Annual performance indicators of enforced driver behaviours, 2002

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ABSTRACT

The Centre for Automotive Safety Research at the University of Adelaide was commissioned by Transport SA to produce a report quantifying the effects of selected enforced driver behaviours: drink driving, speeding and restraint use, in South Australia for the calendar year 2002. The level of random breath testing (RBT) has increased substantially such that the annual average rate of testing was 2 tests for every 3 licensed drivers in 2002. An inverse relationship between detection rates and publicity expenditure suggests current publicity campaigns are supporting enforcement operations.
Overall, speeding detection rates in 2002 decreased, especially speed camera detection rates. However, speeding detection rates were heavily influenced by police enforcement strategies and practices. Rural speed surveys indicated that the mean free speed decreased from 2000 to 2002 on 100km/h roads but showed no meaningful change on 60km/h and 110km/h roads each year.
Determining the effectiveness of restraint use enforcement was very difficult because no specific restraint enforcement campaigns were undertaken. In the absence of available restraint enforcement details, the number of restraint related offences committed annually was used to provide a rough estimate of enforcement activities. Reasonably consistent observational surveys were useful in providing an indication of restraint wearing rates over time in a number of regions. The surveys indicated that both metropolitan and rural wearing rates increased in 2002 to a level of 96 per cent, just above the national target of 95 per cent.

KEYWORDS

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

Summary

The Centre for Automotive Safety Research at the University of Adelaide was commissioned by Transport SA to produce a report quantifying the effects of selected enforced driver behaviours: drink driving, speeding and restraint use, in South Australia for the calendar year 2002.

For each of the driver behaviours, the current levels of police enforcement operations were investigated. The current levels of the involvement of the driver behaviour in fatal and serious casualty crashes were also estimated. Additionally, available information from on-road surveys was examined and the extent of any publicity and advertising for the year was reported.

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

The main findings from performance indicators for each enforced behaviour in 2002 are summarised below.

DRINK DRIVING

The level of random breath testing (RBT) has increased substantially such that the annual average rate of testing was 2 tests for every 3 licensed drivers in 2002. The current high level of RBT operations should be sustained to maintain the high perceived risk of detection.

During the past ten years, a strong association was observed between drink driving detection rates and testing after midnight suggesting detection rates were highly dependant on enforcement operations.

The involvement of illegal alcohol levels in serious and fatal crashes confirmed that the current testing pattern of ‘highly visible’ RBT operations designed to deter potential drink drivers should be continued. However, testing should also be conducted when drink driving rates are highest (ie after midnight) to detect drink drivers.

Roadside breath alcohol surveys provide a useful indication of driver’s alcohol levels independent of enforcement practices. The last survey was conducted in 1997 in the Adelaide metropolitan area.

An inverse relationship between detection rates and publicity expenditure suggests current publicity campaigns are supporting enforcement operations.

SPEEDING

Overall, speeding detection rates in 2002 decreased, especially speed camera detection rates. However, speeding detection rates were heavily influenced by police enforcement strategies and practices.

‘Excessive speed’ is seriously underestimated as an apparent driver error in the TARS database. Consequently, meaningful analysis of serious casualty and fatal crashes was limited due to under-reporting bias.

Representative on-road speed surveys conducted in rural areas over the last three years are to be commended as a useful source for monitoring vehicle speeds. The rural speed surveys indicated that the mean free speed decreased from 2000 to 2002 on 100km/h roads but showed no meaningful change on 60km/h and 110km/h roads each year. Regular systematic on-road vehicle speed monitoring in the metropolitan area is required to identify trends in urban vehicle speeds.

An evaluation of anti-speeding television advertising in the metropolitan area reported small but statistically significant decreases in mean free speeds. Anti-speeding advertising continued to support enforcement operations in the metropolitan area and the media was used to publicise specific speed enforcement activity. A publicity campaign is required in rural regions to support enforcement efforts.

RESTRAINT USE

Determining the effectiveness of restraint use enforcement was very difficult because no specific restraint enforcement campaigns were undertaken. In the absence of available restraint enforcement details, the number of restraint related offences committed annually was used to provide a rough estimate of enforcement activities.

Reasonably consistent observational surveys were useful in providing an indication of restraint wearing rates over time in a number of regions. The surveys indicated that both metropolitan and rural wearing rates increased in 2002 to a level of 96 per cent, just above the national target of 95 per cent.

Restraint use by injured vehicle occupants in serious and fatal crashes was much lower than observed wearing rates for the general driving population. However the confounding nature of the relationship between crash injury and wearing rates in crashes (wearing restraints reduces injury) limited its use as an indicator of restraint use. Furthermore, better records of restraint use for all vehicle occupants in serious and fatal crashes need to be kept to improve database reliability and accuracy.

Advertising promoting restraint use in rural regions has assisted in raising observed rural restraint use. Although more money has been spent on publicity in rural regions than the metropolitan area over recent years, metropolitan and rural wearing rates remain similar. Due to the more overt nature of restraint enforcement, future restraint enforcement campaigns would benefit from high levels of publicity.

Contents

Introduction

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

The specific aim of this study was to quantify the effects of each of the following enforced driver behaviours: drink driving, speeding and restraint use, in South Australia for the calendar year 2002. The findings from this report are important for the evaluation and planning of future drink driving, speeding and restraint enforcement operations.

For each of the driver behaviours, the current levels of police enforcement operations are investigated. The current levels of the involvement of the driver behaviour in fatal and serious casualty crashes are also estimated. Additionally, current information from on-road surveys is examined and the extent of any publicity and advertising for the year is reported.

The first section of the report examining drink driving continues on from other regular annual reports detailing the operations and effectiveness of RBT (Baldock & White, 1997; Hubbard, 1999; Wundersitz & McLean, 2002). In this report, data is presented from 1992 to 2002. The two other major enforceable behaviours included in this report are speeding and restraint use. To analyse recent short-term trends, data is included for the years 2000 to 2002.

1 Drink driving and random breath testing

The first section of this report describes the operation and effectiveness of random breath testing in South Australia for the calendar year 2002 in terms of the number of tests, the percentage of licensed drivers tested, detection rates, alcohol involvement in serious and fatal road crashes in addition to relevant publicity over the same time period.

1.1 RBT practices and methods of operation

Random breath testing (RBT) is an enforcement strategy designed to deter drivers from driving with an illegal blood alcohol concentration (BAC). Homel (1990) suggests that for RBT to be successful, it must be highly visible, rigorously enforced, supported by publicity and sustained in operation.

Information about the police operation of RBT has been provided by the Traffic Intelligence Section of the SA Police. In South Australia, amendments to legislation in June 1981 enabled RBT to operate. RBT operations are conducted using the block testing method or by single car operations. When block testing, several vehicles are pulled over at a time and the drivers tested. Block testing may be undertaken using the facilities of a specially equipped bus ('booze bus') designed for large scale operations or by using two or more single car units. Single vehicle operations involve one police car and two police officers per RBT site, enabling the testing of up to two drivers at one time.

All general patrol and traffic vehicles are equipped with a preliminary breath testing device (currently 909 available). Drivers who register a blood alcohol level over the prescribed limit on the screening test are required to submit to a further test on more accurate apparatus to determine an 'evidentiary' BAC level to be used in prosecution. Those found to be over the prescribed limit in the evidentiary test are officially recorded as having exceeded the prescribed concentration of alcohol.

There are 93 evidentiary breath testing instruments available for use in South Australia. If one of the four booze buses is not available for evidentiary testing, testing is conducted using a specialist testing van (six available) which moves between RBT sites.

In South Australia, the prescribed BAC limit has been 0.05 gms/100mL since July 1991. If apprehended with a BAC level of 0.05 to 0.079, the fully licensed driver incurs a Traffic Infringement Notice (TIN), an expiation fee, and a penalty of three demerit points. If detained with a BAC level of 0.08 or higher, the driver incurs an expiation fee, is required to make a court appearance and faces a licence suspension. The amount of the fine and length of licence disqualification is dependent on the actual BAC level and previous offences, if any.

The coordination of RBT activities was managed centrally until a major police re-structuring was introduced in 2000. Drink drive detection is now the responsibility of Local Service Areas (LSA's). Each LSA Commander has the responsibility of ensuring targets are met and that the operations are efficient and effective. A team of motorcycle officers from each of the two larger services areas (Northern and Southern Operations Service) also assist in RBT activities.

In most states in Australia, RBT operations may either be 'static', whereby an RBT station is set up on a road or 'mobile' which allows any mobile police vehicles to stop vehicles at random and breath test the driver. Mobile RBT was first introduced in New South Wales in late 1987 and has subsequently been introduced into all Australian states with the exception of South Australia. Parliament only very recently (June 2003) passed a Bill legislating the use of mobile testing during prescribed periods (ie public or school holidays). No mobile testing has been conducted at the time this report was written.

Number of tests performed

A testing target of 600,000 breath tests per year in South Australia was set by SAPOL in 1999. This testing target was increased from 500,000 tests set in 1997 and 1998. The current testing target is intended to test an average of one in every two licensed drivers in South Australia. Table 1.1 and Figure 1.1 summarise the changes in the number of random breath tests conducted from 1992 to 2002 for the metropolitan and rural areas. Rural testing refers to testing conducted outside the Adelaide metropolitan area and includes regional cities such as Mount Gambier and Port Augusta.

Table 1.1

Number of random breath tests in South Australia, 1992-2002

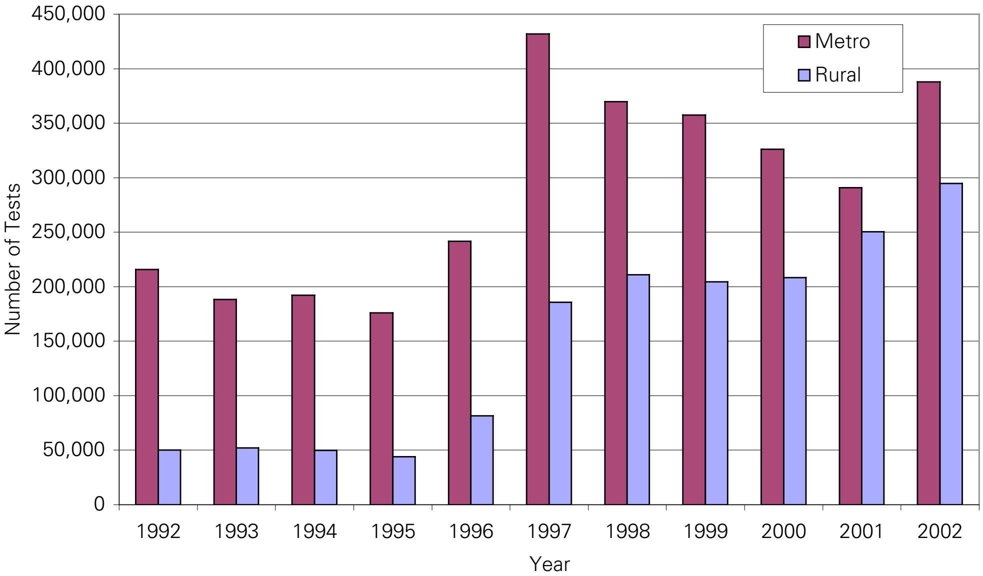
Year	Metro	Rural	Total	% difference from previous year
1992	215,790	50,291	266,081	-8.5
1993	188,266	51,966	240,232	-9.7
1994	192,079	49,748	241,827	0.7
1995	176,038	43,993	220,031	-9.0
1996	241,732	81,484	323,216	46.9
1997	431,784	185,721	617,505	91.1
1998	369,882	211,044	580,933*	-5.9
1999	357,556	204,490	562,046	-3.3
2000	326,168	208,405	534,573	-4.9
2001	290,853	250,282	541,115	1.2
2002	387,867	294,664	682,531	26.1

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

A consultancy report from the Monash University Accident Research Centre in 1996 recommended that the South Australian 1995 RBT numbers be doubled (Vulcan, Cameron, Mullan & Dyte, 1996). Funding was then increased to enable the police to purchase more equipment, and increase police overtime hours to operate additional RBT activities. As a result, in 1997 the number of tests increased significantly by 91 per cent over the previous year to the highest level on record up to that year. However, from 1998 to 2000 the number of tests decreased slightly.

Figure 1.1

Number of random breath tests in South Australia, 1992-2002



The total number of tests (541,115) performed in 2001 increased marginally (1%) from the year 2000. Over the same period, testing levels in rural regions increased by 20 per cent while in the metropolitan area, testing levels decreased by 11 per cent. In 2002, the total number of tests (682,531) performed exceeded the target of 600,000. This level of testing was 26 per cent higher than in 2001 and the highest number on record. The increase in testing was proportionally greater in the metropolitan area (33%) than in rural regions (18%).

DAY OF WEEK

Table 1.2 shows the number of random breath tests performed on each day of the week, as a percentage of all tests in a year, for the years 1992 to 2002. Similar to previous years, the greatest daily percentage of tests were conducted on Fridays and Saturdays in 2001 and 2002. Sundays have the third highest number of tests. The numbers of tests on weekdays has remained relatively consistent in recent years and Tuesday and Wednesday were the days of the week with the least numbers of tests.

Table 1.2

Random breath tests performed by day of week, 1992-2002 (expressed as a percentage of total tests each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1992	16.0	12.0	13.8	13.9	15.9	17.6	10.8
1993	16.9	13.7	12.6	13.2	16.1	16.5	11.0
1994	16.8	12.8	12.6	13.1	15.4	18.2	11.2
1995	13.9	13.3	13.3	12.8	20.4	15.6	10.7
1996	11.8	11.9	10.4	9.9	33.9	13.4	8.7
1997	8.9	8.4	11.1	8.9	28.4	19.1	15.2
1998	9.8	6.8	8.8	17.0	27.1	15.9	14.5
1999	12.8	8.9	8.3	11.4	26.0	16.6	16.0
2000	13.0	9.1	7.4	10.1	23.4	18.8	18.1
2001	12.8	7.0	7.8	12.6	22.7	19.1	17.9
2002	12.0	9.8	9.1	12.4	20.1	19.1	17.6

TIME OF DAY

The percentage of tests performed from 1992 to 2002 by the time of day is summarised in Table 1.3. The greatest percentage of tests in 2002 were conducted at night between 8 and 10 pm (22%). Since 1999 there has been a marked increase of 11 per cent in the number of tests between 6am and 2pm, which reached a record high of almost 21 per cent in 2002. The majority of the tests during this period were conducted around lunch time, from 12 to 2pm (9%). The increase between 6am and 2pm was originally offset by a decrease in the number tested between 8 and 10pm in 1999. The number of tests after midnight, specifically between 2 and 4am, doubled in 2001 but was then reduced to below the 2000 level in 2002.

Table 1.3

Random breath tests performed by time of day, 1992-2002 (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 AM	4-6 AM	6-8 AM	8-10 AM	10-12 AM
1992	8.6	2.3	0.5	1.4	0.9	14.8	15.4	37.8	18.3
1993	9.4	1.9	0.6	1.2	1.1	14.6	14.6	38.5	18.1
1994	11.5	2.4	0.7	1.6	1.0	12.9	14.6	36.3	18.9
1995	11.4	4.7	2.3	1.2	0.9	13.9	14.3	31.8	19.7
1996	10.7	3.5	1.6	6.7	2.1	12.2	10.6	38.6	13.9
1997	19.9	3.0	9.8	5.9	2.7	11.7	9.8	28.2	9.0
1998	9.1	2.5	5.8	9.4	4.9	10.5	12.5	33.4	11.9
1999	4.8	3.8	3.4	16.6	9.2	14.7	12.5	24.9	10.1
2000	3.9	3.1	1.8	18.9	9.9	13.9	13.1	24.9	10.5
2001	3.8	6.4	1.5	17.4	10.7	13.9	10.8	22.4	13.1
2002	4.0	2.5	2.2	20.6	11.4	15.0	11.3	22.2	10.8

Percentage of licensed drivers tested

The number of licensed drivers and percentage of licensed drivers tested in South Australia for the years 1992 to 2002 can be seen in Table 1.4 and in Figure 1.2. The number of licensed drivers has been extracted for each calendar year, except for the years 1999 to 2002 because of differences in data extraction methods.

The testing target level of 1 in 2 drivers has been exceeded since its inception in 1997. However, the testing level decreased by 10 per cent from 1997 to 2001, to 52 per cent which was marginally over the target level. The percentage of licensed drivers tested in 2002 increased by 13 per cent to the highest level recorded (65%). The reason for the increase in 2002 was to provide "...a concerted effort by all areas to attempt to get the drink drive message through to the community through increased RBT activity" (Personal Communication with Inspector Jim Carter, Traffic Support Branch, SAPOL, June 2003).

Table 1.4

Number and percentage of licensed drivers tested in South Australia, 1992-2002

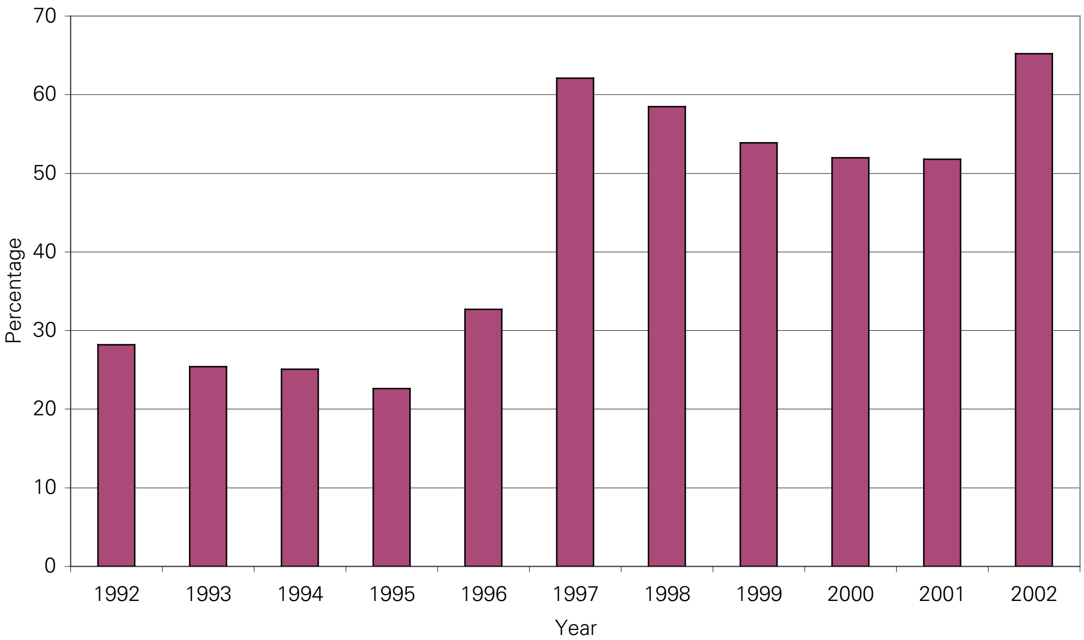
Year	Number of tests	Number of licensed drivers	% of licensed drivers tested
1992	266,081	943,744	28.2
1993	240,232	947,134	25.4
1994	241,827	963,976	25.1
1995	220,031	974,756	22.6
1996	323,216	989,718	32.7
1997	617,505	994,719	62.1
1998	580,933	992,459	58.5
1999	562,046	1,043,581*	53.9
2000	534,573	1,028,083*	52.0
2001	541,115	1,045,077*	51.8
2002	682,531	1,046,878*	65.2

Source: Driver's Database, Registration and Licensing Section, Transport SA

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

Figure 1.2

Percentage of licensed drivers tested, 1992-2002



1.2 Levels of drink driving

Drink driving detections

The number and percentage of drink driving detections by detection method from 2000 to 2002 are shown in Table 1.5. Drivers were most likely to be detected for drink driving after committing traffic offences in the year 2000. However, in 2001 and 2002, more drivers were detected for drink driving by RBT than any other method.

Table 1.5

Drink driving detections by detection method, 2000-2002

Detection method	2000		2001		2002	
	(N)	(%)	(N)	(%)	(N)	(%)
Road crash	458	11.4	608	12.7	655	12.9
DUI	431	10.7	416	8.7	384	7.6
Traffic offence	1653	41.0	1761	36.8	1927	38.0
RBT	1495	37.0	2002	41.8	2108	41.6
Total	4037	100.0	4787	100.0	5074	100.0

Table 1.6 summarises the method of drink driving detection for metropolitan and rural areas from 2000 to 2002. In the metropolitan area RBT is the predominant method for detecting drink drivers while in the rural regions, traffic offences are the main method. This trend has persisted in both regions over the three year period. Drink driving detection by DUI is more common in rural areas than the metropolitan area but the reverse is true for road crashes. The noted increase in RBT detections in 2001 was experienced principally in the metropolitan area. Therefore, such an increase may be attributed to changes in RBT enforcement activities in the metropolitan area.

Table 1.6

Drink driving detections by detection method and region, 2000-2002

Detection method	2000		2001		2002	
	Metro	Rural	Metro	Rural	Metro	Rural
Road crash	12.3	10.0	14.2	9.9	13.9	11.0
DUI	7.4	15.2	4.9	15.7	5.2	12.0
Traffic offence	35.6	48.4	30.8	48.0	33.9	45.6
RBT	44.7	26.5	50.1	26.5	46.9	31.4
Total (N)	2345	1692	3117	1670	3309	1765

RBT Detection Rates

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

The RBT detection rates for metropolitan and rural areas for the years 1992 to 2002 are presented in Table 1.7 and Figure 1.3 in terms of the number of drivers found to be over the legal limit per thousand tested.

Table 1.7

RBT detection rates, 1992-2002 (number of drivers detected with an Illegal BAC per thousand tested)

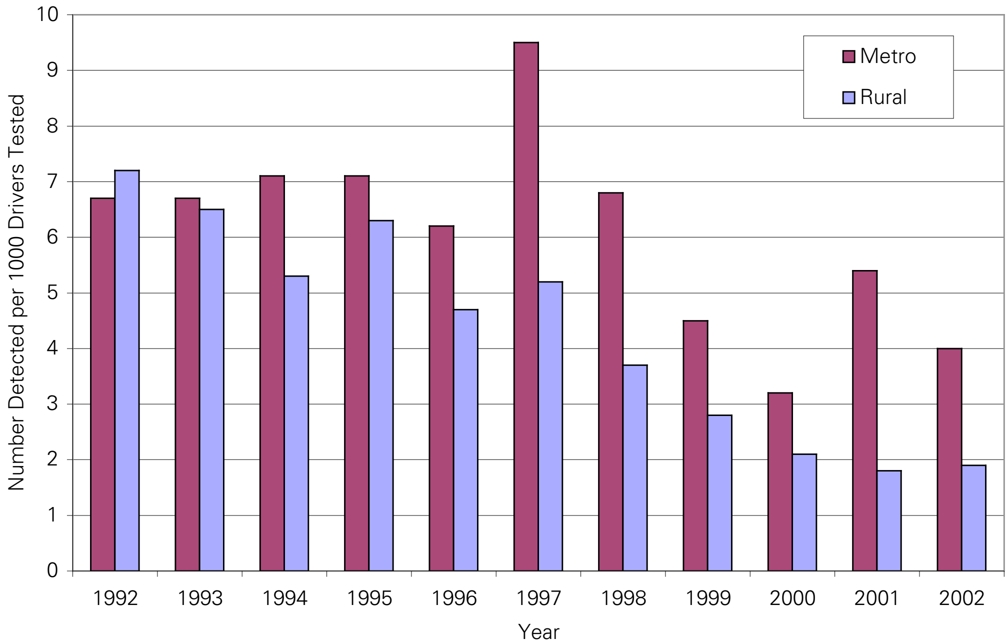
Year	Metro	Rural	Total
1992	6.7	7.2	6.8
1993	6.7	6.5	6.7
1994	7.1	5.3	6.8
1995	7.1	6.3	7.0
1996	6.2	4.7	5.8
1997	9.5	5.2	8.2
1998	6.8	3.7	5.7
1999	4.5	2.8	3.9
2000	3.2	2.1	2.8
2001	5.4	1.8	3.7
2002	4.0	1.9	3.1

If the RBT detection rate is interpreted as the level of drink driving activity, the results suggest that overall, drink driving has been decreasing steadily since 1997 when the highest drink drive detection rate was recorded at 8.2 per thousand drivers tested. Baldock and White (1998) attributed the 1997 rise in RBT detection rates to an increased level of RBT operations after midnight, when drink driving rates were highest, and the targeting of specific locations, such as near hotels, where a greater likelihood of drink driving would be expected.

Overall, the detection rate has decreased since 1997 reaching a record low of just under 3 per thousand tested in 2000. In 2001, the detection rate increased by 32 per cent to 3.7 detections per thousand tested then decreased slightly in 2002 to 3.1 per thousand tested. This current level indicates that the percentage of drivers detected by RBT with an illegal BAC has more than halved over the past ten years.

Figure 1.3

Figure 1.3: RBT detection rates per thousand tests, 1992-2002



In the metropolitan area, the drink drive detection rate increased significantly (by 69%) from 2000 to 2001, then decreased by (26%) in 2002 to a level of 4 per thousand drivers tested. Table 1.8, showing RBT detection rates by time of day, indicates that the increase in the metropolitan detection rate in 2001 may be attributed to the higher detection rates between 12am and 6am, particularly between 4am and 6am. Reasons for the inflated metropolitan detection rate between 4am and 6am, in 2001 only, are unknown. The decrease in the metropolitan detection rate from 2001 to 2002 corresponds with a decrease in the metropolitan detection rate during the same time period after midnight.

In the rural areas, a decrease of 14 per cent in the detection rate was experienced in the year 2001 leading to the lowest detection rate recorded at 1.8 per thousand drivers tested. In 2002, the rural detection rate increased marginally to 1.9 per thousand tested. Table 1.8 indicates that there was little change in rural RBT detection rates after midnight from 2001 to 2002. Generally, RBT detection rates are significantly higher from 12am to 6am although fewer drivers are tested at this time, particularly from 4am to 6am.

Table 1.8

RBT detection rates by time of day, 2000-2002 (number of drivers detected with an Illegal BAC per thousand tested)

Time of Day	2000			2001			2002		
	Metro	Rural	Total	Metro	Rural	Total	Metro	Rural	Total
12am-2am	18.77	6.37	13.71	32.49	8.34	21.65	22.41	7.48	16.87
2am-4am	13.35	13.41	13.36	9.14	15.98	9.56	15.05	17.03	15.28
4am-6am	19.76	2.71	15.19	60.47	0.00	45.24	16.75	0.43	14.18
6am-2pm	1.58	0.69	1.23	3.62	0.70	2.11	1.82	0.57	1.31
2pm-4pm	3.11	0.87	1.87	4.61	2.03	3.11	3.62	1.23	2.60
4pm-6pm	0.26	0.48	0.38	1.64	0.21	0.45	0.73	0.73	0.73
6pm-8pm	0.28	0.55	0.36	0.48	0.55	0.51	0.27	0.18	0.23
8pm-10pm	0.75	0.36	0.53	0.73	0.28	0.45	0.46	0.46	0.46
10pm-12pm	2.05	1.05	1.39	2.16	1.23	1.50	2.41	1.06	1.52

RBT DETECTION RATES BY SEX

Table 1.9 shows the detection rates for males and females from 1995 to 2002, based on the number of licensed drivers of each gender. The detection rate was expressed by the number of licence holders because police do not record the gender of drivers tested that do not have an illegal BAC. Data was not available for 1992 to 1994. It should be noted that the sum of the number of male and female licence holders differs from the number of licence holders in Table 1.4, by an average of 2 per cent, due to an altered method of data extraction and cases where gender was unknown. However, the difference does not affect the pattern of drink driving activities evident in the data.

Table 1.9

Number of licence holders, RBT detection rate and comparative ratio of detection rate by sex, 1995-2002

Year	Male			Female			
	Licence holders	Detected by RBT	RBT detection rate (per thousand licensed)	Licence holders	Detected by RBT	RBT detection rate (per thousand licensed)	Ratio of male to female RBT detection Rate
1995	512,840	1186	2.31	440,780	288	0.65	3.55
1996	532,486	1207	2.27	458,138	318	0.69	3.29
1997	543,017	3254	5.99	467,155	1051	2.25	2.66
1998	553,878	2121	3.83	475,667	603	1.27	3.02
1999	556,399	1740	3.13	482,038	464	0.96	3.26
2000	542,811	1197	2.21	480,120	299	0.62	3.56
2001	553,141	1561	2.82	486,509	441	0.91	3.10
2002	552,451	1665	3.01	488,723	443	0.91	3.31

The ratio of male to female drink drive detection rates in 2001 indicated that on average, males were 3.1 times more likely to be detected than females. In 2002, the ratio increased with males 3.3 times more likely than females to be detected for drink driving. Although the ratio of male to female detection rates has decreased from 2000, the ratio still remains high in 2002. This suggests drink driving continues to be a problem among male drivers.

RBT DETECTIONS BY BAC READING

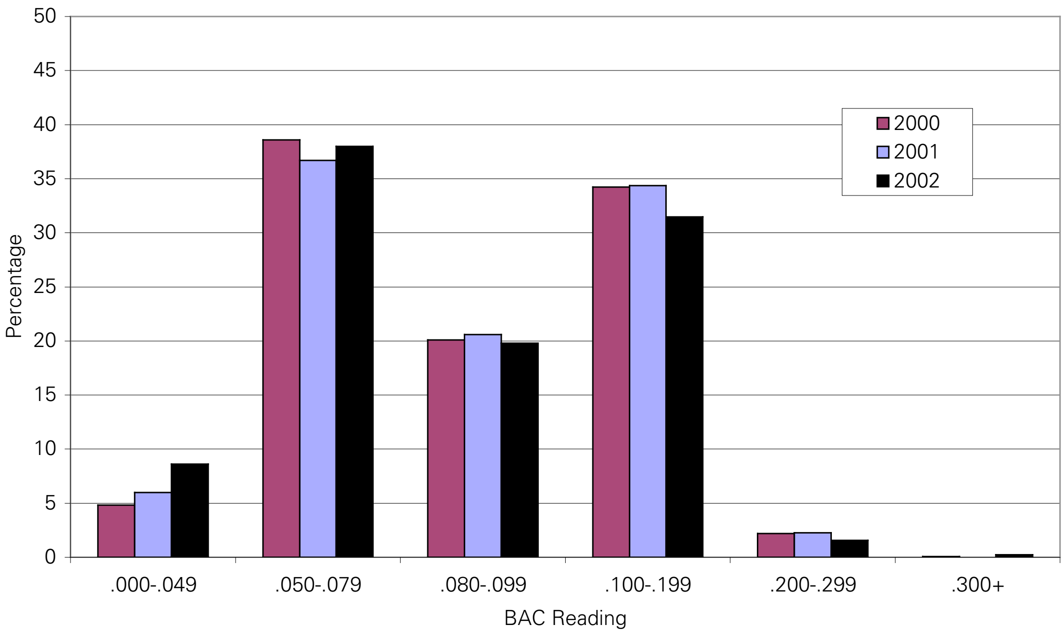
The number of drink drivers detected by RBT in metropolitan and rural regions are displayed in Table 1.10 by BAC category from 2000 to 2002. A number of BAC readings were recorded in the range zero to 0.050. These low readings may be attributed to drivers recording a BAC reading over 0.050 on the initial breath test but by the time an evidentiary sample was taken, their BAC decreased to below 0.050. Additionally, some drivers have special licence conditions (ie truck, taxi, learner, provisional licence drivers) requiring a zero BAC. Therefore, any positive BAC reading was regarded as illegal. The greatest percentage (37%-39%) of drink drivers detected by RBT had a BAC between 0.050 and 0.079. Drivers tested in rural regions were more likely to have a higher BAC, 0.100 or above, than those tested in the metropolitan area (37-41% v 32-35%).

Table 1.10
Number of drivers detected by RBT by BAC category and region, 2000-2002

RBT BAC readings	2000			2001			2002		
	Metro	Rural	Total	Metro	Rural	Total	Metro	Rural	Total
0.000-0.049	46	26	72	85	36	121	123	57	180
0.050-0.079	422	155	577	596	139	735	624	176	800
0.080-0.099	217	83	300	328	85	413	306	112	418
0.100-0.199	345	167	512	522	166	688	472	187	659
0.200-0.299	16	17	33	29	16	45	16	17	33
.300+	1	-	1	-	-	0	4	1	5
Refused	-	-	0	-	-	0	8	5	13
Total	1047	448	1495	1560	442	2002	1553	555	2108

Figure 1.4 shows that the proportion of all drivers in each BAC category remained reasonably consistent over the three year period. However, the proportion of drivers testing over 0.100 decreased slightly from 37 per cent in 2001 to 33 per cent in 2002.

Figure 1.4
Percentage of drivers detected by RBT by BAC category, 2000-2002



Blood alcohol levels of seriously and fatally injured drivers/riders

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

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

Table 1.11, and Figure 1.5 show the percentage of drivers/riders seriously injured in a crash from 1992 to 2002 by known BAC category. A serious injury 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.)

Since 1992, the percentage of illegal BACs for drivers/riders seriously injured in a crash has decreased by 5 per cent. During 2000, the percentage of illegal BACs decreased to a record low of 16 per cent. The percentage of illegal BACs increased in 2001 by 6 per cent, followed by a small decrease in 2002 (2%) to a current level of 20 per cent. The percentage of known BACs in 2001 and 2002 remained consistent with the level in 2000 at approximately 65 per cent.

Table 1.11
Percentage of drivers and motorcycle riders seriously injured in road crashes by known BAC category, 1992-2002

Year	Zero or under .050	.050 - .099	.100 - .199	.200 - .299	.300+	Number of known cases	% known	Total number
1992	75.38	4.22	13.83	6.24	0.34	593	68.87	861
1993	75.30	5.15	13.21	6.00	0.34	583	70.92	822
1994	77.71	2.42	15.02	4.68	0.16	619	72.40	855
1995	76.65	4.23	13.79	5.02	0.31	638	79.65	801
1996	82.21	2.34	11.82	3.51	0.13	770	79.55	968
1997	82.34	2.31	10.07	4.95	0.33	606	70.79	856
1998	83.10	2.84	8.52	4.83	0.71	704	75.21	936
1999	80.25	3.59	12.21	3.59	0.36	557	63.73	874
2000	84.17	2.26	10.61	2.96	0.00	575	65.05	884
2001	77.85	4.56	12.05	5.21	0.33	614	63.43	968
2002	80.20	4.19	12.08	3.36	0.17	596	65.64	908

Figure 1.5
Percentage of drivers and motorcycle riders seriously injured by known BAC category, 1992-2002

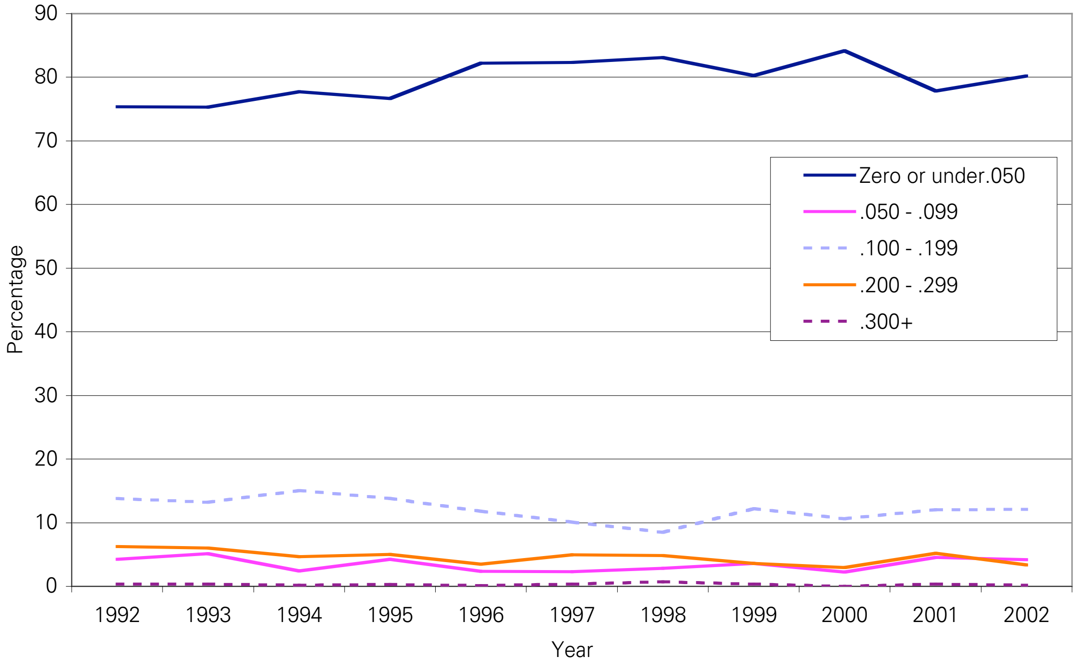


Table 1.12 and Figure 1.6 show the percentage of drivers/riders with a known and illegal (0.05 or above) BAC, killed in a road crash. The lowest level of fatally injured drivers/riders with an illegal BAC (21%) was recorded in 1998. In 2001, the percentage of drivers/riders killed with an illegal BAC increased by almost 5 per cent and increased again in 2002 by 4 per cent. The percentage of drivers/riders killed with an illegal BAC in 2002 (34%) is 13 per cent higher than the lowest recorded level in 1998.

Overall, there were less driver/rider fatalities in 2001 and 2002 than in the year 2000 but more than in the years 1997 to 1999. A greater percentage of fatally injured drivers had a known BAC (94%, 89%) in the years 2001 and 2002 compared to 2000 (76%).

It is worth noting that fatally injured drivers had a greater percentage recording a BAC over 0.100 than did seriously injured drivers, consistently over time.

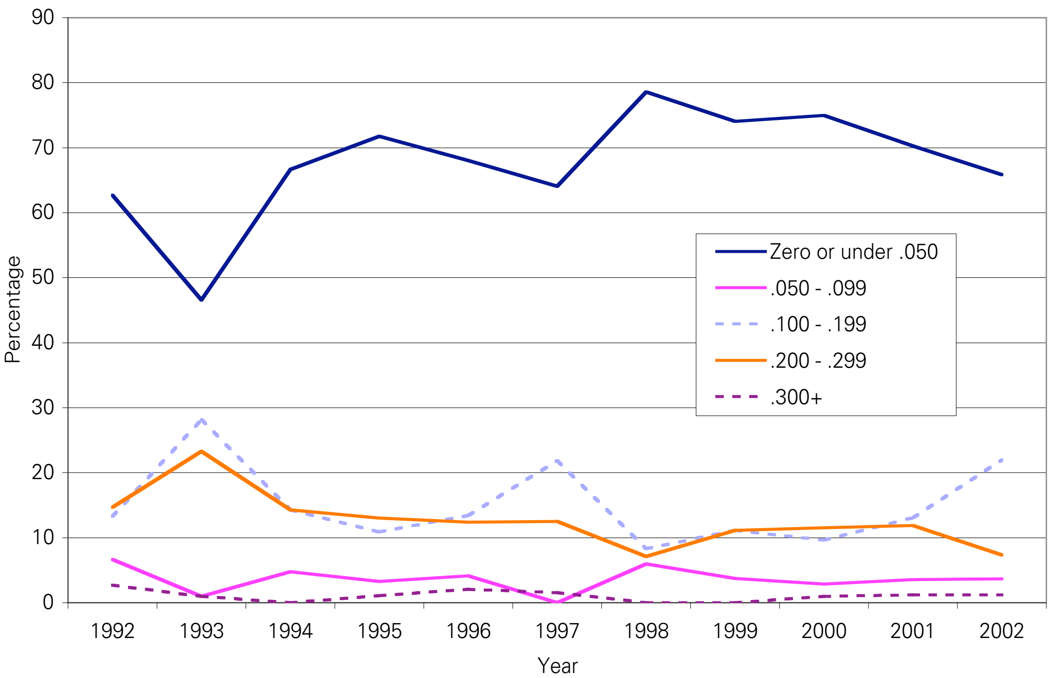
Table 1.12

Percentage of drivers and motorcycle riders killed in road crashes by known BAC category, 1992-2002

Year	Zero or under .050	.050 - .099	.100 - .199	.200 - .299	.300+	Number of known cases	% known	Total number
1992	62.67	6.67	13.33	14.67	2.67	75	94.94	79
1993	46.60	0.97	28.16	23.30	0.97	103	91.96	112
1994	66.67	4.76	14.29	14.29	0.00	84	95.45	88
1995	71.74	3.26	10.87	13.04	1.09	92	95.83	96
1996	68.04	4.12	13.40	12.37	2.06	97	90.65	107
1997	64.06	0.00	21.88	12.50	1.56	64	80.00	80
1998	78.57	5.95	8.33	7.14	0.00	84	98.82	85
1999	74.07	3.70	11.11	11.11	0.00	81	92.05	88
2000	75.00	2.88	9.62	11.54	0.96	81	75.70	107
2001	62.67	6.67	13.33	14.67	2.67	75	94.94	79
2002	46.60	0.97	28.16	23.30	0.97	103	91.96	112

Figure 1.6

Percentage of drivers and motorcycle riders killed by known BAC category, 1992-2002



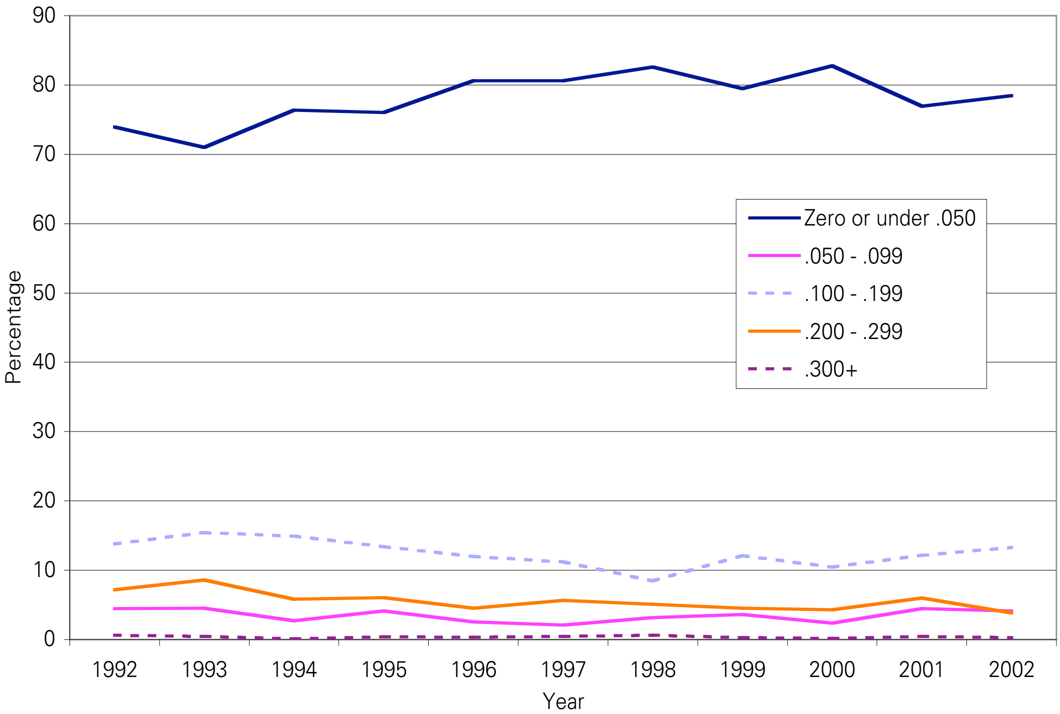
The percentage of drivers/riders seriously or fatally injured with an illegal BAC has been summarised by known BAC levels in Table 1.13 and presented graphically in Figure 1.7. The percentage of drivers/riders with an illegal BAC was 17 per cent in 2000. Despite an increase of 4 per cent from 2000 to 2002, the percentage of drivers/riders with an illegal BAC has fallen by just under 5 per cent from in the last ten years. During 2002, almost 22 per cent of drivers/riders seriously injured or killed had an illegal BAC.

The percentage of known BAC levels remained stable at approximately 68 per cent during 2002.

Table 1.13
Percentage of drivers and motorcycle riders seriously or fatally injured in road crashes by known BAC category, 1992-2002

Year	Zero or under .050	.050 - .099	.100 - .199	.200 - .299	.300+	Number of known cases	% known	Total number
1992	73.95	4.49	13.77	7.19	0.60	668	71.06	940
1993	70.99	4.52	15.45	8.60	0.44	686	73.45	934
1994	76.39	2.70	14.94	5.83	0.14	703	74.55	943
1995	76.03	4.11	13.42	6.03	0.41	730	81.38	897
1996	80.62	2.54	12.00	4.50	0.35	867	80.65	1075
1997	80.60	2.09	11.19	5.67	0.45	670	71.58	936
1998	82.61	3.17	8.50	5.08	0.63	788	77.18	1021
1999	79.47	3.61	12.07	4.55	0.31	638	66.32	962
2000	82.77	2.36	10.46	4.27	0.15	679	67.56	1005
2001	76.93	4.44	12.18	6.02	0.43	698	66.04	1057
2002	78.47	4.13	13.27	3.83	0.29	678	67.80	1000

Figure 1.7
Percentage of drivers and motorcycle riders seriously or fatally injured by known BAC category, 1992-2002



Roadside drink driving surveys

Both roadside breath alcohol surveys and random breath testing operations provide a picture of the distribution of driver's BAC levels. However, roadside surveys are not accompanied by enforcement. The Road Accident Research Unit previously conducted ten night-time roadside surveys in metropolitan Adelaide between 1979 and 1997 (Kloeden & McLean, 1997; McLean, Clark, Dorsch, Holubowycz & McCaul, 1984; McLean, Holubowycz & Sandow, 1980). No roadside surveys have been undertaken in South Australia in recent years.

1.3 Drink driving publicity

During the years 2001 and 2002, Transport SA's advertising campaign continued to target drink driving and support random breath testing operations. The main objective of the drink driving advertising strategy throughout this period did not alter from previous years. The campaign aimed to maintain a perception that there is a high risk of detection of drink drivers in the community and the likely consequences of being apprehended. The primary target audience was males aged 19 to 29 years whilst the secondary target audience was females aged 19 to 29 years.

The main campaigns in metropolitan and rural areas centred around the slogan "Drink Drive. You'll be Sorry". The publicity campaign in the Adelaide metropolitan area used existing television advertisements and supporting radio commercials. The first of the three advertisements aired in the metropolitan area, "Beer Glass", aimed to deter drink drivers while the other two advertisements "Forever and Ever" and "Jaws" dealt with the consequences of drink driving. During Christmas 2002, a new television advertisement "Christmas Surgeon" was launched and aired with "Forever and Ever". A new metropolitan campaign will be launched in May 2003.

A new rural anti-drink drive campaign was developed in 2000/2001, to build on previous campaigns but provide a fresh approach. Three new television advertisements "Bush Telegraph" (deterrence), "Taken for a Ride" (consequences) and "Final" (consequences) were launched in September 2001 with five supporting radio commercials. These commercials were developed from the research findings of a rural drink driving situation analysis conducted in South Australia (O'Connor, 1999). It is anticipated that a new rural campaign will be launched in December 2003.

Commercials were aired in the metropolitan and rural areas during key periods of the year, typically public and school holidays, for 2 to 4-week bursts. Timing was integrated with the police enforcement calendar which designated September and December in 2002 to drink/drug driving enforcement. The annual police enforcement calendar is produced collaboratively by Transport SA and SA Police in an attempt to link public education and enforcement.

Estimated costs for anti-drink driving advertising (media and production) for the calendar year 2001 totalled $595,000, of which $360,000 was spent in the Adelaide metropolitan area and $235,000 spent in rural regions (Personal communication with Amy Cotton, Transport SA, May 2003). In 2002, advertising costs increased to $659,000. A greater proportion was spent in the metropolitan area ($464,000) than in regional areas ($195,000). The total cost of the drink driving advertising campaigns in 2001 and 2002 were substantially less than the last reported campaign costs in 2000 of $1,366,150 (Wundersitz & McLean, 2002). There were two main reasons for the reduction in drink driving advertising in 2001. The total Transport SA advertising budget was reduced, and funds were also redistributed to increase advertising for other enforced behaviours such as speeding and restraint use.

2 Speeding

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

2.1 Speed enforcement practices and levels of operation

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

Speed enforcement in South Australia is considered to be an ongoing issue throughout the year. Speed cameras and non-camera operations (laser devices, hand held radars and mobile radars in Police vehicles) are the two types of speed enforcement currently employed in South Australia. The following information about speed enforcement operations has been provided by the Traffic Research and Intelligence Section of the SA Police.

SPEED CAMERA OPERATIONS

Speed cameras were introduced into South Australia in June 1990. The Police Security Services Branch, a semi-independent body, currently operates the speed cameras. This branch is contracted to perform 86 hours of activity per day over the entire year, and normally exceeds that target. There are 37 staff, using 20 vehicles across metropolitan and rural areas. The speed cameras operate from unmarked vehicles to give some degree of anonymity to the operations but signs may be placed after the location to advise that a camera has been passed in an effort to enhance general deterrence effects.

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

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

NON-CAMERA OPERATIONS

The speeds of vehicles are measured and offending drivers are pulled over to the side of the road to be booked during non-camera operations. Hand held radars are generally used more frequently on open roads and not in the metropolitan area. The number of non-camera speed detection devices used in the metropolitan and rural areas during 2002 are presented in Table 2.1. A number of these devices were used by sections based in metropolitan areas that also worked in rural areas. Currently, laser gun devices are the most common forms of non-camera speed detection in South Australia.

Table 2.1
Non-camera detection devices used in South Australia, 2002

Non-camera detection devices	Metro	Rural	Total
Lasers	71	76	147
Mobile Radars	20	19	39
Handheld Radars		-	35

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

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

Number of hours of speed detection

The total number of hours spent on speed detection in South Australia for both metropolitan and rural areas, from 2000 to 2002, is depicted in Figure 2.1. The location of the speed detection device determines whether speed detection hours are recorded as metropolitan or rural. Overall, the number of speed detection hours in South Australia since the year 2000 has increased by 4 per cent. In the metropolitan area, speed detection hours have decreased by 5 per cent while in rural regions, the number of hours has increased steadily by 14 per cent.

Figure 2.1
Number of Speed Detection Hours in South Australia, 2000-2002

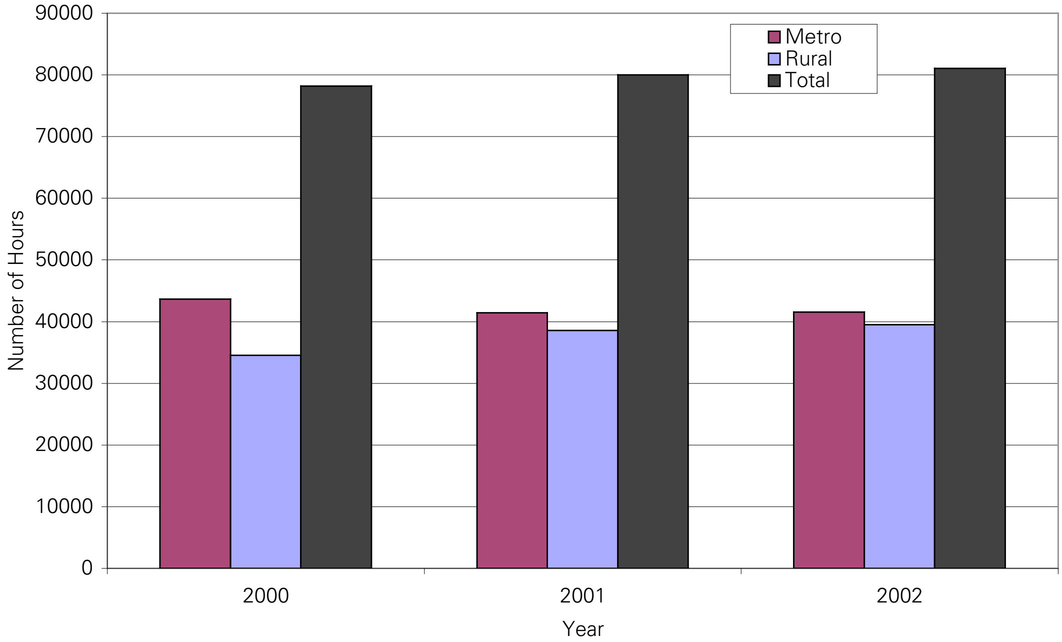


Table 2.2 summarises the changes in hours spent on speed detection by speed cameras only from 2000 to 2002 for the metropolitan and rural areas. Overall, the number of hours utilised for speed camera operation has decreased by 6 per cent from 2000 to 2002 . This decrease in detection hours was evident in the metropolitan area where the number of hours decreased by 9 per cent. However, in the rural regions, speed camera use increased by almost 16 per cent over the same three year period.

Table 2.2
Number of hours for speed detections by speed cameras in South Australia, 2000-2002

Year	Camera			% difference from previous year
	Metro	Rural	Total	
2000	31928	4017	35945	
2001	30456	4959	35415	-1.0
2002	28972	4646	33628	-5.1

In contrast with speed camera devices, non-camera devices were used more widely used in rural areas (see Table 2.3). Non-camera devices include laser guns, mobile radar and handheld radar. The total number of non-camera hours has increased by approximately 6 per cent each year. The number of non-camera hours in rural areas has increased by 14 per cent from 2000 to 2002. During the same period, the use of non speed camera devices in metropolitan areas has increased by 7 per cent.

Table 2.3
Number of hours for speed detections by non-camera devices in South Australia, 2000-2002

Year	Non-Camera			% difference from previous year
	Metro	Rural	Total	
2000	11726	30528	42254	
2001	10968	33632	44600	5.6
2002	12602	34861	47463	6.4

DAY OF WEEK

The number of hours spent on speed detection from 2000 to 2002, in terms of the percentage of all tests performed in a year, is presented in Table 2.4 for speed camera and in Table 2.5 for non-speed camera devices . For both methods of speed detection, the number of hours was spent evenly throughout the week and has varied little each year. Speed cameras were operated slightly more frequently on Wednesdays and non-camera devices on Fridays and Saturdays.

Table 2.4
Number of speed detection hours for speed cameras by day of week, 2000-2002 (expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	13.2	14.6	15.0	14.5	14.2	14.8	13.7
2001	13.5	14.2	15.1	14.3	14.6	15.0	13.4
2002	13.7	14.5	15.2	14.5	14.0	14.5	13.6

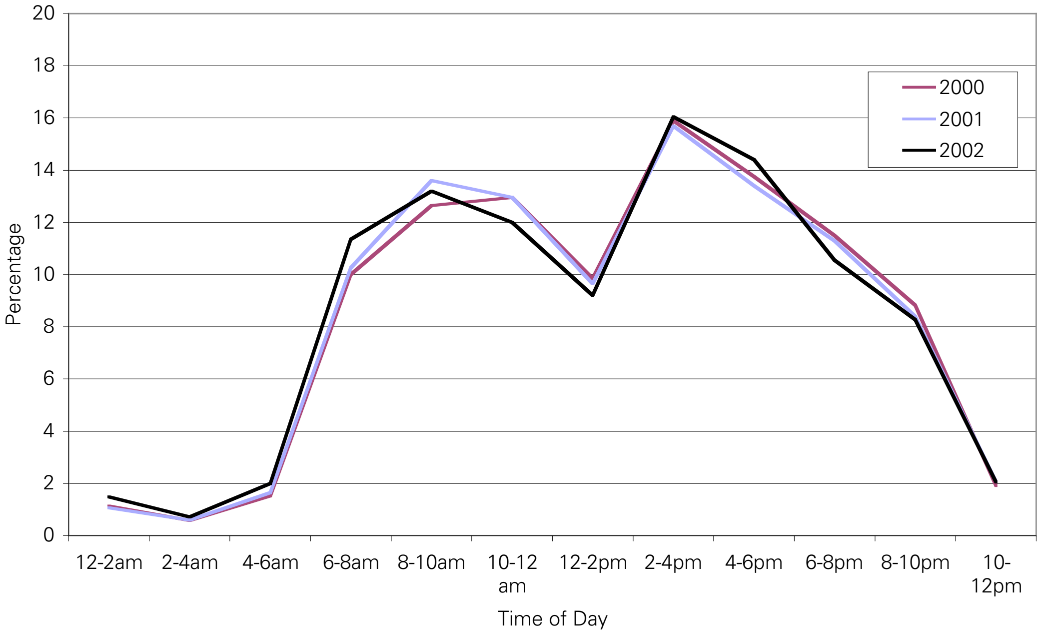
Table 2.5
Number of speed detection hours for non-camera devices by day of week, 2000-2002 (expressed as a percentage of total hours each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	14.2	13.8	12.6	14.3	16.9	15.0	13.4
2001	14.2	13.2	12.6	14.0	16.7	15.3	14.0
2002	13.7	13.1	13.5	14.5	16.4	15.7	13.1

TIME OF DAY

Figure 2.2 depicts changes in the speed detection hours (expressed as a percentage of the total hours each year), from 2000 to 2002, for all speed detection devices by the time of day. There was little variation each year in the distribution of speed detection hours by time of day. The majority of speed detection was conducted from 8am to 8pm. There was a noticeable dip in the distribution of detection hours around lunchtime (12 - 2pm) compared to other times of the day.

Figure 2.2
Hours Spent on Speed Detection in South Australia by Time of Day, 2000-2002



The distribution of hours spent on speed detection by time of day is presented separately for speed cameras (see Table 2.6) and for non-camera devices (see Table 2.7). Speed cameras were operated most frequently between 6am and 8pm. Less than 1 per cent of speed camera detection hours were spent in the early hours of the morning between 12 and 6 am. Over the three year period, there was a slight increase in speed camera operation between 6 and 8 am offset by a decrease between 12 and 2 pm. The low percentage of hours spent between 12 and 2pm noted previously was evident only for speed camera detection.

Table 2.6
Number of speed detection hours for speed cameras by time of day, 2000-2002 (expressed as a percentage of total hours each year)

Year	Midnight-6 AM	6 AM-8 AM	8 AM-10 AM	10 AM-Noon	Noon-2 PM	2PM-4 PM	4 PM-6 PM	6 PM-8 PM	8 PM-12 PM
2000	0.8	13.4	14.0	12.9	7.5	18.9	13.8	12.6	6.1
2001	0.1	16.1	14.2	12.7	5.7	18.6	13.1	13.1	6.4
2002	0.1	18.0	14.1	11.7	5.4	18.8	14.4	11.4	6.2

Non-camera devices were operated predominantly from 8am to 6pm. These police-operated detection devices were more frequently operated late at night and in the early hours of the morning (8pm-6am) than speed cameras (20% vs 6-7%). From 2000 to 2002, an increase in non-camera speed detection hours from 12 to 6am was offset by a decrease from 6 to 8am.

Table 2.7

Number of speed detection hours for non-camera devices by time of day, 2000-2002 (expressed as a percentage of total hours each year)

Year	Midnight-6 AM	6 AM-8 AM	8 AM-10 AM	10 AM-Noon	Noon-2 PM	2PM-4 PM	4 PM-6 PM	6 PM-8 PM	8 PM-Midnight
2000	5.3	6.6	11.3	13.0	12.2	12.9	13.7	10.4	14.7
2001	6.0	4.4	13.0	13.2	13.6	12.8	13.7	9.5	13.7
2002	7.2	4.7	12.3	12.3	13.0	13.3	14.4	9.7	13.2

2.2 Level of speeding

Number of speed detections

The number of licensed drivers and number of speed detections, by speed cameras and non-cameras, in South Australia for the years for the years 2000 to 2002 can be seen in Table 2.8. The number of speed camera detections has decreased by almost 16 per cent from 2000 to 2002, after a slight increase (3.5%) in 2001. The number of non-camera detections increased steadily over this three year period (by 13%). The total number of detections decreased in 2002 (by 14%), after a slight increase in 2002 (3%), reflecting the trend for speed camera detections. The number of speed camera detections is much greater than the number of non-camera detections. This difference is most likely attributable to the greater efficiency of speed cameras. Speed cameras check the speeds of all vehicles, not just those the police officer chooses to check with non-camera devices. Due to their greater efficiency, speed cameras give a more reliable indication of the level of speeding in the community.

Examination of the number of speed detections divided by the number of licensed drivers in South Australia indicated that approximately 25 per cent or 1 in 4 licensed drivers were detected for a speeding offence in 2000 and 2001. The percentage of licensed drivers detected decreased slightly in 2002 to 22 per cent or more than 1 in 5 licensed drivers.

Table 2.8

Number and percentage of licensed drivers detected speeding in South Australia, 2000-2002

Year	Number of speed camera detections	Number of non-camera detections	Total number of detections	Number of licensed drivers	% of licensed drivers detected
2000	219,202	40,520	259,722	1,028,083*	25.3
2001	226,879	41,105	267,984	1,045,077*	25.6
2002	184,765	45,702	230,467	1,046,878*	22.0

Source: Driver's Database, Registration and Licensing Section, Transport SA

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

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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 are also affected by speed enforcement operational practices and factors such as locations, volumes of traffic and type of speed detection as well as exceptional factors such as changes in speed limits.

In this section, speeding detection rates are defined as the number of drivers detected for speeding per hour. Speeding detection rates by detection method are summarised in Table 2.9 for metropolitan and rural areas, 2000-2002. If the speeding detection rate is interpreted as the level of speeding behaviour, the results suggest that overall, speeding has decreased from 2000 to 2002 by 14 per cent to an average level of 2.8 detections per hour. When examining detection rates by type of speed detection, differences become apparent. Each year, speed cameras were responsible for much higher detection rates of approximately 6 detections per hour, compared to non-camera devices detecting less than one driver per hour. As noted previously, the main reason for this difference is most likely due to the greater efficiency of speed cameras. Speed cameras continuously check speeds of all vehicles while it takes time (at least 5 minutes) for police officers to pull over and book speeding offenders when operating non-camera devices. To a lesser extent, the difference in detection rates may also be attributable to the greater number of speed cameras in the metropolitan area where traffic volumes were much greater.

Over the three year period, detection rates for speed cameras increased in 2001 then decreased in 2002 while detection rates for non-camera devices remained relatively stable. The metropolitan area reported higher detection rates than rural regions for all methods of detection. These findings are most likely due to the greater volumes of traffic in metropolitan areas rather than any greater prevalence of speeding in metropolitan areas.

Table 2.9
Speeding detection rates, 2000-2002 (number of drivers detected speeding per hour)

Year	Camera			Non-Camera			Overall
	Metro	Rural	Total	Metro	Rural	Total	Total
2000	6.26	4.79	6.10	1.68	0.68	0.96	3.32
2001	6.67	4.79	6.41	1.67	0.68	0.92	3.35
2002	5.71	4.15	5.49	1.73	0.69	0.96	2.84

DAY OF WEEK

The following tables examining detection rates by day of week and time of day have been separated by detection method due to the differences in detection rates noted previously. All of the ensuing detection rates are expressed in terms of speeding detections per hour. Table 2.10 indicates that speed camera detection rates, or speeding activity, were highest on weekends. From 2000 to 2002, speed camera detection rates decreased for every day of the week apart from Monday. However, during 2001, increases in detection rates were noted for every day of the week except Monday.

Table 2.10
Speeding detection rates for speed cameras by day of week, 2000-2002

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	5.66	5.25	6.03	5.42	6.02	7.01	7.32
2001	5.52	5.56	6.05	6.49	6.41	7.45	7.45
2002	6.04	4.73	4.99	4.82	5.19	6.65	6.14

Table 2.11 shows the detection rates for non-camera devices by day of the week from 2000 to 2002. Detection rates, or speeding behaviour, were highest on weekends, particularly on Sundays.

Table 2.11
Speeding detection rates for non-camera devices by day of week, 2000-2002

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun
2000	0.97	0.92	0.93	0.91	0.90	0.97	1.15
2001	0.90	0.87	0.86	0.92	0.94	0.92	1.04
2002	0.95	0.95	0.97	0.94	0.93	0.99	1.03

TIME OF DAY

Table 2.12 shows the speeding detection rates for speed cameras by the time of day from 2000 to 2002. If high detection rates are equated with high speeding activity, speeding was most prevalent during the day from 6am to 6pm.

Table 2.12
Speeding detection rates for speed cameras by time of day, 2000-2002

Year	Midnight- 6 AM	6 AM- 8 AM	8 AM- 10 AM	10 AM- Noon	Noon- 2 PM	2PM- 4 PM	4 PM- 6 PM	6 PM- 8 PM	8 PM- 12 PM
2000	4.61	7.21	6.25	5.64	6.08	6.90	5.82	5.17	4.56
2001	3.67	7.16	7.42	7.27	6.61	7.76	6.04	3.41	3.34
2002	1.66	5.14	6.26	5.61	5.99	5.91	6.16	3.70	4.74

Speeding detection rates for non-camera devices by time of day for the years 2000 to 2002 are presented in Table 2.13. Detection rates, or speeding behaviour was generally higher between 4 and 8pm. From 12 to 6am, detection rates were the lowest but this may be due to lower traffic volumes rather than lower rates of speeding.

Table 2.13
Speeding detection rates for non-camera devices by time of day, 2000-2002

Year	Midnight- 6 AM	6 AM- 8 AM	8 AM- 10 AM	10 AM- Noon	Noon- 2 PM	2PM- 4 PM	4 PM- 6 PM	6 PM- 8 PM	8 PM- 12 PM
2000	0.88	0.97	0.95	0.94	1.05	0.91	0.94	0.99	0.96
2001	0.55	1.08	0.95	0.94	0.91	0.79	1.08	1.04	0.88
2002	0.69	1.01	1.01	1.00	1.00	0.83	1.05	1.05	0.96

DETECTION RATES BY SEX

Table 2.14 shows the detection rates for males and females from 2000 to 2002 for non-camera devices. Accurate sex and age data is not available for speed camera offences because the infringement notice is sent to the vehicle owner who may not have been the driver at the time of the offence. The ratio of male to female speeding detection rates increased slightly in the year 2001. Although the ratio decreased in 2002 to a level slightly lower than in the year 2000, males were still 2.6 times more likely to be detected than females. Clearly, speeding continues to be a greater problem among male drivers.

Table 2.14

Number and sex of licence holders, detected speeding by non-camera devices, 2000-2002

Year	Male			Female			Ratio of male to female detection rate
	Licence holders	Detected	Detection rate (per hundred licensed)	Licence holders	Detected	Detection rate (per hundred licensed)	
2000	542,811	39,783	7.33	480,120	13,123	2.73	2.68
2001	553,141	36,977	6.68	486,509	11,867	2.44	2.74
2002	552,451	41,118	7.44	488,723	14,000	2.86	2.60

NB: Refer to Table 2.8 for the overall rate of speeding detections.

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

The effectiveness of speed enforcement may be estimated by the involvement of 'excessive speed' in crashes. Each vehicle involved in a crash in the TARS database is assigned an 'apparent error' indicating what the police reported as the primary error made by the driver of the vehicle. Only one driver in each crash is assigned an apparent error. One of these apparent errors is 'excessive speed'. Only one apparent error is listed for each vehicle. Obviously, drivers will not readily admit to police that they were travelling at an excessive speed at the time of their crash. This means that crash involved vehicles will only get classified with an apparent error of 'excessive speed' when there are reliable witnesses to excessive speed or when excessive speed is indicated by tyre marks or vehicle damage and there is considered to be no other more significant error. Therefore, the apparent error of 'excessive speed' is an underestimate of speeding and probably represents only cases of very high speeding rather than speeding in general. Fatal crashes involving more than one vehicle are usually investigated by police to a greater extent but illegal speed is unlikely to be listed as the sole apparent error unless it is clearly excessive and considered to be more important than other factors.

Table 2.15

'Excessive speed' as the apparent error in serious casualty crashes, 2000-2002

Year	'Excessive speed'		Other apparent errors	Total crashes
	(N)	(%)		
2000	37	3.01	1192	1229
2001	34	2.73	1213	1247
2002	48	4.00	1151	1199

Tables 2.15 and 2.16 indicate that from 2000 to 2002, 'excessive speed' was listed as the major driver error in approximately 3 to 4 per cent of serious injury crashes (defined as a pyerson 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) and 10 to 15 per cent of fatal crashes. These are certainly under estimates of the percentage of speed related crashes for the reasons mentioned above.

Table 2.16
'Excessive speed' as the apparent error in fatal crashes, 2000-2002

Year	'Excessive Speed'		Other apparent errors	Total crashes
	(N)	(%)		
2000	15	9.93	136	151
2001	21	15.44	115	136
2002	15	10.87	123	138

Serious casualty crashes and fatal crashes are combined in Table 2.17 to show the distribution of crashes in which the apparent error was listed as 'excessive speed' in metropolitan and rural regions. Although rural 'excessive speed' crashes increased and surpassed the number in metropolitan areas in 2002, chi square analysis indicated there was no statistically significant difference between the number of 'excessive speed' crashes in metropolitan and rural regions from 2000 to 2002.

Table 2.17
'Excessive speed' as the apparent error in serious and fatal crashes by location of crash, 2000-2002

Year	Metro 'Excessive Speed'		Total metro crashes	Rural 'Excessive Speed'		Total rural crashes
	(N)	(%)	(N)	(N)	(%)	(N)
2000	30	4.03	744	22	3.46	636
2001	32	4.48	715	23	3.44	668
2002	31	4.62	671	32	4.80	666

The majority of serious and fatal crashes with an apparent error of 'excessive speed' involved male drivers (Table 2.18). In 2002, males were 20 times more likely than females to be the driver in a speed related crash.

Table 2.18
'Excessive speed' as the apparent error in serious and fatal crashes by sex of driver, 2000-2002

Year	Male		Female		Total 'excessive speed' crashes
	(N)	(%)	(N)	(%)	
*2000	44	88.00	6	12.00	52
2001	45	81.82	10	18.18	55
2002	60	95.24	3	4.76	63

* 2 cases sex unknown

On-road speed surveys

In addition to the difficulties involved in identifying speed related crashes, crash rates are also affected by many other factors. Therefore, the most direct outcome measure of speed enforcement is travelling speed. Speed monitoring, independent of enforcement activities, provides the most accurate record of the distribution of travelling speeds.

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

When investigating recent available metropolitan and rural on-road speed surveys in South Australia, three specific measures of vehicle speeds were examined:

- The *mean* free speed represents the average free speed of all vehicles passing a certain point on the road. Even small changes in the mean speed reflect substantial changes to the whole speed distribution.
- The *85th percentile* of free speeds delineates the speed below which 85 per cent of drivers choose to travel. To put it another way, 15 per cent of drivers choose to travel over this speed. The 85th percentile is regarded as a benchmark in engineering terms and speeds over this level are considered to be undesirable.
- The *95th percentile* of free speeds represents the speed above which 5 per cent of drivers choose to travel. Driving at speeds above the 95th percentile is regarded as the highest and most dangerous level of speeding. There is a high likelihood of detection when driving at this speed.

URBAN ON-ROAD SPEED SURVEYS

At present, there are no systematic on-road speed surveys conducted in the Adelaide metropolitan area. Speed surveys are undertaken for other purposes, usually on a needs basis, so they do not provide a reliable basis for evaluation. The data for this section has been taken from speed surveys of vehicle speeds prior to the introduction of the 50km/h default urban speed limit. At the time of the surveys, the speed limit at all locations was 60km/h.

Surveys of on-road free speeds were conducted using traffic classifiers at 52 locations in urban areas (including the Adelaide metropolitan area and South Australian regional cities). The surveys were conducted at randomly selected sites with 30 surveys undertaken on local access streets, 12 surveys on collector roads and 10 surveys on arterial roads. One site on a collector road was subsequently omitted from the data analysis due to unusually low speeds during part of the day, suggesting some form of traffic disruption. The surveys were conducted over a 24 hour period on weekdays in late November and early December 2002. Due to the short time frame and timing of the surveys (just before school Christmas holidays), this sample should not be considered to be representative of vehicle speeds for the whole year. Traffic travelling in both directions was recorded, and on multi-lane roads, a single lane in each direction was surveyed (preferably the lane closest to the median). Free speed vehicles were defined as those travelling with a headway of at least 4 seconds between the vehicle measured and the preceding vehicle. Four survey sites on local streets registered less than 200 cars or car derivatives travelling at a free speed, the minimum sample size recommended by a recent Austroads review of speed enforcement (McInerney et al, 2001).

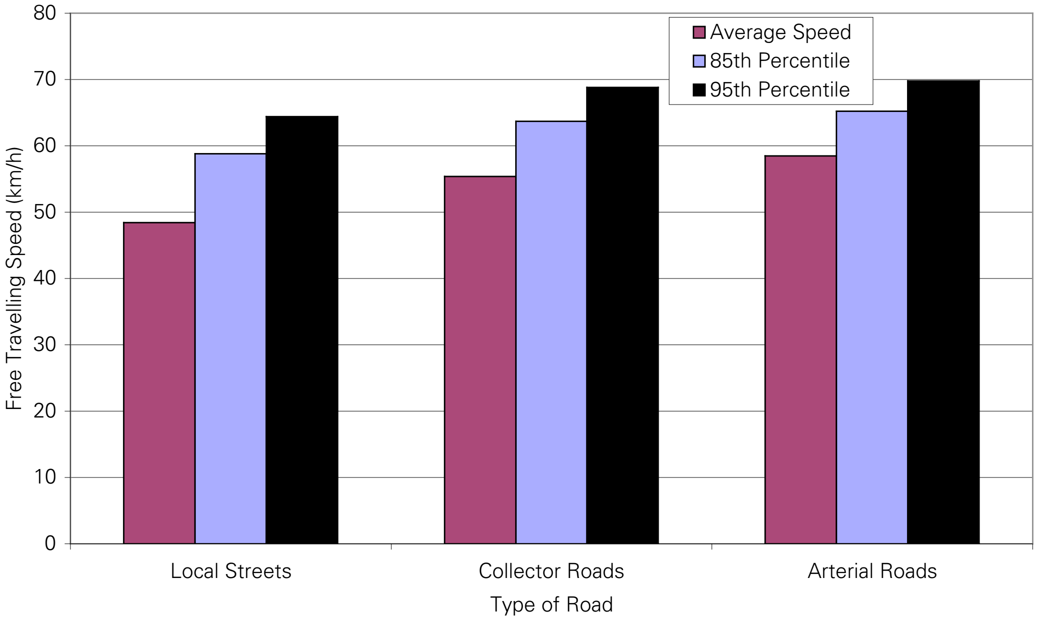
Table 2.19 and Figure 2.3 present the mean free speed, 85th percentile and 95th percentile of free speeds for all vehicle types surveyed in urban areas during 2002. Local streets had the lowest mean speed which was under 50km/h. High level speeding was most prominent on arterial roads where 5 per cent of drivers travelled 10km/h or more over the speed limit.

Of note, less than half of the vehicles surveyed at five of the arterial road sites were travelling at a free speed.

Table 2.19
Surveyed free speeds in urban areas in South Australia for all vehicles by type of road, 2002

Type of road	Mean speed	85th percentile	95th percentile	Free traffic volume	Total traffic volume
Local streets	48.4	58.8	64.4	24,633	26,315
Collector roads	55.4	63.7	68.8	28,273	33,201
Arterial roads	58.5	65.2	69.8	73,024	149,135

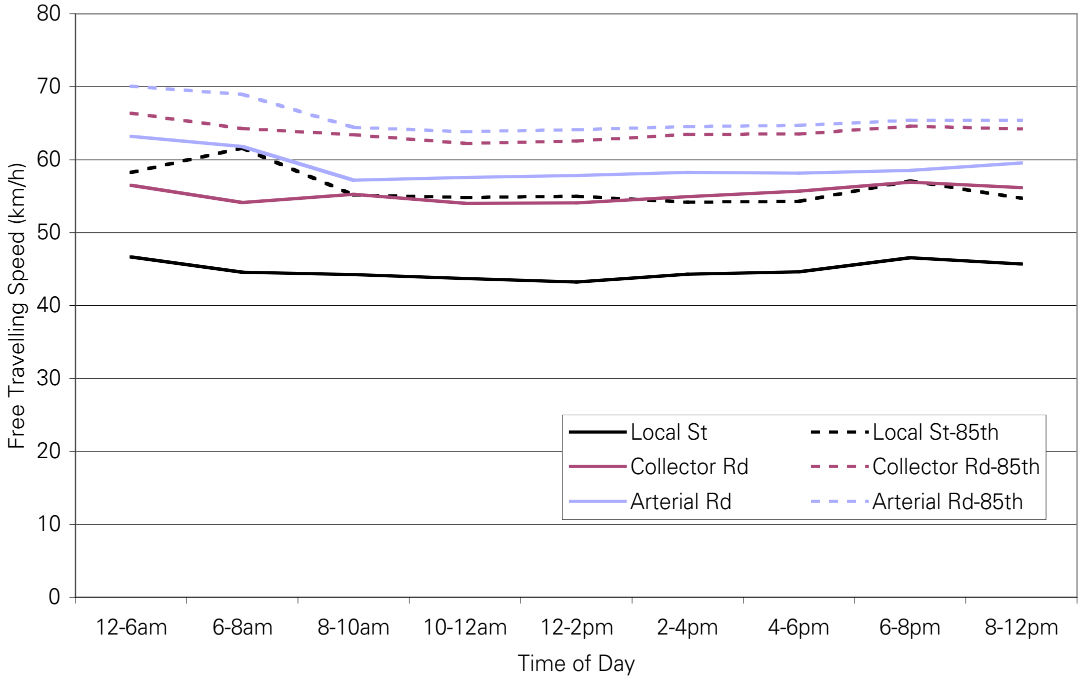
Figure 2.3
Urban free travelling speed survey by type of road in South Australia, 2002



TIME OF DAY

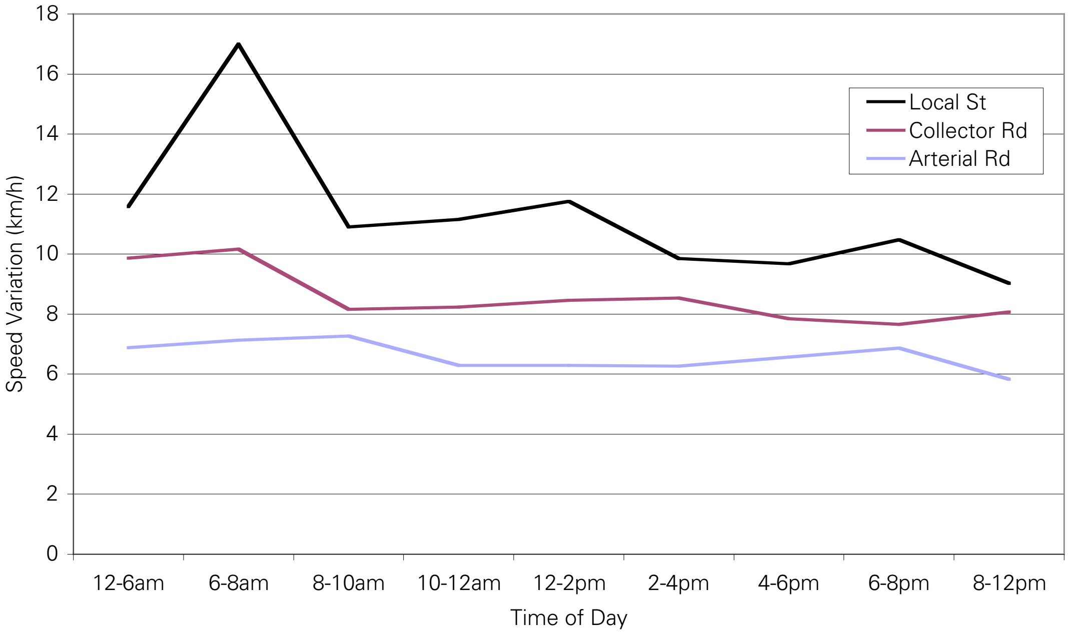
Figure 2.4 displays the distribution of the mean and 85th percentile free speeds for local streets, collector roads and arterial roads by the time of day. Mean and 85th percentile speeds were slightly higher at night.

Figure 2.4
Urban free mean speed and 85th percentile by type of road and time of day, 2002



The variation in urban free speeds by time of day for the different road types is presented in Figure 2.5. A measure of variation was obtained by subtracting the mean from the 85th percentile. Many of the local streets (25/30) did not have a sufficient volume of traffic to calculate the 85th percentile during some time periods, particularly from 12 to 8am. This explains the wide variation in free speeds for local streets, particularly at this time. Collector roads showed greater variability in free speeds than arterial roads.

Figure 2.5
Urban free speed variation by road type and time of day, 2002



RURAL SPEED ON-ROAD SPEED SURVEYS

Annual on-road speed surveys using traffic classifiers have been conducted from 2000 to 2002 within rural South Australia. The one-week surveys were undertaken at 21 locations: 6 in country towns on 60 km/h speed zoned roads, 6 on 100 km/h zoned roads, 6 on 110 km/h zoned roads and 3 on remote area roads. The regions for each location were chosen on a convenience basis but the road to be surveyed in each region was selected randomly. The surveys were conducted over a consecutive seven day period in August because this month was found to most closely represent the annual average daily traffic. Traffic travelling in both directions was recorded. All vehicles travelling at a free speed, defined as a headway of at least 4 seconds, were included.

Table 2.20 provides a summary of the speed parameters and traffic volume for all free speed vehicles in the rural speed surveys conducted from 2000 to 2002 in South Australia. No clear trends were evident. During 2001, the mean free speed on 60km/h roads increased slightly while on 100 and 110km/h roads, all speed parameters decreased. In 2002, all speed parameters decreased on 60 and 100km/h roads while an increase was noted on 110km/h roads.

It is interesting to note that although the mean speeds on the 100km/h roads were much less than the mean speeds for 110km/h roads, the difference between the two road types decreased for the 85th percentile, and particularly for the 95th percentile. This finding suggests that drivers choosing to travel at the highest speeds make little distinction between 100 and 110km/h posted speed limits. The greatest variation in rural free speeds (85th percentile minus mean) occurred on 100 km/h zoned roads, followed by 110km/h roads.

Table 2.20
Surveyed free speeds in rural areas for all vehicles by speed zones, 2000-2002

Speed zone & year	Mean speed	Speed variation	85th percentile	95th percentile	Free traffic volume	Total traffic volume
60 km/h						
2000	61.3	8.4	69.7	74.5	93,387	109,868
2001	61.5	8.2	69.7	76.4	94,188	111,042
2002	60.6	8.0	68.6	75.0	89,426	108,486
100 km/h						
2000	98.4	14.8	113.2	123.0	34,350	39,877
2001	97.7	13.8	111.5	120.5	36,485	42,601
2002	97.5	13.4	110.9	119.9	36,841	43,180
110 km/h						
2000	103.8	12.0	115.8	123.4	40,849	48,643
2001	102.1	12.2	114.3	121.7	40,873	48,474
2002	103.3	11.6	114.9	122.4	42,819	50,533

The decrease in free speed traffic volume in 2002 for the 60km/h speed zone may be attributed to one site which had approximately 33 per cent or 5000 less free speed vehicles than expected (based on previous years). The reason for the reduction in free speeds at this specific site is unknown. Data was not available by time of day.

2.3 Anti-speeding publicity

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

Current publicity campaigns directed at speeding behaviour aim to convey the message that speeding is dangerous and has consequences for the individual as well as other people. Research findings from situation analyses of metropolitan and rural speeding concluded that the contribution of speeding to crash causation was much greater at speeds less than 15km/h over the speed limit because more drivers were travelling within that range (McColl, Wundersitz, Baldock & McLean, 2001; Wundersitz et al, 2001). As a result, lower end speeding was targeted by the campaign. The anti-speeding campaigns did not have a specific target group although a bias towards young males and females aged 19 to 29 years was adopted.

In the Adelaide metropolitan area, three anti-speeding television advertisements were aired. The first advertisement "Extra 10k's", aimed to inform people of the increased likelihood of crashing when travelling only 10km/h over the speed limit while "Sense" was intended to deter speeding behaviour by emphasising the immediate consequences of speeding and loss of licence. The final advertisement, "Excuses" was directed solely at the consequences of speeding behaviour. The television advertisements were supported with radio commercials. There was no consistent slogan for the campaign. A new metropolitan campaign will be developed in 2003.

There was no specific targeting of speed through mass media in rural regions although a specific rural campaign is currently being developed and is expected to be launched during October 2003.

In 2002, television advertisements were usually aired in two week bursts, in conjunction with high police activity during long weekends and school holidays. The advertisements were also scheduled to air during the month (November 2002) dedicated to speed enforcement on the police enforcement calendar. A high priority was placed on coordination between police enforcement and related publicity campaigns.

During the calendar year 2000, approximately $445,000 was spent on advertising costs (media and production) in the Adelaide metropolitan area (Personal communication with Amy Cotton, Transport SA, May 2003). Advertising costs in the metropolitan area were reduced in 2001 by 23 per cent to $343,010 then subsequently increased by 13.6 per cent in 2002 to $397,000.

3 Restraint use

The following section investigates the operations and effectiveness of restraint enforcement by examining restraint-related offences detected by Police, restraint use in fatal and serious casualty crashes and observations of restraint use from on-road surveys.

RESTRAINT ENFORCEMENT PRACTICES AND LEVELS OF OPERATION

The use of vehicle occupant restraints or seat belts has been shown to be effective in reducing serious and fatal injuries as a consequence of a crash (ETSC, 1996). Restraint usage is strongly influenced by legal requirements and enforcement practices. Legislation for the compulsory use of restraints was introduced in South Australia in 1971. Since then, South Australia has experienced substantial long term benefits (Crinion, Foldvary and Lane, 1974) although the full benefits from seat belt wearing will not be achieved until wearing rates are close to 100 per cent.

The National Road Safety Action Plan (1996) identified restraint use as a principal issue in road safety and committed States and Territories to achieve car occupant restraint wearing rates of 95 per cent or above. The National Road Safety Package (1997) reaffirmed the importance of targeting restraint usage and emphasis was placed on rural enforcement of restraint use and the implementation of targeted public education campaigns, concentrating on the importance of wearing restraints at all times.

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

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

There were no specific campaigns targeting restraint use apart from a designated month in the police enforcement calendar (October 2002). It is possible that small localised campaigns may have been enacted in some rural regions but the central Traffic Research and Intelligence Section was unaware of any such campaigns.

3.1 Levels of restraint use

Restraint non-use offences

The number of restraint non-use offences detected depends on police activity in detecting such offences as well as on the actual number of restraint use offences that are committed. There are seven different types of restraint related offences. The frequency of these offences for the years 2000 to 2002 are listed in Table 3.1. It must be noted that the driver of the vehicle is held legally responsible for the last four offences listed. The total number of offences detected increased by 36 per cent in 2001 then decreased slightly in 2002. The most common restraint offence involved the driver failing to wear a seat belt adjusted and fastened properly. All types of restraint offences are combined in the subsequent tables.

Table 3.1
Restraint offences and detections, 2000-2002

Restraint offences	2000		2001		2002	
	(N)	(%)	(N)	(%)	(N)	(%)
Fail to wear seatbelt properly adjusted and fastened (driver)	6329	83.9	8812	85.8	8671	85.6
Fail to wear seatbelt properly adjusted and fastened (passenger)	842	11.2	1060	10.3	1041	10.3
Fail to occupy seat fitted with a seatbelt	28	0.4	30	0.3	14	0.1
Sit in front row of seat when not permitted	5	0.1	2	0.0	1	0.0
Fail to ensure child under 1 year old restrained	24	0.3	26	0.3	32	0.3
Fail to ensure child under 16 wears seatbelt	203	2.7	264	2.6	283	2.8
Fail to ensure front row passenger properly restrained	114	1.5	79	0.8	85	0.8
Total	7545	100.0	10273	100.0	10127	100.0

Table 3.2 shows restraint offences detected in metropolitan and rural areas from 2000 to 2002. Restraint offences were detected more frequently in metropolitan than rural areas each year but this does not necessarily indicate that restraint wearing rates are lower in metropolitan areas. The greater volume of traffic in the metropolitan area may have contributed to the higher number of detections. Since enforcement was not specifically dedicated to restraint use, detection rates could not be calculated (no measure of time spent on restraint enforcement). Overall, the actual number of restraint offences detected increased in 2001 (by 36%) then decreased slightly in 2002. A similar pattern was observed in rural regions, but, in the metropolitan area the number of offences detected increased.

Table 3.2
Restraint offences detected by region, 2000-2002

Year	Metro		Rural		Total restraint offences detected
	(N)	(%)	(N)	(%)	
2000	5079	67.3	1823	32.7	7545
2001	6624	64.5	2739	35.5	10273
2002	6969	68.8	2223	31.2	10127

DAY OF WEEK

The distribution of restraint related offences detected from 2000 to 2002 by day of week is presented in Table 3.3 in terms of the percentage of total offences detected each year. Specific information (ie day of week, time of day, gender) was unknown for almost one tenth of offences detected each year. Restraint offences were detected evenly throughout the week except for a slight increase later in the week.

Table 3.3

Number of restraint offences detected by day of week, 2000-2002 (expressed as a percentage of total offences detected each year)

Year	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Unknown
2000	13.6	12.9	13.4	15.9	15.1	14.8	14.3	643
2001	13.9	13.9	15.3	15.5	14.0	13.9	13.9	910
2002	13.5	14.0	14.4	15.2	15.8	15.9	11.2	935

TIME OF DAY

Table 3.4 displays restraint offences detected by time of day in the three years from 2000 to 2002. Restraint offences were detected most frequently between 8am and 6pm. Restraint offence detections were much less common at night time and in the early hours of the morning.

Table 3.4

Number of restraint offences detected by time of day, 2000-2002 (expressed as a percentage of total offences detected each year)

Year	Midnight-6 AM	6 AM--8 AM	8 AM-10 AM	10 AM-Noon	Noon-2 PM	2PM--4 PM	4 PM-6 PM	6 PM-8 PM	8 PM-12 PM
2000	1.9	2.6	11.1	18.1	17.3	15.3	17.0	8.9	7.8
2001	1.7	2.2	11.7	18.9	17.1	14.6	17.9	9.1	6.7
2002	1.7	2.3	11.2	17.4	17.6	15.7	20.0	7.7	6.4

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 police rely on self report if there is no physical evidence (ie injuries, scuff marks on seatbelt). Restraint use is only recorded on the TARS database if a vehicle occupant is injured. Seat belt status is categorised into six different groups in the database but they have been subsequently 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 receiving injuries in a serious casualty or fatal crash. When calculating these percentages, only car occupants with known restraint use status were considered.

Restraint use for vehicle occupants injured in a serious casualty crash from 2000 to 2002 is presented in Table 3.5. A serious injury is defined as a person who sustains injuries and is admitted to hospital as a result of a road crash but does not die as a result of those injuries within 30 days of the crash. The percentage known to be wearing restraints decreased by 4 per cent in 2001 and has remained stable at 85 per cent in 2002. Only 60 per cent of all injured vehicle occupants in serious crashes reported restraint status in 2002.

Table 3.5
Restraint usage of injured vehicle occupants in serious casualty crashes, 2000-2002

Year	Restraint worn		Number of known cases	Total occupants injured
	(N)	(%)		
2000	633	89.2	710	1230
2001	582	85.1	684	1232
2002	612	85.2	718	1188

Table 3.6 shows the restraint usage for vehicle occupants injured in a fatal crash from 2000 to 2002. On average, restraint usage by injured occupants is much lower in fatal crashes than in serious casualty crashes. Restraint use in fatal crashes increased by 18 per cent in the year 2001. However, in 2002, restraint use decreased by 15 per cent to a level similar to that experienced in 2000. Restraint status was known for 68 per cent of all injured or deceased vehicle occupants in 2002.

Table 3.6
Restraint usage of injured vehicle occupants in fatal crashes, 2000-2002

Year	Restraint worn		Number of known cases	Total occupants injured
	(N)	(%)		
2000	52	62.7	83	128
2001	59	80.8	73	107
2002	49	65.3	75	111

Restraint usage for injured vehicle occupants in fatal and serious casualty crashes is presented in Table 3.7 and Figure 3.1 by the region where the crash was known to have occurred. Seat belt wearing rates were slightly lower (by 3-4%) for these crashes occurring in rural regions than crashes in the Adelaide metropolitan area. Restraint use by injured occupants in serious and fatal crashes has decreased slightly from 2000 to 2002, in both metropolitan and rural areas.

Table 3.7
Restraint usage of injured vehicle occupants in serious and fatal crashes by region, 2000-2002

Year	Metro Worn		Rural Worn		Total Worn		Total Killed/ Injured
	(N)	(%)	(N)	(%)	(N)	(%)	
2000	303	87.0	382	85.7	685	86.4	1358
2001	280	87.0	361	83.0	641	84.7	1339
2002	287	84.9	374	82.2	661	83.4	1299

Figure 3.1
Restraint usage of injured vehicle occupants in serious and fatal crashes, by location, 2000-2002

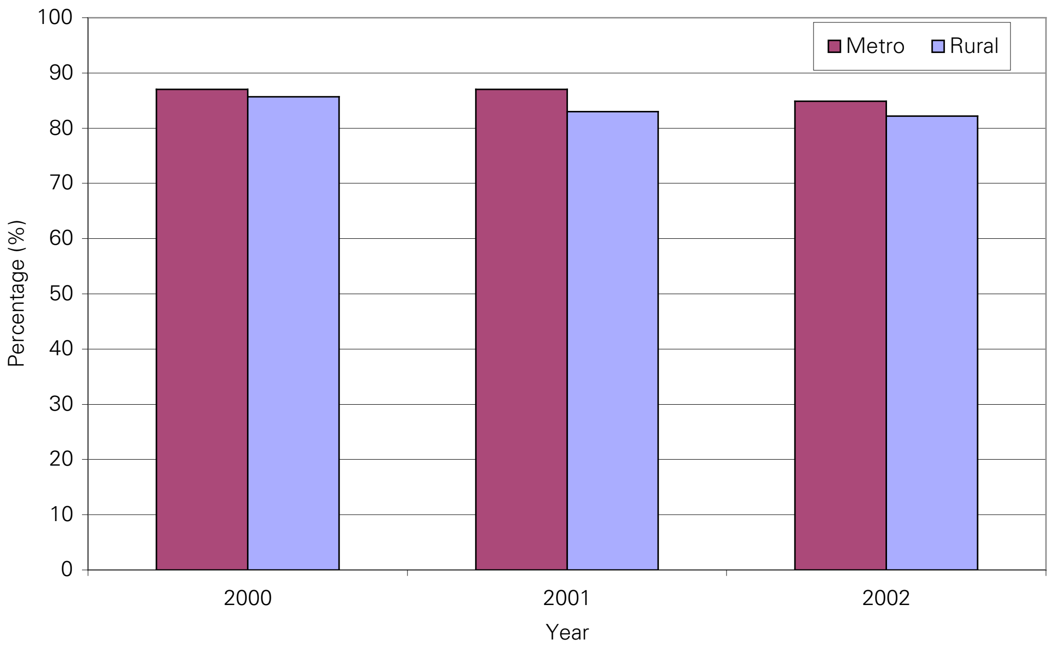
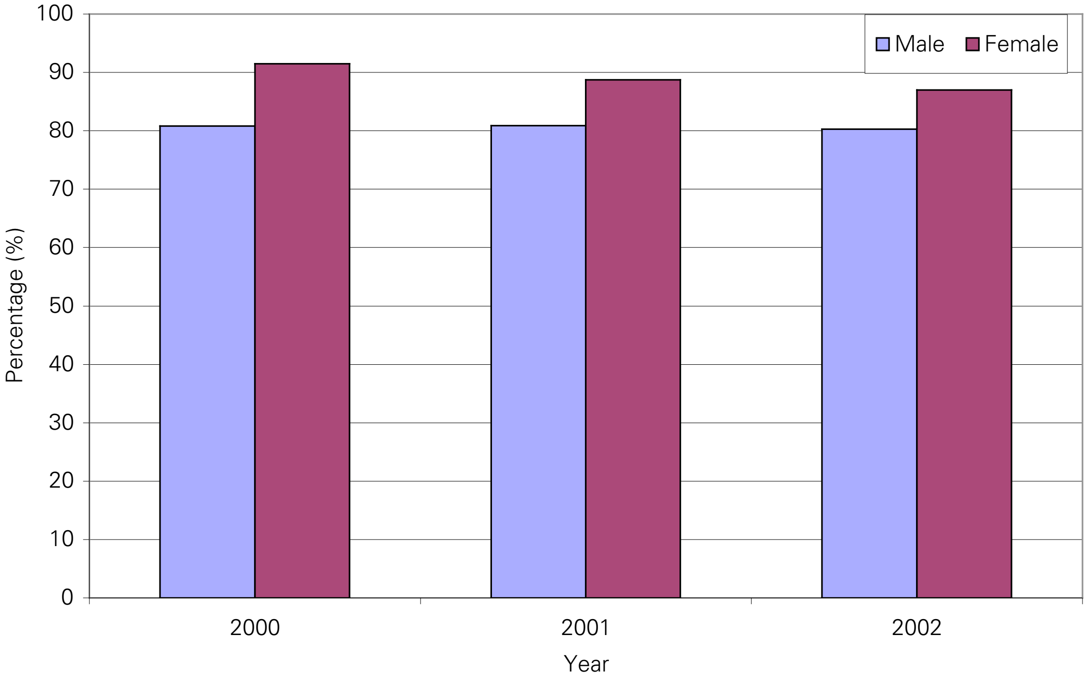


Table 3.8 and Figure 3.2 show the number and percentage of injured vehicle occupants wearing restraints in serious and fatal crashes by sex. Injured males had considerably lower restraint usage rates than injured females. From 2000 to 2002, male restraint use has remained stable at around 80 per cent while restraint usage rates for females has decreased by 5 per cent, to a level of 87 per cent.

Table 3.8
Restraint usage of injured vehicle occupants in serious and fatal crashes by sex, 2000-2002

Year	Male Worn		Female Worn		Total Killed/ Injured
	(N)	(%)	(N)	(%)	
2000	311	80.8	368	91.5	1341
2001	317	80.9	321	88.7	1332
2002	351	80.3	309	87.0	1297

Figure 3.2
Restraint usage of injured vehicle occupants in serious and fatal crashes, by sex, 2000-2002



On-road observational restraint use surveys

On-road observational surveys provide another means to measure the effectiveness of restraint enforcement.

METHODOLOGY

Four on-road observational surveys have been conducted since 1998 in the Adelaide metropolitan area and in the regional areas of Whyalla, the Riverland and Mount Gambier. The last two surveys also included Murray Bridge and Clare. No surveys were conducted in the year 2000.

Observational surveys were undertaken at intersections controlled by traffic lights, stop signs or give way signs based on a modified version of the methodology used by Preece, Johansen and Norrish (1993) in New South Wales. The observation sites in each city or town were selected because they appeared to be busy and represented a variety of occupant types (e.g. local traffic, commuting to work). Details were recorded for each stationary or slowed vehicle at the intersection until they began to move off. Observers only included through traffic to avoid vehicles pulling out of shopping centres, nearby parking spaces etc. Cars, panel vans, utilities and four wheel drives were the only vehicle types included for observation.

The number of occupants was recorded along with seating position, gender, estimated age and restraint wearing for all occupants. The positions of unrestrained children in the vehicle were also noted.

There are some methodological limitations to consider when observing on-road restraint use. It is difficult to complete the desired observations for all occupants of a vehicle in the time available. Additionally, it may be difficult to obtain accurate information about restraint use by passengers in the rear seat of a car, particularly in determining whether a lap belt is being worn.

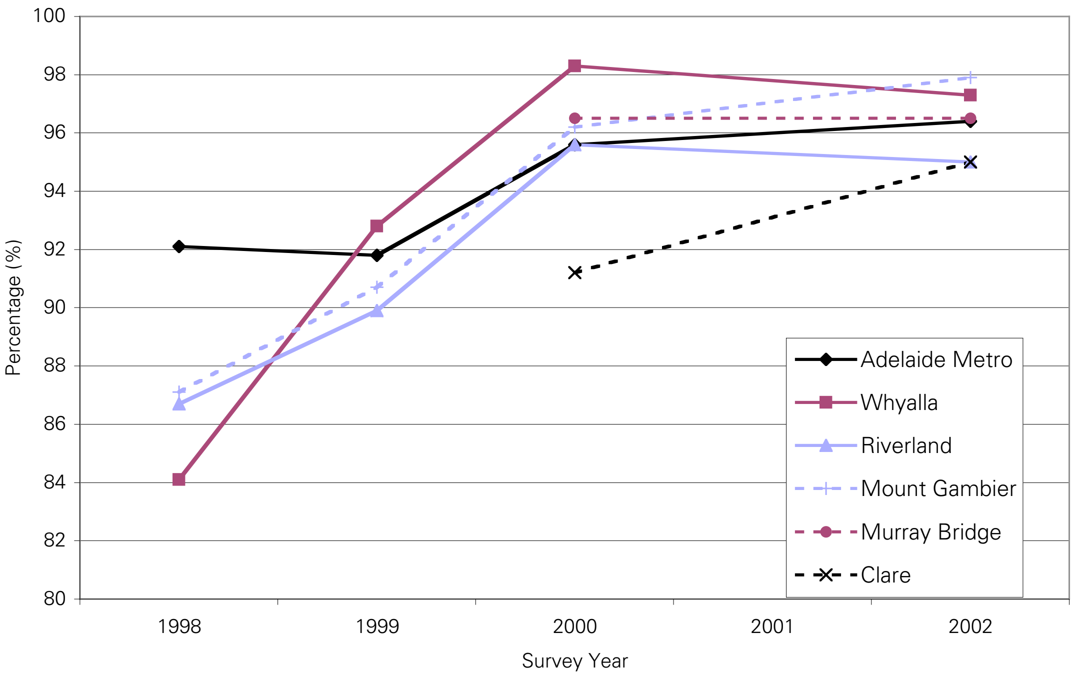
RESTRAINT USE

Observed restraint use for all occupants by geographical region and survey year is depicted graphically in Figure 3.3. The numbers and percentages refer to occupants wearing restraints. In all regions surveyed from 1999 to 2000, restraint use increased significantly to above the 1996 National Road Safety Action Plan national target of 95 per cent compliance. From 2000 to 2002, this high level of restraint use was maintained with all regions remaining above 95 per cent. Even Clare, the only region previously below 95 per cent when first surveyed in 2000, reached the national target. More specifically, in 2002 restraint use decreased slightly in Whyalla (97%) and the Riverland (95%), increased slightly in the Adelaide metropolitan area (96%), Mount Gambier (98%) and Clare (95%) and remained stable in Murray Bridge (97%).

When considering restraint use over time, wearing rates in the Adelaide metropolitan area have increased since 1999. Rural restraint use, calculated from the average wearing rate of all rural regions, has also increased steadily since the first survey in 1998, to the same level as the metropolitan area (96%).

A sharp increase (14%) in restraint use was observed in Whyalla from the survey in 1998 to 2000. The increase in restraint use may be partially explained by a concentrated mass media and enforcement campaign to increase seat belt usage, specifically conducted in Whyalla during November and December in 1998 (Wundersitz, Kloeden & McLean, 1999). The other two rural regions surveyed over the same time period (Riverland, Mount Gambier) also experienced an increase in restraint use although not of the same magnitude (9% increase). However, it is difficult to draw direct comparisons between all the regions because possible changes in police enforcement are unknown (except for Whyalla).

Figure 3.3
Restraint use for all vehicle occupants by survey region, 1998-2002



RESTRAINT USE BY SEATING POSITION

The distribution of on-road observed restraint use by seating position and geographical region from 1998 to 2002 is presented in Table 3.9. Chi-square analysis indicated that restraint use had changed statistically significantly over time in the majority of regions for most seating positions. Rear seat passengers had the lowest compliance rates of all seating positions in all regions. However during the 2000 and 2002 survey periods, rear passenger restraint use has increased to a level only 2 per cent less, on average, than that of drivers and front seat passengers, with the exception of Clare (approximately 4% higher).

RESTRAINT USE BY GENDER

Details of restraint use, by the gender of the vehicle occupant, for the year 2002 is shown in Table 3.10. Gender was not recorded for children estimated to be aged 15 years or less. Approximately 4 per cent (N=527) of vehicle occupants did not have their gender recorded and have subsequently been excluded from this table. When aggregating all regions, males had lower restraint usage rates than females (96% vs 98%). In all regions, children aged up to 15 years had restraint wearing rates similar to males.

Table 3.10
Restraint use by gender and region, 2002

Region	Gender						Total (known)
	Child (0-15 years)		Adult male		Adult female		
	%	N	%	N	%	N	
Adelaide Metro	96.2	200	95.5	1429	97.8	1154	2783
Whyalla	96.5	110	96.4	1112	98.9	714	1936
Riverland	92.9	184	93.7	918	96.9	883	1985
Mount Gambier	96.4	351	97.9	1372	98.2	1558	3281
Murray Bridge	95.7	291	95.3	1046	98.2	914	2251
Clare	97.9	139	91.8	423	97.1	476	1038
All regions	95.9	1275	95.6	6300	97.9	5699	13274

Table 3.9
Restraint use by seating position, region and survey year

	Year of survey									
	Feb 1998		March 1999		May 2000		May 2002		Chi Square	P value
	%	N	%	N	%	N	%	N		
Driver										
Adelaide metro	92.9	2500	91.4	2348	96.0	1872	96.4	2311	70.78	**
Whyalla	86.1	1941	93.4	2342	97.9	1741	97.2	1599	262.28	**
Riverland	88.6	2073	90.8	2214	96.5	1474	95.2	1474	100.85	**
Mount Gambier	88.1	2401	90.5	2243	96.7	1804	98.3	2481	264.44	**
Murray Bridge					96.2	1292	96.7	1681	0.52	NS
Clare					92.1	796	94.2	781	2.76	NS
Front passenger										
Adelaide metro	93.3	531	94.3	581	96.0	396	96.9	152	4.88	NS
Whyalla	82.6	490	92.5	630	99.0	482	97.5	319	108.75	**
Riverland	84.7	542	90.5	599	95.8	424	95.2	396	46.60	**
Mount Gambier	86.3	597	92.0	648	96.6	475	97.2	607	66.73	**
Murray Bridge					98.7	317	96.9	479	2.79	NS
Clare					90.2	225	95.7	211	4.94	*
Rear passenger										
Adelaide metro	81.5	207	89.7	236	94.1	522	94.5	127	30.47	**
Whyalla	73.2	213	89.4	344	99.2	635	97.1	70	153.33	**
Riverland	75.7	202	83.0	289	93.5	613	92.7	177	57.67	**
Mount Gambier	80.5	269	89.9	358	94.8	753	95.8	265	60.42	**
Murray Bridge					97.1	384	93.5	168	4.05	*
Clare					89.6	366	99.0	101	9.10	**
All occupants										
Adelaide metro	92.1	3239	91.8	3165	95.6	2399	96.4	2910	84.79	**
Whyalla	84.1	2646	92.8	3316	98.3	2380	97.3	1991	460.95	**
Riverland	86.7	2817	89.9	3104	95.6	2158	95.0	2105	168.74	**
Mount Gambier	87.1	3267	90.7	3250	96.2	2572	97.9	3365	357.10	**
Murray Bridge					96.5	1723	96.5	2336	0.00	NS
Clare					91.2	1177	95.0	1094	12.35	**
Total (N)		11,969		12,835		12,409		13,801		

* P<.05, **P<.001, NS - Not significant

Observational studies for Murray Bridge and Clare were only conducted in May 2000 and May 2002

3.2 Restraint publicity

Publicity campaigns promoting restraint use in 2002 aimed to reach a primary target audience of parents with young children, and children. The main campaign slogan was simply "Buckle Up".

There were no specific television commercials aired in the Adelaide metropolitan area encouraging restraint use. However, printed materials, such as pamphlets and posters, were distributed through a network of outlets such as Registration and Licensing offices, police stations, RAA, community health centres and hospitals.

A significant restraint use campaign has existed in rural regions since 1998 when four television advertisements "Wear It", "Short Trip", "Role Model" and "Dummy" were developed. These advertisements were structured around three key concepts: information, deterrence and consequences (for more detailed descriptions see Wundersitz et al, 1999). They were supported by radio commercials and other media such as pamphlets, posters and a train-the-trainer program. The train-the-trainer program involved training workers in the areas of community health (e.g. Red Cross or regional Transport SA workers) to teach new parents how to install baby capsules and booster seats, and to identify the most appropriate child restraints for their children. To assist in training, trainers were provided with a training video and pamphlets. Additionally, one of each type of child restraint available (ie, capsule, booster seat etc) was given to community health centres.

A specific campaign targeting Aboriginal restraint use continued in the Upper Spencer Gulf region and was expanded to include the Riverland. This campaign included the television commercial "Buckle Them Up" and was supported by radio, pamphlets and posters; all available in English or Pitjantjatjara. A train-the-trainer program was also implemented in conjunction with local community health centres.

Restraint use advertising was aired during selected times of the year in conjunction with the police enforcement calendar. During 2001, restraint use was targeted in May and September while during 2002, restraint use was targeted in April (Aboriginal) and in October.

During the year 2000, approximately $56,000 was invested in restraint-related advertising (Personal communication with Amy Cotton, Transport SA, May 2003). The majority of the money was spent in rural regions ($51,000) on media and production and a small percentage in the Adelaide metropolitan area ($5000) on the distribution of pamphlets and training material. Advertising costs increased significantly (by 61%) to a total of $90,000 in 2001. Similar to the previous year, the majority was spent in rural regions ($85,000) rather than the metropolitan area ($5000). During 2002, advertising costs were reduced by 41 per cent to a total of $37,000. Approximately $32,000 was spent in rural regions and, again, $5000 in the metropolitan area.

4 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 (2001) recognised the importance of systematically monitoring driver behaviour to create road safety performance indicators. They reviewed monitoring systems for drink driving, speeding and restraint use in Europe. It was concluded that the best features of monitoring systems include monitoring by independent institutions on a regular basis (at least annually), using statistically stratified and representative samples and standardised data collection methods. Furthermore, it was recommended that an appropriate organisation be responsible for the scientific quality of the work and the findings are made publicly available. These principles should be adhered to when quantifying the effects of the enforcement of drink driving, speeding and non-wearing of restraints legislation in South Australia.

4.1 Drink-driving and random breath testing

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

LEVELS OF TESTING

From 2000 to 2001, random breath testing levels in South Australia increased slightly but then increased dramatically (by 26%) in 2002 to the highest level on record. Just over 65 per cent of licensed drivers were breath tested in 2002. Overall the current level of testing, almost 2 in 3 licensed drivers in South Australia, is well over the recommendation of Baldock and White (1997) that 1 in 2 licensed drivers be tested.

In the Adelaide metropolitan area testing levels had been decreasing steadily since 1997. The considerable increase in metropolitan testing during 2002 (33%) was necessary to maintain the testing level of 1 in 2 drivers and to also increase the perceived probability of detection. Meanwhile, in rural areas testing levels continued to increase in 2002 (by 18%), as has been the trend since 2000.

VISIBILITY OF RBT

Homel (1990) suggests that to increase the perceived probability of detection, random breath testing should be conducted on days and at times when it is more likely to be seen by potential drink drivers. Homel maintains that experimentation is required to determine the balance of testing at times and places of high traffic volume when the incidence of drinking and driving is low, and when the incidence of drink driving rates is high but the traffic volume is low. The most recent late night surveys in metropolitan Adelaide indicated that drink driving rates were highest on Wednesday and Thursday nights, and after midnight (Kloeden & McLean, 1997). More recent roadside breath testing surveys conducted in Perth (Friday to Sunday, 10pm-3am) in 1999 found that drink driving rates were highest after midnight and on Friday nights (Ryan, 2000).

In South Australia during 2001 and 2002, the greatest percentage of breath tests continued to be performed on Fridays and Saturdays. Similar to previous years, a high level of testing did not occur on days of the week when drink drive rates were the highest but on days when many potential drink drivers were on the roads.

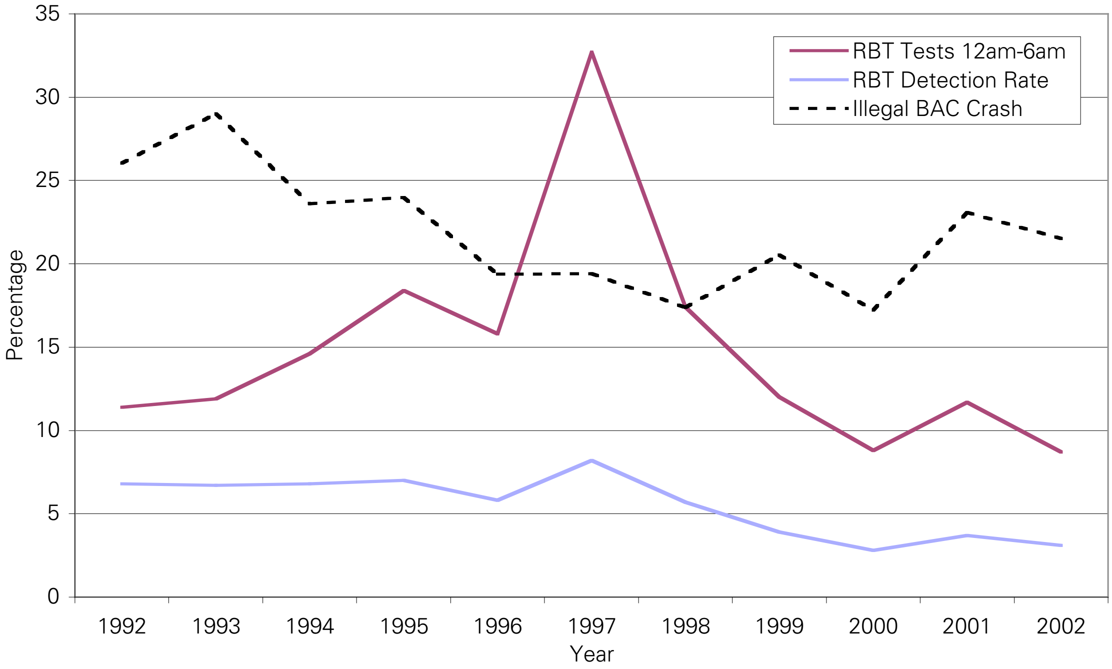
Thirty three per cent of RBT tests in 2002 were performed from 8pm to 12am compared to 9 per cent from 12am to 6am. Time series analysis of Tasmanian RBT data indicated that tests conducted before midnight were more important as a general deterrent than late night or day time testing however, low numbers of crashes and tests after midnight precluded definitive conclusions (Henstridge, Homel & Mackay, 1997). Therefore, both the day of week and time of RBT operations in 2002 occurred when there were higher traffic volumes but not when the greatest drink driving rates were reported. This satisfies the 'high visibility' for potential drink drivers requirement for successful deterrent RBT operations by Homel (1990) and may have contributed to lower detection rates.

However, RBT is also needed at times when the highest drink drive rates occur to detect actual drink drivers. During 2001, the actual risk of detection was increased by increasing the percentage of testing after midnight (testing 12am-6am increased from 9% to 12%) although more tests were still conducted before midnight (36%). Detection rates subsequently increased. Such experimentation should be continued to maintain a balance between deterrence and detection.

EFFECTIVENESS

The increase (32%) in detection rates from 2000 to 2001 would most likely be attributed to a shift in breath testing times to after midnight when drink driving rates are higher. During 2002, detection rates decreased slightly when testing after midnight was reduced to a level similar to 2000. In fact, a positive relationship has been observed between the percentage of testing after midnight (12am-6am) and detection rates over the past ten years. This relationship is illustrated in Figure 4.1, from 1992 to 2002. As the level of testing after midnight decreased, detection rates also decreased indicating detection rates were dependent on specific enforcement operation times and practices as well as the level of drink driving in South Australia (represented by the percentage of seriously or fatally injured drivers/riders with an illegal BAC).

Figure 4.1
RBT detection rate, percentage of tests 12am-6am (percentage of total tests each year) and percentage of seriously or fatally injured drivers/riders with an illegal BAC, 1992-2002



Further evidence of this relationship was evident when examining the difference between metropolitan and rural regions. Similar increases in RBT operations after midnight in 2001 resulted in higher metropolitan detection rates. However, during the same year in rural regions, the percentage of RBT testing after midnight was nearly half of that in the metropolitan area and resulted in lower rural detection rates.

It appears that low detection rates reflect the operation of RBT at times when few drink drivers are on the roads. However, the examination of the involvement of alcohol in serious and fatal road crashes provides perhaps a better picture of the effectiveness of RBT operations. The percentage of illegal BACs for drivers/riders killed or seriously injured in road crashes increased in 2001 then decreased slightly in 2002, although still at a level above the record low achieved in 2000 (see Figure 4.1). This suggests that the RBT operations employed in 2002, based on the deterrent value of high visibility (more testing before midnight) rather than detection, were more effective in deterring drink drivers than the methods used in 2001.

The percentage of cases with an unknown BAC has decreased for fatal crashes and remained stable for crashes involving serious injuries during 2001 and 2002. Improving the matching process of blood samples with the TARS database creates a more complete and reliable database.

Male drivers continued to constitute the majority of drink drive offenders. In 2002, males were on average, 3.3 times more likely to be detected than females. The ratio of male to female drink drive detection rates has remained above 3 since 1995, except in 1997.

PUBLICITY

The level of South Australian RBT operations increased from 2000 to 2002 while the anti drink driving publicity expenditure decreased by approximately 45 per cent. During this time, an inverse relationship has existed between publicity and detection rates such that when the anti-drink driving publicity costs were cut dramatically in 2001, the overall detection rate increased. During 2002, publicity was increased and detection rates decreased. The same inverse relationship was observed in the metropolitan area. In rural regions publicity spending decreased and the detection rate increased. This association suggests publicity is playing a supportive role for drink driving enforcement.

Homel (1990) specified that publicity accompanying RBT activities should not simply be educational but have a deterrent value. The 2001 and 2002 publicity campaigns meet this requirement by including an advertisement centring around RBT and emphasising the high risk of detection.

MOBILE RANDOM BREATH TESTING

Homel (1990) states that static RBT operations should never be relied upon as the sole source of drink driving enforcement. It is expected that the effectiveness of RBT operations in South Australia will be improved by the introduction of 'mobile' RBT to target offenders who believe that RBT can be avoided. The introduction of mobile RBT will allow patrols to test any driver at any time and will increase the flexibility of RBT operations considerably. The low visibility of mobile RBT will complement the high visibility of static RBT and enhance the overall deterrent value of RBT. At present, however, police are authorised to conduct mobile RBT only on certain days (holiday periods, etc).

Mobile RBT will be particularly effective in country areas where personnel are limited and the 'grapevine effect' is known to undermine the potential value of a highly visible static RBT station. Harrison (2001) investigated the effects of drink driving enforcement in two different rural communities (South Australia and Victoria) and concluded that the effectiveness of enforcement strategies in these rural regions would improve with the use of smaller mobile breath testing units.

4.2 Speeding

The success of speed enforcement depends on balanced methods of police enforcement to deter motorists, both specifically and generally, and that this enforcement needs to be supported by regular anti-speeding publicity. Furthermore, this publicity needs to specifically emphasise high levels of speed limit enforcement.

LEVEL OF OPERATIONS

The number of hours spent on speed detection in South Australia increased each year, from 2000 to 2002, by 1-2 per cent. Total hours spent on speed camera operation decreased (by 6%) over this period while non-camera detection activity increased (by 12%). Overall, 22 per cent of licensed drivers were detected for exceeding the speed limit in 2002, or approximately 1 in 5 licensed drivers.

Speed detection hours decreased by 5 per cent in the Adelaide metropolitan area during 2001 and stayed at that level in 2002 but increased in rural regions, mostly from 2000 to 2001. To an extent, this difference reflects the reduction in speed camera hours which were predominantly operated in the metropolitan area.

VISIBILITY OF OPERATIONS

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

Speed detection hours in South Australia, for both speed cameras and non-camera devices, were spread very evenly throughout the week, the majority during daylight hours (6am-8pm). This pattern of speed detection operations has varied very little from 2000 to 2002. Therefore, it appears that speed detection has maintained a high level of general deterrence by operating at times when the majority of drivers are on the road.

Elevated speed detection rates per hour noted during the day and on weekends may be attributed to increased traffic volume at these times although the speed detection data provided did not specify the number of vehicles passing the detection point. Future analyses may be able to obtain and incorporate such data from speed cameras. The urban on-road speed survey indicated that mean and 85th percentile of free travel speeds were actually higher at night on all types of roads. Increased speed detection at night when the incidence of speeding is greater would increase speed detection rates, and subsequently specific deterrence.

A noticeable reduction in speed camera operations was observed at 12-2pm, around lunch time. This decrease may simply be related to speed camera operator's lunch break however, this time of day may be considered as 'lunch time peak hour' when many potential speeders are on the roads (high visibility). Vehicle speed survey data from urban areas confirmed that that there was a large variation in speeds at this specific time. Staggering speed camera operator's lunch times may be an easy way to minimise this aberration in the timing of speed detection and increase perceived likelihood of detection.

EFFECTIVENESS

The overall decrease in speeding detection rates in South Australia from 2000 to 2002, after a slight increase in 2001, may be attributed to a reduction in speeding behaviour but it is also possible that the detection rates were reflecting changes in speed enforcement operations. The decline in detection rates in 2002 was only evident for speed cameras which suggests changes in speed camera operations. Very few changes were observed in speed camera operations by day of week and time of day. The decline in speed camera detection rates may therefore be due to other factors not measured such as the speed camera sites selected.

The incidence of speed-related crashes and the measurement of on-road vehicle speeds provide a better indication of speed distributions and changes in speeding behaviour than detection rates because they are not as heavily influenced by enforcement operations. However, the incidence of speed related crashes is severely under-reported in the TARS database resulting in significant underestimation of the actual involvement of speed in crashes. Therefore, it was not surprising that the number of serious and fatal crashes in South Australia involving 'excessive speed' was of uncertain validity and too small to draw any meaningful conclusions.

On-road speed surveys provide the most direct measure of the effectiveness of speed enforcement operations. Independent on-road speed surveys were conducted in urban and rural areas. However, caution should be exercised when drawing comparisons between the surveys. The surveys were not conducted at the same time of year (rural surveys in August, urban surveys just before Christmas holidays). Additionally, the timing of the surveys differed; the urban survey was conducted over 24 hours on a weekday while the rural surveys were over 7 days, including a weekend. Considering these limitations, free speeds (for all speed parameters) on 60km/h roads in rural towns were higher than on all types of urban roads examined during the year 2002.

The undertaking of systematic speed surveys in rural regions since 2000 indicated that rural free speeds were decreasing each year on 100km/h roads but varied on 60 and 110km/h roads. However, despite these variations, the mean free speeds in all rural speed zones decreased from 2000 to 2002. Similar systematic speed monitoring in urban areas, using a stratified sample, would not only provide a consistent means of identifying trends in urban speed distributions but also assist in achieving the goal of representative speed monitoring in South Australia.

Male drivers consistently constituted the majority of speeding offenders. They were 2.6 times more likely to be detected for speeding than females in 2002. Male drivers were also found to be significantly over-represented (20 times) in 'excessive speed' fatal and serious casualty crashes, although the number of known cases was very small.

PUBLICITY

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

Publicity raises the perceived risk of detection and assists in the process of changing behaviour by providing public acceptance of enforcement (Elliot, 1993; Zaal, 1994). An evaluation of anti-speeding television advertising in the Adelaide metropolitan area reported slight but statistically significant decreases in mean free speeds (Woolley et al, 2001). During 2002, the amount of money invested on metropolitan anti-speeding advertising was increased however, it was unknown whether free speeds decreased because no comparable urban surveys were undertaken. For lack of a better indicator, metropolitan speed detection rates per hour decreased in 2002 suggesting an inverse relationship with metropolitan anti-speeding advertising costs. This was similar to the association between publicity and drink driving detection rates. Advertising appears to be continuing to support speeding enforcement activities in the metropolitan area.

Few clear trends were evident from rural on-road speed surveys and speed detection rates. The proportion of speed-related crashes in rural regions appeared to have increased and surpassed the proportion in the metropolitan area in 2002 but the validity of this information is doubtful because of under-reporting It is anticipated that a rural anti-speeding publicity campaign, expected to be introduced in 2003, will support rural speed enforcement and increase the perceived risk of detection when speeding.

4.3 Restraint use

A lack of information on restraint enforcement operations, compared with the enforcement of speeding and drink driving, made it very difficult to assess their effectiveness. Therefore, the number of restraint offence detections was used as an indication of enforcement activities, and the level of restraint use and publicity were examined to monitor trends in recent years.

LEVELS OF RESTRAINT ENFORCEMENT

The total number of restraint offences detected in South Australia increased significantly in 2001 but then decreased slightly in 2002. The number of restraint offences provided only a rough estimate of the prevalence of restraint non-usage, and was heavily dependent on police enforcement strategies. Therefore, the slight decrease in offences in 2002 may be attributed to either greater restraint wearing or, more likely, changes in enforcement.

A similar trend in restraint offences detected was observed in rural regions but the number of offences steadily increased in the Adelaide metropolitan area. This suggests that either wearing rates in the metropolitan area were decreasing or restraint enforcement was more effective. The greater volume of traffic, and potentially greater number of offenders, would have contributed to the greater number of offences detected in the metropolitan area than in rural regions.

Specific restraint enforcement campaigns were not undertaken on a large scale so few details were available regarding police enforcement operations. If the number of detected offences are used as a rough guide to enforcement activities, it appears that restraint enforcement occurred predominantly during daylight hours and was spread relatively evenly throughout the week.

LEVELS OF RESTRAINT USE AND EFFECTIVENESS

The percentage of injured vehicle occupants wearing restraints in serious and fatal crashes in South Australia decreased from 86 per cent in 2000 to 83 per cent in 2002. This trend was observed in both the metropolitan and rural regions. Overall, wearing rates in rural crashes were lower than in the metropolitan area.

Restraint wearing rates were much lower in fatal crashes, and in serious casualty crashes to a lesser extent, than for the general driving population observed during on-road surveys. This may be because drivers not wearing restraints are generally over-represented in fatal crashes. For example, young male drivers wear restraints less frequently and are disproportionately involved in crashes (Van Kampen, 1985 cited in ETSC, 1999). Even more likely, the higher severity of the injuries sustained in the crash (serious injury or fatal) may be directly related to the vehicle occupant being unrestrained. Restraint use status was only reported for injured vehicle occupants. The confounding nature of the relationship between crash injury and restraint use may compromise crash data as an indicator of the actual level of restraint use.

Restraint use status was unknown for a large proportion of vehicle occupants in serious (56-60%) and fatal (65-68%) crashes. Better records of restraint use need to be kept to improve database reliability and accuracy and for the evaluation of restraint enforcement practices.

On-road observations of restraint use surveys provide the best indication of restraint use levels. Restraint usage can be increased through high levels of enforcement over short periods of time, when applied repeatedly (ETSC, 1999). Although no 'blitz' like restraint campaigns were conducted recently, observed on-road restraint use for all vehicle occupants in 2002 was at a high level. The trends in restraint use varied from region to region, but overall, remained above the 1996 National Road Safety Action Plan national target of 95 per cent compliance.

Since no observational surveys were undertaken in 2001, trends from 2000 to 2002 were analysed. During this period, observed restraint wearing rates increased in the Adelaide metropolitan area. Taking the average wearing rates from all rural regions, observed rural restraint use also increased. The increase in restraint use suggests that the increase in restraint offence detections was due to either more enforcement, or more efficient enforcement (rather than a decrease in restraint use), particularly in the metropolitan area. Unfortunately, this possibility can not be confirmed by the available records.

As reported by some European countries (ETSC, 1999), seat belt usage in South Australia for rear seat passengers was observed to be lower than the wearing rates of drivers and front seat passengers although the difference has become smaller since the 2000 survey. In general, higher restraint use among drivers was observed to correspond with higher restraint use by passengers.

Males were more likely than females to be unrestrained in serious or fatal crashes. They were also observed to have lower restraint wearing rates than females in every region surveyed. Previous research, conducted in Whyalla, found children had lower restraint wearing rates than adults, regardless of gender, prior to publicity and enforcement campaigns. (Wundersitz, Kloeden and McLean, 1999). Results from the 2002 observational survey indicated that children (under 15 years) had wearing rates very similar to males, but slightly higher.

PUBLICITY

Restraint enforcement is by nature more covert than other forms of enforcement such as random breath testing or overt speed detection. For this reason, it is difficult to increase the perceived risk of apprehension, and general deterrence of the behaviour, without high publicity of enforcement (Zaal, 1994). Future restraint enforcement operations in South Australia would benefit from high levels of publicity.

Restraint use publicity in South Australia was limited to print media in the metropolitan area from 2000 to 2002. The amount spent each year has remained consistent. Advertising costs in rural regions have been much greater due to the use of television advertising campaigns since 1998. Rural restraint use increased significantly in the two years following the introduction of television advertising. The amount spent on advertising has varied over the last three years but was reduced to its lowest level in 2002. Despite the varying amounts spent on publicity, both metropolitan and rural regions experienced an increase in restraint usage rates to reach the same level of 96 per cent compliance.

5 Conclusions

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

The main findings from performance indicators for each enforced behaviour in South Australia in 2002 are summarised.

DRINK DRIVING

The level of random breath testing (RBT) has increased substantially such that the annual average rate of testing was 2 tests for every 3 licensed drivers in 2002. The current high level of RBT operations should be sustained to maintain the high perceived risk of detection.

During the past ten years, a strong association was observed between drink driving detection rates and testing after midnight suggesting detection rates were highly dependant on enforcement operations.

The involvement of illegal alcohol levels in serious and fatal crashes confirmed that the current testing pattern of 'highly visible' RBT operations designed to deter potential drink drivers should be continued. However, testing should also be conducted when drink driving rates are highest (ie after midnight) to detect drink drivers.

Roadside breath alcohol surveys provide a useful indication of driver's alcohol levels independent of enforcement practices. The last survey was conducted in 1997 in the Adelaide metropolitan area.

An inverse relationship between detection rates and publicity expenditure suggests current publicity campaigns are supporting enforcement operations.

SPEEDING

Overall, speeding detection rates in 2002 decreased, especially speed camera detection rates. However, speeding detection rates were heavily influenced by police enforcement strategies and practices.

'Excessive speed' is seriously underestimated as an apparent driver error in the TARS database. Consequently, meaningful analysis of serious casualty and fatal crashes was limited due to under-reporting bias.

Representative on-road speed surveys conducted in rural areas over the last three years are to be commended as a useful source for monitoring vehicle speeds. The rural speed surveys indicated that the mean free speed decreased from 2000 to 2002 on 100km/h roads but showed no meaningful change on 60km/h and 110km/h roads each year. Regular systematic on-road vehicle speed monitoring in the metropolitan area is required to identify trends in urban vehicle speeds.

An evaluation of anti-speeding television advertising in the metropolitan area reported small but statistically significant decreases in mean free speeds. Anti-speeding advertising continued to support enforcement operations in the metropolitan area and the media was used to publicise specific speed enforcement activity. A publicity campaign is required in rural regions to support enforcement efforts.

RESTRAINT USE

Determining the effectiveness of restraint use enforcement was very difficult because no specific restraint enforcement campaigns were undertaken. In the absence of available restraint enforcement details, the number of restraint related offences committed annually was used to provide a rough estimate of enforcement activities.

Reasonably consistent observational surveys were useful in providing an indication of restraint wearing rates over time in a number of regions. The surveys indicated that both metropolitan and rural wearing rates increased in 2002 to a level of 96 per cent, just above the national target of 95 per cent.

Restraint use by injured vehicle occupants in serious and fatal crashes was much lower than observed wearing rates for the general driving population. However the confounding nature of the relationship between crash injury and wearing rates in crashes (wearing restraints reduces injury) limited its use as an indicator of restraint use. Furthermore, better records of restraint use for all vehicle occupants in serious and fatal crashes need to be kept to improve database reliability and accuracy.

Advertising promoting restraint use in rural regions has assisted in raising observed rural restraint use. Although more money has been spent on publicity in rural regions than the metropolitan area over recent years, metropolitan and rural wearing rates remain similar. Due to the more overt nature of restraint enforcement, future restraint enforcement campaigns would benefit from high levels of publicity.

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