drivers tested than the two states (Victoria and Queensland) that provided comparative detection rates.

In previous years, the ratio of mobile to static RBT detection rates was much higher in rural regions, suggesting that mobile RBT is of particular benefit in rural regions. Interestingly, in 2006, the ratios were similar for metropolitan and rural areas. This indicates that mobile RBT tests were equally efficient in detecting drink drivers in both environments. Mobile RBT has been claimed to provide a better means of detecting drink drivers, particularly those trying to avoid static RBT sites (Harrison, Newman, Baldock & McLean, 2003). Note that few studies have formally evaluated mobile RBT methods and, in most studies, RBT data have been confounded with those of stationary RBT (Harrison et al, 2003).

While mobile RBT detection rates increased, so did static RBT detection rates, particularly in rural areas. Consistent with previous years, static RBT was predominantly conducted at highly visible times (i.e. 4pm to 10pm), rather than at times when drink driving rates were highest, to enhance the deterrent effect of RBT. In contrast, mobile RBT data showed that a higher level of mobile testing was conducted on days (later in the week) and at times (6pm – 2am) when detection rates were highest.

The percentage of drivers involved in a fatal crash with an illegal BAC (i.e. 0.050 and above) in 2006 increased to 40 per cent, the highest recorded in all the years covered by this report. The proportion of fatally injured drivers with a high BAC level (i.e. 0.100 and above) increased slightly, continuing the trend of recent years. However, the small number of fatalities means that there is much more variation from year to year. Data for serious injury crashes suggested that the proportion of drivers with an illegal BAC in 2006 (22% above 0.050) was similar to the previous year. The larger number of serious injury crashes means that they are a more reliable indicator of alcohol involvement in crashes. The percentage of cases in which BACs for drivers were known was still low in 2006 for both fatal (87%) and serious injury crashes (63%). Improving the matching process of blood samples with the TARS database would create a more complete and reliable database, and provide a more accurate indicator of the level of drink driving.

The best indicator of the level of drink driving in the community and, consequently, of the effectiveness of RBT as a deterrent, is a roadside survey. Unfortunately, no such surveys have been conducted in South Australia since 1997.

PUBLICITY

In 2006, expenditure on anti-drink driving publicity decreased substantially, by 34 per cent, from that in 2005. The decrease in spending is most likely due to the fact that an existing campaign was used in 2006 (production costs were much lower) and that a considerable amount was spent on developing two new drug driving campaigns. The 2006 campaign encompassed both metropolitan and rural regions and used a variety of innovative media.

Homel (1990) specified that publicity accompanying RBT activities should not simply be educational but have a deterrent value. The anti-drink driving publicity campaign used in 2006 closely accompanied police drink driving operations but did not specifically focus on deterrence. Instead, the campaign focused on the consequences of when a driver is only slightly over the legal limit, particularly the impairment of decision making skills.

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). While the 2006 campaign focused on decision making, they tended to examine the decision to drive after drinking. Harrison's 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.

LEVEL OF OPERATIONS

The number of hours spent on speed enforcement in South Australia in 2006 increased by approximately 7 per cent to the highest recorded level since the year 2000. This total does not include hours of operation of dual purpose red light/speed cameras (first introduced in 2004). Therefore, the true number of hours of speed detection is greater than is stated within this report.

The number of speed camera hours was substantially higher in 2006 compared to 2005 in both metropolitan and rural areas. This total was the highest recorded total since 2000 and exceeded the recommended target. In contrast, the hours of operation for non-camera devices (laser devices, hand-held radars and mobile radars) in 2006 decreased slightly (by 3%) but remained at a relatively high level. Non-camera devices are generally used less frequently in the metropolitan area and this is where the decrease in hours was recorded in 2006. A small increase in hours was observed in rural regions (6%).

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 (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). In addition, 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 with the majority operating during daylight hours from 6am to 8pm (although in comparison to speed cameras, non-camera devices were more frequently operated at night). This pattern of speed detection operations has varied little from 2000 to 2006. Consequently, it appears that speed detection has been organised 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 conduct speed enforcement during times when rates of speeding are higher. Speed camera data suggest higher speeding rates on weekends, in terms of both detections per hour and detections per 1,000 vehicles passing. The fact that speed enforcement was conducted evenly across all days of the week appears to constitute a good balance between operations during high traffic periods (weekdays) and high speeding days (weekends). Detection data for time of day in 2006 indicated higher rates of speeding during the day time hours and so 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 operators' lunch breaks, or to this 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 the lunch time of speed camera operators 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

In 2006, 24 per cent of licensed drivers in South Australia were detected for speeding offences, including the number detected with dual purpose red light/speed cameras. Note that over half of the detections were made with conventional speed cameras. 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. Cameras are also used more in the metropolitan area, which is characterised by a higher level of traffic density than rural areas. For speed camera detections only, the numbers increased substantially in 2006. This is at least partly attributable to the low level of speed camera operations for a three-month period in 2005. Speed detections by dual purpose red light cameras also increased in 2006, by 30 per cent. This is most likely due to a significant expansion in the number of cameras and sites.

The overall detection rate in 2006 (excluding red light/speed camera detections) increased for the first time since 2001, but it remained at a relatively low level of 1.5 detections per hour of enforcement or 10 detections per 1,000 vehicles passing. Both the metropolitan and rural areas reported increases in speed camera detection rates per hour and per 1,000 vehicles passing speed cameras during 2006. The higher detection rate was accompanied by an increase in speed camera detection hours. In contrast, the detection rate per hour for non-camera devices remained similar to the previous year (with an increase in the metropolitan area and a decrease in rural areas) while the number of detection hours decreased slightly (3%). Detection rates accounting for traffic volumes were higher in rural areas, suggesting a greater prevalence of speeding in rural areas, probably due, in part, to a greater opportunity in rural areas to freely choose your travelling speed. Thus, higher levels of speed enforcement may be needed in rural areas.

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, four per cent of metropolitan crashes (consistent with previous years) and two per cent of rural crashes were attributed to speed. Interestingly, the proportion of rural speed crashes decreased substantially to the lowest level recorded since 2000. 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 most speed-related crashes (in which the driver’s sex was known) involved male drivers emphasises the importance of deterring male drivers from speeding to reduce crashes. However, note that the proportion of females increased substantially in 2006. In previous years, males were also two and a half times as likely as females to have been detected speeding by non-camera devices (data by sex was not available in 2006).

On-road travel speed surveys were not conducted in the Adelaide metropolitan area in 2006; however, it is anticipated that surveys will recommence in 2007. The measurement of on-road travel speeds in rural areas is undertaken on a more consistent basis than is the case for urban areas. In contrast to 2005 results, roads zoned at 60, 100, and 110 km/h all demonstrated decreases in travel speeds in 2006 such that travel speeds were similar to those recorded in 2004. Travel speeds on roads zoned at 50km/h in rural towns continued to decrease in 2006. Travel speeds on rural roads in remote locations were the only ones to increase. Note that low traffic volumes in rural areas make it difficult to draw firm conclusions from these data.

PUBLICITY

Information and publicity campaigns aiming to educate motorists about speed limits have had little success (Sivak *et al.*, 2007). Instead, publicity can be useful in raising the perceived risk of detection and assisting 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).

In 2006, the spending on publicity covered the continued airing of a campaign developed in 2005. The campaign was designed to generate awareness of the risks and consequences of speeding even when slightly over the speed limit, and reinforce the value of speed limits in the community. Although the second phase of the campaign operated during the same month as police enforcement operations (April), the campaign did not attempt to raise the perceived risk of detection. Consequently, speed enforcement in South Australia would benefit from complementary media and publicity concentrating on deterrence.

5.3 Restraint use

In comparison with the enforcement of speeding and drink driving, a lack of information on restraint enforcement operations made it very difficult to assess its effectiveness. On-road observational surveys of restraint use provide the best indication of restraint use levels. However, observational surveys were not undertaken in 2006. 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 2006.

LEVELS OF RESTRAINT ENFORCEMENT

The total number of restraint offences detected in South Australia increased by 13 per cent in 2006. Problems with data cleansing meant that changes in the proportion of offences by location could not be accurately ascertained. 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. As a result, the increase in offences in 2006 may be attributed to either less compliance with restraint laws or higher levels of enforcement.

Restraint usage can be increased through high levels of enforcement over short periods, when applied repeatedly (ETSC, 1999). SAPOL's enforcement focus of the month was restraint use in February and October. While these months had a high number of restraint-related detections, they did not have the highest. Nevertheless, 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), consistent with previous years. Restraint enforcement was spread relatively evenly throughout weekdays, but was lower on weekends. The majority of offences were detected in the metropolitan area. This could be attributed to greater enforcement in the metropolitan area or to greater traffic volumes and, thus, a greater number of potential offenders.

Consistent with previous years, males were three times as likely as females to be detected for a restraint offence in 2006 and vehicle occupants aged 20 to 29 years were detected for more offences than any other age group.

LEVELS OF RESTRAINT USE AND EFFECTIVENESS

The percentage of injured vehicle occupants wearing restraints in serious injury crashes in South Australia was 89 per cent in 2006, which was slightly higher than the previous year but generally comparable to other years. The level of restraint use in fatal crashes, 65 per cent, was also broadly consistent with previous years, except for 2001 (an anomalously high level of 81%). Similar to previous years, in 2006 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 still 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). It is likely that restraint wearing rates are lower in fatal crashes because the higher severity of the injuries sustained is 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 considerable proportion of injured vehicle occupants in serious (37%) and fatal (23%) 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 during 2006, 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 (Wundersitz & McLean, 2004). Males were also found to have slightly lower restraint use rates than females. This is consistent with the finding in 2006 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 males in fatal and serious injury crashes (83%) increased to the highest level recorded since the year 2000 but was still much lower than the level for females (92%). Self-reported restraint use has also been found to be lower among males in the literature (Milano, McInturff & Nichols, 2004; Reinfurt, Williams, Wells & Rodgman, 1996). Therefore, males remain an important target for restraint enforcement.

The 2002 observational restraint use survey did not provide any information on restraint use by age. A more recent observational study investigated the frequency of child restraint use for children aged up to 10 years in the Adelaide metropolitan area, by observing usage during trips to school/preschool (Edwards, Anderson & Hutchinson, 2006). Only 1 per cent of children were completely unrestrained. Note that the rate of *appropriate* restraint use was between 64 per cent and 72 per cent on such trips, (according to weight criteria in the Australian and New Zealand Standard on child restraints for motor vehicles). Most of those who were not restrained appropriately had prematurely progressed to an adult seatbelt. However, failure to ensure that a child is appropriately restrained is not an offence in South Australia.

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 levels of publicity of enforcement is recommended (Zaal, 1994).

The amount of money invested in restraint use publicity in South Australia in 2006 decreased by almost 27 per cent. This is predominantly due to the reduction in production costs from the use of an existing campaign. The restraint use campaign, incorporating both the metropolitan and rural areas, focused on the risks and consequences of not wearing a restraint, particularly on short trips. Although radio and banner advertisements (but not television) deliberately coincided with SAPOL's enforcement focus on restraint use in February and October, the advertisements did not publicise 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 organization(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). It is not known how much unpaid restraint use publicity was received during 2006 but it 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 2006 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.

Acknowledgments

This study was funded by the South Australian Department for Transport, Energy and Infrastructure (DTEI) through a Project Grant to the Centre for Automotive Safety Research. The DTEI Project Manager was Tamra Fedojuk.

The Centre for Automotive Safety Research receives core funding from both DTEI and the South Australian Motor Accident Commission.

South Australian data for this report were provided by numerous sources. These included:

- Bruce Creed and Frank Dixon of the Traffic Intelligence Section, Traffic Support Branch, SAPOL
- Nicole Kerley, Marketing Manager of Road Safety, Motor Accident Commission
- Tamra Fedojuk, Statistician, Safety Policy, Safety and Regulation Division, DTEI.
- Andrew Krause and Justin Mann, Transport Information Management Section, Transport Services Division, DTEI

Interstate data were requested by Jaime Royals of CASR and were provided by:

- Bob Gyselman, Inspector of Police, OIC Corporate Reporting Services, Tasmania Police
- Kelly Sultana, Research Officer, Road Safety Strategic Development and Intelligence Unit, State Traffic Support Branch, Queensland Police Service
- Richard Mu, Manager Statistics Section, Northern Territory Police, Fire and Emergency Services
- Thaphei Chang, Corporate Statistics, Corporate Strategy and Performance, Victoria Police and Martin Boorman, Inspector, Traffic Alcohol Section Technical Unit, Victoria
- Clyde Jones, (Acting) Data Production Officer, Information Release Centre, Office of Information Management, Western Australia Police
- Meaghan Vendittii, Intelligence Analyst, Traffic Research and Intelligence Unit, New South Wales Police

Many thanks to Jeremy Woolley, from the Centre for Automotive Safety Research, for liasing with DTEI to obtain speed survey data and Sam Doecke for formatting the speed data.

The views expressed in this report are those of the authors and do not necessarily represent those of the University of Adelaide or the sponsoring organizations.

References

Baldock MRJ, Bailey TJ (1998). *Random breath testing in South Australia: Operation and effectiveness, 1997.* Transport SA, ORS Report Series 3/98. Office of Road Safety: Adelaide.

Baldock MRJ, Woolley JE, Wundersitz LN, McLean AJ (2007) *Annual performance indicators of enforced driver behaviours in South Australia, 2004.* CASR Report Series CASR031. Adelaide: Centre for Automotive Safety Research.

Cameron M, Delaney A (2006). *Development of strategies for best practice in speed enforcement in Western Australia.* Clayton, Victoria: Monash University Accident Research Centre.

Delaney A, Lough B, Whelan M, Cameron M (2004). *Review of mass media campaigns in road safety.* Report No. 220. Clayton, Victoria: Monash University Accident Research Centre.

Edwards S, Anderson RWG, Hutchinson P (2006). *A survey of drivers' child restraint choice and knowledge in South Australia.* CASR Report Series CASR012. Adelaide: Centre for Automotive Safety Research.

Elliot B (1993). *Road safety mass media campaigns: A meta analysis.* Report No. CR 118. Sydney: Federal Office of Road Safety.

ETSC (1996). *Seat belt and child restraints: Increasing use and optimising performance.* Brussels: European Transport Safety Council.

ETSC (1999). *Police enforcement strategies to reduce traffic casualties in Europe.* Brussels: European Transport Safety Council.

ETSC (2001). *Transport safety performance indicators.* Brussels: European Transport Safety Council.

Fitzharris M, Gelb KR, Harrison WA, Newstead SV, Diamantopoulou K, Cameron MH (1999). Evaluation of the effect of the deployment of hand-held laser speed-detection devices in the Melbourne metropolitan area. In *Proceedings of the road safety research, policing and education conference* (Vol. 2, pp. 709-720). Canberra.

Gains A, Humble R, Heydecker B, Robertson S (2003). *A cost recovery system for speed and red-light cameras - two year pilot evaluation.* London: PA Consulting Group and University College London.

Goldenbeld C, Van Schagen I (2005). The effects of speed enforcement with mobile radar on speed and accidents. An evaluation study on rural roads in the Dutch province Friesland. *Accident Analysis and Prevention, 37*, 1135-1144.

Gundy (1988). The effectiveness of a combination of police enforcement and public information for improving seat belt use. In J.A. Rothengatter & R.A. de Bruin (Eds.) *Road user behaviour: Theory and research.* Assen, NL: Van Goreum.

Harrison WA (2001). *Drink driving and enforcement: Theoretical issues and an investigation of the effects of three enforcement programs in two rural communities in Australia.* (AP-R181). New South Wales: Austroads.

Harrison W, Newman S, Baldock MRJ, McLean AJ (2003). *Drink driving enforcement: issues in developing best practice.* Sydney: Austroads.

Henstridge J, Homel R, Mackay P (1997). *The long-term effects of random breath testing in four Australian states: A time series analysis.* Report No. CR 162. Canberra: Federal Office of Road Safety.

Homel RJ (1988). *Policing and punishing the drinking driver: a study of general and specific deterrence.* New York, Springer-Verlag.

Homel R (1990). Random breath testing and random stopping programs in Australia (Ch 7). In R.J. Wilson & R.E. Mann (Eds.), *Drinking and Driving: Advances in Research and Prevention* (pp. 159-202). New York: The Guilford Press.

Hubbard NR (1999). *Random breath testing in South Australia: operation and effectiveness, 1998.* Report Series 3/99. Adelaide: Transport SA.

Kloeden CN, McLean AJ (1997). *Night-time drink driving in Adelaide: 1987-1997.* ORS Report No. 5/97. Adelaide: Office of Road Safety.

Kloeden CN, McLean AJ, Holubowycz OT (1993). *An investigation into the reasons why BAC data for road accident casualties is missing from the South Australian traffic accident database.* ORS Report No. 1/93. Adelaide: Office of Road Safety.

Kloeden CN, Woolley JE, McLean AJ (2004). *Evaluation of the South Australian default 50 km/h speed limit.* CASR Report Series CASR005. Adelaide: Centre for Automotive Safety Research, The University of Adelaide.

McInerney R, Cairney P, Toomath J, Evans J, Swadling D (2001). *Speed enforcement in Australasia: Volume 1; Practice – Performance measures – Outcome measures & Volume 2: Appendices.* AP-R189/01. Sydney: Austroads.

Milano M, McInturff B, Nichols JL (2004). The effect of earned and paid media strategies in high visibility enforcement campaigns. *Journal of Safety Research*, 35, 203-214.

Pogarsky G (2002). Identifying 'deterrable' offenders: Implications for research on deterrence. *Justice Quarterly, 19*, 3.

Reinfurt DW, Williams AF, Wells JK, Rodgman E (1996). Characteristics of drivers not using seat belts in a high belt use state. *Journal of Safety Research*, 27(4), 209-215.

Rothengatter T (1990). The scope of automatic detection and enforcement systems. In: *Proceedings of road safety and traffic environment in Europe, in* Gothenburg*, Sweden, September 26-28, 1990,* VTI rapport 365A, p 166-176.

Ryan GA (2000). *Roadside survey of drinking drivers in Perth, Western Australia.* Research Report No. 94. Perth: Road Accident Prevention Unit.

Sivak M, Luoma J, Flannagan MJ, Bingham CR, Eby DW, Shope JT (2007). Traffic safety in the US: Re-examining major opportunities. *Journal of Safety Research, 38*, 337-355.

Stefani AM (2002). *Progress in implementing strategies to increase the use of seat belts*. Report No. MH-2002-109. Washington, DC: National Highway Traffic Safety Administration.

Swadling D (1997). *Speed enforcement strategies in Western Australia.* Research Report ARR 310. Victoria: ARRB Transport Research.

Transport Information Management Section, Transport SA (2001). *Road crashes in South Australia, 1999.* Statistical Report. Adelaide: Transport SA.

White M, Baldock MRJ (1997). *Random breath testing in South Australia: Operation and effectiveness 1996.* ORS Report No.3/97. Adelaide: Office of Road Safety.

Woolley JE, Dyson CB, Taylor MAP (2001). T*he South Australian road safety media evaluation study – Final draft*. Adelaide: Transport SA. And Motor Accident Commission Transport Systems Centre, University of South Australia, Adelaide.

Wundersitz LN, Baldock MRJ (2008). *Annual performance indicators of enforced driver behaviours in South Australia, 2005*. CASR Report Series CASR035. CASR Adelaide: Centre for Automotive Safety Research.

Wundersitz LN, Baldock MRJ, Woolley JE, McLean AJ (2007) *Annual performance indicators of enforced driver behaviours in South Australia, 2003.* CASR Report Series CASR030. Adelaide, Australia: Centre for Automotive Safety Research, The University of Adelaide.

Wundersitz LN, Kloeden CN, McColl RA, Baldock MRJ, McLean AJ (2001). *Metropolitan Adelaide 2001 speed situation analysis.* Unpublished Report: Transport SA.

Wundersitz LN, McLean AJ (2002). *The operation and effectiveness of random breath testing in South Australia, 2000*. Unpublished Report: Transport SA.

Wundersitz LN, McLean AJ (2004). *Annual performance indicators of enforced driver behaviours, 2002.* CASR Report Series CASR001. Adelaide, Australia: Centre for Automotive Safety Research, The University of Adelaide.

Wundersitz LN, Woolley JE (2008). *Best practice review of drink driving enforcement in South Australia* CASR Report Series CASR036. Adelaide: Centre for Automotive Safety Research.

Zaal D (1994). *Traffic law enforcement: A review of the literature.* Report No. 53. Canberra: Federal Office of Road Safety.

Appendix A - Rural travel speeds for individual sites

Table A1
Mean and 85th percentile free speeds on rural 60 km/h roads 2000-2006

	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
2005			61.2	62.0	56.1	56.9
2006			59.9	61.0	52.7	53.9
85th 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
2005			67.2	71.4	64.4	64.0
2006			66.0	69.6	60.2	60.4

* 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 2000-2006

	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
2005			24,004	9,941	13,435	14,165
2006			20,536	9,052	12,691	14,142
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
2005			29,987	10,568	14,327	15,651
2006			25,639	9,588	13,518	15,573

* 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 2000-2006

	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
2005	104.4	86.2	92.9	100.4	98.0		99.7
2006	105.0	86.6	96.4	97.3	101.4		96.5
85th 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
2005	115.6	97.8	105.8	111.1	114.4		111.8
2006	116.9	97.8	108.8	107.2	115.3		108.7

* 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 2000-2006

	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
2005	1,833	18,690	5,338	12,216	1,153		3,001
2006	1,784	18,531	4,651	10,884	1,136		2,877
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
2005	1,872	23,509	5,804	14,521	1,178		3,129
2006	1,810	23,532	5,046	12,662	1,158		2,979

* 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 2000-2006

	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
2005	102.6	105.9	104.1	98.6	106.8		105.8
2006	98.8	105.4	100.9	98.6	106.9		106.7
85th 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
2005	113.9	115.4	114.7	110.3	115.0		119.2
2006	111.7	114.7	110.7	110.0	115.0		117.8

* 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 2000-2006

	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
2005	3,932	4,224	19,153	3,800	10,598		1,111
2006	4,405	4,224	14,765	3,189	9,994		1,376
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
2005	4,096	4,392	24,635	4,030	12,490		1,129
2006	4,605	4,389	19,057	3,373	11,576		1,435

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

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