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Annual performance indicators of enforced driver behaviours in South Australia, 2010

SD Doecke, JAL Grigo

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AUTHORS

SD Doecke, JAL Grigo

PERFORMING ORGANISATION

Centre for Automotive Safety Research
The University of Adelaide
South Australia 5005
AUSTRALIA

SPONSORED BY

Department of Planning, Transport and Infrastructure
GPO Box 1533
Adelaide SA 5001
AUSTRALIA

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ABSTRACT

This report was produced to quantify performance indicators for selected enforced driver behaviours (drink driving, drug driving, speeding and restraint use) in South Australia for the calendar year 2010. The level of driver screening tests (DST) for alcohol in South Australia in 2010 increased to the highest level since 2006. The proportion of tests conducted using mobile DST for alcohol was similar to the previous year. The detection rate, based on evidentiary testing, decreased slightly in 2010 and was lower than in two of the three other jurisdictions that supplied comparison data. The level of driver screening testing for drugs increased by three per cent in 2010 from the 2009 level. Testing rates per head of population continued to be the highest in Australia. The drug detection rate rose in 2010, though the level of drug driving among fatally injured drivers decreased slightly, relative to 2009. THC (the active component of cannabis) was the most commonly detected drug. The number of hours spent on speed enforcement in 2010 decreased by three per cent from 2009. The number of speeding detections also decreased relative to 2009 for all types of detection devices. Detections per thousand vehicles passing a speed camera decreased markedly after January in 2010. Systematic speed surveys found reductions in mean travelling speeds on most metropolitan roads but no significant change on rural roads. Speeding by more than five km/h also decreased on most metropolitan roads and also on 110 km/h rural roads. Restraint offences decreased by 10 per cent in 2009. Restraint use in serious and fatal crashes remained lower in rural regions than in the metropolitan area. Males were more likely to be charged with a restraint offence and less likely to be wearing a restraint in a fatal or serious injury crash.

KEYWORDS

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

Summary

The Centre for Automotive Safety Research at the University of Adelaide has been engaged by the Department of Planning, Transport and Infrastructure (DPTI) to produce an annual report quantifying the performance indicators for selected enforced driver behaviours (drink driving, drug driving, speeding and restraint use) in South Australia. The present report examines performance indicators for the calendar year 2010.

For each of the chosen driver behaviours, information was collected on the current levels and outcomes of police enforcement operations, 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, drug driving, speeding and restraint use will assist in optimising enforcement operations and related publicity, and may assist in reducing road trauma on South Australian roads. The main findings from the performance indicators for enforced behaviours in 2010 are summarised below.

DRINK DRIVING

In 2010, the level of driver screening tests (DST) for alcohol conducted in South Australia increased to the highest level since 2006 and exceeded the annual testing target. The increase in level of testing was particularly evident in rural regions and equated to testing approximately 64 per cent of licensed drivers in South Australia. Static testing was over twice as common as mobile testing in 2010, with the proportion of tests conducted by mobile units remaining at a similar level to the preceding years.

Based on results of evidentiary testing, South Australian detection rates (drink drivers detected per 1,000 drivers tested), decreased slightly in 2010 compared to 2009. The decrease was evident in both metropolitan and rural areas. The overall detection rate in South Australia for evidentiary tests was similar to Tasmania, but lower than two other jurisdictions for which this data was available. In comparison to evidentiary testing, the overall detection rate for screening tests in South Australia increased slightly in 2010 relative to 2009.

Consistent with previous years, mobile DST was more efficient in detecting drink drivers than static DST. Mobile DST testing detection rates in rural regions were particularly high between 10pm and 4am, while in metropolitan regions the rate was highest from 8pm to 6am. Static DST was predominantly conducted at highly visible times (i.e. 4pm to 10pm) to enhance the deterrent effect of DST. DST was also more common on days when drink driving rates were highest (i.e. Friday and Sunday).

Crash data from 2010 indicated that there was a reduction in the involvement of alcohol in fatal crashes (27%) as well as slight decrease in its involvement in serious injury crashes (15%) relative to 2009. Although the BAC of crash involved drivers was known for a greater proportion of crashes in 2010 compared to 2009, the BAC of drivers remained unknown for a considerable number of serious injury crashes (34%) and a small proportion of fatal crashes (2%).

There was one anti-drink driving publicity campaign run by the South Australian Motor Accident Commission in 2010. This campaign encouraged people to plan ahead before drinking so as to avoid taking a car.

DRUG DRIVING

Legislation allowing random drug testing in South Australia was introduced in July 2006, therefore information on driver screening tests for drugs and drug detection data are available for four full years.

In 2010, 45,121 random driver screening tests for drugs were conducted, equating to testing 3.9 per cent of licensed drivers in South Australia. The majority of these tests were conducted in the metropolitan area. The level of testing increased by about 3% compared to the previous year. South Australia achieved the highest rate of testing per head of population compared to other Australian jurisdictions supplying this data.

Drug detection rates in 2010 were increased compared to the previous year, with around 31 drivers per 1,000 testing positive (confirmed by evidentiary laboratory analysis) for at least one of the three prescribed drugs. The increase in detection rate may indicate improvement in enforcement practices or it may indicate that drug driving has increased. Enforcement of drug driving is becoming more targeted and police skill in conducting the testing, which is more subjective than alcohol testing, is increasing. This suggests that, at least, some of this increase is due to the improvement of enforcement practices. The drug detection rates were similar in metropolitan and rural regions. THC (the active component of cannabis) was the most commonly detected illicit drug followed closely by Methylamphetamine.

Of the drivers fatally injured in a crash in 2010, 21 per cent tested positive for the prescribed drugs, a level that was slightly lower than the previous year. This may suggest that the increase in the detection rate is largely due to improved enforcement practices rather than an increase in drug driving, though random variation can affect fatal injury statistics.

In 2010, one anti-drug driving publicity campaign was run by the South Australian Motor Accident Commission. This was a continuation of a campaign that began in 2009. The campaign aimed to address myths associated with drug driving and increase awareness of the negative impact drugs have on driving ability. Analysis of both drug test results of drivers fatally injured in a crash and offence data suggest that publicity campaigns should continue to target male drivers.

SPEEDING

The number of hours spent on speed enforcement in South Australia (excluding dual purpose red light/speed cameras) decreased by three per cent in 2010 from 2009. The decrease in speed detection hours was confined to metropolitan areas while rural speed detection hours marginally increased. The hours of both camera and non-camera detection devices decreased compared to 2009 levels.

The total number of speed detections decreased in 2010 relative to 2009, with the equivalent of around 26 per cent of licensed drivers in South Australia detected for speeding (including red light/speed cameras). Decreases in detections were recorded for speed cameras, red light/speed cameras, and non-camera devices. Detection rates (excluding red light/speed camera detections) per hour of enforcement and per 1,000 vehicles passing speed cameras decreased markedly in 2010 compared to 2009. Speed camera detection rates per hour decreased relative to 2009 in both the metropolitan area and in rural regions, while non-camera devices' detection rates increased in the metropolitan area and increased slightly in rural areas, relative to 2009. The reason for the decrease in speed camera detections rates is not immediately clear. Speed camera detection rates per 1,000 vehicles passing were higher in rural areas than in the metropolitan area suggesting that speeding is more prevalent in rural areas.

The systematic measurement of vehicle speeds at 130 sites across South Australia in 2010 showed mean speeds decreased on metropolitan roads in general but no significant change occurred on rural roads. The percentage of drivers speeding by more than five, 10 and 15 km/h decreased from 2009 levels on the same roads that showed reductions in mean speed, and also 110 km/h rural roads. These reductions no doubt contributed to some of the reduction in detection rate though it is unlikely they are entirely responsible.

The anti-speeding publicity campaign in 2010 was a continuation of the campaign developed in 2008. The message focused on changing the perception that driving a small amount (i.e. 5 km/h) over the speed limit is not dangerous.

RESTRAINT USE

As in previous years, determining the effectiveness of restraint use enforcement was problematic because of the lack of information on specific hours of restraint enforcement undertaken in 2010. The number of restraint offences provides some indication of the level of enforcement. Restraint offences in 2010 decreased by 10 per cent relative to 2009. This may have been partially due to a three month long grace period that followed the introduction of new child restraint laws in July.

Crash data indicated that 65 per cent of fatally injured occupants and 92 per cent of seriously injured occupants were wearing a restraint in 2010, both marginally increased from the previous year. 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).

The observational restraint use survey undertaken during 2009 revealed seat belt usage in South Australia was at a high level (above 98%) and had increased since the last survey in 2002 (Wundersitz and Anderson, 2009). Males were also found to have slightly lower restraint use rates than females. This, combined with 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 South Australian Motor Accident Commission ran one restraint use publicity campaign during 2010. The campaign focused predominantly on the risks and consequences of not using restraints.

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 engaged by the Department of Planning, Transport 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 is to assess performance indicators related to drink driving, drug driving, speeding and restraint use in South Australia for the calendar year 2010. 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. In addition, any information available from on-road surveys was reported.

The first section of the report examining drink driving continues on from other annual reports discussing the operations and effectiveness of driver screening tests (DST), previously referred to as RBT (White & Baldock, 1997; Baldock & Bailey, 1998; Hubbard, 1999; Wundersitz & McLean, 2002). From 2002 onwards, the annual report also evaluated two other major enforceable behaviours, speeding and restraint use (see Wundersitz & McLean, 2004; Wundersitz et al., 2007; Baldock et al., 2007; Wundersitz & Baldock, 2008a; Wundersitz & Baldock, 2008b). As random roadside drug testing commenced in South Australia in 2006, drug driving enforcement data was added to the enforced driver behaviours examined in this report. (Wundersitz *et al*., 2009; Wundersitz *et al*., 2010, Doecke and Grigo, 2011).

In this report speeding, restraint use, and DST for alcohol data are presented for the years 2006 to 2010 and DST for drugs are shown for 2007 to 2010.

The majority of the data presented in this report originates from police officers and therefore has various limitations that need to be understood. The collection of statistics is not listed explicitly in the core functions of SAPOL (*Police Act 1998* (SA)) therefore a balance must be struck between paperwork and actual enforcement and patrol. A relevant example is the time of day a drink driving offence took place. Police officers are only required to enter the start and end hour of the enforcement, the duration of enforcement, how many tests were conducted, and how many of these tests were positive.

In previous years reports the start time of the enforcement was used as a surrogate measure of the actual time the enforcement or offence took place. If the enforcement only occurs in short blocks of time then this method would provide an accurate reflection of the reality, however, the longer the enforcement blocks the less accurate it becomes. For this report a new method of determining the relevant statistics by time of day was used. For each individual entry the data (e.g. number of tests) was spread over the hours spanning the start and the end hour. The core assumption of this method is that the variable being measured is occurring at a uniform rate for the block of time. This should produce a result closer to the reality than attributing all the data from an enforcement block to the start hour, however it is still only an approximation of the actual situation. See Appendix A for further discussion and examples on this topic. The use of this new method means the time of day data for previous years (2006 to 2009) will not exactly match the data in previous reports.

2 Drink driving

The first section of this report describes the operation and effectiveness of driver screening tests (DST) for alcohol (previously referred to as random breath testing or RBT) in South Australia for the calendar year 2010 in terms of the number of tests, the percentage of licensed drivers tested, detection rates, and alcohol involvement in serious and fatal road crashes. To enable a comparison between South Australian practices and those of the police in other Australian jurisdictions, DST statistics from all Australian states and territories are provided. In addition, anti-drink driving publicity campaigns operating during 2010 are reviewed.

2.1 DST practices and methods of operation

Driver screening tests (DST), formally known as random breath testing (RBT), are used as 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 DST in the 1980s, with South Australia first implementing alcohol DST in 1981.

Driver screening tests (DST) are primarily used as an enforcement strategy designed to deter drivers from driving with an illegal blood alcohol concentration (BAC). A secondary aim is the detection of drink drivers. Homel (1990) argued that for DST to be successful, the testing 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 DST 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 information about operation of South Australian DST. In South Australia, DST are conducted using either 'static' or 'mobile' methods. Traditional static or stationary DST involve 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 testing was first introduced in New South Wales in late 1987 and has subsequently been introduced into all Australian states. Mobile testing allows police in any mobile vehicle to stop vehicles at random and breath test the driver. An important part of the DST 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' which included long weekends, school holidays and four other periods during the year. In June 2005, legislation passed through state parliament enabling mobile testing to be conducted on a full-time basis rather than only during prescribed periods. Consequently, 2010 is the fifth year in which data for full-time mobile testing is available for the entire 12-month period.

All police patrol and traffic vehicles are equipped with a preliminary breath testing device (971 alco-testers were available in 2010). 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 sites, evidentiary testing is either conducted in special vans, a smaller version of the traditional booze bus, or at a suitably equipped police station. Drivers testing over the legal limit with mobile DST are usually driven to the nearest police station or static 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. As in 2009, there were 145 evidentiary breath testing instruments available for use in South Australia.

Drink driving enforcement is the responsibility of the SAPOL's 13 Local Service Areas (LSAs) in South Australia, six of which are located in the Adelaide metropolitan area and seven in rural regions. A Commander in each LSA has the responsibility for ensuring drink driving enforcement targets are met and that the operations are efficient and effective. A number of corporate traffic operations specifically targeting drink/drug drivers were conducted in 2010. Known as Operation Consequence these were conducted in February, May, August, October and November. A number of other corporate traffic operations targeted the 'fatal five', which includes drink driving.

In South Australia, the prescribed BAC limit for general drivers (excluding drivers of a prescribed vehicle and drivers with a learners or provisional licence) has been 0.05 g/100 ml since July 1991. In 2010, if apprehended with a BAC level of 0.05 to 0.079 g/ml, as a first offence a general driver will incur four demerit points, and a $438 expiation fee, or a $700 court fine and a minimum three month licence suspension. If as a first offence, a general driver was apprehended with a BAC level of 0.08 to 0.15 g/ml, the driver would have received a licence suspension for a minimum of six months, five demerit points, and a court fine ranging from $500 to $900. In comparison, if the BAC level recorded was over 0.15 g/ml, the penalty would have included a minimum licence suspension of 12 months, six demerit points, and a court fine ranging from $700 to $1200. Therefore higher BAC levels lead to longer minimum licence suspensions and more costly minimum fines. Subsequent offences also lead to greater minimum penalties.

2.1.1 Number of tests performed

The following sections examine DST for alcohol in terms of levels of testing and detections, based on data from SAPOL. To provide a complete picture of the operation and effectiveness of DST in South Australia, the following data represent a combination of both static and mobile testing. Table 2.1 and Figure 2.1 summarise the changes in the number of driver screening tests for alcohol conducted from 2006 to 2010 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 driver screening tests for alcohol in South Australia, 2006-2010

Year	Metro	Rural	Total	% difference from previous year
2006	399,967	290,920	690,891	6.8
2007	389,251	289,031	678,282	-1.8
2008	371,785	289,294	661,079	-2.5
2009	397,872	318,727	716,599	8.4
2010	387,163	344,412	731,575	2.1

A testing target was set at 600,000 (combined static and mobile) in 2006 with the intention that an average of one in every two licensed drivers will be tested in South Australia. The testing target was further increased to 660,000 in 2008.

In 2010, the total number of tests (731,575) exceeded the target by over ten per cent. This equates to the highest level of testing over the last five years. Compared to the previous four years, the testing levels increased in rural areas. The number of tests conducted in metropolitan areas in 2010 decreased relative to the previous year.

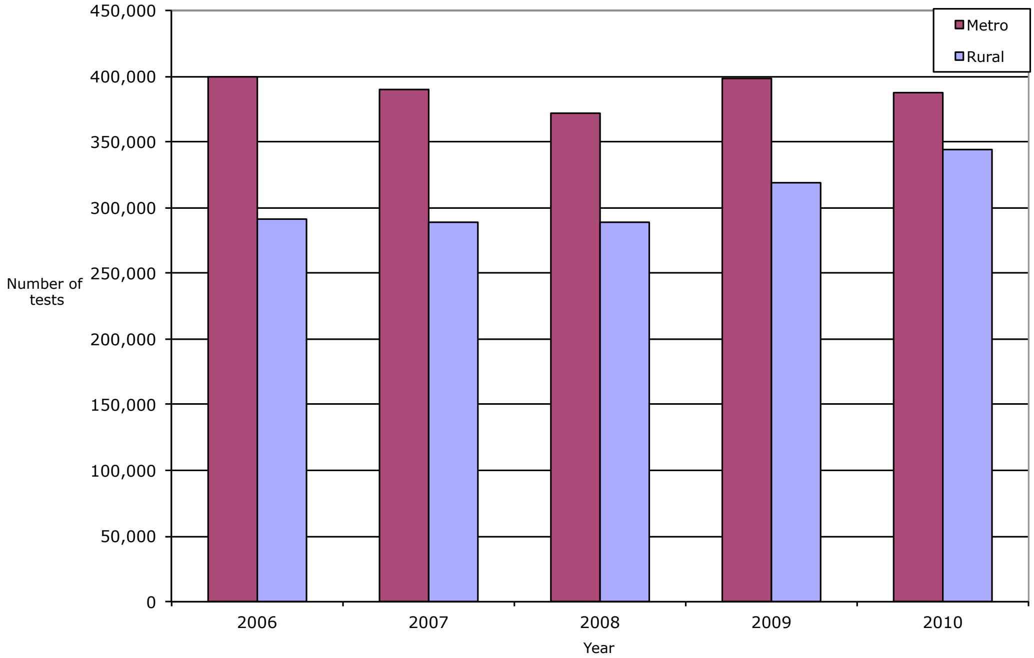

Figure 2.1
Number of driver screening tests (alcohol) in South Australia, 2006-2010

The number of driver screening tests for alcohol conducted by static and mobile testing methods from 2006 to 2010 is summarised in Table 2.2. With the exception of 2009, over the last five years the proportion of mobile testing has increased over time to reach its highest level in 2010.

Table 2.2
Number of driver screening tests (alcohol)
conducted in South Australia by testing method, 2006-2010

Year	Static	Mobile	Total	% Mobile
2006	576,261	114,630	690,891	16.6
2007	530,939	147,343	678,282	21.7
2008	477,273	183,806	661,079	27.8
2009	521,470	195,129	716,599	27.2
2010	517,101	214,474	731,575	29.3

DAY OF WEEK

The number of driver screening tests for alcohol performed on each day of the week, as a percentage of all tests in a year, is shown in Table 2.3 for the years 2006 to 2010.

Consistent with previous years, the greatest proportion of testing was performed on Friday and Saturday in 2010.

Table 2.3
Driver screening tests (alcohol) performed by day of week, 2006-2010
(expressed as a percentage of total tests each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2006	10.1	10.1	8.3	10.4	20.3	24.0	16.7
2007	12.7	6.9	10.1	10.2	19.4	26.1	14.8
2008	10.5	9.0	11.5	11.2	17.7	25.1	14.9
2009	10.7	8.6	8.5	15.1	16.0	27.0	14.0
2010	11.8	10.6	8.8	13.1	18.3	23.3	14.1

Table 2.4 shows that the distribution of testing by day of week for static and mobile DST for alcohol in 2010 was similar to previous years with the majority of both static and mobile DST occurring on Friday to Sunday.

Table 2.4
Driver screening tests (alcohol) performed by day of week in 2006-2010
(expressed as a percentage of total tests each year) for static and mobile DST

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
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
2007							
Static	13.2	6.2	10.1	9.6	19.1	26.7	15.1
Mobile	11.1	9.1	9.8	12.2	20.2	23.8	13.9
2008							
Static	10.1	8.4	11.6	10.7	17.4	26.2	15.5
Mobile	11.3	10.7	11.4	12.6	18.5	22.3	13.3
2009							
Static	10.6	8.0	7.9	15.5	15.4	28.6	14.0
Mobile	11.0	10.2	10.1	14.0	17.8	22.9	14.0
2010							
Static	12.4	10.3	8.1	13.4	17.8	23.6	14.4
Mobile	10.5	11.2	10.5	12.4	19.4	22.7	13.4

TIME OF DAY

The percentage of tests performed from 2006 to 2010 by time of day is presented in Table 2.5. Note that the eight hours between 6am and 2pm have been grouped while all other columns represent only two hours. Also, the data presented may differ to that presented in previous reports due to changes to the analysis of time of day data (see Appendix A).

In 2010, DST for alcohol were conducted most commonly between 8pm and 10pm. This finding is similar to the previous year. Also, consistent with previous years, there were relatively low levels of testing in the early morning hours between 2am and 6am.

Table 2.5
Driver screening tests (alcohol) performed by time of day, 2006-2010
(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
2006	8.4	3.3	3.6	20.1	7.7	13.6	14.0	21.3	8.0
2007	8.4	3.4	3.6	20.4	7.8	13.0	14.2	21.3	7.7
2008	8.5	3.4	3.1	22.6	7.5	13.6	13.3	20.5	7.6
2009	9.5	3.8	4.0	20.8	6.7	11.1	13.3	21.9	8.9
2010	7.6	3.2	3.9	22.0	7.7	12.9	13.7	21.9	7.0

Time of day testing data from 2006 to 2010 is shown in Table 2.6 separately for static and mobile DST. In 2010, police conducted static DST most frequently between 4pm and 10pm, whereas mobile testing was most frequent between 8pm and 10pm. In comparison to static testing, mobile testing tended to be more common during the late night and early hours of the morning (i.e., 10pm to 6am). This is a similar pattern to the previous years.

Table 2.6
Driver screening tests (alcohol) performed by time of day in 2006-2010
(expressed as a percentage of total tests in the year) for static and mobile DST

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
2006									
Static	7.6	2.7	3.7	20.0	7.9	14.4	14.5	21.9	7.2
Mobile	12.2	6.4	3.1	20.2	6.8	9.5	11.7	18.5	11.6
2007									
Static	7.4	2.8	3.7	20.9	8.1	13.8	14.5	22.1	6.8
Mobile	12.1	5.8	3.4	18.7	6.9	10.1	13.1	18.5	11.3
2008									
Static	7.0	2.4	2.7	23.1	7.9	15.2	13.7	21.6	6.4
Mobile	12.5	6.1	3.9	21.2	6.3	9.6	12.2	17.6	10.6
2009									
Static	8.6	2.7	3.7	20.5	6.9	11.8	13.6	24.0	8.2
Mobile	12.0	6.6	4.9	21.4	6.1	9.2	12.4	16.5	10.9
2010									
Static	6.0	1.9	3.5	22.5	8.0	14.1	14.3	24.0	5.6
Mobile	11.5	6.3	4.8	20.9	6.8	9.9	12.4	16.9	10.4

Table 2.7 shows the percentage of DST for alcohol per month for static and mobile testing in 2010. There were few discernable patterns by month for static or mobile testing. Generally, lower levels of both static and mobile testing occurred in June and July. There were two peaks in static testing levels occurring in April and October. The peak in April was largely accounted for by an increase in static testing levels in rural regions whereas the peak in October involved an increase in both metropolitan and rural static testing.

Table 2.7
Driver screening tests (alcohol) by month in 2010
(expressed as a percentage of total tests in the year) by location for static and mobile DST

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	7.7	9.7	8.6	9.9	7.1	8.4
Feb	7.2	8.5	7.8	7.4	7.4	7.4
Mar	10.1	6.7	8.6	9.3	6.8	7.9
Apr	8.2	14.4	10.9	7.6	9.6	8.7
May	6.9	7.1	7.0	7.7	10.5	9.2
Jun	5.2	4.7	5.0	5.6	6.2	5.9
Jul	6.9	5.6	6.3	6.7	7.6	7.2
Aug	9.4	7.7	8.6	8.8	11.0	10.0
Sep	7.2	7.9	7.5	7.7	8.1	7.9
Oct	12.9	9.4	11.4	10.9	8.2	9.4
Nov	8.9	7.9	8.5	7.6	7.9	7.8
Dec	9.6	10.2	9.9	10.7	9.7	10.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

2.1.2 Percentage of licensed drivers tested

The numbers of licensed drivers and percentage of licensed drivers tested in South Australia for the years 2006 to 2010 are presented in Table 2.8 and in Figure 2.2. The testing target level of 1 in 2 drivers has been exceeded each year during this time period. A similar proportion of licenced drivers were tested in 2010 and 2009 (approximately 64%).

Table 2.8
Number and percentage of licensed drivers tested in South Australia, 2006-2010

Year	Number of tests	Number of licensed drivers [a]	% of licensed drivers tested
2006	690,891	1,042,774	66.3
2007	678,282	1,073,103	63.2
2008	661,079	1,085,503	60.9
2009	716,599	1,126,847	63.6
2010	731,575	1,145,591	63.9

Note. Licence information could only be extracted for the financial year to June 30.

[a] Source: 2006-2010 TRUMPS database, Registration and Licensing Section, DPTI.

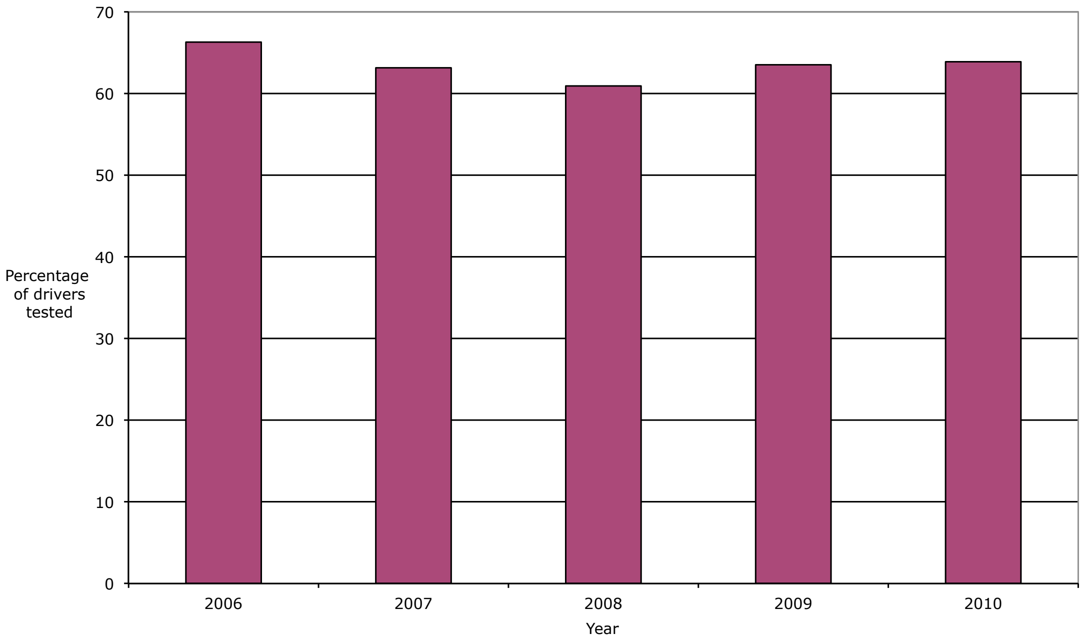

Figure 2.2
Percentage of licensed drivers tested, 2006-2010

2.1.3 Interstate comparisons

To establish standards against which South Australian practices may be assessed, information was collected on the levels of DST conducted in other Australian jurisdictions.

Table 2.9 shows the levels of overall DST for alcohol in all Australian jurisdictions, including South Australia, with total numbers expressed, where possible, in terms of the relative contributions of mobile and static testing methods. Victoria, the Northern Territory, and the Australian Capital Territory were unable to provide data in 2010 due to personnel or data-related reasons.

Consistent with previous years, the highest levels of DST were conducted in New South Wales and Queensland. Although data was not available for Victoria, Victoria has also previously had a high level of tests conducted. In South Australia, the proportion of DST that were conducted using mobile testing methods was similar to Queensland, with the proportion of mobile testing being higher in Tasmania and Western Australia compared to South Australia, but lower in New South Wales.

Table 2.9
Number of driver screening tests (alcohol)
conducted in Australian jurisdictions in 2010, by testing method

Jurisdiction	Static	Mobile	Total	% Mobile
South Australia	517,101	214,474	731,575	29.3
New South Wales	3,442,975	983,060	4,426,035	22.2
Queensland	2,069,918[a]	864,928	2,934,846	29.5
Tasmania	208,796	415,654	624,450	66.6
Victoria	UK	UK	UK	UK
Western Australia	320,118[b]	231,786	551,904	42.0
Northern Territory	UK	UK	UK	UK
Australian Capital Territory	UK	UK	90,146[c]	UK

[a] Total includes 47,795 tests conducted using DST 'booze buses'.
[b] Total is only tests conducted using DST 'booze buses'.
[c] Total includes traffic stops that are not DST specific
NB: UK = unknown

A more appropriate measure of the level of DST in different jurisdictions can be gained by adjusting the number of DST with the number of drivers in each jurisdiction. To avoid any difficulties associated with differences in licensing conditions across jurisdictions, a simpler measure is number of 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 levels of DST are expressed as rates per head of population (Table 2.10), the highest rates of testing were reported for Tasmania, followed by Queensland and New South Wales. Although the 2010 statistics for Victoria and the Northern Territory are unknown, the Northern Territory had the second highest rate of testing per head of population in 2009 (see Doecke & Grigo, 2011). In addition, similar to 2009, South Australia's level of testing was around 44 per cent and was higher than levels in the Australian Capital Territory and Western Australia (see Doecke & Grigo, 2011).

Table 2.10
Number of driver screening tests (alcohol)
conducted in Australian jurisdictions in 2010, as a percentage of population

Jurisdiction	Total	Pop 2010[a]	% of Pop
South Australia	731,575	1,650,400	44.3
New South Wales	4,426,035	7,272,200	60.9
Queensland	2,934,846	4,548,700	64.5
Tasmania	624,450	509,300	122.6
Victoria	UK	5,585,600	UK
Western Australia	551,904	2,317,100	23.8
Northern Territory	UK	229,900	UK
Australian Capital Territory	90,146	361,900	24.9

[a] Source: Estimated resident population data from Australian Bureau of Statistics (2011) *Australian Demographic Statistics, December 2010.* Catalogue No 3101.0.

2.2 Levels of drink driving

2.2.1 Alcohol detections

The numbers of alcohol detections from DST in South Australia for the years 2006 to 2010 are shown in Table 2.11. Note that alcohol detections in this table refer only to drivers who recorded an illegal BAC using evidentiary testing. 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 the table. In 2010, the number of detections decreased by eleven per cent compared to the previous year, with the lowest number of detections recorded in the last four years.

Table 2.11
Number of alcohol detections in South Australia, 2006-2010

Year	Number of DST detections	Per cent change from previous year
2006	4,419	-11.1
2007	5,835	24.3
2008	5,313	-8.9
2009	5,690	7.1
2010	5,058	-11.1

2.2.2 Alcohol detection rates

There is no suitable measure of the effectiveness of the operation of DST but detection rates and the percentage of drivers with illegal BACs involved in serious and fatal crashes provide an estimate. A lower detection rate may indicate greater effectiveness of DST and other drink driving countermeasures, although it must be acknowledged that detection rates are also affected by operational factors such as the locations, times and types of testing enforcement used.

The detection rates from DST for metropolitan and rural areas from 2006 to 2010 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 detection rate in 2010 was lower than the previous three years. This decrease in detection rate was observed in both metropolitan and rural regions.

Table 2.12
DST alcohol detection rates, 2006-2010
(number of drivers detected with an Illegal BAC per 1,000 tested)

Year	Metro	Rural	Total
2006	7.1	5.5	6.4
2007	9.4	7.4	8.6
2008	9.4	6.3	8.0
2009	8.8	6.9	7.9
2010	7.9	5.8	6.9

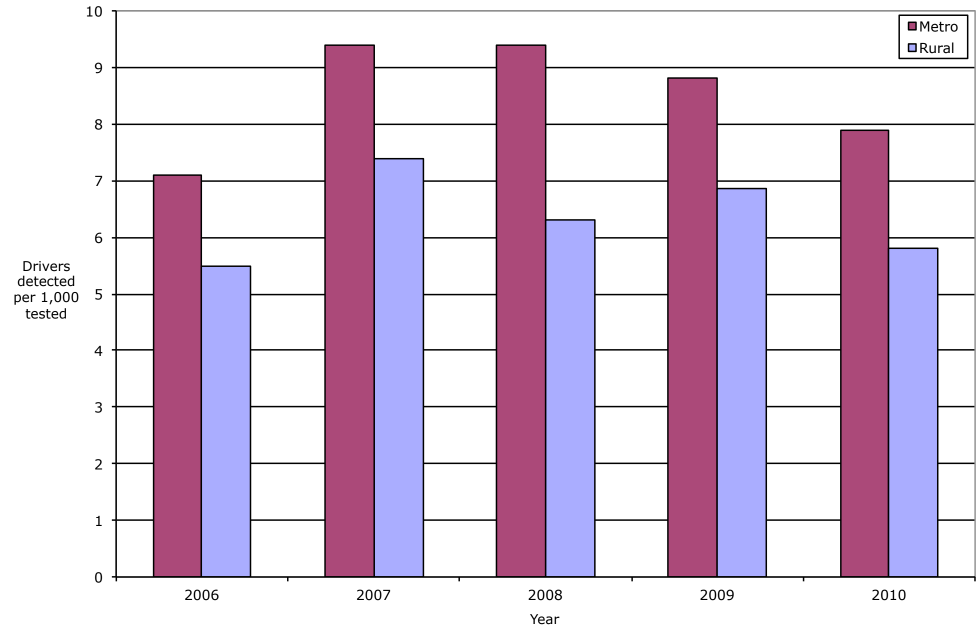

Figure 2.3
DST alcohol detection rates per 1,000 tests, 2006-2010

Table 2.13 shows the detection rates associated with static and mobile DST in metropolitan and rural areas from 2006 to 2010. 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 DST separately. Percentages of drivers detected over the limit on screening tests will exceed the number detected over the limit on 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).

A total of 7,029 drivers were detected with an illegal BAC by a screening test in 2010. The overall detection rate for screening tests increased slightly from 9.0 per 1000 in 2009 to 9.6 per 1000 in 2010, while the overall detection rate for evidentiary tests decreased from 7.9 per 1000 in 2009 to 6.9 per 1000 in 2010. Table 2.13 shows that static detection rates in 2010 remained at similar levels to 2009 but mobile detection rates increased slightly. Mobile DST continue to detect a greater percentage of drink drivers than static DST, and static and mobile detection rates were highest in metropolitan areas, consistent with previous years. With the exception of 2006, the ratio of mobile to static detection rates indicates that mobile testing is more effective in detecting drink driving relative to static testing in rural areas than in metropolitan areas.

Table 2.13
DST detection rates (screening test only), 2006-2010
(number of drivers detected with an Illegal BAC per 1,000 tested)
for static and mobile DST, by location

Year and location	Static	Mobile	Ratio of mobile to static
2006			
Metro	9.9	57.4	5.8
Rural	6.1	34.0	5.6
Total	8.4	43.5	5.2
2007			
Metro	6.4	40.7	6.4
Rural	2.8	22.4	8.0
Total	5.0	30.5	6.1
2008			
Metro	6.0	23.8	4.0
Rural	2.1	18.9	9.0
Total	4.4	21.5	4.9
2009			
Metro	6.5	24.4	3.8
Rural	2.2	17.3	7.8
Total	4.7	20.6	4.4
2010			
Metro	5.8	28.2	4.9
Rural	2.2	18.0	8.2
Total	4.2	22.6	5.4

TIME OF DAY

Detection rates (screening test results) by time of day, shown in Table 2.14, indicate that the highest alcohol detection rates in 2010 were between midnight and 6am. This is consistent with the previous three years.

Table 2.14
DST detection rates (screening tests only) by time of day, 2006-2010
(number of drivers detected with an illegal BAC per 1,000 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
2006									
Metro	54.1	49.8	40.5	22.2	13.3	28.3	26.2	30.0	41.2
Rural	59.4	80.6	38.9	33.7	26.7	25.8	32.5	40.7	51.5
Total	55.9	59.3	40.1	27.9	23.2	26.5	29.2	33.9	45.4
2007									
Metro	20.6	29.8	23.4	5.4	4.9	8.2	9.1	7.9	17.6
Rural	26.4	35.5	18.0	4.4	2.7	3.5	8.9	9.8	16.6
Total	22.7	31.6	22.1	4.9	3.3	4.8	9.0	8.6	17.2
2008									
Metro	20.4	30.3	23.2	4.3	6.1	7.5	9.1	8.0	15.4
Rural	25.8	31.7	19.5	3.6	2.9	2.9	5.3	7.8	16.2
Total	22.3	30.8	22.1	4.0	3.7	4.2	7.1	7.9	15.8
2009									
Metro	17.4	27.8	21.4	4.8	5.7	8.2	8.9	7.5	13.4
Rural	21.3	27.6	12.8	3.3	3.3	3.5	5.6	7.8	13.3
Total	18.6	27.7	19.2	4.1	4.0	4.9	7.2	7.6	13.4
2010									
Metro	20.4	31.0	20.3	5.4	5.9	10.0	9.8	8.7	17.6
Rural	23.6	25.6	18.6	4.3	3.8	3.8	6.5	8.3	14.6
Total	21.4	29.1	19.9	4.8	4.4	5.6	8.2	8.6	16.2

Alcohol detection rates by time of day for mobile and static DST are presented in Table 2.15. In rural regions the mobile testing detection rate was high from 10pm to 6am, while in metropolitan regions the mobile testing detection rate was high from 8pm to 6am. Static detection rates were highest from 10pm to 6am in metropolitan and rural areas.

Table 2.15
DST detection rates (screening test only) in 2010
(number of drivers detected per 1,000 tested) by time of day, method and location

Method	12-2 AM	2-4 AM	4-6 AM	6 AM-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
Static									
Metro	11.7	15.6	13.4	2.5	2.6	3.7	4.7	4.6	8.3
Rural	8.6	10.9	6.9	1.0	1.3	1.7	2.5	3.3	5.1
Total	11.1	14.9	12.8	1.7	1.7	2.2	3.7	4.3	7.2
Mobile									
Metro	37.9	50.9	40.4	12.5	12.7	22.7	28.7	31.9	38.2
Rural	30.8	28.5	23.0	13.3	12.0	13.4	14.7	16.1	21.4
Total	34.4	39.3	32.4	12.9	12.2	17.3	20.5	23.2	28.0
Both									
Metro	20.4	31.0	20.3	5.4	5.9	10.0	9.8	8.7	17.6
Rural	23.6	25.6	18.6	4.3	3.8	3.8	6.5	8.3	14.6
Total	21.4	29.1	19.9	4.8	4.4	5.6	8.2	8.6	16.2

To determine whether there were any combinations of location (metro or rural) and time of day in which mobile testing was more likely than static testing to detect drink drivers, the ratio, for each location and time of day combination, of mobile to static detection rates were calculated. The results, displayed in Table 2.16, indicate that the detection rate of mobile testing is greater than that of static testing throughout both day and night in both metropolitan and rural regions. This is particularly the case in rural regions between 6am and 6pm, and metropolitan areas between 4pm and 10pm.

Table 2.16
The ratio of mobile to static alcohol detection rates from DST in 2010
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	3.3	3.3	3.0	5.1	4.8	6.1	6.1	6.9	4.6
Rural	3.6	2.6	3.3	13.4	9.0	7.9	5.9	4.9	4.2
Total	3.1	2.6	2.5	7.5	7.4	7.9	5.5	5.4	3.9

DAY OF WEEK

Table 2.17 shows alcohol detection rates by day of week for static and mobile DST, presented separately for metropolitan and rural testing. Detections here are for drivers testing positive on the screening test rather than on the evidentiary test. Overall, detection rates were higher from Friday to Sunday, reflecting the same day of week pattern as for numbers of tests. This trend was evident in both metropolitan and rural areas. Although the greatest number of tests were conducted on Friday and Saturday, the highest detection rate on the screening tests was on Sunday.

Table 2.17
Alcohol detection rates from DST (screening tests only) in 2010
(number of drivers detected per 1,000 tested) by day of week, method and location

Method	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Static							
Metro	2.8	4.4	3.3	4.3	6.9	7.1	9.2
Rural	1.4	1.6	1.8	1.7	2.4	2.8	2.8
Total	2.2	3.4	2.7	3.1	4.5	5.1	6.4
Mobile							
Metro	22.2	17.3	21.1	25.7	34.8	35.6	37.5
Rural	10.0	13.5	21.8	17.9	19.3	19.2	19.1
Total	16.4	15.8	21.4	21.9	24.7	25.1	27.8
Both							
Metro	7.2	8.2	9.1	9.9	13.9	13.1	16.0
Rural	4.0	5.6	9.4	6.4	8.4	8.6	8.1
Total	5.9	7.3	9.2	8.3	10.8	10.8	12.4

ALCOHOL DETECTION RATES BY MONTH

Static and mobile detection rates from DST by month are displayed in Table 2.18 for both metropolitan and rural areas. Note, again, that these alcohol detection rates refer to the results of screening tests. For static testing, the detection rate was particularly high in May and particularly low in September. The peak in May can be explained by a peak in static detection rate in the metropolitan region during this period. The drop in September can also be attributed to the metropolitan region. For mobile testing, rates were highest in February and March.

Table 2.18
Detection rates from DST by month in 2010
(number of drivers detected with an Illegal BAC per 1,000 tested), by location

Month	Static			Mobile		
	Metro	Rural	Total	Metro	Rural	Total
Jan	5.5	2.6	4.1	20.8	27.0	23.6
Feb	5.8	2.9	4.4	33.1	27.0	29.8
Mar	6.4	2.1	4.9	30.8	25.7	28.4
Apr	5.7	1.6	3.3	29.8	17.0	22.1
May	8.4	2.8	5.9	22.6	14.6	17.7
Jun	4.8	2.6	3.9	29.1	15.4	21.3
Jul	4.5	1.9	3.5	31.0	20.4	24.9
Aug	5.5	1.7	4.0	28.4	14.8	20.3
Sep	3.4	1.6	2.6	34.1	13.9	22.9
Oct	6.4	2.8	5.1	25.8	16.5	21.4
Nov	4.8	2.0	3.6	26.3	13.6	19.3
Dec	6.8	2.4	4.8	29.6	15.1	22.1
Total	5.8	2.2	4.2	28.2	18.0	22.6

ALCOHOL DETECTION RATES BY SEX

Table 2.19 shows the detection rates for males and females from 2006 to 2010, based on evidentiary testing data and the number of licensed drivers of each gender. The detection rate is 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. Note 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 3493 cases for which sex was unknown. However, the difference does not affect the pattern of drink driving activities evident in the data.

The ratio of male to female drink driving detection rates in 2010 indicates that, on average, males are over three times more likely to be detected than females. This trend is consistent with previous years and reinforces the view that drink driving continues to be a problem among male drivers.

Table 2.19
Number of licence holders, alcohol detection rate from DST and comparative ratio of detection rate by sex, 2006-2010

Year	Male			Female			
	Licence holders	Detected by DST	DST detection rate (per thousand licensed)	Licence holders	Detected by DST	DST detection rate (per thousand licensed)	Ratio of male to female detection rate
2006	535,440	3,485	6.51	501,470	934	1.86	3.50
2007	553,341	4,609	8.33	514,047	1,226	2.38	3.50
2008	519,648	4,173	8.03	560,287	1,140	2.03	3.96
2009	582,108	4,476	7.69	540,587	1,214	2.25	3.42
2010	591,487	3,907	6.61	550,611	1,151	2.09	3.16

Note. The number of licence holders for 2006-2010 was obtained from the TRUMPS database, Registration and Licensing Section, DPTI.

ALCOHOL DETECTION RATES BY AGE GROUP

The detection rates by age group for 2010 are shown in Table 2.20, based on evidentiary testing data and number of licensed drivers of each age group. The detection rate is expressed in terms of the number of licence holders because police do not record the age of drivers tested who do not have an illegal BAC. Note that the total number of detections is less than shown previously, as there were four drivers who were under 16 years old who had a positive BAC (and were also driving unlicensed). This does not affect the data presented in Table 2.20.

The highest detection rates in 2010 were for drivers aged 20 to 29. After reaching a peak at 20 to 24 the detection rate declined with increasing age. This pattern is similar to 2009 and shows that drink driving is still a problem in the younger age groups (see Doecke & Grigo, 2011). The overall detection rate also decreased slightly from 5.04 per 1000 tests in 2009, to 4.41 per 1000 tests in 2010, this was evident in reductions in detection rates in all age groups other than drivers aged over 60 years. Compared to 2009, the greatest reductions in detection rates were seen in drivers aged 20 to 29, with detection rates in drivers of this age group reducing by 3.85 per 1000 in 2010.

Table 2.20
Number of licence holders, alcohol detections from DST and detection rate by age group, 2010

Age Group (yrs)	Licence holders	Detected by DST	DST detection rate (per thousand licensed)
16-19	67,218	339	5.04
20-24	91,610	918	10.02
25-29	96,299	889	9.23
30-39	193,607	1,140	5.89
40-49	217,868	980	4.50
50-59	205,175	551	2.69
60 +	273,814	237	0.87
Total	1,145,591	5,054	4.41

DST DETECTIONS BY BAC READING

The number of drink drivers detected by DST in metropolitan and rural regions by BAC category is presented in Table 2.21. The table includes all drivers detected during evidentiary testing because BACs are not recorded for the screening test. Consequently, BAC readings are not available separately for static and mobile DST. Note that the BAC categories were changed in 2006.

A number of BAC readings were recorded in the range from 0.001 to 0.049mg/L. These low readings may be attributed to some drivers having special licence conditions (i.e. truck, taxi, learner and provisional licence drivers) requiring a zero BAC. For these drivers, any positive BAC reading was regarded as illegal. In 2010, around 18 per cent of detected drivers recorded a high BAC level, that is, a BAC of 0.150mg/L and above, this is slightly lower than 2009 (19%). Rural regions had a greater proportion of drivers with a high BAC level (23%) than the metropolitan area (15%).

Table 2.21
Number of drivers detected by DST by BAC category and region, 2006-2010

	BAC readings (mg/L)					
Year	0.001-0.049	0.050-0.079	0.080-0.149	0.150+	Refused	Total
2006						
Metro	285	827	1,321	388	0	2,821
Rural	145	360	742	351	0	1,598
2007						
Metro	429	981	1,691	577	23	3,701
Rural	219	418	1,031	489	17	2,174
2008						
Metro	390	906	1,592	577	28	3,493
Rural	174	376	833	414	21	1,818
2009						
Metro	475	948	1,507	574	28	3,532
Rural	240	422	1,009	515	13	2,199
2010						
Metro	414	839	1,357	458	16	3,084
Rural	217	427	883	460	9	1,996

2.2.3 Interstate comparisons

Alcohol detection data from DST were obtained from all Australian jurisdictions and are shown in Table 2.22. 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 2.22 is split into screening and evidentiary testing detections to allow meaningful comparisons. South Australian detections are given for both screening and evidentiary testing.

The screening test data show that Queensland had the highest number of detections in 2010 and, when adjusted for population, the highest screening detection rate. The Australian Capital Territory had a lower screening detection rate compared to South Australia. For evidentiary testing, New South Wales was the only jurisdiction to have a lower alcohol detection rate compared to South Australia.

Table 2.22
DST alcohol detections in 2010 in Australian jurisdictions

	Jurisdiction	DST Detections	% of Population
Screening	South Australia	7,029	0.43
	Queensland [a]	32,214	0.71
	Western Australia	UK	UK
	Victoria	UK	UK
	Australian Capital Territory	1,361	0.38
Evidentiary	South Australia	5,058	0.31
	New South Wales	18,795	0.26
	Western Australia [b]	17,788	0.77
	Tasmania	4,566	0.90
	Australian Capital Territory	1,221	0.34
	Northern Territory	UK	UK

Source: Estimated resident population data from Australian Bureau of Statistics (2011) *Australian Demographic Statistics, December 2010.* Catalogue No 3101.0

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

[b] Includes 3,687 detections conducted at a booze bus.

Data were unavailable to calculate DST detection rates per thousand drivers tested for alcohol in Victoria and the Northern Territory. South Australian detection rates per thousand tested are compared to rates in other jurisdictions for static and mobile methods in Table 2.23. Once again, to make meaningful comparisons, detection rates are given separately for screening and evidentiary testing. For testing with screening devices, South Australia had a detection rate that was lower than the Australian Capital Territory and Queensland. The detection rate for mobile DST in South Australia was comparable to the other jurisdictions for which data were available. With respect to evidentiary testing, South Australia’s overall detection rate was similar to Tasmania. The detection rate was greater than that of New South Wales, but lower than Western Australia and the Australian Capital Territory.

Table 2.23
DST detection rates, 2010
(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	4.2	22.6	9.6
	Queensland	7.1	20.3	11.0
	Western Australia	UK	UK	UK
	Victoria	UK	UK	UK
	Australian Capital Territory	UK	UK	15.1
Evidentiary	South Australia	2.7	17.2	6.9
	New South Wales	1.6	13.4	4.2
	Western Australia	11.5	60.8	32.2
	Tasmania	3.5	9.3	7.3
	Australian Capital Territory	UK	UK	13.5
	Northern Territory	UK	UK	UK

Overall, compared to other Australian jurisdictions, in 2010 South Australia had a relatively low rate of testing per head of population, but a comparable detection rate per thousand tested and proportion of tests conducted using mobile methods.

2.2.4 Blood alcohol levels of seriously and fatally injured drivers

The BAC levels of drivers and motorcycle riders involved in road crashes provide an estimate of the effectiveness of DST for alcohol. 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 0.05mg/L, 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. Not all crash involved drivers have a known BAC due to limitations in the matching process for forensic blood samples with the DPTI Traffic Accident Reporting System (TARS) database and the infrequency with which police record BAC data for drivers (Kloeden, McLean & Holubowycz, 1993).

The BAC distribution of drivers who were fatally injured in a road crash and for whom a BAC was recorded is presented in Table 2.24. The results for 2010 are indicative of relatively high levels of alcohol involvement in fatal crashes. In 2010, there was an 11 percentage point reduction in fatally injured drivers recording a BAC above 0.050mg/L compared to 2009. The percentage of drivers with a BAC level above 0.100mg/L was similar in 2010 compared to the previous year, with around 24 per cent in 2009 compared to around 21 per cent in 2010. The relatively small number of fatalities means that the results can be expected to fluctuate from year to year more than the results for serious injuries (see Table 2.25 for serious injuries). The proportion of known BAC levels remained high in 2010 at around 97 per cent.

Table 2.24
Percentage of drivers and motorcycle riders fatally injured
in road crashes by known BAC category, 2006-2010

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
2006*	52.78	5.56	5.56	1.39	19.44	12.50	2.78	41.67	72	90.00	80
2007	62.50	7.14	0.00	5.36	19.64	3.57	1.79	30.36	56	84.85	66
2008	55.36	7.14	1.79	1.79	16.07	17.86	0.00	37.50	56	91.80	61
2009*	58.11	4.05	2.70	10.81	9.46	8.11	6.76	37.84	74	98.67	75
2010	64.79	8.45	1.41	4.23	7.04	4.23	9.86	26.76	71	97.26	73

*Data for 2006 and 2009 differs from the previous report due to the continuous updating of data

Table 2.25 shows the percentage of drivers seriously injured by known BAC level. 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 2010, over 15 per cent of drivers seriously injured in a crash had a BAC of 0.050mg/L or greater, which was the lowest level recorded over the five year period. The percentage of drivers with a BAC above 0.100 in 2010 was around 12 per cent, also lower than previous years. Note that the percentage of seriously injured drivers with a BAC above 0.100mg/L was considerably lower than the percentage above this BAC level for fatally injured drivers (21%, refer to Table 2.24). The percentage of known BAC levels for seriously injured drivers in 2010 increased but remained at a relatively low level (66%).

In general, these results are indicative of a lower level of alcohol involvement in fatal and serious injury crashes during 2010 compared to previous years.

Table 2.25
Percentage of drivers and motorcycle riders seriously injured
in road crashes by known BAC category, 2006-2010

Year	Zero	.001 - .049	.050 - .079	.080 - .099	.100 - .199	.200 - .299	.300+	> .050	Number of known cases	% known	Total number
2006	74.02	3.74	2.43	2.06	14.02	3.74	0.00	22.24	535	63.02	849
2007	75.66	2.45	1.02	1.84	15.13	3.89	0.00	21.89	489	57.60	849
2008	72.14	2.59	2.59	2.81	15.33	4.32	0.22	25.27	463	60.92	760
2009*	77.59	3.59	1.48	2.33	12.47	2.54	0.00	18.82	473	64.35	735
2010	83.76	0.94	1.88	1.88	7.53	4.00	0.00	15.29	425	65.69	647

*Data for 2009 differs from the previous report due to the continuous updating of data

2.3 Anti-drink driving publicity

There was one drink driving campaign conducted during 2010. This campaign was named ‘Thinking About Drinking’ and was continued from 2009. The main objective of the campaign was to urge people to leave their car at home when going out to drink and to positively reinforce this type of planning ahead.

The campaign provided audiences with ideas for alternatives to driving and reinforced these ideas by showing the personal benefits that can arise from these behaviours. An additional goal of the campaign was to encourage consideration of alternatives to drink driving every time drinking is planned.

The campaign was run during March, September, and December 2010 using a combination of television and online advertising, as well as through posters and on the sides of buses. Role-models were depicted in the television advertisements using alternative forms of transport while enjoying responsible use of alcohol. The online banners were posted on websites prior to the weekends to promote pre-planning, while the poster advertisements were placed in clubs and pubs to promote transport alternatives during drinking occasions.

The campaign slogan was ‘Thinking about drinking? Don’t take the car’ and the audience targeted by the campaign were males living in regional areas with those aged 20 to 39 being the primary audience and those aged 40 to 55 being the secondary audience.

3 Drug driving

3.1 Drug driving enforcement and operations

Victoria was the first jurisdiction in the world to introduce legislation for the random drug screening of drivers in December 2004. The legislation made it an offence to drive with any level of methylamphetamine (MA, 'speed', 'ice', 'crystal meth') or Delta-9-tetrahydrocannabinol (THC, the active component of cannabis) in the blood or saliva. In September 2006, methylenedioxymethamphetamine (MDMA, ecstasy) was added to the Victorian legislation (Boorman, 2007).

Random roadside saliva testing is now conducted in all states in Australia, with only the territories yet to introduce such testing prior to 2010 (see Table 3.1). It is carried out to detect recent drug use, rather than driver impairment. That is, in Australia, a 'zero tolerance' approach is used, meaning that it is an offence if the test detects any level of drug.

Table 3.1
Chronology of introduction of random roadside drug testing legislation in Australian jurisdictions

Australian jurisdiction	Year legislation introduced
Victoria	December 2004
Tasmania	July 2005
South Australia	July 2006
New South Wales	December 2006
Western Australia	October 2007
Queensland	December 2007

In South Australia, random drug testing of drivers for THC and methylamphetamine began in July 2006. MDMA was added later to the legislation in September 2006, as in Victoria. Any driver in South Australia may be required to undertake a random roadside saliva test, including the passenger acting as a 'qualified supervising driver' for a learner driver. DST sites for drugs are set up similarly to static alcohol testing sites but signage clearly states that drug testing is being undertaken. Some drug DST sites are random while others are more targeted, selected on the basis of crash data or the area being known to have a drug problem. Increasingly, intelligence is being used to enable DST to be conducted in areas that are known to have higher levels of drug driving.

Driver screening tests for drugs are combined with alcohol enforcement. Therefore, the testing can occur anywhere and at anytime where breath alcohol testing is permitted. This procedure begins after a driver has provided a sample of breath for an alcohol test. The procedure for drug testing itself occurs in three stages. Firstly, drivers are required to complete a saliva screening test. The saliva test involves licking an absorbent swab until the saliva sample is collected. The sample is screened at the roadside by the Securetec Drugwipe II Twin device while the driver is still seated in their car. This process takes approximately 5 minutes. Secondly, if the first test is positive, the driver is required to leave their vehicle to accompany police for further testing in the drug truck or police station. At this stage, the driver will be required to undertake a second oral fluid test using the Cozart Drug Detection System. Finally, if positive results are recorded on this second test, the oral fluid is divided into two separate portions and a sample is submitted to the Forensic Science Centre for further laboratory analysis. The total process takes approximately 30 minutes.

Results from the laboratory analysis take approximately two weeks to obtain. If the results confirm the presence of THC, methylamphetamine or MDMA, police will charge the driver on the basis of driving with ‘a prescribed drug (THC or methylamphetamine or MDMA) in oral fluid or blood’. All saliva and blood samples are destroyed after prosecution proceedings are completed.

Drivers who test positive for THC or methylamphetamines are advised by police not to drive until the drug is no longer detectable in their system (up to 5 hours for THC and up to 24 hours for methylamphetamines and MDMA). If the driver is alone, police will assist in arranging alternative transport. All drivers who test positive are given a driver direction notice that directs them not to drive based on suspicion about their fitness to drive (Section 40(k), Road Traffic Act). Violation of the driver direction notice incurs a maximum fine of $5000.

Drivers found with a prescribed drug in oral fluid or blood for the first time in a five year period can elect to either pay an expiation fee or dispute the fee but risk receiving a higher court fine if they lose the case. From the 1st of July, 2008, demerit points for this offence increased from three to four, while from the 1st of July, 2009, expiation fees increased from $420 to $438. For a first offence the court fine ranged from $500 to $900. For a second offence, a driver must appear in court and face court imposed penalties including a $700 to $1200 fine and a licence disqualification for no less than six months. Drivers committing a third offence receive a court fine ranging from $1100 to $1800 and licence disqualification for no less than 12 months. All subsequent offending drivers receive the same court fine as would a driver committing a third offence, and a licence disqualification for 24 months. Police acknowledge that most offenders elect to pay the expiation fee.

Under the current legislation, a driver who is pulled over for a random roadside saliva test is required to undertake the test, with penalties applied for refusal. From 2008, if it was the driver’s first offence and he/she failed to undertake the test, a court fine ranging from $500 to $900, six demerit points and a court imposed licence disqualification for no less than six months applied. Second and subsequent offences lead to a larger fine, ranging from $1100 to $1800, and a longer licence disqualification, lasting for no less than 24 months.

During 2007 random DST for drugs were conducted by a group of 13 traffic police, who were specifically trained to conduct driver drug testing full time. One truck was dedicated to drug DST throughout South Australia. In 2008, the operations were expanded significantly with a testing target set at 40,000 tests for the financial year 2008/2009 and remaining at this level into 2010. An integral part of this expansion was decentralisation. Approximately 260 traffic enforcement members from LSAs throughout South Australia were trained to conduct DST for drugs from February to October 2008. The core group of 13 specialist drug testers continued to monitor and oversee the testing operations by providing training and extra resources when needed. Unlike alcohol detection where the testing device provides a definitive reading, the oral fluid drug test is a far more subjective test. The skills and experience of the police officer conducting the initial screening test play an important role. The Traffic Support Branch was responsible for providing LSAs with testing targets but it was the responsibility of individual LSAs to determine where, when and how the testing was undertaken.

In 2010, a corporate traffic operation ‘Operation Consequence’ specifically targeted drug/drink drivers in February, May, August, October and November.

3.1.1 Number of tests performed

Based on data from SAPOL, the following sections explore drug driving in terms of levels of random roadside Driver Screening Tests (DST) for drugs and confirmed detections. Table 3.2 shows the number of DST for drugs conducted in South Australia from 2007, the first calendar year for which 12 months of data were available, to 2010. In 2010, the total number of drivers tested was similar to the previous year, with a slight increase (approximately 3% increase). The percentage of licensed drivers tested also remained at a similar level. In 2010 a greater number of tests were undertaken in the metropolitan area (70%) compared to rural regions, this is consistent with previous years.

Table 3.2
Number and percentage of licensed drivers drug tested in South Australia, 2007-2010

Year	Metro	Rural	Total	No. of licensed drivers	% of licensed drivers tested
2007	9,753	2,575	12,328	1,073,103	1.15
2008	20,505	5,384	25,889	1,085,503	2.38
2009	32,504	11,217	43,721	1,126,847	3.88
2010	31,781	13,340	45,121	1,145,591	3.94

DAY OF WEEK

Table 3.3 shows the number of drug DST performed on each day of the week as a percentage of all tests in 2010. Generally, the greatest proportion of testing was performed at the end of the week (Friday to Sunday). This trend was evident in both metropolitan and rural areas.

Table 3.3
Drug DST performed by day of week, 2010
(expressed as a percentage of total tests each year)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Metro	14.2	13.4	9.9	10.1	14.9	21.5	16.0
Rural	12.5	10.9	11.5	14.6	19.3	19.0	12.2
Total	13.7	12.6	10.4	11.4	16.2	20.8	14.9

TIME OF DAY

The distribution of drug DST by time of day, as shown in Table 3.4, indicates that testing in 2010 was predominantly conducted from 10am to 10pm. Very little testing was conducted in rural areas in the early hours of the morning (i.e. 12am to 8am). These patterns are similar to those found in 2009 despite some changes to the analysis of time of day data in 2010 (See Appendix A for details of changes).

Table 3.4
Drug DST performed by time of day, 2010
(expressed as a percentage of total tests each year)

	12-2 AM	2-4 AM	4-6 AM	6-8 AM	8–10 AM	10-12 AM	12-2 PM	2-4 PM	4-6 PM	6-8 PM	8-10 PM	10-12 PM
Metro	5.0	3.9	2.4	2.3	5.9	11.6	9.9	9.2	9.9	11.7	18.3	9.6
Rural	1.5	0.6	0.3	0.7	4.3	12.7	17.4	15.1	17.6	14.6	10.2	5.0
Total	3.9	3.0	1.8	1.8	5.5	11.9	12.1	11.0	12.2	12.6	15.9	8.3

TESTING BY MONTH

The distribution of DST for drugs performed by month in 2010 is presented in Table 3.5. There were three main peaks in testing in 2010, these occurred during April, May and October. With the exception of these peaks, testing was similar throughout the year with a slight dip during June and July. In metropolitan areas the greatest proportion of tests occurred in October while in rural areas the greatest proportion of tests occurred in May.

Table 3.5
Drug DST performed by month of year, 2010
(expressed as a percentage of total tests each year)

Month	Metro	Rural	Total
Jan	9.0	4.9	7.8
Feb	7.1	9.1	7.7
Mar	8.7	5.5	7.7
Apr	9.2	11.8	9.9
May	7.7	16.8	10.4
Jun	6.7	4.4	6.0
Jul	7.0	4.3	6.2
Aug	8.6	10.8	9.2
Sep	7.7	6.7	7.4
Oct	12.2	7.7	10.9
Nov	7.0	10.2	8.0
Dec	9.1	8.0	8.8
Total	100.0	100.0	100.0

3.1.2 Interstate comparisons

Information on the levels of DST for drugs conducted in other Australian jurisdictions was collected to provide standards with which South Australian practices might be compared. To provide a measure of testing levels in different jurisdictions, testing numbers are adjusted for population in each jurisdiction. DST for drugs per head of population are given in Table 3.6 rather than tests per licensed driver to avoid differences in licensing conditions across jurisdictions.

In comparison to other jurisdictions, South Australia conducted the greatest number of tests and also had the highest testing rate per head of population (2.73%), followed by Victoria (0.75%). Tasmanian drug test data was not available for 2010 due to a change in data recording systems.

Table 3.6
Number of drug DST conducted in Australian jurisdictions in 2010
as a percentage of population

Jurisdiction	Total	Pop 2010 [a]	% of Pop
South Australia	45,121	1,650,400	2.73
New South Wales	32,252	7,272,200	0.44
Queensland	21,654	4,548,700	0.48
Tasmania	UK	509,300	UK
Victoria	41,642	5,585,600	0.75
Western Australia	9,764	2,317,100	0.42

[a] Source: Estimated resident population data from Australian Bureau of Statistics (2011) *Australian Demographic Statistics, December 2010.* Catalogue No 3101.0.

3.2 Levels of drug driving

3.2.1 Confirmed positive drug detections

As mentioned in Section 3.1, current driver screening tests (DST) in South Australia are designed to detect three types of illicit drugs: methylamphetamines (i.e. 'speed'), THC (i.e. cannabis) and MDMA (i.e. 'ecstasy'). Unlike alcohol tests, there are no legal concentration levels for the prescribed drugs. Test results are given as either positive or negative for drugs. The number of confirmed positive drug detections in 2010 by type of drug is shown in Table 3.7. A confirmed positive drug detection refers to a positive drug test result from forensic testing in the laboratory. The results indicate that many drivers tested positive for more than one drug. A total of 377 drivers tested positive for a combination of two of the three prescribed drugs but no drivers were found to test positive to MDMA alone or to all three drugs. In 2010, THC continued to be the drug type detected most frequently. Compared to 2009, there was a 47% increase in confirmed positive drug detections which can be largely attributed to greater numbers of drivers testing positive to a combination of drugs (see Doecke & Grigo, 2011).

Table 3.7
Confirmed positive drug detections by drug type, 2010

Drug	Detections
Methylamphetamine	503
THC	521
MDMA	0
Combination	377
All prescribed drugs	0
Total	1401

DETECTIONS BY SEX

The numbers of confirmed positive detections for males and females in 2010 are shown in Table 3.8. Around 84 per cent of the confirmed positive detections were for males. This proportion was higher in rural areas (around 91%). Note that sex is not recorded for testing data so detection rates could not be calculated. While detection rates are the only way to provide a true comparison, it does appear that males were the predominant drug drivers in 2010.

Table 3.8
Confirmed positive drug detections by sex, 2010

Sex	Metro	Rural	Total
Female	173	45	218
Male	736	447	1,183
Total	909	492	1,401

DETECTIONS BY AGE GROUP

Table 3.9 indicates that detections were more prevalent among drivers aged 20 to 49 years, and that drug detection was particularly common in drivers aged 30 to 39 years. Similar to the detection data by sex in Table 3.8, there were no comparable testing data to calculate detection rates among the different age groups and so these findings should be interpreted with caution. Note the total number of confirmed positive drug detections is different in Table 3.9 compared to Table 3.8 because one driver who tested positive was less than 16 years old.

Table 3.9
Confirmed positive drug detections by age group, 2010

Age Group (yrs)	Metro	Rural	Total
16-19	31	11	42
20-24	97	52	149
25-29	130	69	199
30-39	360	175	535
40-49	240	148	388
50-59	47	29	76
60 +	4	7	11
Total	909	491	1,400

3.2.2 Detection rates

Drug detection rates provide an estimate of the effectiveness of DST for drugs. Detection rates, based on the number of drivers detected with an illegal drug per thousand tested, are presented in Table 3.10. In 2010, approximately 29 drivers per 1000 tested were confirmed positive for the illicit drugs tested in the metropolitan area, a level that is higher compared to the previous years. Detection rates in rural regions were greater than those in metropolitan areas by around 8 in 1000.

Table 3.10
Confirmed positive drug detection rates (per 1,000 tested) in South Australia, 2007-2010

Year	Metro		Rural		Total	
	No. of detections	Detection rate	No. of detections	Detection rate	No. of detections	Detection rate
2007	236	24.2	59	22.9	295	23.9
2008	447	21.8	105	19.5	552	21.3
2009	714	22.0	239	21.3	953	21.8
2010	909	28.6	492	36.9	1,401	31.0

DETECTION RATES BY DAY OF WEEK

Table 3.11 shows that drug detection rates were highest on Wednesday and Thursday and lowest on Monday and Friday. This pattern differs from 2009, in which the greatest detection rates occurred on Friday (see Doecke & Grigo, 2011). In 2010, metropolitan detection rates were highest on Wednesday and Thursday, while in rural regions both Thursday and Saturday had a higher detection rate compared to other days of the week.

Table 3.11
Confirmed positive drug detections per 1,000 tests by day of week, 2010

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Metro	27.2	25.2	34.3	32.1	24.1	26.3	28.6
Rural	25.8	39.9	39.1	43.0	31.8	45.0	36.9
Total	26.8	28.9	35.9	36.3	26.8	31.4	31.0

DETECTION RATES BY MONTH

The distribution of drug detection rates by month is displayed in Table 3.12. The detection rates generally increased throughout the year before reaching a peak in September. After September's peak drug detection rates dropped to a moderate level and remained there until the end of the year. In metropolitan areas the greatest detection rates occurred in both June and September, while in rural regions there was a large peak in detection rates during September.

Table 3.12
Confirmed positive drug detections per 1,000 tested by month of year, 2010

Month	Metro	Rural	Total
Jan	23.9	33.8	25.7
Feb	23.5	20.6	22.5
Mar	27.2	36.5	29.2
Apr	26.0	28.7	27.0
May	31.1	41.1	35.9
Jun	36.4	27.4	34.5
Jul	35.4	22.9	32.9
Aug	31.1	51.5	38.2
Sep	37.3	61.9	43.9
Oct	21.8	45.6	26.8
Nov	29.6	31.6	30.4
Dec	26.6	31.1	27.8
Total	28.6	36.9	31.0

3.2.3 Interstate Comparison

The drug detection rates in the Australian jurisdictions that conducted testing in 2010 are shown in Table 3.13. Tasmanian drug detection data was not available for 2010 due to a change in data recording systems. The detection rate in South Australia was higher than other states with the exception of Western Australia.

Table 3.13
Confirmed positive drug detections and detection rates (per 1,000 tested) in Australian jurisdictions in 2010

Jurisdiction	Total Positives	Detection rate
South Australia	1401	31.0
New South Wales	626	19.4
Queensland	440	20.3
Tasmania	UK	UK
Victoria	692	16.6
Western Australia	522	53.5

3.2.4 Drug driving in fatal crashes

The number of drivers and motorcycle riders testing positive for illegal drugs in road crashes can also be used as a measure of the effectiveness of roadside drug testing. If motorists were deterred from drug driving, the percentage of crash involved drivers with a positive drug test would be expected to decrease. Positive drug test results for fatally injured drivers from 2006 to 2010 are presented in Table 3.14. Note that test data for drivers seriously injured in a crash are not reported due to difficulties with obtaining the data and matching records. A positive result means that a driver has been detected with one or a combination of the three prescribed drugs tested for using DST: methylamphetamine, THC or MDMA.

Similar to BAC levels, positive drug test results are derived from the analysis of blood and are acquired directly from forensic toxicology reports. Drug results are entered into the TARS crash database, manually matched to fatal crashes by name and age of driver, and date of crash. Table 3.14 shows that a high rate of fatally injured drivers were tested for the presence of drugs (97%) in 2010. The proportion of fatally injured drivers who tested positive for drugs in 2010 (21%) was similar to previous years.

Table 3.14
Drug test results of fatally injured drivers and riders by location, 2006-2010

Year	Number of positives			% of tested positive	Number tested	Total fatalities
	Metro	Rural	Total			
2006	9	8	17	23.6	72	80
2007	3	11	14	25.0	56	66
2008	6	5	11	19.6	56	61
2009*	5	12	17	23.0	74	75
2010	6	9	15	21.1	71	73

*Data for 2009 differs from the previous report due to the continuous updating of data

Table 3.15 shows that for the five-year period from 2006 to 2010, the majority of fatally injured drivers who tested positive for drugs were male. The proportion of drivers that tested positive for drugs that were males was similar in 2009 and 2010 but reduced compared to the previous three years.

Table 3.15
Drug test results of fatally injured drivers and riders by sex, 2006-2010

	Males		Females			
Year	N	% of positives	N	% of positives	Number tested	Total fatalities
2006	17	100.0	0	0.0	72	80
2007	14	100.0	0	0.0	56	66
2008	10	90.9	1	9.1	56	61
2009*	14	82.4	3	17.6	74	75
2010	12	80.0	3	20.0	71	73

*Data for 2009 differs from the previous report due to the continuous updating of data

3.3 Anti-drug driving publicity

In 2010, anti-drug driving publicity was promoted using the campaign 'Mythbusters', run for the first time in 2009. The slogan for this campaign was "So you think you're okay to drive on drugs?" and 20 to 40 year old males were the target audience.

The aim of the campaign was to reduce the incidence of drug driving by raising awareness of drug-related driving impairment and challenging associated myths. Television, online, radio and print advertisements were run in 2010 during January, May and August. The posters were placed in pubs and nightclubs and advertisements also appeared in street press. The television commercials portrayed a surgeon, a bus driver, and a pilot under the influence of cannabis, speed or ecstasy making ludicrous claims they could still safely perform their tasks. These claims were then paralleled to a driver under the influence of drugs.

4 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, anti-speeding campaigns operating in 2010 are described.

4.1 Speed enforcement practices and levels of operation

Effective speed enforcement is necessary to create high levels of specific deterrence (through high levels of apprehension and punishment) and general deterrence (through the belief in the high likelihood of encountering enforcement). Current theories of speed management in Australia argue that balanced methods of covert and overt, and fixed/static and mobile enforcement are required to deter motorists, both specifically and generally (McInerney, *et al*, 2001; Wundersitz *et al*, 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) and reduce travelling speeds on rural freeways (Retting et al., 2008).

Speed cameras (mobile and fixed) 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 SA Police has provided the following information about speed enforcement operations.

SPEED CAMERA OPERATIONS

Speed cameras are currently operated by the Traffic Camera Unit, under the command of the Traffic Support Branch. The first speed cameras introduced into South Australia in June 1990 were mobile speed cameras. There were 18 mobile speed cameras available for use in 2010 and they were expected to operate for a target of 3,060 hours per month. Two cameras were deployed in rural areas each week. The speed cameras operate from unmarked vehicles to give some degree of anonymity and covertness to the operations. Prior to 6 July 2009, signs could be placed after the location to advise that a camera has been passed to enhance general deterrence effects. This policy was changed due to physical violence against camera operators and the signs were no longer displayed.

Since December 2003 fixed speed cameras have recorded speeding offences at traffic lights. Initially such cameras were red light cameras with the extended ability to record vehicle speeds, however dedicated speed cameras have since begun operation, including the first camera not located at traffic lights which began operation in 2010. Information provided by SAPOL indicates that there were 80 fixed speed cameras in 2010: 71 in the metropolitan area and nine in rural regions.

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), and consequently reduce 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.

While the term speed limit implies that it is the maximum allowable speed it is common practice in speeding enforcement to have a threshold or tolerance above the speed limit that is the actual speed at which an infringement is issued. For speed cameras this is a centrally set value but for non-camera speed detection devices the operator has the discretion to choose the tolerance. In October 2007 the speeding tolerance was reduced for all speed cameras.

Each day, a list of camera locations is generated by a computer program which gives each road a road safety risk rating based primarily on the number of crashes on that particular road. Also factored into the risk rating is the number of speeding related complaints from the public and the volume of speed related detections at a particular location. The locations of some speed cameras (though not precise times of operations) are also provided in advance to media outlets for publication/broadcasting in return for road safety publicity and support. This information is also posted on SAPOL's own news website. Some major speed detection operations are advertised in advance in order to raise the profile of speed enforcement practices.

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. Mobile and hand held radars are used more frequently on open roads. The numbers of non-camera detection devices used in metropolitan and rural areas during 2010 are summarised in Table 4.1. The number of lasers increased by nine in rural areas but decreased by two in metropolitan areas in 2010. Numbers of both hand held and mobile radars decreased slightly (by two and three respectively). Mobile radars remained the most common form of non-camera speed detection device in South Australia.

Table 4.1
Non-camera detection devices used in South Australia, 2010

Non-camera detection devices	Metro	Rural	Total
Lasers	61	112	173
Mobile Radars	0	216	216
Handheld Radars	0	34	34

The coordination of police operated speed detection is managed by SAPOL Local Service Areas (LSAs). Corporately there is a benchmark for the number of speed detection hours (including mobile cameras) and this is divided amongst the services. 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 spend a significant amount of time on speed detection activity.

4.1.1 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 2006 to 2010, is depicted in Figure 4.1. The location of the speed detection device determines whether speed detection hours are recorded as metropolitan or rural. Note that hours of speed detection are not recorded for fixed speed cameras.

In 2010, the total number of speed detection hours for South Australia decreased by approximately three per cent. The decrease in speed detection hours was confined to metropolitan areas (8.6%) while rural speed detection hours marginally increased (0.8%). Note that the hours of operation of fixed speed cameras were unavailable and so are not included here, or in any of the following tables.

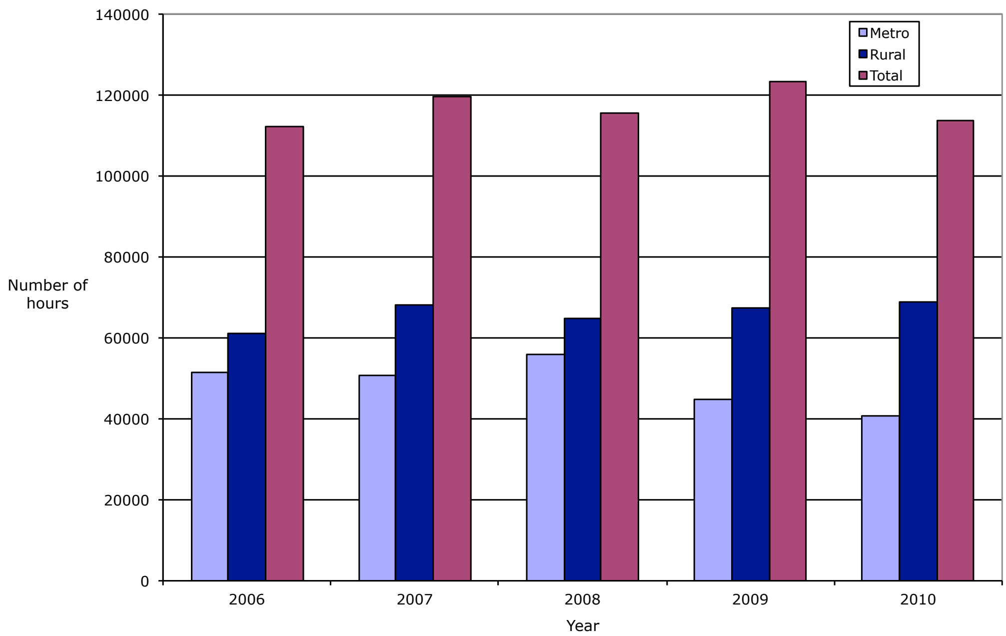

Figure 4.1
Number of speed detection hours in South Australia, 2006-2010

Table 4.2 summarises the hours spent on speed detection for speed cameras only, from 2006 to 2010 in metropolitan and rural areas. Speed cameras were used predominantly in the metropolitan area. The numbers of hours for speed camera operation have remained relatively stable over the past five years. In 2010, the number of hours was slightly decreased relative to the previous year. Almost all of the overall decrease occurred in rural regions (8.9%); virtually no change was observed in the metropolitan area. The total exceeds the target number of speed camera detection hours (36,720).

Table 4.2
Number of hours for speed detections by speed cameras in South Australia, 2006-2010

Year	Camera			% difference from previous year
	Metro	Rural	Total	
2006	31,103	8,674	39,777	32.5
2007	28,937	9,609	38,546	-3.1
2008	30,051	8,421	38,472	-0.2
2009	28,898	11,275	40,173	4.4
2010	28,896	10,267	39,163	-2.5

Note: the data in this table does not include fixed speed cameras

In contrast to speed cameras, non-camera devices were used more widely in rural areas (see Table 4.3). Non-camera devices include laser guns, mobile radar and handheld radar. The total number of non-camera hours decreased by a further 3.1 per cent in 2010 to the lowest levels seen in the past five years. A large decrease in hours in the metropolitan area (24.3%) was somewhat offset by an increase in the rural regions (2.7%). The number of metropolitan hours of non-camera speed detection in 2010 was less than half of the 2008 number.

Table 4.3
Number of hours for speed detections by non-camera devices in South Australia, 2006-2010

Year	Non-Camera			% difference from previous year
	Metro	Rural	Total	
2006	20,556	59,373	79,929	-2.9
2007	21,637	55,316	76,953	-3.7
2008	25,739	59,025	84,764	10.2
2009	15,824	57,545	73,369	-13.4
2010	11,976	59,098	71,074	-3.1

DAY OF WEEK

The number of hours spent on speed detection from 2006 to 2010 by day of week is presented in Table 4.4 for speed cameras and in Table 4.5 for non-speed camera devices. Speed detection hours are given in terms of the percentage of all hours undertaken in a year. For both methods of speed detection, the number of hours were spread relatively evenly throughout the week and were relatively consistent from year to year. Speed camera detection hours were somewhat lower on Sunday and Monday. Non-camera detection hours were higher on Thursday and Friday than any other day.

Table 4.4
Number of speed detection hours for speed cameras by day of week, 2006-2010
(expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total (%)
2006	13.6	14.1	14.6	15.2	15.0	14.2	13.2	100
2007	14.1	14.1	14.8	14.6	14.8	14.6	13.1	100
2008	13.8	14.6	14.9	14.7	14.1	14.5	13.5	100
2009	13.3	13.9	15.3	15.2	14.2	14.8	13.2	100
2010	13.3	14.8	14.5	14.6	14.6	14.7	13.5	100

Note: the data in this table does not include fixed speed cameras

Table 4.5
Number of speed detection hours for non-camera devices by day of week, 2006-2010 (expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total (%)
2006	14.1	14.0	13.5	14.8	15.7	14.4	13.5	100
2007	14.1	13.7	14.6	14.5	15.4	14.1	13.6	100
2008	14.0	14.0	14.8	14.8	15.8	13.7	12.9	100
2009	14.7	13.2	13.8	15.3	16.1	13.4	13.4	100
2010	13.9	12.9	13.6	15.6	16.4	14.2	13.3	100

TIME OF DAY

Figure 4.2 displays the speed detection hours (expressed as a percentage of the total hours each year) for all speed detection devices (excluding fixed speed cameras) by the time of day, for 2010 and the average from 2006 to 2009. 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 7am to 9pm. There is a noticeable dip in the distribution of detection hours around 2pm compared to other times of the day.

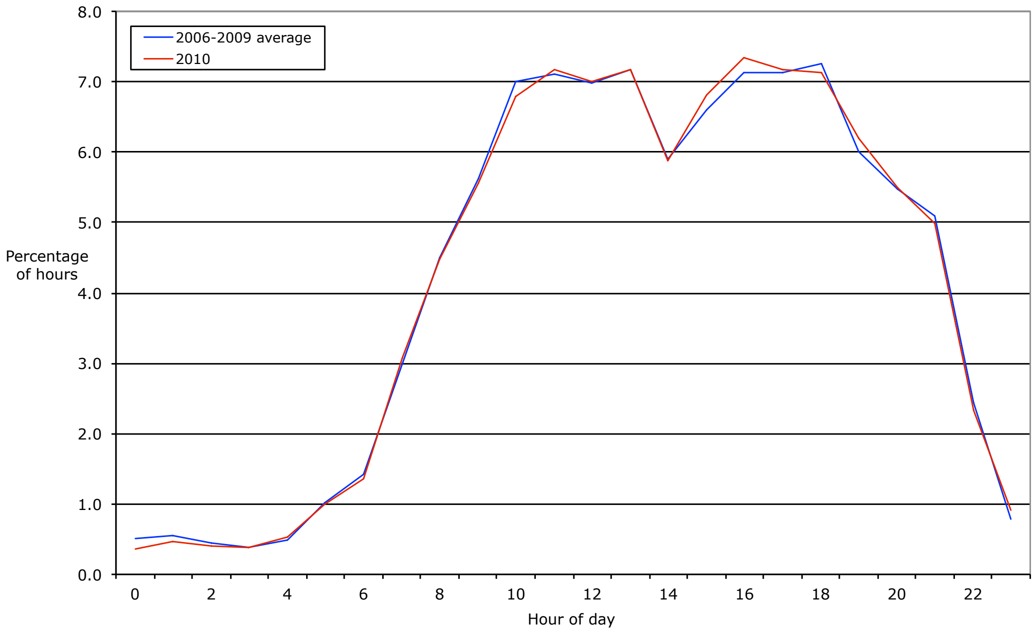

Figure 4.2
Hours spent on speed detection in South Australia by time of day

The distribution of hours spent on speed detection by time of day is presented separately for speed cameras (Table 4.6) and for non-camera devices (Table 4.7). In 2010, the distribution of speed camera hours by time of day was comparable to that in previous years. Speed cameras were operated most frequently in the twelve hours from 8am to 8pm, though the dip noticeable in Figure 4.2 is apparent between 2pm and 4pm. Speed cameras were operated less frequently at night (8pm to midnight) and very little in the early hours of the morning (midnight to 6am).

Table 4.6
Number of speed detection hours for speed cameras by time of day, 2006-2010
(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
2005	<0.1	6.0	12.4	16.4	13.1	8.9	12.4	16.7	14.1
2006	<0.1	6.2	12.5	16.0	13.1	8.7	12.5	16.8	14.1
2007	0.2	5.6	12.5	15.6	12.5	8.2	13.3	17.5	14.5
2008	0.2	6.0	13.0	16.4	13.2	8.3	12.6	16.6	13.7
2009	<0.1	6.2	12.8	15.8	12.9	8.8	13.2	16.4	13.8

Note: the data in this table does not include fixed speed cameras

Non-camera devices were operated predominantly from 10am to 8pm. The pattern of non-camera speed detection hours resembled that of previous years. Relative to camera operations, non-camera devices were more frequently operated in the early hours of the morning (Midnight-6am), and between 2pm and 4pm. Non-camera devices were used less frequently between 6am and 8am as well as 6pm and 8pm, compared to speed cameras.

Table 4.7
Number of speed detection hours for non-camera devices by time of day, 2006-2010
(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
2006	4.6	3.8	8.9	13.1	15.0	15.5	15.4	11.1	12.7
2007	4.8	3.6	8.8	13.1	14.7	14.4	15.1	11.6	13.9
2008	5.3	3.4	8.9	13.1	14.6	13.6	15.0	11.8	14.3
2009	5.5	3.7	8.9	13.1	14.6	14.4	14.7	11.3	13.8
2010	4.8	3.5	8.5	12.9	14.9	14.9	15.2	11.6	13.7

DETECTION HOURS BY MONTH

Table 4.8 shows the distribution of speed detection hours by month for speed camera and non-camera devices in 2009 and 2010. Both speed camera and non-camera devices were operated relatively evenly throughout 2010. Note that the target of 3,060 hours of detection per month for speed cameras was not met in February, March and April.

Table 4.8
Number of speed detection hours by month for speed cameras and non-camera devices in 2009 and 2010 (expressed as a percentage of total hours each year)

Month	2009			2010		
	Camera	Non-cam	Total	Camera	Non-cam	Total
Jan	8.5	9.1	8.9	8.6	8.4	8.4
Feb	8.1	8.3	8.3	7.8	8.5	8.2
Mar	8.3	9.5	9.1	7.6	7.9	7.8
Apr	8.6	10.1	9.5	7.2	8.9	8.3
May	9.1	7.8	8.3	8.7	9.7	9.4
Jun	9.2	6.6	7.5	8.6	7.7	8.0
Jul	8.6	7.9	8.2	7.9	8.6	8.4
Aug	9.0	8.6	8.7	9.3	10.6	10.2
Sep	7.7	8.2	8.0	8.9	7.9	8.2
Oct	7.7	7.9	7.8	9.1	7.4	8.0
Nov	7.8	7.5	7.6	7.9	6.8	7.2
Dec	7.5	8.4	8.1	8.5	7.6	7.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: the data in this table does not include fixed speed cameras

4.2 Levels of speeding

It is important to note that the data for detections provided to CASR and displayed in the following tables only represents expiations notices arising from the detections that had been paid at the time the data was extracted (usually towards the middle of the following calendar year), though all data on all detections had been requested. CASR was only made aware of this just before publication.

4.2.1 Number of speed detections

Table 4.9 presents the numbers of speed detections, by speed cameras and non-cameras, in South Australia for the years 2006 to 2010. Inspection of the number of speed detections divided by the number of licensed drivers in South Australia indicates that approximately 26 per cent of licensed drivers were detected for a speeding offence in 2010. It should be noted that for half of October in 2009 new digital speed cameras were trialled, resulting in operation hours being logged but no detections being recorded.

The total number of detections decreased by 17 per cent in 2010 compared to 2009. Speed camera detections decreased by 17 per cent, non-camera detections decreased by nine per cent and dual purpose camera detections decreased by 20 per cent.

As noted in Section 4.1.1, 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 a quarter of 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 that are characterised by lower traffic densities.

Table 4.9
Number and percentage of licensed drivers detected speeding in South Australia, 2006-2010

Year	Number of speed camera detections	Number of fixed speed camera detections	Number of non-camera detections	Total number of detections	Number of licensed drivers	% of licensed drivers detected
2006	137,370	67,255	46,966	251,591	1,042,774	24.1
2007	180,866	100,563	44,805	326,234	1,073,103	30.4
2008	258,198	119,407	48,795	426,400	1,085,503	39.3
2009	225,732	85,911	42,036	353,679	1,126,847	31.4
2010	186,479	68,661	38,129	293,269	1,145,591	25.6

Note. Licence information could only be extracted for the financial year to June 30.

4.2.2 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. It should be noted that on 1 October 2007 there was a reduction in the speed limit tolerance applied to detections of violations using speed cameras. That is, motorists could be detected as speeding for exceeding the speed limit by a smaller minimum amount than previously.

In this section, speeding detection rates are defined as the number of drivers detected for speeding per hour of enforcement. Table 4.10 summarises speeding detection rates for camera and non-camera devices for metropolitan and rural areas, for the years 2006 to 2010. In 2010 the overall speeding detection rate decreased by 13% from 2009 but remained higher than in 2006 and 2007. Note that the lower tolerance was introduced in October 2007.

The decrease in the speed camera detection rate in 2010 of 19 per cent was consistent in metropolitan and rural areas. The non-speed camera detection rate also decreased (5%) though the decrease was limited to the metropolitan area; the non-camera detection rate increased marginally in rural areas.

As noted previously, the main reason for this greater detection rate of speed cameras is 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 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 at least partly responsible for the higher detection rate. Detection rates based on traffic volumes are examined in Section 4.2.3. 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 4.10
Speeding detection rates, 2006-2010 (number of drivers detected speeding per hour)

Year	Camera			Non-Camera			Overall
	Metro	Rural	Total	Metro	Rural	Total	Total
2006	3.72	2.50	3.45	1.11	0.41	0.59	1.54
2007	5.13	3.37	4.69	0.93	0.45	0.58	1.95
2008	7.39	4.30	6.71	0.92	0.43	0.58	2.49
2009[a]	6.49	4.24	5.86	1.11	0.43	0.57	2.35
2010	5.23	3.43	4.76	1.03	0.44	0.54	2.04

[a] Data for October excluded due to new speed camera trial

Note: the data in this table does not include fixed speed cameras

DAY OF WEEK

The following tables show detection rates per hour and have been separated by detection method because of the differences in detection rates noted above. Table 4.11 shows that during 2010, speed camera detection rates were spread relatively evenly throughout the week, although Friday and Saturday had slightly higher detection rates, similar to previous years with the exception of 2009. Rates by day were lower in 2010 compared to 2009, reflecting the overall decrease shown in Table 4.10. The most notable difference was on Sunday; in 2009 it had the highest detection rate per hour and in 2010 it had the lowest.

Table 4.11
Speeding detection rates per hour for speed cameras by day of week, 2006-2010

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2006	3.24	3.37	3.27	3.53	3.63	3.93	3.15
2007	4.16	4.44	4.18	4.72	5.18	5.43	4.70
2008	6.88	6.39	6.14	6.23	7.23	7.70	6.44
2009	5.54	5.07	5.00	5.59	5.69	5.97	6.54
2010	4.56	4.43	4.81	4.89	5.00	5.31	4.29

Note: the data in this table does not include fixed speed cameras

Detection rates per hour for non-camera devices by day of the week from 2006 to 2010 are shown in Table 4.12. Similar to previous years, 2010 detection rates were very consistent across the days of the week. Like camera devices, detection rates for non-camera devices were lower in 2010 relative to 2009. However, Sunday remained as the day with the highest detection rate.

Table 4.12
Speeding detection rates per hour for non-camera devices by day of week, 2006-2010

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2006	0.60	0.57	0.58	0.57	0.56	0.60	0.64
2007	0.58	0.58	0.57	0.56	0.59	0.57	0.62
2008	0.59	0.59	0.55	0.56	0.56	0.57	0.63
2009	0.58	0.59	0.56	0.53	0.55	0.57	0.64
2010	0.54	0.52	0.51	0.53	0.53	0.54	0.59

Table 4.13 shows the total detections for fixed speed cameras by day of week from 2006 to 2010 (detections per hour could not be calculated). There were more fixed camera speed detections on weekends than weekdays in 2010, consistent with previous years apart from 2006. Note that detection data are difficult to interpret without data for hours of operation.

Table 4.13
Speeding detections for fixed speed cameras by day of week, 2006-2010

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2006[a]	10,879	10,675	10,661	10,959	9,521	942	33
2007	12,923	12,609	12,708	12,796	13,637	18,212	17,678
2008	15,793	14,469	14,861	15,327	16,184	21,322	21,451
2009	10,954	10,225	10,554	10,829	11,273	16,179	15,897
2010	8,944	8,277	8,255	8,456	9,435	12,913	12,381

[a] Day of week was unknown for 10,769 fixed speed camera detections

TIME OF DAY

The speeding detection rates for speed cameras by time of day from 2006 to 2010 are presented in Table 4.14. The after school and evening peak hours of 2pm to 6pm had a higher detection rate than other times while the hours of 8pm to midnight had a lower detection rate. The low number of hours of operation during the early morning may contribute to highly variable detection levels at this time from year to year.

Table 4.14
Speeding detection rates per hour for speed cameras by time of day, 2006-2010

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
2006	4.7	3.3	3.2	3.5	3.4	4.3	4.5	3.3	2.3
2007	9.6	4.7	4.5	4.6	4.6	5.7	6.0	4.5	3.5
2008	1.6	7.1	6.7	6.5	6.4	8.6	8.8	6.4	4.5
2009	2.8	5.7	5.7	5.7	5.7	6.9	7.1	5.2	3.8
2010	0.5	4.9	4.8	4.7	4.5	5.7	6.1	4.6	3.3

Note: the data in this table does not include fixed speed cameras

Table 4.15 shows the speeding detection rates for non-camera devices by time of day for the years 2006 to 2010. In 2010 detection rates with non-camera devices were relatively evenly spread across the hours of the day, though the detection rate was lower in the early hours of the morning.

Table 4.15
Speeding detection rates per hour for non-camera devices by time of day, 2006-2010

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
2006	0.37	0.55	0.66	0.62	0.57	0.51	0.65	0.63	0.60
2007	0.34	0.56	0.65	0.61	0.58	0.53	0.65	0.62	0.56
2008	0.24	0.53	0.64	0.62	0.58	0.54	0.67	0.63	0.51
2009	0.27	0.56	0.68	0.66	0.58	0.54	0.65	0.58	0.49
2010	0.32	0.48	0.57	0.57	0.53	0.52	0.62	0.58	0.48

The number of speeding detections for fixed cameras by time of day from 2006 to 2010 are presented in Table 4.16. Detections were highest during the day between 10am and 4pm but these numbers are difficult to interpret without data for hours of operation.

Table 4.16
Speeding detections for fixed speed cameras by time of day, 2006-2010

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
2006	7,540	5,860	7,022	8,470	9,038	8,343	7,065	6,344	7,567
2007	11,707	8,891	10,178	12,192	13,204	12,741	10,972	9,249	11,429
2008	12,286	10,043	12,420	14,538	15,756	15,252	13,656	12,142	13,314
2009	8,336	7,755	9,230	11,067	11,552	11,208	9,730	8,285	8,748
2010	6,918	6,093	7,394	9,002	9,320	8,649	7,352	6,752	7,181

DETECTION RATES BY MONTH

The speeding detection rates by month for speed cameras and non-camera devices for 2009 and 2010 are shown in Table 4.17. Speed camera detection rates per hour decreased in all months except October 2010, however the low speed camera detection rate in October 2009 was the result of the trial of new speed cameras during which hours were logged but no detections recorded. Non-camera detection rates per hour in 2010 were lower than in 2009 for nine months, as they were on average for the duration of 2010.

Table 4.17
Speeding detection rates per hour by month
for speed cameras and non-camera devices, 2009 and 2010

Month	2009			2010		
	Camera	Non-cam	Total	Camera	Non-cam	Total
Jan	7.13	0.56	2.77	6.21	0.49	2.55
Feb	6.39	0.63	2.60	4.31	0.52	1.79
Mar	6.66	0.64	2.59	5.33	0.52	2.18
Apr	5.79	0.60	2.25	4.86	0.55	1.88
May	5.01	0.55	2.28	4.56	0.63	1.93
Jun	5.28	0.53	2.59	4.54	0.53	2.05
Jul	5.13	0.54	2.25	4.24	0.52	1.77
Aug	5.92	0.59	2.54	4.08	0.64	1.76
Sep	5.48	0.62	2.27	3.95	0.60	1.89
Oct	2.70	0.60	1.32	4.52	0.50	2.13
Nov	5.51	0.47	2.31	4.75	0.43	2.11
Dec	6.44	0.50	2.44	5.90	0.43	2.51
Total	5.62	0.57	2.36	4.76	0.54	2.04

Note: the data in this table does not include fixed speed cameras

4.2.3 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 (not including fixed speed cameras) record the actual number of vehicles passing each camera detection point. To determine whether the higher detection rates in metropolitan areas may be attributed to greater traffic volumes, in this section speed detection rates are calculated based on the number of speeding vehicles per 1,000 vehicles recorded passing the detection point. Equivalent data were not available for non-speed camera devices.

Speeding detection rates per 1,000 vehicles passing a speed camera for the years 2006 to 2010 are shown in Table 4.18. Consistent with detection rates per hour of speed enforcement, detection rates per 1,000 vehicles passing decreased in 2010. The overall decrease of 22% was relatively evenly spread between the metropolitan area (22%) and rural areas (20%). Rural detection rates per 1,000 vehicles passing decreased for the first time in the previous years of data shown in Table 4.18.

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 lower traffic volumes in rural areas allowing for a greater opportunity for drivers to freely choose their own travelling speed or a lower perceived risk of being detected.

Table 4.18
Number of vehicles passing speed cameras and speeding detection rates (per 1,000 vehicles passing), 2006-2010

Year	Metro		Rural		Total detection rate
	No. of vehicles	Detection rate	No. of vehicles	Detection rate	
2006	12,094,519	9.57	1,342,133	16.14	10.22
2007	12,018,107	12.35	1,603,790	20.22	13.28
2008	10,528,044	21.09	1,336,892	27.07	21.76
2009[a]	8,889,877	19.48	1,614,637	27.39	20.70
2010	9,906,664	15.27	1,612,056	21.85	16.19

[a] Data for October excluded due to new speed camera trial

Note: the data in this table does not include fixed speed cameras

Speeding detection rates per 1,000 vehicles passing by day of week and time of day for speed cameras in the years 2006 to 2010 are shown in Table 4.19 and Table 4.20 respectively. In previous years detection rates have been higher on the weekend than on weekdays. In 2010 this remained the case for Saturday, but not for Sunday. With respect to the time of day, the detection rate per 1,000 vehicles passing varied considerably. Detection rates early in the morning vary due to few detection hours during this time (see Table 4.6). The detection rate was highest between 6am and 8am and was also moderately high from 2pm to 6pm.

Table 4.19
Speeding detection rates for speed cameras (per 1,000 vehicles passing) by day of week, 2006-2010

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2006	9.6	9.3	9.5	9.6	9.9	13.0	11.5
2007	11.7	12.1	11.1	12.5	13.0	18.6	15.9
2008	22.3	19.6	17.9	19.7	21.6	29.0	24.9
2009	18.6	18.5	16.0	19.5	20.3	22.3	25.8
2010	14.9	12.9	15.9	16.3	17.4	19.9	17.3

Note: the data in this table does not include fixed speed cameras

Table 4.20
Speeding detection rates for speed cameras
(per 1,000 vehicles passing) by time of day, 2006-2010

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
2006	15.0	10.3	10.2	10.1	10.0	11.1	10.4	10.2	9.6
2007	24.1	13.4	13.4	13.0	13.3	14.0	13.3	13.0	13.2
2008	12.1	23.1	22.5	20.2	19.8	24.7	24.3	21.6	19.2
2009	15.4	21.7	20.7	19.0	18.8	22.8	21.7	19.3	17.1
2010	5.2	19.4	16.2	14.9	14.9	17.9	17.7	16.2	14.6

Note: the data in this table does not include fixed speed cameras

Figure 4.3 shows speed detection rates per 1,000 vehicles passing by month of the year for the years 2006 to 2010. There is no discernable pattern across the five years. After January, the detection rate per 1,000 vehicles in 2010 drops below the higher level first observed in October 2007, when the speeding tolerance was reduced for all speed cameras, yet still higher than before this time.

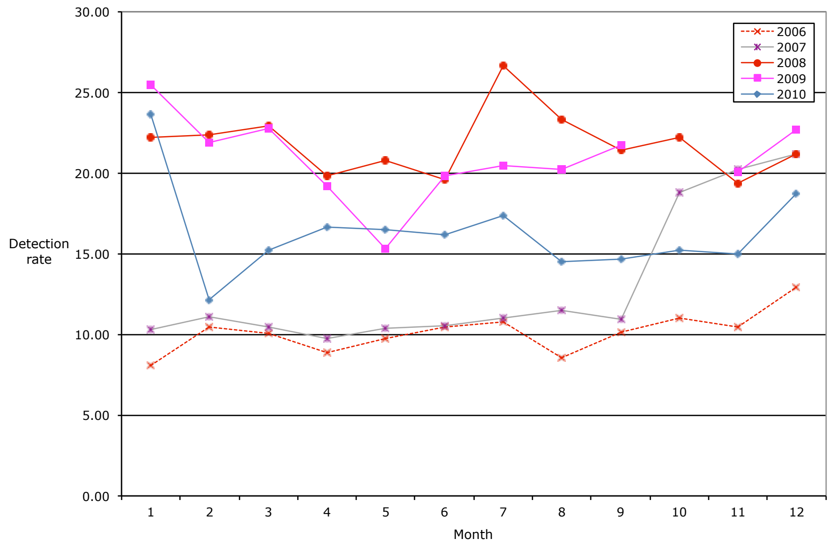

Figure 4.3
Speed camera detection rate (per 1,000 vehicles passing)
in South Australia by month, 2006–2010

4.2.4 On-road speed surveys

Speed monitoring independent of enforcement activities provides an indication of what travelling speed 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.

A systematic and ongoing method of measuring vehicle speeds was introduced in South Australia in 2007 to assess the effects of speed reduction countermeasures and to monitor the speed behaviour of South Australian motorists over time. The collection of speed data at 130 sites is described by Kloeden and Woolley (2012) in the CASR report “Vehicle speeds in South Australia 2010”. Speed data were collected for one week in 2010 at each of the selected sites and summary speed statistics and speed distributions were analysed for each of the road types surveyed. Sites were located in metropolitan Adelaide and in rural regions.

To summarise the Kloeden and Woolley (2012) report, in 2010 mean speeds on metropolitan roads decreased (with the exception of 50km/h collector roads), however no significant change was seen on rural roads. The percentage of vehicles travelling at speeds more than five, 10 and 15 km/h above the speed limit has reduced significantly on the same roads in the metropolitan area. This change was only observed in rural areas on 110 km/h roads. For further details, see the full report.

4.3 Anti-speeding publicity

In 2010, the ‘Creepers’ campaign was used to target speeding, continuing from 2008 and 2009. The campaign was aimed at reducing low level speeding by encouraging understanding that the behaviour is unlawful and harmful.

The campaign was run in the months of February, June and October 2010, and targeted drivers aged 16 to 39 in both metropolitan and regional South Australia. There was also an emphasis on reaching the male drivers in that demographic.

Advertisements appeared on television, radio, bus shelters, regional outdoor billboards, and bus backs. The television advertisements included the original 30 second Creeper commercial and two new 30 second commercials taken from real footage of crashes from traffic cameras. The radio advertisements included one of four 30 second commercials or one of eleven shorter, 10 second commercials. Three of the 30 second radio commercials were new and demonstrated a different consequence for low level speeding such as enforcement, a car crash, or social consequences.

5 Restraint use

The following section investigates the operation and effectiveness of restraint enforcement by examining restraint-related offences detected by police, restraint use in fatal and serious casualty crashes, on-road restraint use surveys, and publicity promoting restraint use.

5.1 Restraint enforcement practices and levels of operation

Vehicle occupant restraint (or seat belt) usage has been shown to be effective in reducing serious and fatal injuries in the event of a crash (ETSC, 1996; Evans, 1996; Richards *et al*., 2008). Restraint usage is strongly influenced by legal requirements and enforcement practices. South Australia introduced the legislation for the compulsory use of restraints 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 is similar to speeding enforcement as it 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.

The driver is responsible for ensuring that seat belts are available and fit for use. On 1 March 2008, legislation came into effect making a driver of a vehicle legally responsible for the restraint use of all their passengers, regardless of age. Previously a driver was only legally responsible for the restraint use of passengers aged less than 16 years. On 1 July 2010 legislation came into effect specifying the type of restraints that must be used for children up to seven years old. Previously this was only specified for children up to one year old. Children up to four were prohibited from occupying the front seat as were children more than four but less than seven years old unless all rear seating positions are already occupied by children less than seven years old. A three month grace period was allowed in which no expiations were issued to drivers therefore these new laws were only in effect for the last quarter of 2010. This grace period was followed by a month of targeted enforcement of the new laws in November.

Similar to previous years, no specific information was available on the hours spent by police exclusively targeting restraint use in 2010. Consequently, this section will provide details of restraint offences, restraint use among vehicle occupants involved in road crashes, on-road survey results and advertising promoting the use of restraints.

5.2 Levels of restraint use

5.2.1 Restraint non-use offences

Table 5.1 displays the total number and frequencies of type of restraint offence from 2006 to 2010. In 2010 there were a total of 17 restraint offence categories, however, some of these categories are very similar and have therefore been grouped in Table 5.1. For example, there are separate offence categories for failing to ensure a single passenger or multiple passengers are unrestrained that have been grouped together. In 2010, there was a 10 per cent decrease for the total number of restraint offences detected. Note that a passenger over 16 years of age can also incur an offence if unrestrained and so multiple offences can be generated for a single unrestrained occupant.

Failure to wear a seat belt adjusted and fastened properly (driver) has been the most common restraint offence from 2006 to 2010. The offence of ‘failure to ensure passenger over 16 wears seatbelt’ that was only introduced in March 2008 contributed 6.3 per cent of the total restraint offences. Two per cent of offences in 2010 involved a failure to ensure that children under the age of 16 years were wearing seat belts. The new laws relating to children less than 7 years of age that were only enforced for the last quarter of 2010 contributed 0.5 per cent of the total restraint offences. All types of restraint offences are aggregated in the subsequent tables.

Table 5.1
Restraint offences and detections, 2006-2010

Offence (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)
Fail to wear seatbelt properly adjusted & fastened (driver)	85.6	84.3	77.0	74.8	72.7
Fail to wear seatbelt properly adjusted & fastened (passenger)	9.8	9.9	11.1	12.3	13.0
Fail to occupy seat fitted with a seatbelt	0.1	0.3	0.3	0.3	0.0
Sit in front row of seats when not permitted	<0.1	<0.1	<0.1	0.1	<0.1
Child under 7 in front row of seats	-	-	-	-	0.1
Fail to ensure front row passenger properly restrained	0.5	0.6	1.0	1.1	0.4
Fail to ensure child under 1 year restrained	0.5	0.7	0.6	0.5	0.3
Fail to ensure child under 7 in appropriate restraint	-	-	-	-	0.5
Fail to ensure child under 16 wears seatbelt	3.5	3.9	2.8	2.7	1.2
Fail to ensure passenger under 16 wears seatbelt	-	-	2.5	2.7	5.5
Fail to ensure passenger over 16 wears seatbelt	-	-	4.6	5.4	6.3
Total (%)	100.0	100.0	100.0	100.0	100.0
Total (N)	10,758	9,346	11,810	12,969	11,707

Table 5.2 shows restraint offences detected in metropolitan and rural areas from 2006 to 2010. Region is determined by where the police officer issuing the expiation is based; the unknowns representing officers who travel both metropolitan and rural areas. Note that there are a minimal number of unknowns relative to previous years. The large number of unknowns in previous years makes it difficult to meaningfully compare 2010 data with that of previous years. There were more than twice as many restraint offences detected in the metropolitan area than in rural areas in 2010.

Table 5.2
Restraint offences detected by region, 2006-2010

Year	Metro		Rural		Unknown	Total restraint offences detected
	(N)	(%)	(N)	(%)	(N)	
2006	6,514	73.8	2,307	26.2	1,937	10,758
2007	3,675	39.3	1,838	19.7	3,833	9,346
2008	6,777	57.4	2,577	21.8	2,442	11,810
2009	8,200	63.2	3,759	29.0	1,010	12,969
2010	8,044	68.7	3,575	30.5	88	11,707

DAY OF WEEK

The distribution of restraint-related offences detected from 2006 to 2010 by day of week, in terms of the percentage of total offences detected each year, is displayed in Table 5.3. The offences were relatively evenly spread throughout the days of the week, the exception being Sunday, which had a lower proportion of offences than other days of the week. The distribution of the offences over the week in 2010 was similar to previous years, with the exception of 2009.

Table 5.3
Number of restraint offences detected by day of week, 2006-2010
(expressed as a percentage of total offences detected each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total (%)
2006	15.4	15.8	15.5	15.7	13.9	12.9	10.8	100
2007	14.7	14.4	15.7	16.7	15.1	12.2	11.2	100
2008	14.9	14.5	15.3	16.3	15.0	13.4	10.6	100
2009	14.9	14.1	13.4	11.1	16.6	14.3	15.5	100
2010	14.5	13.8	14.8	17.5	15.6	13.1	10.7	100

TIME OF DAY

In 2010, the distribution of restraint offence detections by time of day was similar to that in previous years (see Table 5.4). Restraint offences were detected most frequently during the day between the hours of 8am and 6pm. The proportion of restraint offence detections occurring in the early hours (midnight to 6am) has steadily increased over the past five years, as has the detections between 8pm and midnight.

Table 5.4
Number of restraint offences detected by time of day, 2006-2010
(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	Total (%)
2006	1.3	2.4	12.5	20.6	19.3	15.4	17.0	6.8	4.7	100
2007	1.6	2.4	13.4	21.3	18.0	14.2	16.6	7.3	5.1	100
2008	2.6	2.1	12.0	19.3	17.1	15.3	18.2	7.7	5.7	100
2009	2.6	2.4	12.9	19.5	18.2	15.1	15.1	8.3	5.9	100
2010	3.0	2.1	12.1	19.8	18.3	15.0	15.5	8.1	6.1	100

RESTRAINT OFFENCES BY MONTH

Table 5.5 shows restraint offences for both metropolitan and rural areas in terms of the percentage of total offences detected in 2010. The percentage of offences detected in November is much higher than any other month. This is likely to be due to the targeted enforcement of the new child restraint laws in this month. Aside from November the restraint offences are spread relatively evenly throughout the year, although the summer months have a slightly higher than average proportion of offences.

Table 5.5
Number of restraint offences detected by month in 2010
(expressed as a percentage of total offences detected in the year)

Month	Metro	Rural	Unknown	Total
January	9.5	7.4	3.4	8.8
February	9.3	9.0	6.8	9.2
March	8.5	7.8	5.7	8.3
April	6.9	8.1	6.8	7.3
May	7.0	10.0	19.3	8.0
June	6.0	6.5	9.1	6.2
July	8.0	5.6	8.0	7.2
August	6.9	8.7	6.8	7.4
September	6.7	6.9	5.7	6.8
October	8.1	7.0	3.4	7.7
November	14.0	13.8	18.2	14.0
December	9.2	9.1	6.8	9.2

SEX AND AGE

Table 5.6 displays the detected restraint offences by sex and age for 2009 and 2010. The greatest proportion of restraint offences of all age groups during 2009 and 2010 was recorded for vehicle occupants aged 20 to 29 years. In both years males were much more likely to have been detected for a restraint offence than females. Note that the offence is attributed to the responsible person, hence the few offences for persons aged less than 16 years old.

Table 5.6
Number and percentage of restraint offences detected by year, sex and age, 2009-2010

	2009						2010					
	Male		Female		Total		Male		Female		Total	
Age	N	%	N	%	N	%	N	%	N	%	N	%
0-15 yrs	6	0.1	3	0.1	9	0.1	1	<0.1	0	0.0	1	0.0
16-19 yrs	687	7.5	440	11.8	1,127	8.7	596	7.1	380	11.5	976	8.3
20-29 yrs	2,389	26.1	1,113	29.9	3,502	27.0	2,127	25.5	966	29.2	3,093	26.4
30-39 yrs	1,899	20.8	720	19.4	2,619	20.2	1,720	20.6	705	21.3	2,425	20.7
40-49 yrs	1,698	18.6	654	17.6	2,352	18.1	1,652	19.8	581	17.5	2,233	19.1
50-59 yrs	1,340	14.7	436	11.7	1,776	13.7	1,166	14.0	388	11.7	1,554	13.3
60+ yrs	1,119	12.2	350	9.4	1,469	11.3	1,076	12.9	291	8.8	1,367	11.7
Unknown	6	0.1	1	<0.1	7	0.1	2	<0.1	0	0.0	2	<0.1
Unknown sex	-	-	-	-	108	0.8	-	-	-	-	56	0.5
Total	9,144	100.0	3,717	100.0	12,969	100.0	8,340	100.0	3,311	100.0	11,707	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.

5.2.2 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 there is no physical evidence such as injuries or indicative wear on seatbelts so police must rely on self-report. The TARS database records restraint use if a vehicle occupant is injured. Restraint use is categorised into seven different groups in the database but they have been condensed into three groups for this report: restraint worn (includes child restraints), restraint not worn (includes child restraints and restraint not fitted) and unknown (restraint is fitted but unknown if worn). The following tables give the number and percentage of restraint use for car occupants seriously or fatally injured in a crash. When calculating these percentages, only car occupants with known restraint use status were considered.

Table 5.7 shows the restraint usage for fatally injured vehicle occupants from 2006 to 2010. In 2010, 65 per cent of vehicle occupants in fatal crashes were wearing restraints. This is relatively consistent with most previous years shown in Table 5.7, save 2007. Restraint status was known for 89 per cent of all fatally injured vehicle occupants in 2009. This is the highest proportion of known cases presented in the table.

Table 5.7
Restraint usage of fatally injured vehicle occupants, 2006-2010

Year	Restraint worn		Number of known cases	Total occupant fatalities
	(N)	(%)		
2006	39	65.0	60	78
2007	52	75.4	69	95
2008	36	60.0	60	69
2009	44	63.8	69	93
2010	46	64.8	71	80

Restraint use for seriously injured vehicle occupants from 2006 to 2010 is presented in Table 5.8. A serious injury is defined as an injury that requires the person to be admitted to hospital but which does not cause the person to die within 30 days of the crash. In 2010, 92 per cent of seriously injured occupants were wearing restraints, the highest percentage in the five years shown. Restraint status was reported for 73 per cent of seriously injured vehicle occupants. This is a higher proportion of known restraint status than in previous years (63 to 66%). Restraint use is consistently higher for seriously injured occupants than for fatally injured occupants.

Table 5.8
Restraint usage of seriously injured vehicle occupants, 2006-2010

Year	Restraint worn		Number of known cases	Total occupants injured
	(N)	(%)		
2006	548	89.3	614	973
2007	580	87.7	661	1,034
2008	496	88.4	561	848
2009	474	90.1	526	798
2010	487	92.4	527	718

Restraint usage according to the region where the crash occurred for fatally and seriously injured vehicle occupants is presented in Table 5.9. Overall restraint use increased slightly to 89 per cent in 2010, the highest percentage of restraint use in the past five years. This increase was solely due to the increase in fatally or seriously injured vehicle occupant restraint wearing rates for crashes in the Adelaide metropolitan area (95%). Rural restraint wearing rates decreased marginally and remained lower than metropolitan rates.

Table 5.9
Restraint usage of fatally and seriously injured vehicle occupants by region, 2006-2010

Year	Metro Worn		Rural Worn		Total Worn		Total Killed/ Seriously Injured
	(N)	(%)*	(N)	(%)*	(N)	(%)*	
2006	287	89.7	300	85.2	587	87.4	1,051
2007	307	89.0	325	84.4	632	86.6	1,129
2008	255	91.4	277	81.0	532	85.7	917
2009	239	88.8	279	85.6	518	87.1	891
2010	231	95.1	302	85.1	533	89.1	798

* Percentage of known

Note: some data differs from previous years reports as data is continuously updated

Table 5.10 shows the number and percentage of fatally and seriously injured vehicle occupants wearing restraints, by sex. Overall, seriously or fatally injured males had lower restraint usage rates than injured females. Male restraint use was higher in 2010 than in previous years at 85 per cent. Female restraint use was similar to previous years at 93%.

Table 5.10
Restraint usage of fatally and seriously injured vehicle occupants by sex, 2006-2010

Year	Male Worn		Female Worn		Total Killed/ Seriously Injured
	(N)	(%)*	(N)	(%)*	
2006	301	83.1	286	92.3	1,051
2007	339	82.3	293	92.1	1,129
2008	263	81.2	269	90.6	917
2009	249	80.3	269	94.4	891
2010	256	85.0	276	93.2	798

* Percentage of known

5.2.3 On-road observational restraint use surveys

On-road observational surveys of restraint use provide another means to measure the effectiveness of restraint enforcement. An observational survey was conducted in March, 2009 at 61 sites in metropolitan and rural areas of South Australia. The survey found that 98.4 per cent of occupants in the metropolitan area were wearing a seatbelt, a two per cent increase from the last observational survey of restraint use conducted in 2002. This percentage was marginally lower in most rural areas. The percentage wearing a restraint in rural areas had also increased slightly, relative to the 2002 observation survey. Males had slightly lower restraint use rates than females, consistent with the 2002 survey. The full methodology and results can be seen in Wundersitz and Anderson (2009).

5.3 Restraint publicity

Advertising campaigns to target restraint use were run during April and December in 2010. The campaign used was named ‘Dead Easy’ and was a continuation of a campaign developed and run in 2009. The campaign’s primary audience was 16 to 39 year olds, particularly males and those in regional zones. Passengers were also targeted by the campaign.

The ‘Dead Easy’ campaign aimed at increasing the use of seatbelts, both in general and during short trips, and to increase awareness of restraint use benefits and non-use potential consequences. Radio and outdoor media were used to promote the campaign. This included eleven short radio advertisements, each challenging a different excuse for restraint non-use. The outdoor media was presented on bus backs, bus shelters, in large format, and on regional banners.

6 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) recommends the systematic monitoring of driver behaviour by independent institutions to create road safety performance indicators. Following these recommendations, this annual report details such indicators.

6.1 Drink-driving

In a review of the impact of driver screening tests for alcohol across Australia, Homel (1990) concluded that the most successful model includes highly visible DST 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, that is, by increasing the perceived likelihood of detection and emphasising the consequences of legal sanctions.

In June 2005, legislation enabled mobile DST to be conducted on a full time basis rather than only during 'prescribed periods' in South Australia. Consequently, 2010 was the fifth calendar year in which full time mobile data were available for the entire 12-month period.

LEVELS OF TESTING

The level of driver screening tests for alcohol increased in 2010 to the highest level of the five year period. SAPOL's target of 660,000 tests per year was exceeded. The total tests represent approximately 64 per cent of licensed drivers in South Australia. The increase in testing was particularly evident in rural areas.

Comparisons with other Australian jurisdictions revealed that South Australia tested a greater proportion of the population than the ACT and Western Australia but a smaller proportion than the remaining jurisdictions for which this data was provided. This trend is consistent with previous years. In Tasmania, the levels of DST for alcohol were greater than one test for every person in the state per year, compared to less than one in every two people in South Australia.

While static testing remained at a similar level in 2010, decreasing only slightly, the proportion of mobile testing remained relatively stable at 29 per cent (27% in 2009, 28% in 2008). Compared to other jurisdictions, the proportion of mobile testing in South Australia was higher than in New South Wales and similar to Queensland, but lower than two other jurisdictions (WA, TAS). Tasmania recorded the highest level at around 67 per cent.

VISIBILITY OF ALCOHOL DST

To increase the perceived probability of detection, Homel (1990) suggests that driver screening tests 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, driver screening tests need to be at times when most drink driving occurs. Homel maintains that experimentation is required to determine the balance of testing at times and places of high traffic volume when the incidence of drinking and driving is low, and when the incidence of drink driving rates is high but the traffic volume is low.

Night time surveys of drink driving provide information about times when the incidence of drink driving is greatest but such surveys have not been conducted in South Australia since 1997. The most recent roadside breath testing surveys conducted in Australia (Friday to Sunday, 10pm-3am), found that drink driving rates were highest after midnight and on Friday nights in Perth (Ryan, 2000). Consequently, to detect drink drivers, DST is needed later in the evening (after midnight) and on days when the highest drink driving rates occur.

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

During 2010, the greatest percentage of static and mobile driver screening tests continued to be performed on Friday and Saturday, days when drink driving rates are typically higher. For time of day, highly visible static testing was undertaken predominantly from 4pm to 10pm, an earlier part of the evening when potential drink drivers would see DST activities on their way to drinking venues. This might increase perceived risk of detection and general deterrence. The level of mobile testing was highest from 8pm to 2am and was much higher than static testing from 10pm to 4am. Therefore, mobile testing, the form of DST most likely to detect drink drivers, was undertaken at times when drink driving rates are highest, consistent with best practice in the literature.

EFFECTIVENESS

For specific deterrence, it is important to apprehend a large proportion of drink drivers. In 2010, the total number of DST detections (evidentiary) in South Australia decreased by eleven per cent. Generally, a low number of detections are interpreted as indicating a lower level of drink driving activity, or, reflecting enforcement practices that concentrate largely on deterrence rather than detection. In comparison to other states providing evidentiary DST detection data, the number of detections per head of population in South Australia was lower than two of the three jurisdictions that provided this data.

Detection rates (drink drivers detected per 1,000 drivers tested) provide a measure for estimating the effectiveness of DST. Based on evidentiary testing, detection rates in South Australia decreased slightly in 2010. A decrease was experienced in both metropolitan and rural areas. The overall detection rate in South Australia for evidentiary tests was similar to Tasmania, but lower than two other jurisdictions for which the data was available.

In comparison to evidentiary testing results, the overall detection rate for screening tests increased slightly in 2010. The overall detection rate was lower than Queensland and the Australian Capital Territory.

Consistent with previous years, mobile DST was more efficient in detecting drink drivers than static DST. It has been argued that mobile DST provides a better means of detecting drink drivers, particularly those trying to avoid static DST sites (Harrison et al., 2003). Note that few studies have formally evaluated mobile DST methods and, in most studies, mobile data have been confounded with those of stationary DST (Harrison et al, 2003). The ratio of mobile to static detection rates was higher in rural regions, suggesting that mobile testing was of particular benefit in rural regions. Specifically, mobile testing was most effective in detecting rural drink drivers from 8pm to 6am. Mobile DST require fewer police personnel, a limited resource in rural regions, and offers a solution for the ‘grapevine’ or ‘word-of-mouth’ effect known to undermine highly visible static operations. Effective drink driving enforcement is particularly important in rural regions because this is where a greater proportion of high BAC levels (0.150mg/L and above) were recorded by DST operations.

Detection rate data for alcohol indicate that static and mobile detection rates were highest from midnight to 6am, a period typically associated with high alcohol consumption. Consequently, even though fewer DST activities were conducted after midnight, they were effective in detecting drink drivers. With respect to day of week, detection rates were highest from Friday to Sunday, days when drink driving rates are highest.

The BAC distribution of drivers who were fatally injured in a crash in 2010 is indicative of a lower level of alcohol involvement than in the previous year. The percentage of fatally injured drivers with an illegal BAC (i.e. 0.050mg/L and above) decreased to 27 per cent and the proportion with a high BAC level (i.e. 0.100mg/L and above) also decreased slightly to 21 per cent. However, the small number of fatalities means that random variation may play a large role in the variation from year to year. Data for serious injury crashes also showed a slight decrease in the proportion of drivers with an illegal BAC (15% at 0.050mg/L and above). The greater 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 increased in 2010 for serious injury crashes (66%), but remained similar for fatal crashes (98% in 2010, compared to 99% in 2009). However, there is still scope for improvement in obtaining more BAC data for serious injury crashes so that the database can provide an even better indication of the level of drink driving.

PUBLICITY

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). Although the sole anti-drink driving campaign conducted in 2010 followed these recommendations, positively reinforcing planning ahead before drinking, Homel (1990) has emphasised that publicity accompanying DST activities should not simply be educational but have a deterrent value. The campaign used a variety of media to convey its message.

6.2 Drug driving

Introduced in July 2006, random roadside drug testing (now referred to as driver screening tests) was a relatively new enforcement activity in South Australia. This present report is the fourth in this series to examine drug driving enforcement operations and its effectiveness. As a result, this report is limited to only four years of data.

LEVELS OF TESTING

In 2010, the fourth full year of drug DST, 45,121 drivers or 3.9 per cent of the licensed drivers in South Australia were tested. This level of testing represents an increase of about 3% over the previous year with the majority of tests performed in the metropolitan area (70%). Testing rates per head of population were over three and a half times higher in South Australia than in other Australian jurisdictions supplying comparative testing data.

DST for drugs were conducted predominantly at the end of the week (Friday to Sunday), when drug driving rates are likely to be higher, and from 10am to 10pm, times when testing would be highly visible.

EFFECTIVENESS

As drug detection data are available for only four years, limited conclusions can be drawn about the effectiveness of the testing operations. Drug detection rates provide a guide as to the times and days when drug driving is more prevalent and give an indication of the profile of drivers detected drug driving. This information can be used to refine future enforcement activities.

Examination of confirmed positive detections (detections confirmed by evidentiary laboratory analysis) revealed that THC was the most commonly found illicit drug of the three tested, very closely followed by methylamphetamine. This is despite the screening tests detecting methylamphetamine more reliably than cannabis. There is evidence that roadside screening tests often fail to detect cannabis when it is present (Verstraete & Raes, 2006). Note also that cannabis can only be detected for five hours after consumption while methylamphetamines can be detected 24 hours afterwards. Detection data also indicated that drivers aged 30-39 years were detected for the greatest number of drug offences and males were much more likely to be detected than females. However, testing data were not available to clarify whether this finding was due to more drug driving among these groups or to more drivers in these groups being tested.

Detection rates (drug drivers detected per 1,000 tested) provide an indication of the effectiveness of DST for drugs. Approximately 31 drivers per 1,000 tested were confirmed positive for at least one of the prescribed drugs, a higher level compared to the previous year. The increase in detection rate may indicate improvement in enforcement practices or it may indicate that drug driving has increased. Enforcement of drug driving is becoming more targeted and police skill in conducting the testing, which is more subjective than alcohol testing, is increasing. This suggests that, at least, some of this increase is due to the improvement of enforcement practices.

This detection rate in South Australia was higher than most other Australian jurisdictions providing this data. Both metropolitan and rural areas had similar detection rates. In comparison to evidentiary alcohol detection rates, drug detection rates (per 1,000 tested) were 4.5 times higher. This should not be automatically interpreted as meaning that there are more drug drivers than drink drivers as there may be differences in enforcement practices that account for the difference.

The number of crash involved drivers testing positive for drugs can provide an indication of the level of drug driving. Of the drivers fatally injured in a crash, 21 per cent were positive for at least one of the prescribed drugs in 2010. This proportion was slightly lower than the previous year. This may suggest that the increase in the detection rate is largely due to improved enforcement practices rather than an increase in drug driving. However, it should be noted that, due to the low number of fatally injured drivers, the number testing positive for drugs can be heavily affected by random variation.

PUBLICITY

In 2010 one anti-drug driving campaign that supported enforcement activities was run. The campaign was a continuation of a campaign that began in 2009. It aimed to address myths associated with drug driving and increase awareness of the negative impact drugs have on driving ability.

Various media were used to convey the campaign message and males aged 20 to 40 years were targeted. Given that fatal crash data and drug driving offence data indicate that the majority of drug drivers are male and aged 30 to 39 years, publicity campaigns and enforcement activities should continue to target this group.

6.3 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 and the certainty of detection.

LEVEL OF OPERATIONS

The number of hours spent on speed enforcement in South Australia in 2010 decreased by approximately three per cent. The hours of operation of fixed speed cameras are not included in this total. Therefore, the true number of hours of speed detection is greater than is stated within this report.

The number of speed camera hours in 2010 decreased relative to the previous year, but still exceeded the target number of detection hours. In rural areas, the number of hours decreased while in the metropolitan area, the number of hours remained static. The hours of operation for non-camera devices (laser devices, hand-held radars and mobile radars) decreased (by 3.1%) in 2010 to the lowest level of the five year period (2006 to 2010). Hours in the metropolitan area fell but hours in rural areas were increased. Non-camera devices were used much more frequently in rural areas while camera devices were used much more frequently in metropolitan areas.

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). Consequently, 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 operations in South Australia have been organised to produce a high level of general deterrence by operating at times when the majority of drivers are on the road. Unfortunately, the physical violence against camera operators that brought about the removal of signs alerting motorists to the fact they had passed a speed camera reduced the general deterrence of these cameras. For speed cameras and non-camera devices, speed detection hours were spread evenly throughout the week with the majority operating during daylight hours (although in comparison to speed cameras, non-camera devices were more frequently operated at night). This pattern of speed detection operation has varied little from 2006 to 2010.

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 Friday and weekends. As speed enforcement was conducted evenly across all days of the week, it appears that a good balance between operations during high traffic periods (weekdays) and high speeding days (weekends) was achieved. Detection data from speed cameras for time of day in 2010 indicated higher rates of speeding from 6am to 8am. A relatively low number of enforcement hours are apportioned to these hours of the day, therefore this could represent an opportunity to increase the specific deterrence of enforcement operations. Data from on-road speed surveys could be analysed by time of day and day of week to determine more accurately when speeding rates are highest, as these data are not influenced by enforcement operations.

EFFECTIVENESS

In 2010, the proportion of licensed drivers in South Australia detected for speeding offences, including the number detected with fixed speed cameras, decreased to 26 per cent. A decrease in the number of detections was observed for all forms of speed detection with speed camera detections decreasing by 17 per cent and non-camera detections decreasing by 9 per cent. Fixed speed detections decreased by 20%.

A marked reduction in speed offence detection rate was also observed in 2010 relative to 2009, though only from February. In the previous year's report (Doecke and Grigo, 2010) it was suggested that the reduction in detections and detection rate in 2009 may have been due to drivers adjusting their behaviour to the reduction of the tolerance in late 2007 over time. The step change in detection rate observed in February suggests a more systematic change occurred in 2010. The obvious place for a systematic change to occur would be enforcement operations, however SAPOL were not aware of any such changes. Of course motorists may simply be speeding less. While the on-road speed surveys did show a drop in speeds and speeding these reductions were small; it is therefore unlikely to explain all of the reduction in detection rate.

The moderate decrease in fixed speed camera detections may be the result of driver adjustment to the presence of the camera at a given location. As no data are available for hours of enforcement or vehicles passing these devices a detection rate could not be calculated, therefore reduced exposure can not be ruled out as the cause of this decrease in detections.

Over half of all detections were made with conventional speed cameras, most likely due to the greater efficiency of speed cameras. Speed cameras check the speeds of all vehicles, not just those that the police officer selects and no time is lost to write a ticket. Cameras are also used more frequently in the metropolitan area, which is characterised by greater traffic density than rural areas.

Detection rates accounting for traffic volumes were much higher in rural areas, suggesting a greater prevalence of speeding in rural areas. This is probably due, in part, to a greater opportunity to freely choose travelling speeds in rural areas. There may also be a lower perceived risk of being detected in rural areas. Consequently, to reduce speeding in rural areas, higher levels of rural speed enforcement are needed.

The measurement of on-road vehicle speeds can 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. A systematic method of measuring vehicle speeds was introduced in South Australia in 2007 to assess the effects of speed reduction countermeasures and to monitor the speed behaviour of South Australian motorists over time. Speed data were collected at 130 sites (historical and new sites). In 2010 mean speeds decreased on metropolitan roads, in general, but no change was seen on rural roads. The percentage of drivers speeding by more than five, 10 and 15 km/h decreased on the same metropolitan roads and on 110 km/h rural roads.

The involvement of speed as a factor in crashes can not be reliably determined in sufficient numbers to examine the effect of enforcement. However, such data can be used to observe trends in speeding crashes. Males consistently represent a clear majority of drivers involved in fatal crashes where speed was determined to be a factor (by the NSW RTA method) and remain an important target for speed enforcement. Over two-thirds of these crashes occurred in rural areas, further highlighting the need for higher levels of speed enforcement in rural areas.

PUBLICITY

Information and publicity campaigns developed 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). This is important because the certainty of detection is more important as a deterrent than severity or immediacy of sanctions. An evaluation of anti-speeding television advertising in the Adelaide metropolitan areas reported slight but statistically significant decreases in mean free speeds (Woolley et al., 2001).

The publicity campaign conducted in 2010 sought to increase public awareness of the consequences of speeding, death and injuries, even when slightly over the speed limit. Given that between about 12 and 43 per cent of drivers broke the speed limit by less than 10 km/h (depending on the road type) on both metropolitan and rural roads in 2010, low level speeding appears to be a suitable focus for a campaign (Kloeden and Woolley, in press). The campaign did not specifically attempt to raise drivers' perceived risk of detection.

6.4 Restraint use

It was very difficult to assess the effectiveness of restraint use enforcement operations, as there was a lack of information on this type of enforcement. On-road observational surveys of restraint use provide the best indication of restraint use levels. Such a survey was undertaken in 2009. The number of restraint offence detections (an indicator of enforcement activities), the level of restraint use for injured occupants in crashes, the level of restraint use found in on-road observational surveys and publicity were examined to monitor trends in 2010.

LEVELS OF RESTRAINT ENFORCEMENT

The total number of restraint offences detected in South Australia decreased by 10 per cent in 2010 compared to 2009. 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. A new restraint non-use offence came into effect on 1 March 2008. This new rule made it an offence for the driver to fail to ensure passengers over the age of 16 are restrained. This offence allows the offending passenger to be fined as well as the driver and so two offences can be generated for a single unrestrained occupant. 2010 is the second full year since this rule came into effect. On 1 July 2010 legislation came into effect specifying the type of restraints that must be used for children up to seven years old. Previously this was only specified for children up to one year old. A three month grace period was allowed in which no expiations were issued to drivers, therefore these new laws were only in effect for the last quarter of 2010. This grace period was followed by a month of targeted enforcement of the new laws in November.

Restraint usage can be increased through high levels of enforcement over short periods, when applied repeatedly (ETSC, 1999). It is difficult to determine from the available data if this has taken place, however restraint non-use was only specifically targeted during November, and this was aimed at the new child restraint laws. High levels of enforcement were conducted around holiday periods that targeted all of the 'fatal five', of which restraint non-usage is one, though it is unknown how much of this increased enforcement was directed towards restraint non-use.

If the number of detected offences is used as an approximate guide to enforcement activities, it appears that restraint enforcement was spread relatively evenly throughout the week. Restraint enforcement occurred predominantly during daylight hours (8am-6pm) when restraint use is most easily observed. The majority of offences were detected in the metropolitan region. This could be attributed to greater enforcement in the metropolitan area or to greater traffic volumes.

In 2010, males were 2.5 times more likely than females to be detected for a restraint offence, and vehicle occupants aged 20 to 29 years were detected for more offences than any other age group. This was consistent with previous years.

LEVELS OF RESTRAINT USE AND EFFECTIVENESS

The percentage of injured vehicle occupants wearing restraints in serious injury crashes in South Australia in 2010 was 92 per cent, which was slightly higher than the previous year but generally comparable to other years. The level of restraint use of 65 per cent in fatal crashes was slightly higher than the previous year (64%) but the small numbers of fatal crashes makes it difficult to interpret these results. Similar to previous years, restraint wearing rates for injured vehicle occupants in serious and fatal crashes in 2010 were higher in the metropolitan area (95%) than rural regions (85%), as is historically the case, suggesting that attention still needs to be given specifically to non-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 Raftery and Wundersitz, 2011). Restraint wearing rates might be lower in fatal crashes, compared to serious injury crashes, due to police not specifically trained in crash investigation overestimating seat belt usage in less severe crashes. More likely, however, is that restraint wearing rates were lower in fatal crashes because the higher severity of the injuries sustained were directly related to the vehicle occupant being unrestrained. The status of restraint use is 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 fatal (11%) and serious (27%) crashes. Continuing improvement in the recording of restraint use status will improve database reliability and accuracy, and also improve the evaluation of restraint enforcement practices.

The observational restraint use survey undertaken during 2009 revealed seat belt usage in South Australia was at a high level (above 98%) and had increased since the last survey in 2002 (Wundersitz and Anderson, 2009).

Males were also found to have slightly lower restraint use rates than females. This is consistent with the finding in 2010 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 in serious and fatal crashes among males was, however, higher than in the past five years and five percentage points higher than in 2009. Self-reported restraint use has also been found to be lower among males in the literature (Milano et al., 2004; Reinfurt et al., 1996). Data from the United States have also shown that male drivers restrain their child passengers less than female drivers (Glassbrenner, 2003). Therefore, males remain an important target for restraint enforcement.

Many children in Australia are not using an appropriate restraint for their size (Edwards et al., 2006; Stewart & Lennon, 2007). A recent study found that more than 30 per cent of children from four to six years of age were too small for the restraints they were using. Therefore, in order to improve children's safety in the car as passengers, parents should be informed of when to move children into larger restraints (Stewart & Lennon, 2007). The introduction of the new child restraint laws that cover children up to the age of seven (rather than one) in July 2010 and the continuing enforcement of and education surrounding these laws should help to ensure appropriate child restraints are used.

PUBLICITY

Restraint enforcement is by nature more covert than other forms of enforcement such as driver screening tests for alcohol or overt speed detection. In order to increase the perceived risk of apprehension and general deterrence of the behaviour, a high level of enforcement publicity is recommended (Zaal, 1994).

Restraint use legislation seems to be most effective when it is accompanied by strict enforcement and publicity. Restraint use of drivers in Korea rose from 23 per cent to 98 per cent in less than a year as a result of increased publicity from the national police enforcement campaign and doubling the fines for not using a restraint. Increased publicity and enforcement also increased restraint use in provinces in France and Canada by 10 to 15 per cent within one year (World Health Organization, 2004).

The advertising campaign conducted during 2010 to promote restraint use focused predominantly on the risks and consequences of not using restraints. The advertisements were skewed towards high risk groups; younger occupants, males and those in rural areas. Future restraint enforcement operations in South Australia would benefit from accompanying publicity concentrating on deterrence, particularly one or two weeks prior to, and during, the enforcement period (see Stefani, 2002).

The use of unintentional or unpaid publicity (that is, publicity not supported by the organisation(s) that disseminated the mass media campaign) is important for the outcome of a publicity campaign (Delaney et al., 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, it was also noted that unpaid media was not effective by itself to reach high-risk groups (i.e. young males). The amount of unpaid restraint use publicity received in 2010 is unknown but it should be encouraged to enhance future restraint use publicity campaigns and enforcement.

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- Clyde Jones, Senior Business Intelligence Analyst, Western Australia Police
- Linda Zammit, Traffic Research and Intelligence Unit, Traffic Services Branch, New South Wales Police
- Nikki Archer, Blood and Breath Officer, ACT Policing, Australian Federal Police

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References

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

Baldock, M.R.J., Woolley, J.E., Wundersitz, L.N., & McLean, A.J. (2007). *Annual performance indicators of enforced driver behaviours in South Australia, 2004*. CASR Report Series CASR031. Adelaide: Centre for Automotive Safety Research.

Boorman, M. (2007). *Random drug testing of drivers in Victoria.* Paper presented at the 2007 Road Safety Research, Policing and Education Conference, Melbourne, Australia

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

Doecke, S. D., & Grigo, J.A.L. (2011). *Annual performance indicators of enforced driver behaviours in South Australia, 2009.* CASR Report Series CASR084. Adelaide: Centre for Automotive Safety Research.

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.

Diamantopouloe, K., Hoareau, E., Oxley, P., Cameron, M. (2003). *The feasibility of identifying speed-related and fatigue-related crashes in police-reported mass crash data.* Report No. 197. Clayton, Victoria: Monash University Accident Research Centre.

Edwards, S., Anderson, R., & 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.

Evans, L. (1996). Safety-belt effectiveness: The influence of crash severity and selective recruitment. Accident Analysis & Prevention, 28(4), 423-433.

Fitzharris, M., Gelb, K. R., Harrison, W. A., Newstead, S. V., Diamantopoulou, K., & Cameron, M. H. (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.

Glassbrenner, D. (2003*). The use of child restraints in 2002*. Research Note: DOT HS 809 555. United States of America: National Highway Traffic Safety Administration.

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, W.A. (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, M., & McLean, J. (2003). *Drink driving enforcement: issues in developing best practice*. Sydney: Austroads.

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

Kloeden, C.N. & McLean, A.J. (1997). *Night-time drink driving in Adelaide: 1987-1997.* ORS Report No. 5/97. Adelaide: Office of Road Safety.

Kloeden, C.N. McLean, A.J. & Holubowycz, O.T. (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, C.N., & Woolley, J.E., (2012). Vehicle speeds in South Australia 2010. CASR097. Adelaide: Centre for Automotive Safety Research.

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, J. L. (2004). The effect of earned and paid media strategies in high visibility enforcement campaigns. *Journal of Safety Research*, 35, 203-214.

NSW Centre for Road Safety. (2008). *Road traffic crashes in New South Wales 2007*. Sydney: NSW Centre for Road Safety, Road Traffic Authority.

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

Police Act 1998 (SA).

Raftery, S.J., Wundersitz, L.N. (2011). *No restraint? Understanding differences in seat belt use between fatal crashes and observational surveys.* CASR Report Series CASR090, Centre for Automotive Safety Research, Adelaide.

Reinfurt, D. W., Williams, A. F., Wells, J. K., & Rodgman, E. (1996). Characteristics of drivers not using seat belts in a high belt use state. *Journal of Safety Research*, 27(4), 209-215.

Retting, R.A., Kyrychenko, S.Y., & McCartt, A.T. (2008). Evaluation of automated speed enforcement on Loop 101 freeway in Scottsdale, Arizona, Accident Analysis and Prevention, 40, 1506 - 1512.

Richards, D. C., Hutchins, R., Cookson, R. E., Massie, P., & Cuerden, R. W. (2008). Who doesn't wear seat belts? 3rd International conference: Expert Symposium on Accident Research. Hanover, Germany.

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

Sivak, M., Luoma, J., Flannagan, M. J., Bingham, C. R., Eby, D. W., & Shope, J. T. (2007). Traffic safety in the US: Re-examining major opportunities. *Journal of Safety Research, 38*, 337-355.

Stewart, T. M. & Lennon, A. J. (2007). Parents’ knowledge and use of child restraints in regional and rural NSW: results from a survey. In: *Proceedings Australasian College of Road Safety Conference on Infants, Children and Young People and Road Safety*, Sydney.

Stefani, A. M. (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.

Verstraete A.G. & Raes E. (2006). *ROSITA-2 Project Final Report.* Belgium: Ghent University, Department of Clinical Biology, Microbiology and Immunology.

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.

World Health Organization. (2004). *World report on road traffic injury prevention*. Geneva.

Woolley, J.E., Dyson, C.B. & Taylor, M.A.P. (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, L.N., & Anderson R.W.G. (2009). *On-road observational survey of restraint and child restraint use, 2009.* CASR Report Series CASR065. Adelaide: Centre for Automotive Safety Research

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

Wundersitz, L.N., & Baldock, M. (2008b). *Annual performance indicators of enforced driver behaviours in South Australia, 2006*. CASR Report Series CASR043. CASR Adelaide: Centre for Automotive Safety Research.

Wundersitz, L.N., Baldock, M.R.J., Woolley, J.E. & McLean, A.J. (2007). *Annual performance indicators of enforced driver behaviours in South Australia, 2003.* CASR Report Series CASR030. Adelaide: Centre for Automotive Safety Research.

Wundersitz L.N., Doecke, S.D., & Baldock M.R.J., (2010) *Annual performance indicators of enforced driver behaviours in South Australia, 2008.* CASR Report Series CASR073. Adelaide: Centre for Automotive Safety Research.

Wundersitz, L.N., Hiranandani, K., & Baldock, M. (2009). *Annual performance indicators of enforced driver behaviours in South Australia, 2007*. CASR Report Series CASR058. Adelaide: Centre for Automotive Safety Research.

Wundersitz, L.N., Kloeden, C.N., McColl, R.A., Baldock, M. R. J. & McLean, A. J. (2001). *Metropolitan Adelaide 2001 speed situation analysis.* Unpublished Report: Transport SA.

Wundersitz, L. N. & McLean, A. J. (2002). *The operation and effectiveness of random breath testing in South Australia, 2000.* Unpublished Report: Transport SA.

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

Appendix A - Enforcement time of day calculations

Data relating to time of day was produced in a different way in the 2010 report to previous years reports in an attempt to improve accuracy. The data from SAPOL contains start hour, end hour and duration. The duration may or may not bear a relationship to the start and end hour. In previous years the start hour was used as the time at which all the enforcement took place. For example, if the start and end hour was documented as 8am and 11am respectively, and the duration recorded was 3.5 hours with 20 detections, the 3.5 hours of enforcement and 20 detections were attributed to 8:00am to 8:59am. In comparison, in this report the data was spread between the start and end hour. For the example above, 0.875 hours of enforcement and 5 detections were attributed to 8:00am to 8:59, 9:00am to 9:59, 10:00am to 10:59 and 11:00am to 11:59am.

The difference between the two methods is most sensitive to the length of the enforcement and the spread of the start times. Comparisons between the two methods for various types of enforcement can be seen for hours of enforcement in Figures A1-A5. The most obvious difference is in speed camera enforcement that has two main clumps of start times (presumably representing shift start times) and long enforcement times.

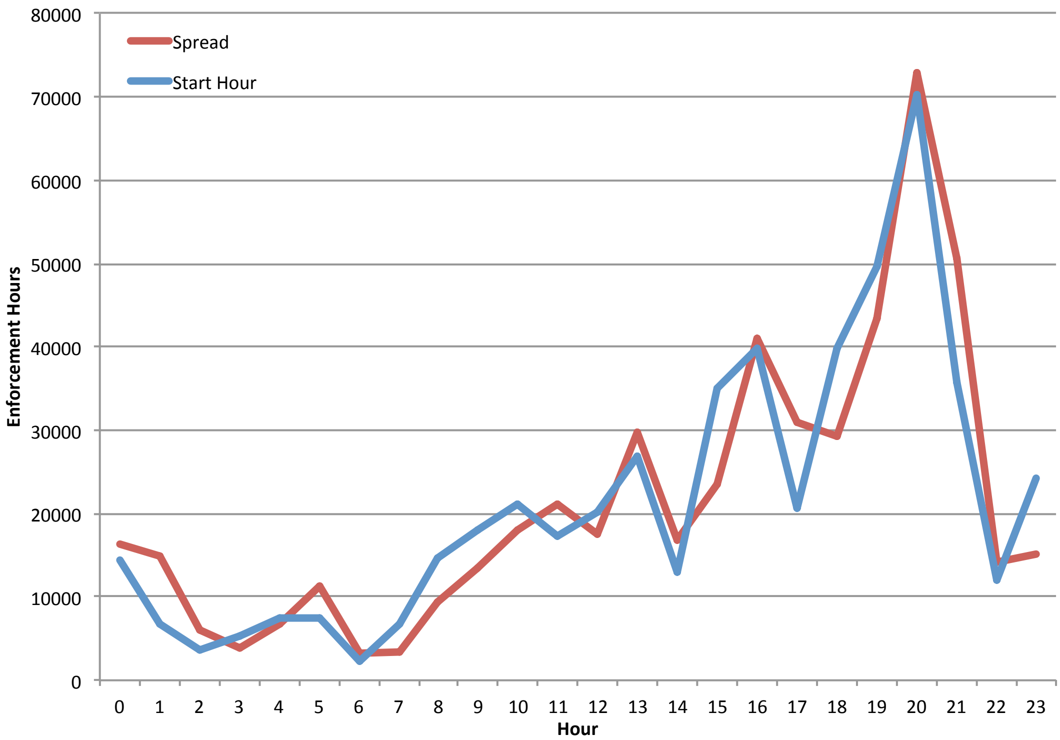

Figure A1
Comparison of static DST (alcohol) enforcement by hour of day determined using the different methods

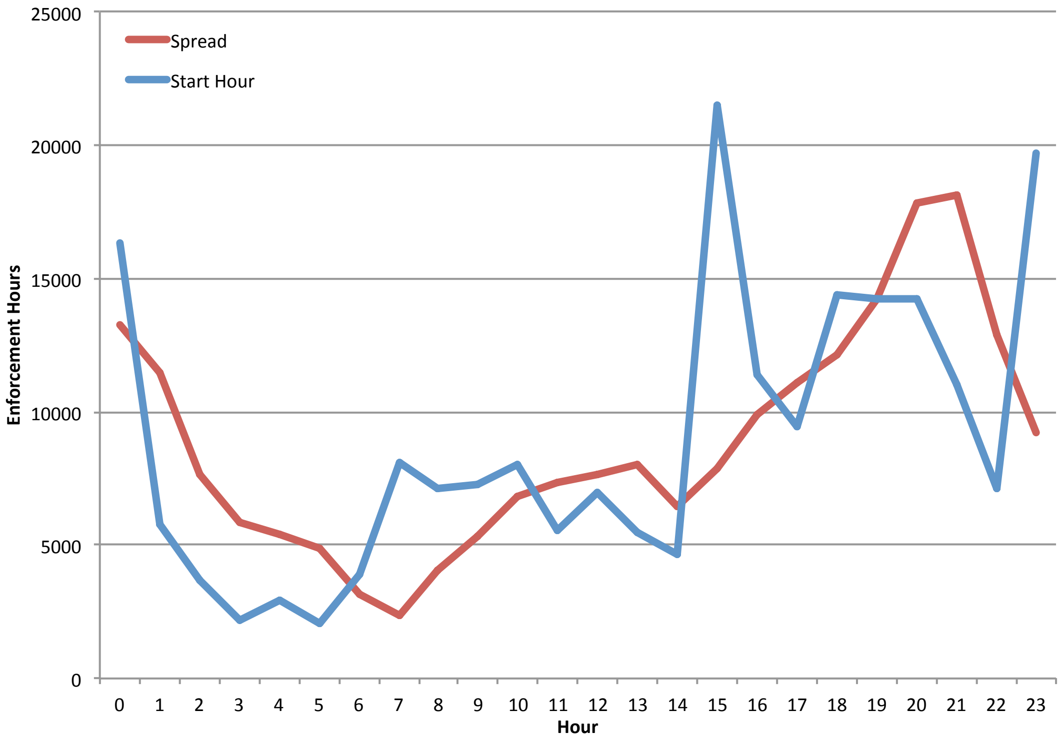

Figure A2
Comparison of mobile DST (alcohol) enforcement by
hour of day determined using the different methods

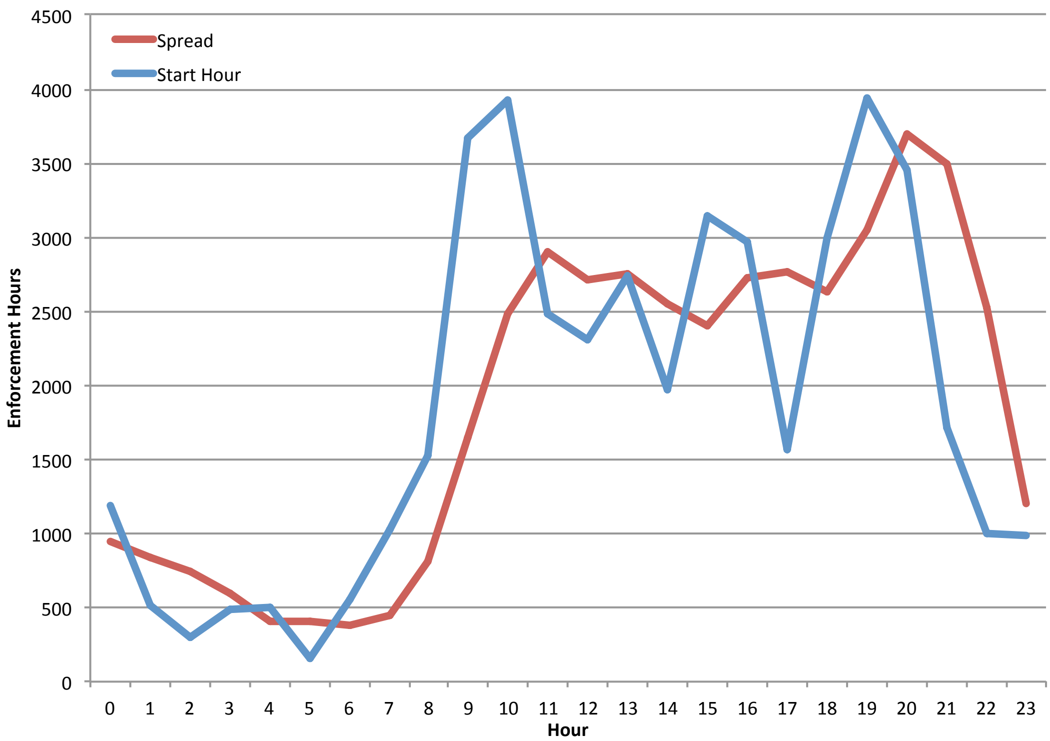

Figure A3
Comparison of drug driving enforcement by
hour of day determined using the different methods

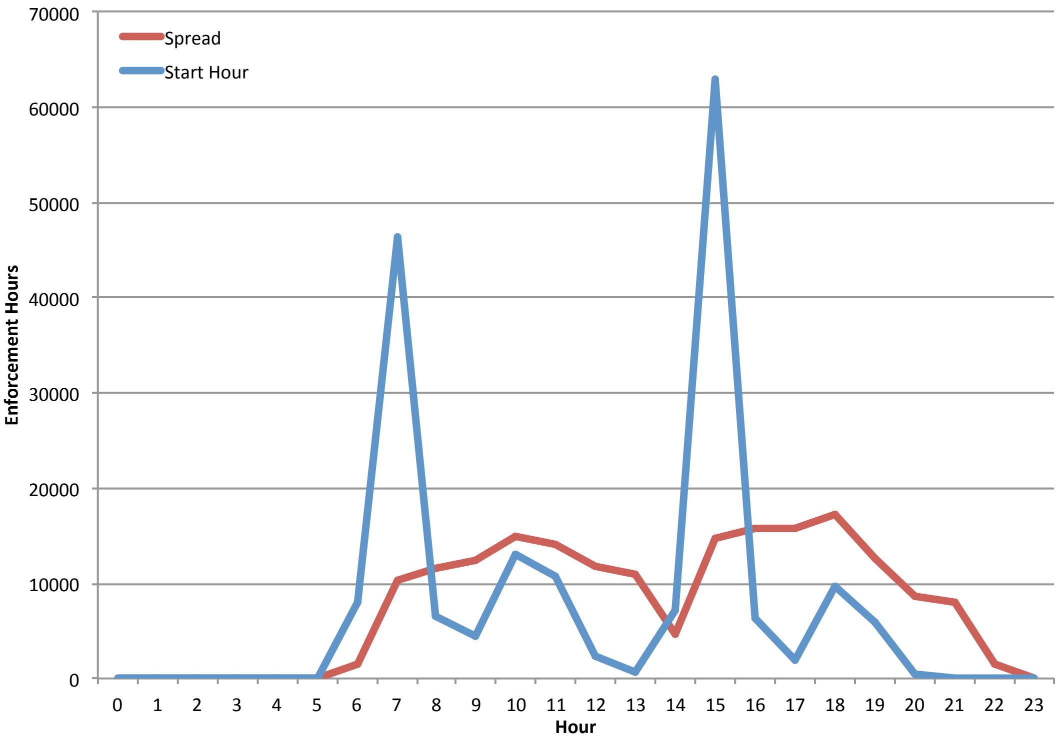

Figure A4
Comparison of speed camera enforcement by
hour of day determined using the different methods

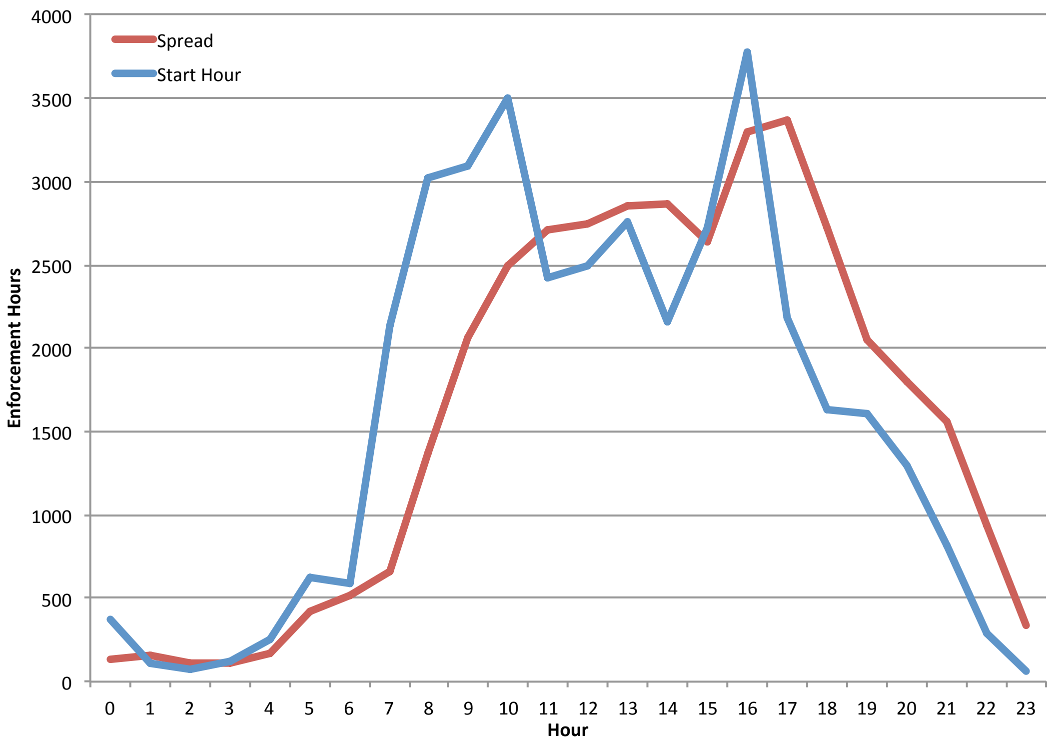

Figure A5
Comparison of speed non-camera enforcement by
hour of day determined using the different methods