A national examination of Random Breath Testing and alcohol-related traffic crash rates (2000-2012)

March 2015

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This research was funded by the Foundation for Alcohol Research and Education.

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Acknowledgments

The authors wish to acknowledge and thank the Foundation for Alcohol Research and Education (FARE) for funding this research and the data custodians within each jurisdiction who provided data for this study. The authors also thank Adele Somerville, University of Queensland, for their editorial assistance. The authors also acknowledge the use of text in this report from:

> Ferris et al., (2013) Random breath testing in Queensland and Western Australia: Examination of how the random breath testing rate influences alcohol related traffic crash rates. *Accident analysis and prevention, 60*(Nov), 181–188
>
> Ferris, J. A. (2014). The impact of alcohol on society: Exploring the burden on police, ambulance, emergency departments and hospital. (PhD) The University of Queensland, St Lucia.

The correct citation for this publication is:

> Ferris, J., Devaney, M., Sparkes-Carroll, M., Davis, G. (2015). *A national examination of random breath testing and alcohol-related traffic crash rates (2000-2015)*. Canberra: Foundation for Alcohol Research and Education.

[1] World Health Organization (2010). *Global strategy to reduce the harmful use of alcohol.* Geneva: World Health Organization.

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Acronyms

ABC	Australian Broadcasting Corporation
AIL	Alcohol Ignition Lock
ARTC	Alcohol-Related Traffic Crashes
BAC	Blood Alcohol Content
CEPS	Centre of Excellence in Policing and Security
CONROD	Centre of National Research on Disability and Rehabilitation Medicine
CRS	Centre of Road Safety, New South Wales
DUI	Driving Under the Influence
EDDN	Excessive Drink-Driving Notice
ISSR	Institute for Social Science Research
LSA	Local Service Area
MPC	Monthly Per cent Change
NDS	National Drug Strategy
NHMRC RARU	National Health and Medical Research Council Road Accident Research Unit
NSCSP	National Survey of Community Satisfaction with Policing
PCA	Prescribed Concentration of Alcohol
QPC	Quarterly Per cent Change
RBT	Random Breath Testing
RID	Reduced Impaired Driving
SAPOL	South Australia Police
SD	Standard Deviation
TAC	Transport Accident Commission, Victoria

Executive summary

Random Breath Testing (RBT) is a practice where police stop motor vehicle drivers chosen by chance to measure the amount of alcohol in their system. RBT is a central and important law enforcement initiative in reducing alcohol-related road traffic accidents, which has been embraced by all jurisdictaions in Australia since the 1980s.

Australia is deemed to have the most successful RBT program internationally, measured in terms of alcohol-related traffic crash (ARTC) reductions (Erke, Goldenbeld, & Vaa, 2009). This is attributed to the high intensity of the RBT programs and the associated perception by drivers of being charged for drink-driving (Erke et al., 2009; Peek-Asa, 1999).

However within Australia, RBT programs are not implemented uniformly and their effectiveness varies considerably between the states and territories (see Harrison, Newman, Baldock, & McLean, 2003; Homel, 1988; Papafotiou-Owens & Boorman, 2011).

This research report examines the relationship between RBT and ARTC rates for each Australian jurisdiction, in order to better understand state-specific trends and to undertake a national comparison which ranks the success of the RBT programs operating in each jurisdiction.

The research draws on data spanning January 2000 – December 2012 (where available), and uses joinpoint regression (Statistical Research and Applications Branch, 2013) to evaluate and quantify any significant deviations in trends over time for each of the administrative datasets.

The research finds jurisdictions with RBT to licensed driver ratios of 1:1 or greater, New South Wales, Queensland, Victoria, Tasmania and the Northern Territory, report stable to declining ARTC trends and lower percentages of reported drink-driving (8.38 to 12.49 per cent; Australian Institute of Health and Welfare, 2011) compared with jurisdictions where the RBT ratio is 1:2 or 1:3; with the exception of the Northern Territory. The Northern Territory reports a higher percentage of reported drink-driving (14.95 per cent; Australian Institute of Health and Welfare, 2011) and a current ARTC rate of more than double that of Tasmania.

Jurisdictions with an RBT ratio of 1:2 or 1:3, South Australia, Australian Capital Territory and Western Australia, also report declining ARTC trends however these jurisdictions show higher percentages of reported drink-driving (13 to 14.56 per cent; Australian Institute of Health and Welfare, 2011).

The results suggest the relationship between RBT and ARTC rates is not clear cut. While the expected pattern between RBT and ARTC rates is observed, that is an increase in the RBT ratio is associated with a decrease in ARTC rates, this pattern is not observed for all jurisdictions. This suggests that trends for both RBT ratios and ARTC rates are likely to also be influenced by other factors such as geographic differences, varying levels of RBT publicity and educational campaigns, responses for recidivist drink-drivers (rehabilitation), and drink-driving penalties.

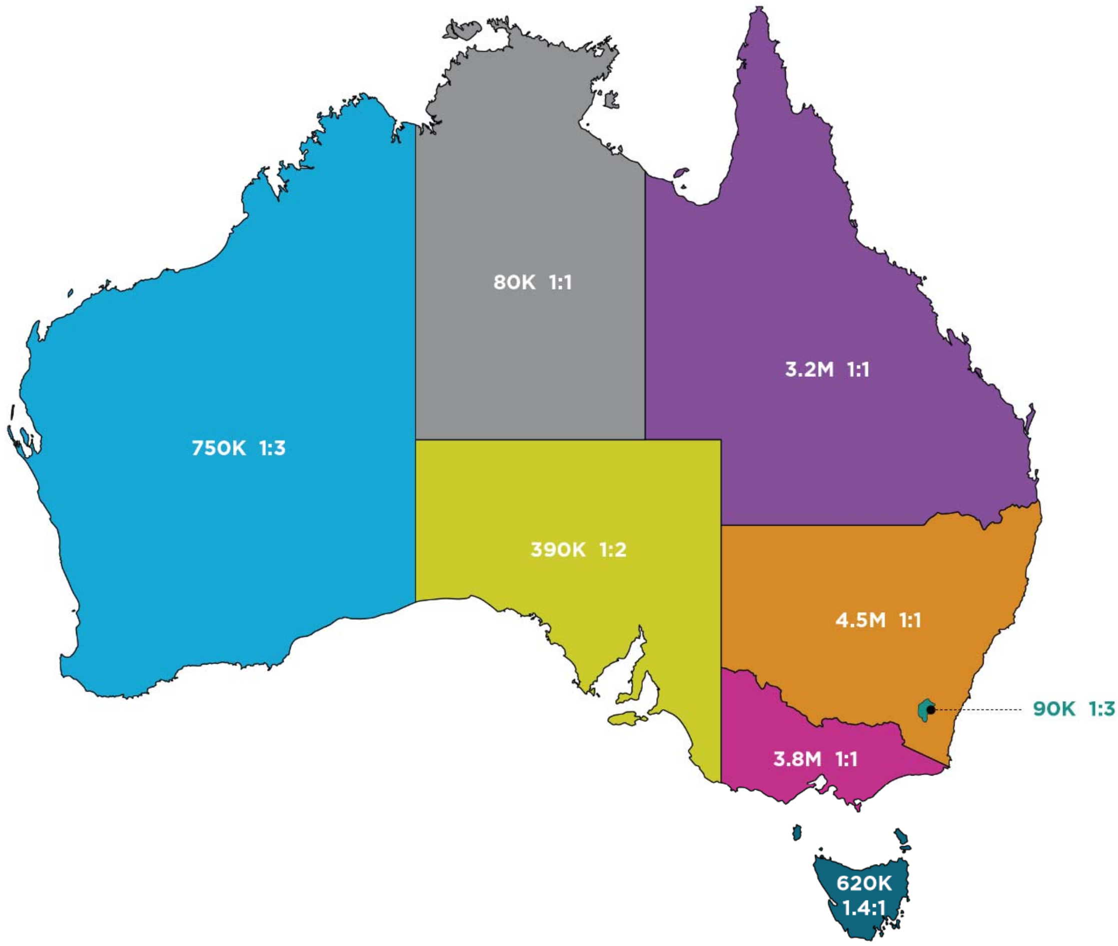

Figure 1. Number of RBTs by jurisdiction (2010) and current RBT to licensed driver ratio

After ranking all Australian jurisdictions, based on their RBT ratio, ARTC trend, and reported drink-driving in the past 12 months (Australian Institute of Health and Welfare, 2011), this research concludes that New South Wales has the most successful RBT program in the country. The lowest score was given to Western Australia (see Table 1 over page).

Table 1: Jurisdiction overview for current RBT ratio, ARTC rates and trends and reported drink-driving in 2012.

Jurisdiction	Current RBT ratio	ARTC trend	Drink-driving (%)	Criterion score	ARTC rate for last 6 months of series/ 100,000 LD†
New South Wales	1:1	Decreasing after July 2007	8.38	**20**	2.78
Queensland	1:1	Stable	9.30	**18.5**	5.27
Victoria	1:1	Decreasing after October 2005	9.50	**17.5**	1.32
Tasmania	1.4:1	Decreasing after January 2009	12.49	**16**	5.72
Northern Territory	1:1	Decreasing after August 2009	14.95	**14.5**	14.41
South Australia	1:2	Decreasing after December 2007	13.00	**13.5**	2.11
Australian Capital Territory	1:3	Decreasing	14.56	**9.5**	1.23
Western Australia	1:3	Decreasing after November 2008	13.87	**7**	5.31

† ARTC rate/month for the last six months of the series is presented in this table in order to provide context for current RBT practice, this measure was not however used in calculating the criterion scores.

Future research is recommended to examine a number of factors, other than RBT ratios, that may impact on ARTC rates such as saturated versus targeted RBT operations, geographical differences and community perceptions of drink-driving detection.

This research concludes that it is critical that RBT best practice principles are consistently monitored and maintained in each jurisdiction in order for RBT to be an effective drink-driving deterrent across all of Australia.

1 Random Breath Testing in Australia

Random Breath Testing (RBT) is the principal drink-driving law enforcement strategy used throughout Australia. The Australian community strongly supports RBT, with almost universal agreement for the Random Breath Testing of drivers (Freeman & Watson, 2009; Petroulias, 2011). Victoria introduced RBT in 1976 as an approach to reduce alcohol-related traffic crashes (ARTCs). It was adopted by other Australian jurisdictions from 1980 to 1988 (Papafotiou-Owens & Boorman, 2011). Over the period 1981 to 2006, the percentage of fatally injured motorists with a Blood Alcohol Concentration (BAC) of .05 fell by more than 35 per cent (Faulks, Irwin, Watson, & Sheehan, 2010). Most of the decline in alcohol-related traffic injuries and fatalities has been attributed to the implementation of RBT (see Harrison, Newman, Baldock, & McLean, 2003).

1.1 RBT theory and best practice principles

1.1.1 Deterrence theory applied to RBT

Deterrence theory is frequently applied to explain drink-driving behaviour (Bates, Soole, & Watson, 2012; Davey & Freeman, 2011; Freeman & Watson, 2006; Lapham & Todd, 2012). In the academic literature, deterrence refers to one of two types: general deterrence and specific deterrence. General deterrence is defined as an intervention (legislation, policy or practice) that conveys to the general public that actions and behaviours are not acceptable. Thus, applied to RBT, general deterrence occurs when the public at large avoids drink-driving because of the perceived risk of detection and the perceived certainty, severity and swiftness of the punishment following detection. Specific deterrence, on the other hand, is defined as the actions taken against an individual that alters his or her future propensity to offend. Specific deterrence, applied to RBT, occurs when someone who has been detected drink-driving and punished, avoids repeating the behaviour as a consequence (Homel, 1988b; Ross, 1984).

The success of general deterrence relies particularly on the perceived severity, certainty and swiftness of punishment (Homel, 1988). In Australia the penalties for drink-driving vary across jurisdictions (see individual state and territory chapters for a review). Given the variations in punishment by jurisdiction, it is likely that there are differing perceptions across the states of the legal consequences related to drink-driving. The actual penalty applied to an offender may affect the likelihood that a drink-driver will reoffend. Research using participants from New South Wales identified that, all other things being equal, higher fines did not act as a specific deterrent against drink-driving (Weatherburn & Moffatt, 2011).

1.1.2 RBT best practice principles

For a RBT strategy to be effective it must be perceived as truly random and ever present by the general community (Homel, 1988a, 1988b). Testing must be highly visible, unpredictable, and difficult to evade, and there must be penalties (Homel, 1988a, 1988b). This is achieved through the following best practice principles:

- Jurisdiction-wide *random* RBT*:* To maximise its general deterrent impact, RBT operation locations should be highly visible (observed in action), random and unpredictable to reinforce the perceived likelihood of detection (Homel, 1988a, 1988b; Papafotiou-Owens & Boorman, 2011).

- Jurisdiction-wide *strategically deployed* RBT: Given drink-driving offences are not committed consistently over time strategically deployed RBT operations should also be implemented. For example, enforcement during peak periods for alcohol consumption has been shown to be an effective means of deterring drink-driving and preventing night-time crashes (Delaney, Diamantopoulou, & Cameron, 2006).

- Jurisdiction-wide *enforcement* of the program: Drivers can become undeterred by evading RBTs or avoiding drink-driving penalties (Homel, 1988). To prevent driver evasion of RBTs, police should be strategically located and supported by mobile patrol vehicles to intercept drivers attempting to perform U-turns or turning into side streets to evade breath testing (Hendrie, 2003; Papafotiou-Owens & Boorman, 2011).

- *Credible* RBT program ('no one gets off'): To maintain the credibility of the RBT program and sustain the deterrence of drink-driving, drink-drivers must be swiftly penalised and never 'let off'(Papafotiou-Owens & Boorman, 2011).

- Jurisdiction-wide *publicity*: RBT needs to be supported by effective publicity campaigns (public education and media) to raise awareness and maximise the deterrent impact (Homel, 1988a, 1988b).

- Targeted *responses* for recidivist drink-drivers: Responses (e.g. rehabilitation programs) for recidivist drink-drivers are required. This group is unlikely to be influenced by deterrence-based strategies (Freeman & Watson, 2006).

It is critical that the RBT best practice principles are consistently monitored and maintained for RBT to be an effective drink-driving deterrent.

1.2 Introduction and impact of RBT in Australia

International research considers Australia to have the most successful RBT program in terms of alcohol-related traffic crash reductions in comparison to other countries (Erke, Goldenbeld, & Vaa, 2009). Peek-Asa (1999) reported that, on average, RBT in Australia reduced alcohol-related fatalities by 33 per cent and alcohol-related injuries by 17 per cent.

This outcome is attributed to the high intensity of the program (enforcement, number of stops and breath tests and increased visibility of the program). It is believed that the configuration of RBT in Australia may lead to a stronger perception by drink-drivers of being caught (Erke et al., 2009; Peek-Asa, 1999).

A survey of 1,555 Australians in 2011 found 80 per cent of the sample had seen a RBT in operation in the last six months and 37 per cent had been breath tested. Moreover, Australian RBT programs use "booze buses" in high visibility locations, state governments spend large amounts on publicity, and the total number of drivers tested in Australia is higher than in other countries (Erke et al., 2009). Nevertheless, within Australia there is considerable diversity in RBT program implementation both at the stage of first introduction and how it is implemented today (see Harrison et al., 2003; Homel, 1988a; Papafotiou-Owens & Boorman, 2011). See Figure 2 for the commencement dates of the RBT programs in each Australian state and territory.

Road blocks, introduced in Queensland and Western Australia, were pseudo RBT operations as testing was not dependent on the motorists way of driving, however the decision to breath test was dependent on police suspicion of alcohol use (Homel, 1988a). Homel (1988a) referred to this practice as ‘RBT by the back door’. Victoria’s introduction of RBT has been referred to as RBT ‘Some of the Time’ (Homel, 1988a), as it introduced RBT at a low level, episodically, and restricted operations to Melbourne metropolitan area. Victorian RBT has also used intensified periods of testing in selected areas. The introduction of RBT in South Australia, the Northern Territory and the Australian Capital Territory was characterised by low levels of enforcement and publicity, referred to as Clayton’s RBT (Homel, 1988a). In South Australia, RBT was opposed by specific interest groups and a major daily newspaper (Homel, 1988a). Public support in South Australia was also modest compared to other states (Homel, 1988a). The launch of RBT in New South Wales in 1982 was a ‘game-changer’ because it commenced immediately with a higher rate of testing than had been used anywhere else before, and a strong media campaign. The New South Wales program was referred to as RBT ‘Boots and All’ (Homel, 1988a). Tasmania introduced RBT a month after New South Wales, also in a strongly publicised and enforced ‘Boots and All’ approach (Homel, 1988a). In 1985 Tasmania police tested more than 200,000 drivers out of a driving population of 268,887.

Evaluations conducted after the introduction of RBT in Australia suggest that RBT produced long term reductions in ARTCs (M. Baldock & White, 1997; Henstridge, Homel, & Mackay, 1997; Homel, Carseldine, & Kearns, 1988). Henstridge et al. (1997) found the impact was most clear in New South Wales, where RBT reduced fatal accidents initially by 48 per cent. The initial impact of RBT ranges from 48 per cent for fatal accidents in New South Wales to 13 per cent for all serious accidents in Western Australia, and the degree of effectiveness appears to be linked to the type of program implemented (Faulks et al., 2010). The initial success of RBT was linked to the ‘Boots and All’ approaches featuring high levels of testing, sustained operations and strong media campaign support, while long term success was linked to sustained testing levels and innovation (Faulks et al., 2010). There was evidence to show a considerable deterrent effect for Tasmania, where RBT had a 24 per cent reduction on all serious accidents however there was no effect after three months (Henstridge et al., 1997). For Western Australia there was a 13 per cent initial reduction on all serious accidents which was sustained over time, and both Victoria and South Australia experienced only a slight temporary effect on casualties with RBT (Homel, 1988b). The pseudo RBT program in Queensland had an initial large deterrent effect but the effect diminished over time (Homel, 1988b). Formal RBT programs achieved accident reductions 50 per cent higher than the defacto programs in Western Australia and Queensland. Little is known about the initial impact of RBT in both territories following its introduction, except that in both territories the program began with a low levels of enforcement and low levels of publicity (Homel, 1988a). According to the Federal Office of Road Safety in 1986, the effect of the program was small but statistically significant (Homel, 1988a). The introduction of RBT in South Australia was evaluated using random roadside surveys: 30,000 drivers were sampled in three roadside breath alcohol surveys conducted in early 1981, 1982 and 1983 (McLean, Clark, Dorsch, Holubowycz, & McCaul, 1984). The first survey was run seven months before the introduction of RBT, the second five months after RBT, and the third a year after that. There was an initial reduction in the proportion of drivers above the legal limit of 0.08. Percentages over 0.08 were 2.7 (seven months before the introduction of RBT), 2.3 (five months after RBT) and 2.7 (a year after). McLean et al. (1984) concluded, initially RBT had an effect on all drinking drivers but a year later the residual effect was concentrated among light drinkers (some gave up drinking completely when driving).

Figure 2. Commencement year of pseudo RBT and RBT programs in Australia

1.3 Current RBT operations

1.3.1 Stationary and mobile RBT operations

Australian RBT operations can be either mobile or stationary. Mobile RBT involves police patrols being "authorised" to pull over any motorist anytime regardless of driver behaviour or whether a crash has occurred. After the motorist has been pulled over, the unit follows the procedure of a stationary RBT operation (Harrison et al., 2003).

A stationary operation involves the setting up of checkpoints at locations that are varied and generally not publicly announced. Motorists passing the checkpoint are randomly directed over to the side of the road and breath tested by police, who use a hand held calibration device to test the blood alcohol content of drivers (Harrison et al., 2003). Drivers are required to breathe through a small plastic tube into the device, which returns a blood alcohol concentration reading within a few seconds.

A stationary operation can be undertaken in a variety of ways: 1) an operation involving a large number of police at a fixed location using a drink-driving bus ('booze bus') for testing, 2) large coordinated operations using local resources, often at peak travel/socialising times, and 3) mobile RBT using a single vehicle (Faulks et al., 2010).

1.3.2 RBT saturation or targeting?

Some police jurisdictions in Australia saturate RBTs relative to the numbers of licensed drivers, while other jurisdictions place more emphasis on the detection of drink-drivers and utilise more targeted RBT operations (Road Safety Council, 2010). Saturated RBT operations have a random element because drivers are pulled over indiscriminately, and the sites and times of operation are deliberately varied, which contributes to a perception that anybody could be pulled over and tested anywhere and at any time (Homel, 1988a). The perception of detection ('RBT exposure') is not simply determined by the volume of RBT conducted. The perceived omnipresence of RBTs is important and a key contributor to why people alter their drink-driving behaviour. For example, as Petroulias (2011) reported in 2010, 80 per cent of the surveyed Australian population actually saw police conducting RBTs in the six months prior to the survey (higher than the 2008 and 2009 result of 75 per cent).

Notionally, both saturation and target testing should act as a means to generally deter people from drink-driving (Homel, 1988a). Evidence shows RBT loses much of its deterrent effect if enforcement levels are too low or if they are insufficiently well targeted (Collins & Lapsley, 2008). From the police perspective (Hart, Watson, & Tay, 2003), there can be confusion about the goal of RBT, with a view that "detection of drink-drivers should be the primary goal of RBT" (Hart et al., 2003, p. 5) and that the effectiveness of an RBT operation should therefore be measured by the number of drink-drivers detected. Police report some concerns about stationary operations being a means to satisfy quotas and state that they are often viewed as counterproductive to the apprehension of drink-drivers.

Australia does not have a regulatory policy that dictates how many RBTs should be conducted annually by each jurisdiction. Each state has targets that vary in their degree of formality. See Figure 2 for population size and RBT targets for each jurisdiction.

Most Australian states and territories loosely adopt an annual RBT target equivalent to one-third of the number of licensed drivers within their jurisdiction, which is largely based on the reviews of Homel and others (Henstridge et al., 1997; Homel, 1988b; Homel et al., 1988).

Henstridge et al. recommended:

> *"All states should increase high visible stationary RBT to a level equivalent to one test per licence holder per year. This could be accomplished in a cost effective manner by using general duties police, and possibly also booze buses, and by utilising the management techniques embodied in the random road-watch program" (Henstridge et al., 1997, p. 2).*

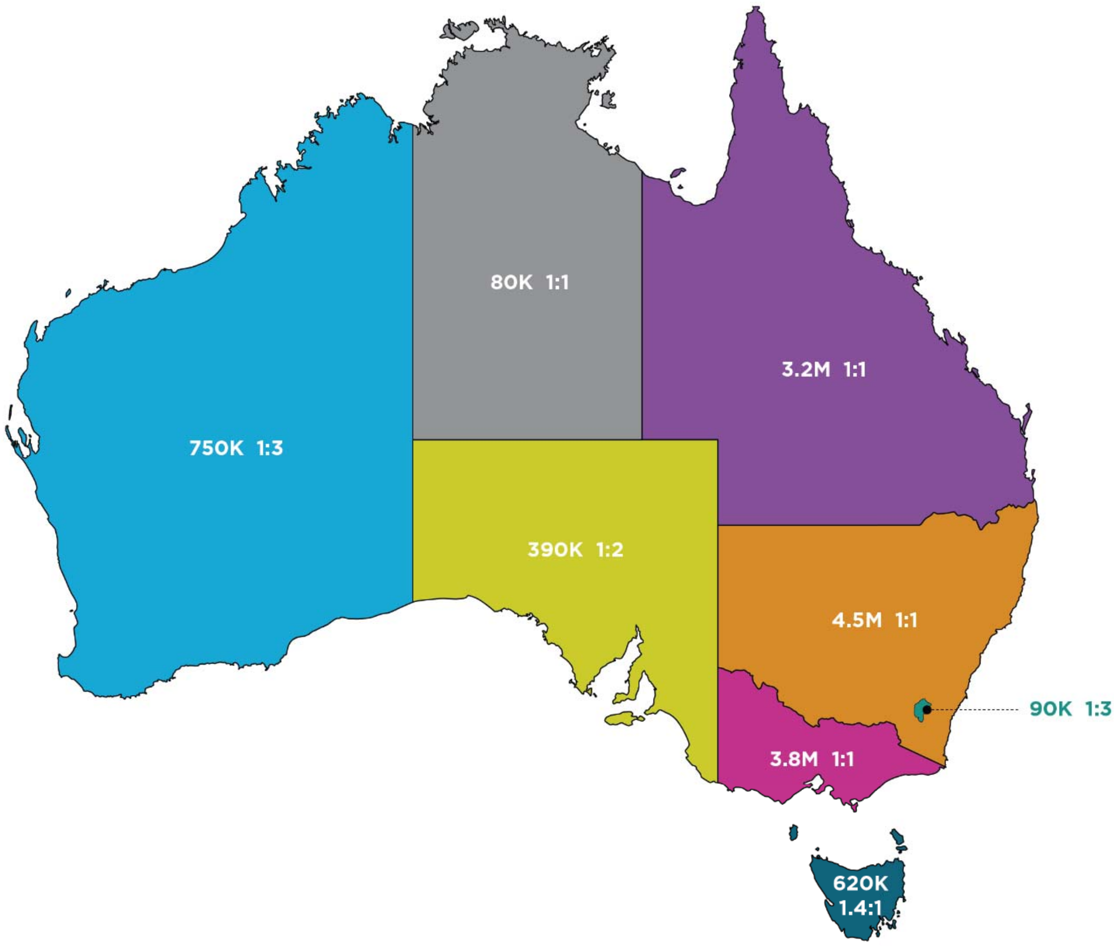

Figure 3. Number of RBTs by jurisdiction (2010) and current RBT to licensed driver ratio

While there have been considerable long-term reductions in alcohol-related fatalities in Australia, these reductions appear to have plateaued to 25-30 per cent. This may be in part due to RBT programs losing their deterrent effect. Ferris et al. (2013) explored the relationship between monthly Random Breath Testing rates and ARTC rates over time for two states, Queensland and Western Australia. The results from this paper show Queensland's alcohol-related traffic crash rate was almost half the rate of Western Australia while their RBT rate was, in some periods, over four times that of Western Australia. Moreover, it was illustrated that if the RBT ratio of 1:2 in Western Australia doubled to a ratio of 1:1, the expected number of ARTC per 10,000 RBTs should more than halve from almost 16 alcohol-related traffic crashes per month to seven.

1.4 Aims of the research

This research examines the relationship between RBT and ARTC rates for all Australian states and territories. The research will provide a series of graphical models contrasting RBT and ARTC rates after adjusting for the number of licensed drivers for all Australian jurisdictions. The results will provide an evidence base for all states and territories to hypothesise about state-specific characteristics critical to policy decisions for RBT operations in Australia.

2 Methods and data sources

Our research draws on three administrative data sources, where possible data collected spans 1 January 2000 to 31 December 2012.

2.1 Random Breath Testing data

The RBT administrative dataset includes the number of Random Breath Tests (RBTs) conducted per month, spanning January 2000 – December 2012 where available. The police departments in each jurisdiction (see list below) have assisted in the provision of data:

- Traffic & Highway Patrol Command, New South Wales Police Force
- Road Policing Command, Victoria Police
- Traffic Analysis Unit, Queensland Police Services
- Traffic Intelligence Section, South Australia Police
- State Traffic Operations, Western Australia Police
- Department of Police and Emergency Management, Tasmania Police
- Police, Fire and Emergency Services, Northern Territory
- Traffic Operations, Australian Federal Police, Australian Capital Territory

2.2 Licensed driver data

The licensed driver administrative data was provided by appropriate data custodians in each state and territory. Most data provided were annual numbers of registered licensed drivers for the years 2000 to 2011. As monthly data were required for analysis, where annual data was provided, the monthly count of registered licensed drivers was extrapolated by interpolating monthly numbers between consecutive pairs of annual numbers. While data spanning 2000 to 2011 was requested, in some jurisdictions data for this full period was not provided.

2.3 Alcohol-related traffic crash data

The ARTC administrative dataset contains a unit level count of the number of traffic crashes where an individual's recorded BAC reaches or exceeds 0.05g/ml of alcohol in blood for all jurisdictions. Data was made available by the ARTC data custodians from each jurisdiction (in most cases this was the Police Service). Limitations in the period of data were due to administrative processes. For example in Queensland the ARTC data is only available for the period spanning July 2004 to June 2009. The ARTC data was aggregated to monthly counts.

2.4 Statistical analyses

Prior to analysis, all administrative data was transformed to monthly counts. The estimated annual number of RBTs is based on a percentage (or ratio) of the annual count of licensed drivers. To present monthly RBT to licensed driver ratio we divided the annual number of licensed drivers by 12 (months).

We first use Joinpoint Regression (Statistical Research and Applications Branch, 2013) to evaluate and quantify any significant deviations in trends over time for each of the administrative datasets. This software is data driven and uses joinpoint (or piecewise) regression as a statistical method to identify significant variations in trends within epochs.

The general form of a joinpoint regression model seen in Equation 1 (Kim, Fay, Feuer, & Midthune, 2000) is for a series of observations $(x_1, y_1), \cdots, (x_n, y_n)$ where x (for all values $x_1 \leq \cdots \leq x_n$) represents the independent variable, time, and y is the dependent variable.

$$E[y_i|x_i] = \beta_0 + \beta_1 x_i + \delta_1(x_i - \tau_1)^+ + \cdots + \delta_k(x_i - \tau_k)^+ \qquad \textbf{Equation 1}$$

Where β_0, β_1 are regression coefficients

$\delta_1 \cdots \delta_k$ are the differences in slope

$\tau_1 \cdots \tau_k$ are unknown joinpoints

and $(x_i - \tau_k)^+ = (x_i - \tau_k)$ for $(x_i - \tau_k) > 0$

otherwise $(x_i - \tau_k)^+ = 0$

Joinpoint regression is an extension of simple linear regression, and as such, the underlying assumptions about the data apply. For example, it is assumed that a linear relationship between the outcome y_i and time x_i exists; that the variance of the outcome y_i is the same for all data (homoscedastic) and that the error term for the outcome y_i is independent and identically distributed (Dobson & Barnett, 2008). In this report we draw on time series count data to model trends. When using time series data the assumptions of linear regression are typically violated. For example, it is often the case that the assumption of homoscedasticity is invalid as the variance of the outcome changes with time and potentially other variables in the model (i.e., heteroscedastic). Finally, it is well known that the error terms associated with the outcome variable in a time series are often correlated (or dependent) with each other from one or more time points to the next.

$$y_i = Poisson\left(\frac{\mu_i}{licensed\ driver\ population_i}\right) \qquad \textbf{Equation 2}$$

Where $population_i$ is the state or territory population of licensed drivers

Whilst these assumptions of linear regression are violated with time series data, alternative statistical models are available that directly model heteroscedasticity and autocorrelation in the residuals. For joinpoint regression applied to time series data these statistical models can be estimated using the program (see Jiang, Qiu, & Hatcher, 2009; Kim et al., 2000) As the outcome variables used throughout this report are count data such data arises from a Poisson distribution where the functional form is right skewed. To help normalise data where rates have been adjusted to account for the number of licensed drivers, we model the data using the Poisson distribution with an offset to account for licensed driver population (see Equation 2). In particular, we have used the exact method, proposed by Dobson et al. (1991) to calculate the standard error for the event rates. For simplicity we have assumed that the error variance of the data is homoscedastic and therefore treated the variance as constant (for more details on this approach see Kim et al., 2000). While we recognised that some seasonal auto-correlation may exist, but may differ between states, to facilitate comparison between states we have modelled the data assuming uncorrelated residual errors.

Using Joinpoint Regression avoids the need to arbitrarily select a base for estimating the direction and magnitude of slopes within a data series. The software uses statistical criteria to determine when and how often the monthly per cent change (MPC) across a series by fitting rates using joined log-linear segments. We specified the model to test with the maximum number of three join points within the series and allow the calculations to adjust for any auto-correlation error estimated directly from the data. Based on the number of estimated line segments drawn from the analysis, each segment of the series is characterised by an MPC (Kim et al., 2000) and the associated 95 per cent confidence interval is indicative of the adequacy of the final model and the degree of random variation inherent in the underlying rates. In text, we have used asterisks (*) to indicate if the MPC segment is significantly different from zero. The model uses a Monte Carlo Permutation method to test if an apparent change in trend is statistically significant. A re-sampling method of 5,000 iterations is specified. For further information the reader is encouraged to visit www.surveillance.cancer.gov/joinpoint.

All descriptive analysis and the regression analysis (and associated diagnostics) estimates where undertaken using Stata (StataCorp, 2011).

2.4.1 Interpretation of Monthly Per cent Change (MPC)

To aid the interpretation of results produced by the program, we present the findings from an example data series (see Figure 4). In the example, we examine the RBT rate for the state of New South Wales. The period of analysis is monthly. The figure depicts one joinpoint commencing January 2003 (T_1). The model for this series is described in Equation 3 and the coefficients (β) of the line segments are highlighted in Figure 4. The estimated trend or monthly per cent change (MPC) for the first line segment between January 2000 and January 2003 (i.e. 2003m1) is 1.43 (95% confidence interval: 0.64 to 2.22; $p<0.001$). For the line segment between January 2003 to the end of the series December 2011 the MPC is 0.45 (0.31 to 0.59; $p<0.001$). As the confidence interval, in either line segment, does not contain zero this implies that the slope is statistically significant. If the confidence interval contains zero the trend or MPC is considered flat (i.e., not significantly increasing or decreasing).

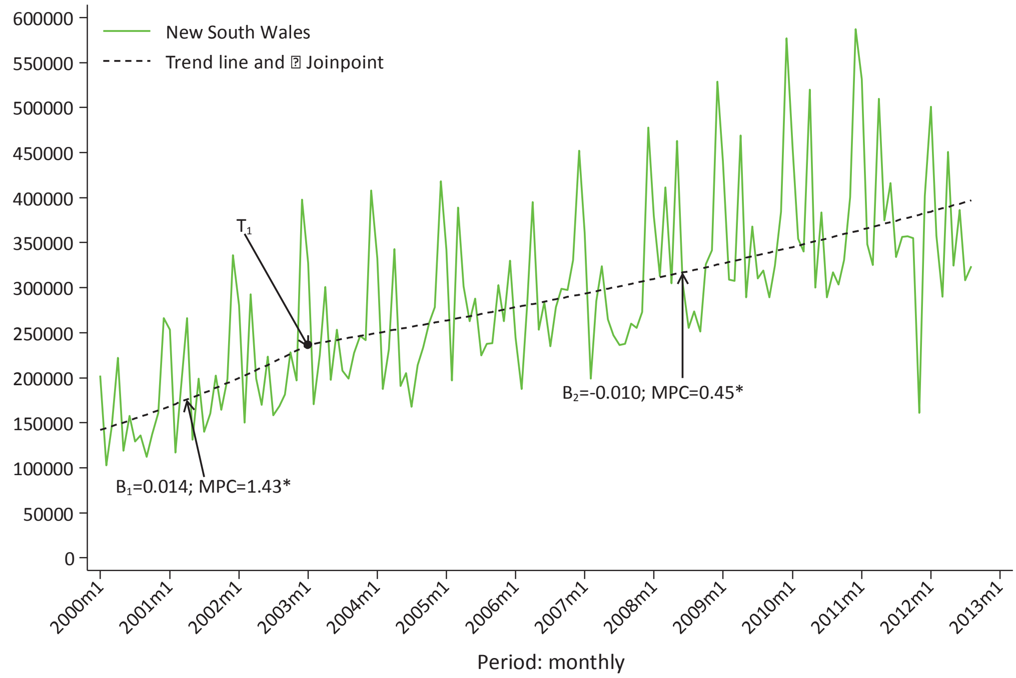

Figure 4. Illustration of joinpoint regression model using an example data series.

$$E[y|x] = 5.06 + 0.014x - 0.010(x - 2003_{m1})^{+}$$ **Equation 3**

Details of MPC segments for a particular series will be presented in the form of a point estimate, an associated confidence interval to signify significance at alpha= 0.05 (i.e., p<0.05). In the following example 1.43 (0.64 to 2.22; p<0.001) the value 1.43 represents the point estimate for rate or monthly percentage change; the values 0.64 to 2.22 represents the 95 per cent confidence interval of the point estimate. As the p-value is less than 0.05 the segment is statistically significant. For ease of reading we have used presented p-value as either the value of p if p is greater than 0.001 or p<0.001. A statistically significant MPC indicates that the slope of the segment differs statistically from zero. A 'true' zero slope is neither increasing nor decreasing over time. A positive point estimate indicates that the slope is increasing whilst a negative point estimate indicates that the slope is decreasing. If the confidence interval spans zero this suggests that the true point estimate could be zero and therefore the test cannot reject that the true slope is not zero.

3 New South Wales

New South Wales (see Table 2) is the most populous state with approximately 7.2 million people. The capital city, Sydney, is Australia's largest city with 4.6 million people; about two-thirds of the state's population live in the Greater Sydney area. There are 4.8 million licensed drivers in New South Wales. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011), 38 per cent of New South Welshmen drink alcohol at least once per week and in the past 12 months 8.4 per cent reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, New South Wales had about a 1:1 RBT to licensed driver ratio.

Table 2. New South Wales population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	7,218,529
Capital city (population)†	4,608,949
Geographical size#	0.8 million km^2
Proportion urban*	72.6%
Licensed drivers	4,893,688 (2011)
Current weekly drinkers‡	38% of population
Drink-driving last 12 months‡	8.38%
Odds Ratio of drivers admitting DUI p.a. ‡	1.0
RBT: licensed driver ratio	≈ 1:1

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

3.1 RBT: Introduction and current enforcement practices

RBT was formally introduced on 17 December 17 1982 (Homel, 1988a). During the early 1980s, public opinion polls indicated significant support for the implementation of RBT. As measured by the question, “Do you agree or disagree with random breath testing of drivers in New South Wales?” support in Sydney rose from 37 per cent in 1973 to 80 per cent in December 1982 and 91 per cent in March 1983, four months after implementation (Homel, 1988a). Homel (1988a) referred to this program as ‘RBT Boots and All’, as the program had been enforced in a vigorous manner, and had been extensively supported by high quality media publicity. The distinct elements of this approach include high exposure to RBT, extensive formal or informal publicity, randomised testing so it is difficult to predict where tests will be operating and it is hard to evade once it is in sight, and both the extensive enforcement and publicity are maintained permanently (Homel, 1990, 1994). Homel (1990) argued that this approach best operationalises the key concepts of general deterrence and provides an opportunity to evaluate the general deterrence model both as a theory and as a guide to effective action.

The implementation of RBT was well publicised, with more than one million dollars ($AUD) spent on television, print and radio advertising over Christmas 1982 and Easter 1983. The early publicity focused on the consequences of failing a RBT and centred on the memorable slogan, “How will you go when you sit for the test, will you be under .05 or under arrest?” (Homel, 1988a, p. 115). Within the first year of implementation, nearly one million preliminary breath tests were conducted, representing approximately one test for every three licensed drivers (Cashmore, 1985). Comparatively, in the year prior to the introduction of RBT, 1982, 113,985 non-random preliminary breath tests were conducted (Homel, 1988a). Further, by 1987, the fifth year of operation, more than 50 per cent of motorists in Sydney had been tested at least once, and more than 80 per cent reported having seen the program in operation (Grabosky & James, 1995).

Initial evaluations of the New South Wales RBT program was very positive, demonstrating substantial and immediate reduction effects on traffic accidents. These findings remained consistent irrespective of whether the outcome measure was alcohol-related fatalities (Homel, 1988a; Homel et al., 1988), single vehicle night-time crashes (Henstridge et al., 1997), crashes during 'high alcohol hours' (Span & Stanislaw, 1995) or total fatal crashes (Homel, 1994; Homel et al., 1988).

Further, studies have demonstrated that the positive effect of the RBT program has remained over time (Henstridge et al., 1997). For example, Homel and colleagues (1988) found an overall reduction of 22 per cent in fatal crashes and a 36 per cent reduction in alcohol-related fatalities and serious injuries which had been sustained for five years. Additionally, Henstridge and colleagues' (1997) study examined the long-term effectiveness of RBT in four Australian states. In New South Wales, RBT led to an initial reduction of 48 per cent for fatal accidents, 19 per cent for all serious accidents and 26 per cent for single vehicle night-time accidents. Overall, they found that the impact of RBT in New South Wales was instantaneous, substantial and permanent, however the magnitude of the effect varied greatly over time. This change in magnitude was first attributed to the decay of the introduction effect and second, to increasing enforcement intensity which began in 1987. Specifically, they estimated that an increase of 1,000 tests each day corresponded to a 19 per cent reduction in single vehicle night-time accidents and a six per cent decline in serious accidents.

In addition to favourable outcomes from accident data, a series of surveys conducted by the Roads and Traffic Authority identified changes in attitudes and reported behaviours of drivers since the introduction of RBT (Homel et al., 1988; Prabhakar, Lee, & Job, 2006). Five years since RBT was introduced, drivers indicated they were more likely to arrange not to drive if they planned on drinking and were more likely to view drink-driving as criminal and irresponsible (Homel et al., 1988).

Nevertheless, significant improvements in alcohol-related fatalities have appeared to plateau since the late 1990s (Faulks et al., 2010). Over the period of 1997 to 2008 and for where the BAC is known, the percentage of fatally injured New South Wales motorists with a BAC of 0.05 has varied from 25 per cent to 19 per cent, but the overall trend is for little to no reduction over the decade (Faulks et al., 2010).

ARTC are defined as a traffic incident involving at least one motor vehicle driver or rider with an illegal blood alcohol concentration. *The Road Transport (Safety and Traffic Management) Act 1999* prescribes a zero alcohol limit in New South Wales for novice licence holders commencing 3 May 2004. The zero alcohol limits mean learner and provisional licence holders may not consume any alcohol before driving. Thus the ARTC recording incorporated the zero alcohol limits for novice drivers starting in January 2005.

Within Transport for New South Wales, the Centre of Road Safety (CRS) is responsible for the collation and dissemination of road crash data. In the analyses of road crash data, results of the blood alcohol analyses are regularly obtained from the Sydney West Area Health Service's Forensic and Analytical Science Service (Transport for NSW, 2012). Before 2000, Section 8 (3) of the *Traffic Act 1909* required a road crash in New South Wales to be reported to police when any person was killed or injured; or there was property damage of more than $500. In December 1999 this legislation was repealed and replaced by new traffic legislation including the adoption of the Australian Road Rules. Under Rule 287 (3) of the Road Rules, a road crash is required to be reported to police when any person is killed or injured; when drivers involved in the crash do not exchange particulars; or when a vehicle involved in the crash is towed away (Transport for NSW, 2012).

In 1982 the RBT program initially aimed to test one in every three drivers, and this improved to one in every two drivers since the increase in implementation intensity in 1987. In 1997-98, 2.1 million Random Breath Tests were conducted, equating to approximately one in every two drivers being tested during the year long period (Harrison et al., 2003). The frequency of RBT has increased in recent years with New South Wales Police conducting 4.42 million breath tests in 2010, equating to just less than one test per licensed driver each year (Doecke & Grigo, 2011).

In 2012 it was estimated that New South Wales had conducted more than 85 million Random Breath Tests with 545,000 motorists charged with drink-driving offences and had saved an estimated 7,000 lives since the program's introduction in 1982 (Gallacher & Gay, 2012). Further, New South Wales police have implemented several RBT blitzes including Operation Paciullo, launched in summer 2012 to recognise the 30th anniversary of RBT in New South Wales (Gallacher & Gay, 2012). Operation Paciullo saw police conduct two million Random Breath Tests over four months, from December 2012 to March 2013. As a result of this operation 8,000 motorists were charged with drink-driving offences and an estimated 166 lives were saved (Feneley, 2013).

The legislative provisions related to drink-driving offences are contained in Part 5.1 of the *Road Transport Act 2013*. If an individual is caught drink-driving in New South Wales they will have to go to court. A magistrate will decide the length of licence disqualification and whether they are fined or sentenced to a term of imprisonment.

The following table shows the maximum penalties that may apply for a first time drink-driving offence:

Table 3. Penalties that may apply for a first time drink-driving offence in New South Wales

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification	Maximum term of imprisonment
Novice range- Less than 0.02 (learner, probationary or provisional licences, and drivers of particular motor vehicles)	$1,100	6 months	N/A
Special range- between 0.02 and 0.049 (see above)	$1,100	6 months	N/A
Low range- between 0.05 and 0.079	$1,100	6 months	N/A
Mid-range- between 0.08 and 0.149	$2,200	Unlimited (minimum 6 months)	9 months
High range- 0.15 and over	$3,300	Unlimited (minimum 12 months)	18 months

The penalties for repeat drink-driving offences within a five year period can include:

- Having your licence disqualified for a minimum of two years for a high range offence
- Being fined up to $5,500
- Having your car fitted with an alcohol interlock system or
- Being sentenced to a maximum imprisonment term of two years.

In New South Wales if a driver refuses a breath test they can be fined up to $1,100. If a driver refuses a breath analysis or wilfully alter their BAC they can be fined up to $5,500 and be sentenced up to 18 months imprisonment.

Furthermore, drink-drivers charged with any of the offences listed below will have their licence immediately suspended if:

- They are charged with a mid-range or high range drink-driving offence (0.08 BAC and over) or
- They fail to provide police with a specimen of breath or blood when requested.

The immediate suspension will end when the drink-driving charge has been dealt with by the court, is withdrawn or discontinued.

3.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

3.2.1 Rate of RBTs

The New South Wales RBT data spans January 2000 to August 2012 (see the lower data series in Figure 5). During this period the minimum monthly rate of RBTs conducted was 102,498 (February 2000); the maximum rate of RBTs was 587,464 (December 2010). The mean rate of RBTs conducted across the period was 288,461 (SD 100,724). For the first six months of the series the average monthly rate of RBTs conducted in New South Wales was 158,364 (SD 46,536); this increased to 347,298 (SD 60,110) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates. The first section is between January 2000 and January 2003, and the MPC for this section was 1.43 (0.64 to 2.22; $p<0.001$). The second section is between January 2003 and August 2012, and the MPC for this section was 0.45 (0.31 to 0.59; $p<0.001$). This suggests that the estimated monthly rate of RBTs significantly increases by 1.43 per cent between two consecutive months until January 2003, and then the estimated monthly RBT rate reduces to 0.45 per cent for the remainder of the series.

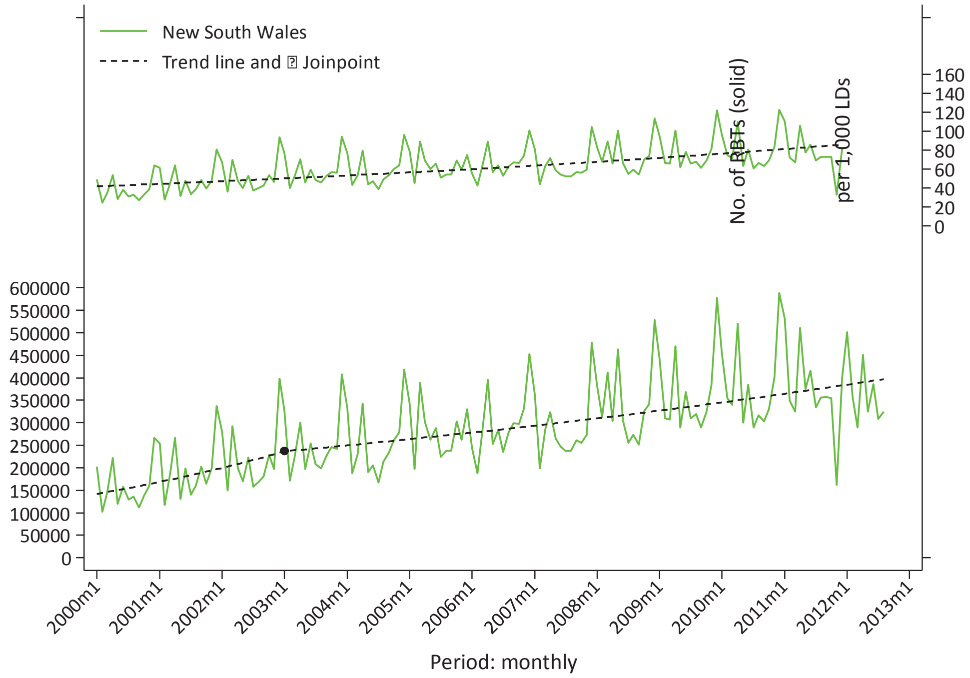

Figure 5. New South Wales: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

3.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 5 represents the RBT rate after accounting for the population of licensed drivers in New Sales Wales. The data spans January 2000 to December 2011 as New South Wales annual licensed driver data was not available for 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 24.75 (February 2000); the maximum rate of RBTs was 122.61 (December 2010). The mean rate of RBTs conducted across the period was 63.27 (SD 20.38). For the first six months of the series the average monthly rate of RBTs conducted in New South Wales was 38.24 (SD 11.24); this increased to 67.27 (SD 17.34) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly RBT rates per 1,000 licensed drivers. The MPC for the series was 0.50 (0.40 to 0.60; p<0.001). This suggests that the estimated monthly RBT rate, after adjusting for the number of licensed drivers, significantly increases by 0.50 per cent between any two consecutive months.

3.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

3.3.1 Rate of ARTCs

The New South Wales ARTC data spans January 2001 to December 2012 (see the lower data series in Figure 6). During this period the minimum monthly rate of ARTCs reported was 94 (February 2012); the maximum rate of ARTCs reported was 245 (July 2000). The mean number of ARTCs reported across the period was 162 (SD 32). For the first six months of the series the average monthly rate of ARTCs reported in New South Wales was 209 (SD 23); this decreased to 121 (SD 11) for the last six month period.

The trend line suggests that there were three significant deviations across the series in the monthly ARTC rates. The first section is between January 2000 and May 2002; the MPC for this section was −0.05 (−0.58 to 0.49; p=0.864). The second section is between May 2002 and May 2004; the MPC for this section was −1.29 (−2.00 to −0.58; p<0.001). The third section is between May 2004 and August 2007; the MPC for this section was 0.24 (−0.10 to 0.58; p=0.166). The fourth section is between August 2007 and December 2012; the MPC for this section was −0.50 (−0.66 to −0.35; p<0.001). This suggests that the estimated monthly rate of ARTCs for the first and third sections between January 2000 and May 2002 and May 2004 and August 2007, respectively, do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the second section, the ARTC rate significantly decreases by 1.29 per cent between May 2002 and May 2004, and again, in the last section, the ARTC rate significantly decreases by 0.50 per cent commencing August 2007 until the remainder of the series.

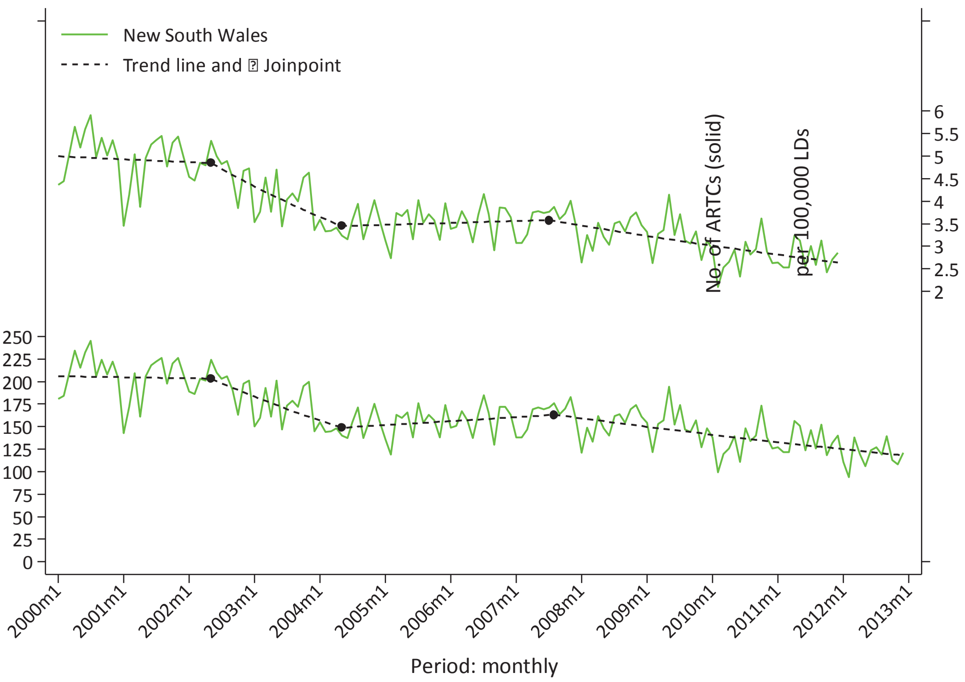

Figure 6. New South Wales: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

3.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 6 represents the ARTC rate after accounting for the population of licensed drivers in New South Wales. The data spans January 2000 to December 2011 as New South Wales annual licensed driver data was not available for 2012. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 2.09 (February 2010); the maximum rate of ARTCs was 5.92 (July 2000). The mean rate of ARTCs reported across the period was 3.76 (SD 0.84). For the first six months of the series the average monthly rate of ARTCs reported in New south Wales was 5.05 (SD 0.55); this decreased to 2.78 (SD 0.26) for the last six month period.

The trend line suggests that there were three significant deviations across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between January 2000 and May 2002; the MPC for this section was −0.11 (−0.64 to 0.43; p=0.692). The second section is between May 2002 and May 2004; the MPC for this section was −1.41 (−2.11 to −0.70; p<0.001). The third section is between May 2004 and July 2007; the MPC for this section was 010 (−0.25 to 0.45; p=0.576). The fourth section is between July 2007 and December 2011; the MPC for this section was −0.57 (−0.78 to −0.37; p<0.001).

This suggests that the estimated monthly rate of ARTCs, after adjusting for the number of licensed drivers, for the first and third sections, between January 2000 and May 2002 and May 2004 and July 2007, respectively, do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the second section, the ARTC rate significantly decreases by 1.41 per cent between May 2002 and May 2004 and again, in the last section, the ARTC rate decreases by 0.57 per cent commencing July 2007 until the remainder of the series.

3.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

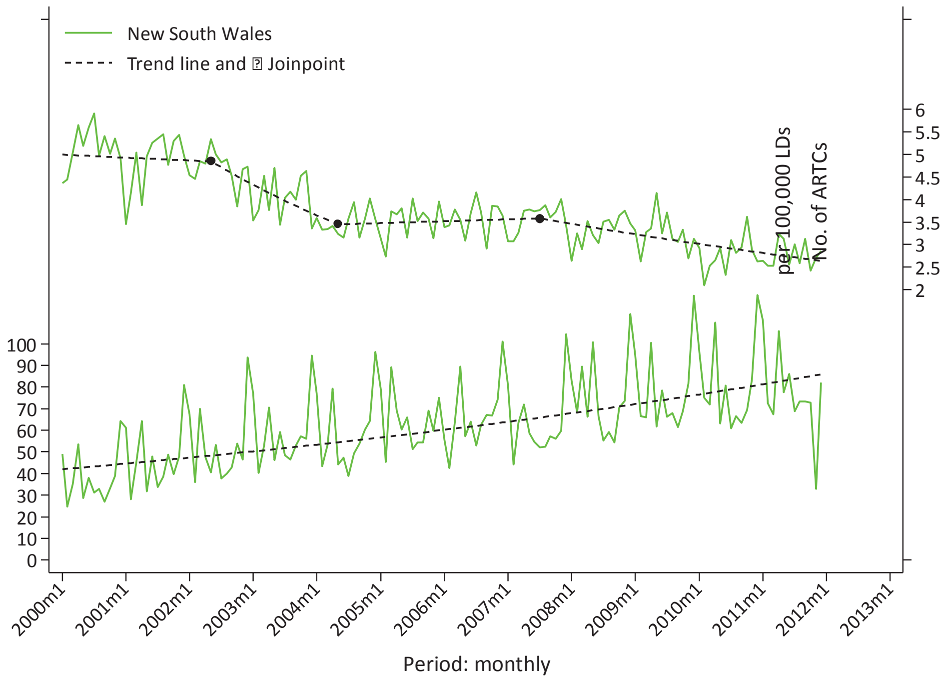

Figure 7. New South Wales: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 7 highlights, since January 2000, the rate of RBTs in New South Wales has remained stable, yet increasing. The estimated monthly RBT for the series was 0.50 per cent between two consecutive months. For the six months commencing January 2000 the estimated monthly rate of RBTs was 38.24 (SD 11.24); by the end of the series (December 2011) the estimated monthly rate of RBTs for the last six months was 67.27 (SD 17.34). In the 11 year study period the estimated monthly rate of RBTs increased by 29.04 per 1,000 licensed drivers. Based on the estimated RBT rate of the last six months of the series, the annual RBT rate of 807 per 1,000 licensed drivers is equivalent to an RBT to licensed driver ratio of 0.8:1. The ARTC trend line suggests three significant deviations across the monthly ARTC rates per 100,000 licensed drivers. The first and third sections (between January 2000 and May 2002 and May 2004 and July 2007) do not significantly differ from a flat trend. For the second section, the ARTC rate significantly decreases by 1.41 per cent between May 2004 and July 2007 and again, in the last section, the ARTC rate decreases by 0.57 per cent commencing July 2007 until the remainder of the series.

3.5 Conclusion

New South Wales has maintained a stable yet increasing RBT rate with the monthly rate of RBTs increasing by 29.04 per 1,000 licensed drivers across the series. The increasing RBT rate appears to be reflected by a flat to declining ARTC trend. The first and third sections (between January 2000 and May 2002 and May 2004 and July 2007) of the trend show a flat trend and the second and last sections (between May 2002 and May 2004 and July 2007 until the remainder of the series) show significant decreases in ARTC rates.

4 Victoria

Victoria (see Table 4) is the most densely populated and the second most populous state overall in Australia with approximately 5.5 million people. The capital city, Melbourne, is Australia's second largest city with 4.1 million people. Geographically, Victoria is the smallest state on the mainland. There are 4.2 million licensed drivers in Victoria. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 38 per cent of Victorians drink alcohol at least once per week and in the past 12 months 9.5 per cent reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, Victoria had a 1:1 RBT to licensed driver ratio.

Table 4. Victoria population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	5,537,817
Capital city (population)†	4,169,366
Geographical size#	227,416 km^2
Proportion urban*	75%
Licensed drivers	4,200,000 (2012)
Current weekly drinkers‡	38% of population
Drink-driving last 12 months‡	9.50%
Odds Ratio of drivers admitting DUI p.a. ‡	1.15 (p=0.034)
RBT: licensed driver ratio	1:1

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

4.1 RBT: Introduction and current enforcement practices

Victoria was the first state to introduce a RBT program, initiated in July 1976. The total number of tests in 1982 was only 72,957, in comparison to New South Wale's nearly one million tests. Because of this lower number, it was referred to as the RBT 'Some of the Time' approach (Homel, 1988a). Reasons for the lower testing rate may have included the newness of the program, and the controversy with which it was met in government and by the public. The police procedure was also very different, as motorists who were over the limit were first charged on summons and wouldn't be arrested until undertaking another breath test in the police station (Homel, 1988a).

A particular distinguishing feature about the Victorian approach has been the use of intensified "blitzing" periods in predetermined areas (Homel, 1988a). The blitzing reportedly produced an immediate 24 per cent reduction in night time serious casualty accidents in the area of the blitz for two weeks after operation ceased. However, the actual impact of these blitzes is disputably exaggerated and the overall impact unclear (Homel, 1989). For instance, research by South (1988) suggests that there were other causes for the rapid decline in alcohol-related injuries and fatalities from 1977 to 1986, including publicity, education and industry initiatives. After 1983, a plateauing of driver/rider deaths over 0.05 BAC occurred (Moloney, 1995) and the evident success of the New South Wales's program encouraged Victoria to increase the overall testing rate to 314,000. While more effective, this was still well below Homel's recommended one test for every three drivers mark (Homel, 1989).

Despite a very low level of enforcement, and almost half of all preliminary breath tests being targeted, the RBT program in Victoria remains arguably successful, with a reported reduction from 49 per cent of all drivers/riders killed over 0.05 BAC in 1977 to 24 per cent in 1994 (Moloney, 1995). Transport Accident Commission (TAC) Senior Manager of Marketing Simon Strahan said close to a quarter (23 per cent) of Victorian road fatalities involves a driver or rider with a blood-alcohol concentration of greater than 0.05, with almost 80 per cent killed being male (Transport Accident Commission Victoria, 2013b). TAC further reports a significant reduction in drivers and riders dying in road crashes with an illegal blood alcohol concentration, from 114 in 1989 to 42 in 2009. The proportion of drivers and motorcycle riders killed with a BAC greater than 0.05 has declined from 38 per cent in 1987 to 24 per cent in 2012 (Transport Accident Commission Victoria, 2013a).

Evidence for the effectiveness of the program during the 90s in Melbourne is much more readily available than the same data for the regional areas (Harrison & Fitzharris, 1999). Homel (1989) suggests that due to an arguable deficiency of strong political leadership, Victorian police may not have grasped the main aim of general deterrence, and that forms of targeted testing have led to RBT avoidance, especially in the regional areas. A study by Cameron, Diamantopoulou and Dyte (1997) showed that, in regional areas, a net increase in 'high alcohol hour' crashes occurs when drivers are faced with a car and bus combination high enforcement operation. The study hypothesises that when drink-drivers are faced with high enforcement and publicity, they change their usual driving routes to favour usually unsafe minor roads. A consequent survey by Harrison (1999) of hotel patrons in rural towns revealed similar behavioural approaches to RBT avoidance. Furthermore, TAC statistics from 2012 to 2013 suggest that while in metropolitan Melbourne there has been a 20 per cent reduction in the road death toll, rural Victoria has only experienced a nine per cent drop (Transport Accident Commission Victoria, 2013a)

Melbourne today, despite having two thirds of the driving population and vehicles of Victoria, also has one of the lowest road tolls in the Western World (Moloney, 1995). Meanwhile, the number of alcohol screening tests is significantly lower since 1996 than other jurisdictions, with only 3,423,387 breath tests conducted in 2007. Much of the program's success is attributed to the RBT method program, with a strong and sustained publicity campaign (Moloney, 1995). This campaign, first instituted in Victoria and then in other Australian states and even New Zealand was found to be effective, although again there has been some controversy about the impact of other external factors (Elder et al., 2004).

Statistics on Victoria focus on recording the number of driver's fatally injured and found to have a BAC over 0.05. Drivers are required to take a preliminary breath test, and then if the driver is found to be over the legal limit for their licence type, they undergo an evidential breath test which will be accepted by the courts as evidence (Harrison & Fitzharris, 1999).

The legislative provisions related to drink-driving offences are contained in the *Road Safety Act 1986.* As with other jurisdictions, truck drivers, bus drivers, taxi drivers or probationary and learner drivers must maintain a blood alcohol level of zero, all other drivers must stay under .05 BAC. Penalties include fines, loss of licence and possible imprisonment for serious offending (VicRoads, 2013). The following table outlines the maximum penalties for a first time drink-driving offence in Victoria.

Table 5. Penalties that may apply for a first time drink-driving offence in Victoria

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification/ Demerit points	Maximum term of imprisonment
Less than 0.05 (learner or provisional licences, and professional drivers)	$352	10 points	N/A
Between 0.05 and 0.069 (special licences and full licence holders under 26 years)	$422	6 months	N/A
Between 0.05 and 0.069 (full licence holders 26 years or older)	$422	10 points	N/A
Between 0.07 and 0.149	$599	14 months	N/A
0.15 and over	Magistrate's decision	48 months	N/A
Driving Under the Influence	$2,800	Unlimited (minimum 24 months)	3 months

4.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

4.2.1 Rate of RBTs

The Victorian RBT data spans July 2000 to December 2012 (see the lower data series in Figure 8). During this period the minimum monthly rate of RBTs conducted was 11 (September 2011); the maximum rate of RBTs was 606,961 (December 2010). As seen in Figure 8 there are two substantial dips in the monthly number of RBTs conducted: the first dip spanned August to October 2001, the second dip spanned June to October 2011. These two dips represent industry action taken by Victoria Police. This industry action impacted on the collection of data by Victoria Police members (personal communication Sergeant Philip Shields, Road Policing Command, Victoria Police, 31 October 2014). For consistency with data from other states, the following RBT summaries include the data that occurred during the industrial period.

The mean number of RBTs conducted across the period was 188,408 (SD 91,347). For the first six months of the series the average monthly rate of RBTs conducted in Victoria was 119,404 (SD 14,920); this increased to 227,585 (SD 54,896) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly RBT rates until the commencement of the industrial action, at which point there was a substantial dip in the monthly rate of RBTs (in September 2011 – the monthly number of RBTs recorded was 11).

Prior to the commencement of the 2011 industrial action the trend line for the series suggests that there was no significant deviation in the monthly RBT rates. Between July 2000 and May 2011 the MPC for the series was 0.67 (0.37 to 0.96; $p<0.001$). This suggests that the estimated monthly rate of RBTs significantly increases by 0.67 per cent between two consecutive months. Following the industrial action, there was no significant deviation in the remainder of the RBT series. Between November 2011 and December 2012 the MPC for the series was −0.37 (−5.52 to 5.08; p=0.891)[2].

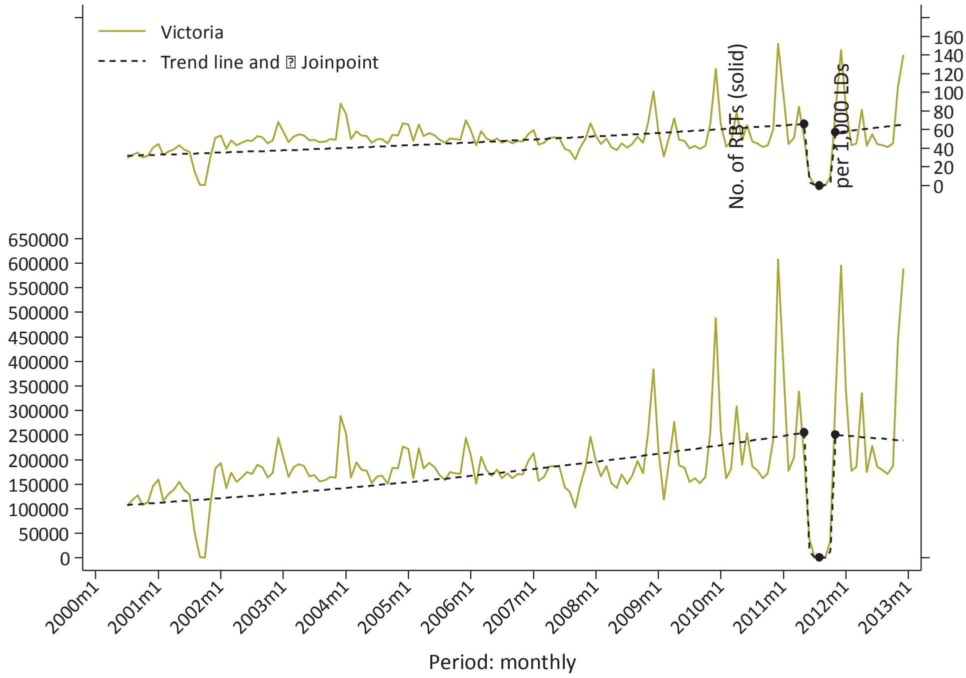

Figure 8. Victoria: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

4.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 8 represents the RBT rate after accounting for the population of licensed drivers in Victoria. The data spans July 2000 to December 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 0.00[3] (September 2011); the maximum rate of RBTs was 151.74 (December 2010). The mean rate of RBTs conducted across the period was 50.75 (SD 22.47). For the first six months of the series the average monthly rate of RBTs conducted in Victoria was 33.17 (SD 4.14); this increased to 69.82 (SD 42.50) for the last six month period.

The impact of the industrial action by Victoria Police was only significant during the 2011 period and not the 2001 period. Prior to the commencement of the 2011 industrial action the trend line for the series suggests that there was no significant deviation in the monthly RBT rates per 1,000 licensed drivers. Between July 2000 and May 2011 the MPC for the series was 0.57 (0.26 to 0.87; p<0.001). This suggests that the estimated monthly rate of RBTs, after adjusting for the number of licensed drivers, significantly increases by 0.57 per cent between two consecutive months. Following the industrial action, there was no significant deviation in the remainder of the RBT series. Between November 2011 and December 2012 the MPC for the series was 1.07 (−8.27 to 11.36;

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[2] The industrial action did result in a significant decrease in the MPC between May 2011 and August 2011 and a significant increase in the MPC between August 2011 and November 2011 but we have not reported these as it is a function of the industrial action and not changes to RBT practices.

[3] The true value was 0.0027 per 1,000 licensed drivers but this rounds to 0 at two decimal places.

p=0.828)[4]. This suggests that the estimated monthly rate of RBTs for the first section, after adjusting for the number of licensed drivers, significantly increases by 0.57 per cent between two consecutive months. Whereas, following the industrial action, the monthly rate of RBTs does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

4.2.3 Rate of ARTCs

The Victorian ARTC data spans January 2001 to December 2011 (see the lower data series in Figure 9. During this period the minimum monthly rate of ARTCs reported was one (at multiple months: March 2001, October 2001, April 2002, October 2002 and September 2003); the maximum rate of ARTCs reported was 96 (December 2006). The mean number of ARTCs reported across the period was 43 (SD 30). For the first six months of the series the average monthly rate of ARTCs reported in Victoria was 2 (SD 1); this increased to 54 (SD 8) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly ARTC rates. The first section is between January 2001 and April 2004; the MPC for this section was 3.00 (1.88 to 4.13; p<0.001). The second section is between April 2004 and October 2005; the MPC for this section was 13.84 (9.59 to 18.25; p<0.001). The third section is between October 2005 and December 2011; the MPC for this section was −0.30 (−0.71 to 0.12; p=0.160). This suggests that the estimated monthly rate of ARTCs significantly increased by 3.00 per cent between two consecutive months until April 2004. For the second section, the ARTC rate significantly increases by 13.84 per cent until October 2005 and in the last section, the ARTC rate does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

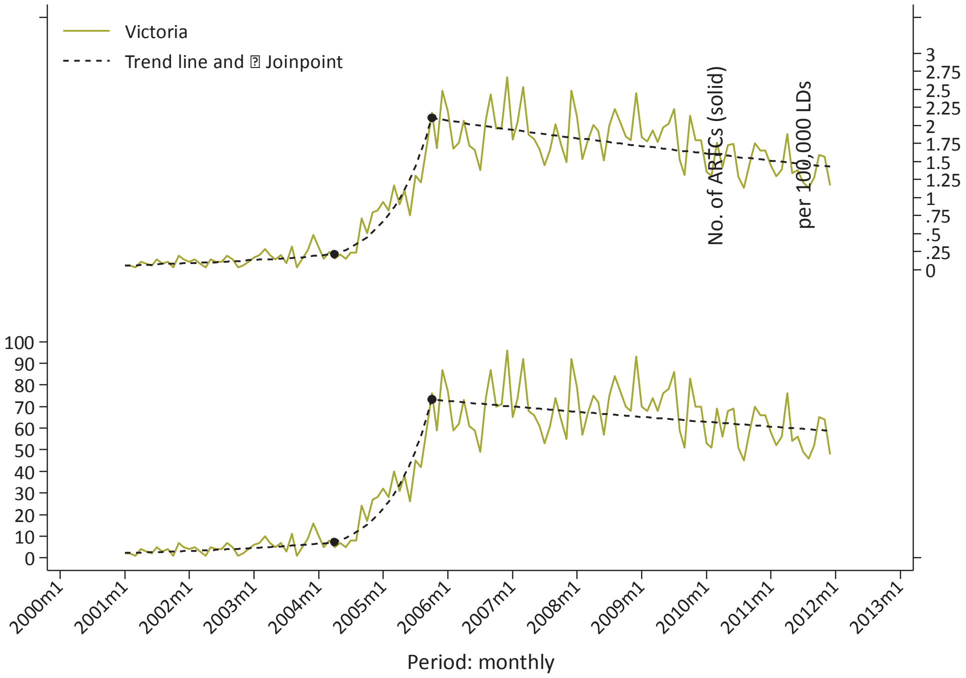

Figure 9. Victoria: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

[4] The industrial action did result in a significant decrease in the MPC between May 2011 and August 2011 and a significant increase in the MPC between August 2011 and November 2011 but we have not reported these as it is a function of the industrial action and not changes to RBT practices by Victoria Police.

4.2.4 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 9 represents the ARTC rate after accounting for the population of licensed drivers in Victoria. The data spans January 2001 to December 2011. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 0.03 (at multiple months: March 2001, October 2001, April 2002 and October 2002); the maximum rate of ARTCs was 2.67 (December 2006). The mean rate of ARTCs reported across the period was 1.15 (SD 0.80). For the first six months of the series the average monthly rate of ARTCs reported in Victoria was 0.06 (SD 0.03); this increased to 1.32 (SD 0.20) for the last six month period.

The trend line suggests that there were two significant deviations across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between January 2001 and April 2004; the MPC for this section was 3.25 (2.13 to 4.39; p<0.001). The second section is between April 2004 and October 2005; the MPC for this section was 13.59 (9.35 to 18.00; p<0.001). The third section is between October 2005 and December 2011; the MPC for this section was −0.52 (−0.93 to 0.10; p=0.014). This suggests that the estimated monthly rate of ARTCs, after adjusting for the number of licensed drivers, significantly increased by 3.25 per cent between two consecutive months until April 2004. Then the ARTC rate significantly increases by 13.59 per cent until October 2005 and in the last section, the estimated monthly ARTC rate per 100,000 licensed drivers decreases by 0.52 per cent for the remainder of the series.

4.3 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

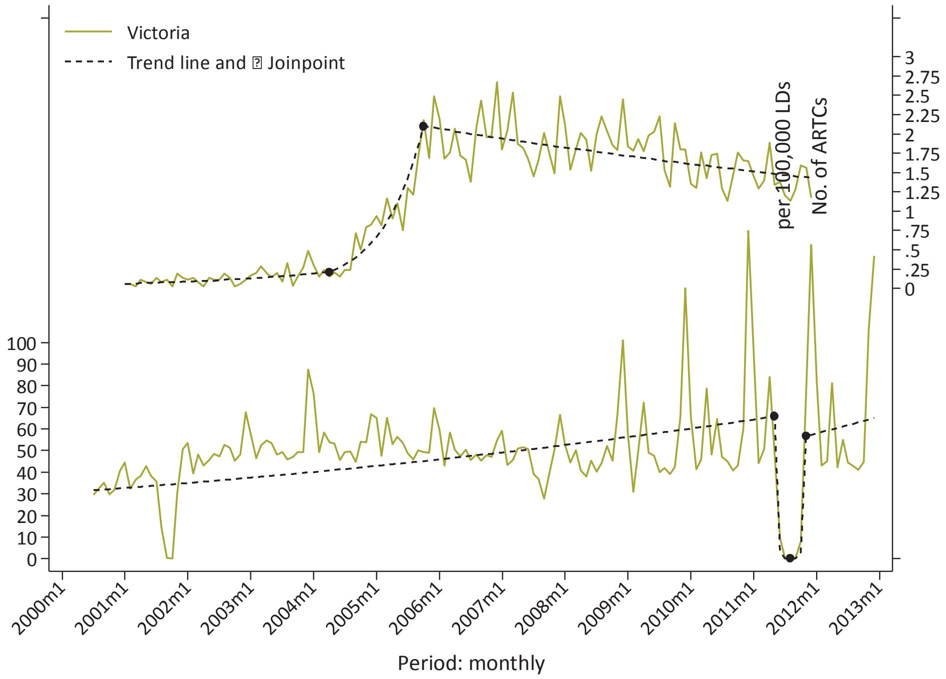

Figure 10. Victoria: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 10 depicts two significant deviations in the monthly ARTC rate. Between January 2001 and April 2004 the series was increasing; the estimated monthly ARTC rate was 3.25 per cent between two consecutive months. For the six months commencing January 2001 the estimated monthly rate of reported ARTCs was 0.07 (SD 0.03); by the end of the segment (April 2004) the estimated monthly rate of ARTCs for the last six months was 0.27 (SD 0.12). In the three years and three month period the estimated monthly rate of ARTCs increased by 20.00 per 100,000 licensed drivers. After April 2004 the estimated monthly ARTC trend significantly increased again by 13.59 per cent between two consecutive months until October 2005. For the six months commencing April 2004 the estimated monthly rate of ARTCs was 0.28 (SD 0.21); by the end of the segment (October 2005) the estimated monthly rate of ARTCs for the last six months was 1.38 (SD 0.50). In the 18 month period the estimated monthly rate of ARTCs increased by 1.09 per 100,000 licensed drivers. In the last segment, commencing October 2005 until December 2011, the ARTC rate significantly decreases by -0.52 per cent between two consecutive months. For the six months commencing October 2005 the estimated monthly rate of ARTCs was 2.00 (SD 0.34); by the end of the series (December 2011) the estimated monthly rate of ARTCs for the last six months was 1.32 (SD 0.20). In this six year period the estimated monthly rate of ARTCs had decreased by 0.67 per 100,000 licensed drivers.

4.4 Conclusion

Prior to the 2011 Victorian police industrial action the trend line for the RBT series showed a significant increase over time. Following the industrial action, the monthly rate of RBTs did not significantly differ from a flat trend. The monthly ARTC rate showed increasing trends between January 2001 and April 2004 and again between April 2004 and October 2005. Following October 2005 until December 2011, the ARTC rate significantly decreased. In this six year period the estimated monthly rate of ARTCs had decreased by 0.67 per 100,000 licensed drivers.

5 Queensland

Queensland (see Table 6) is the second-largest jurisdiction in Australia, geographically (1.7 million km2) and the third-most populous state with almost 4.5 million people. The capital city, Brisbane, is Australia's third largest city with 2.1 million people. There are 3.2 million licensed drivers in Queensland. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 41 per cent of Queenslanders drink alcohol at least once per week and in the past 12 months 9.3 per cent of Queenslanders reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, Queensland had a 1:1 RBT to licensed driver ratio.

Table 6. Queensland population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	4,476,778
Capital city (population)†	2,147,436
Geographical size#	1.7 million km^2
Proportion urban*	60%
Licensed drivers	3,252,811 (2011)
Current weekly drinkers‡	41% of population
Drink-driving last 12 months‡	9.30%
RBT: licensed driver ratio	1:1

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011).

5.1 RBT: Introduction and current enforcement practices

RBT was formally introduced in 1988 (Papafotiou-Owens & Boorman, 2011). Prior to this, a pseudo-RBT program known as Reduced Impaired Driving (RID) was the primary drink-driving enforcement tool. Homel (1988a) referred to this program as ‘RBT by the back door’. RID involved stopping motorists who were breath tested only when police had formed the suspicion that the driver had been drinking. As a result large numbers of drivers were not breath tested. In response to the greater success of RBT in other states, such as New South Wales where RBT reduced fatal accidents initially by 48 per cent (Henstridge et al., 1997), Queensland eventually introduced RBT (Hart, 2005; Homel, 1988a, 1988b).

Decreases in alcohol-related fatalities in Queensland were achieved in the late 1980s and early 1990s (Henstridge et al., 1997; Watson, Fraine, & Mitchell, 1994) due to new drinking driving laws, enforcement strategies (RBT) along with public education. The introduction of the program was associated with an 18 per cent reduction in alcohol-related fatalities (Watson et al., 1994). Further, Henstridge and colleagues (1997) found that in Queensland, RBT had an initial reduction of 18.5 per cent on serious traffic accidents and 35 per cent on fatal accidents, corresponding to reductions of 789 serious accidents and 194 fatal accidents each year.

The pseudo RBT program in Queensland had an initial large deterrent effect, with a 32.9 per cent decline in alcohol-related fatal crashes within the first 12 months of implementation, however the effect diminished (Homel, 1988b). In comparison to RBT program, the RID program had an initial reduction of 12 per cent for all serious accidents and 15 per cent for fatal accidents, equivalent to reductions of 483 serious accidents and 78 fatal accidents per year (Henstridge et al., 1997). Overall, RBT achieved accident reductions 50 per cent higher than defacto programs in Western Australia and Queensland.

Nevertheless, significant improvements in alcohol-related fatalities have plateaued in Queensland since the mid-1990s (Freeman & Watson, 2009; Hart et al., 2003; Kolesnik, 2002; Transport and Main Roads, 2010). For example, over the period of 2006 to 2011, the percentage of road fatalities where drink-driving is a contributing factor has varied between 27.5 per cent to 20.4 per cent (Centre of National Research on Disability and Rehabilitation Medicine (CONROD), 2012). Further, between 2003 and 2012, the percentage of crash causalities hospitalised that involved drink-driving varied from 11.4 per cent to 8.7 per cent, indicating a three per cent decrease over the decade however this relationship was not linear (FARE, 2013).

According to CONROD (2012) the most common type of contributing factor/characteristic in fatal crashes in Queensland during 2011 was alcohol, contributing to 33.1 per cent (n=89) of all fatalities. Illegal manoeuvres contributed to 24.5 per cent (n=66) of all fatalities during 2011, with speeding (17.8 per cent, n=48) and fatigue (15.2 per cent, n=41) also common.

Alcohol-related traffic crashes are defined as a "contributing factor where any controller involved, including pedestrians and bicycle riders, was attributed as having an "over prescribed concentration of alcohol" or were 'under influence of liquor or drug'" (CONROD, 2012, p. 5). This indicates that alcohol impairment (of any degree) was a contributing factor, not necessarily that an illegal BAC was involved (though it may have been). Further, over the prescribed concentration of alcohol is related to a driver's licence level (e.g. learner or provisional licence), vehicle type (e.g. heavy freight vehicle) or purpose of vehicle use (e.g. taxi) at the time of the crash (CONROD, 2012). The Queensland Government introduced a zero limit for learner and provisional licences on the 1 of July 2010, meaning that these licence holders may not consume any alcohol before driving (Maddison, 2010).

In response to a plateauing of alcohol-related crashes in the mid 1990s Queensland devoted more resources to RBT (Hart et al., 2003). Over recent years, the Queensland RBT program has become one of the largest within Australia which operates with a target of one test per licensed driver per annum, for example if there are 1 million licensed drivers in Queensland, one million breath tests are conducted annually. There is a strong commitment to RBT within Queensland Police and a consensus that it is an important police activity with strong community support (Hart et al., 2003).

If an individual is caught drink-driving in Queensland they will have to go to court. A magistrate will decide the length of licence disqualification and whether they are fined or sentenced to a term of imprisonment. The severity of the penalty depends on:

- BAC at the time of the offence
- Traffic history, including whether the person has been previously convicted of a drink-driving offence.

The following table illustrates the maximum penalties that may apply for a first time drink-driving offence:

Table 7. Penalties that may apply for a first time drink-driving offence in Queensland

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification	Maximum term of imprisonment
Less than 0.05 (learner, probationary or provisional licences, and drivers of particular motor vehicles)	$1,594	9 months	3 months
Between 0.05 and 0.099	$1,594	9 months	3 months
Between 0.10 and 0.149	$2,227	12 months	6 months
0.15 and over	$3,188	Magistrate's decision (minimum 6 months)	9 months

The penalties for repeat drink-driving offences can include:

- Having your car impounded (if you have a BAC 0.15 and over or fail to provide a specimen of breath or blood)
- Having your licence disqualified for up to two years
- Having your car impounded or confiscated for high range drink-driving
- Being fined up to $6,600 or
- Being sentenced to a term of imprisonment determined by the court.

In Queensland if a driver is charged with drink-driving and over the no alcohol (0.00) limit or general alcohol limit (0.05) but under the high alcohol limit (0.15) their licence will be suspended for at least 24 hours from the time BAC is confirmed as having exceeded the limit.

Furthermore, in Queensland drink-drivers charged with any of the offense listed below will have their licence immediately suspended if:

- They are charged with a low range drink-driving offence (over 0.0 but under 0.10 BAC) while an earlier drink-driving charge is still pending or were holding a replacement licence ordered by the court
- They are charged with a mid-range or high range drink-driving offence (0.10 BAC and over)
- Fail to provide police with a specimen of breath or blood when requested
- They are charged with dangerous operation of a motor vehicle while under the influence.

The immediate suspension will end when the drink-driving charge has been dealt with by the court, is withdrawn or discontinued.

5.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

5.2.1 Rate of RBTs

The Queensland RBT data spans January 2000 to December 2011 (see the lower data series in Figure 11). During this period the minimum monthly rate of RBTs conducted was 149,023 (February 2002); the maximum rate of RBTs was 359,594 (April 2011). The mean number of RBTs conducted across the period was 246,476 (SD 40,629). For the first six months of the series the average monthly rate of RBTs conducted in Queensland was 217,444 (SD 27,910); this increased to 288,019 (SD 28,261) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly RBT rates. The MPC for the series was 0.16 (0.10 to 0.22; p<0.001). This suggests that the estimated monthly rate of RBTs significantly increases by 0.16 per cent between two consecutive months.

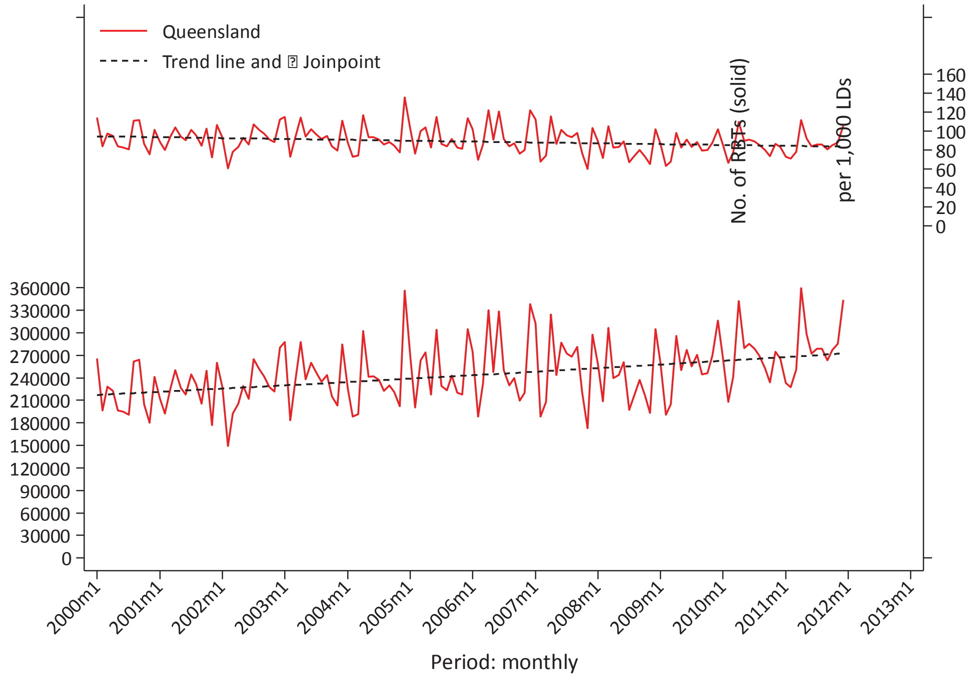

Figure 11. Queensland: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

5.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 11 represents the RBT rate after accounting for the population of licensed drivers in Queensland. The data spans January 2000 to December 2011. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 60.05 (November 2007); the maximum rate of RBTs was 135.93 (December 2004). The mean rate of RBTs conducted across the period was 90.17 (SD 14.08). For the first six months of the series the average monthly rate of RBTs conducted in Queensland was 92.99 (SD 12.19); this decreased to 88.57 (SD 8.69) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly RBT rates per 1,000 licensed drivers. The MPC for the series was −0.08 (−0.14 to −0.02; $p=0.005$). This suggests that the estimated monthly RBT rate, after adjusting for the number of licensed drivers, significantly decreases by 0.08 per cent between any two consecutive months.

5.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

5.3.1 Rate of ARTCs

The Queensland ARTC data spans July 2004 to June 2009 (see the lower data series in Figure 12). During this period the minimum monthly rate of ARTCs reported was 113 (February 2005); the maximum rate of ARTCs reported was 212 (August 2008). The mean number of ARTCs reported across the period was 154 (SD 21). For the first six months of the series the average monthly rate of ARTCs reported in Queensland was 145 (SD 16); this increased to 159 (SD 26) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly ARTC rates. The MPC for the series was 0.27 (0.08 to 0.47; $p=0.004$). This suggests that the estimated monthly rate of ARTCs significantly increases by 0.08 per cent between two consecutive months.

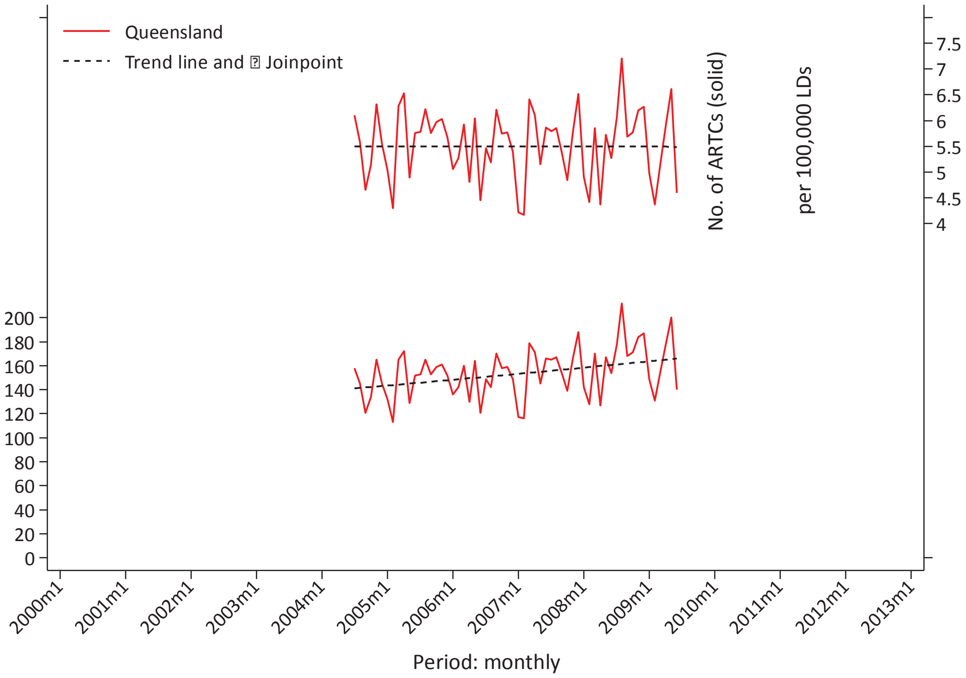

Figure 12. Queensland: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

5.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 12 represents the ARTC rate after accounting for the population of licensed drivers in Queensland. The data spans July 2004 to June 2009. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 4.16 (February 2002); the maximum rate of ARTCs was 7.20 (August 2008). The mean rate of ARTCs reported across the period was 5.54 (SD 0.69). For the first six months of the series the average monthly rate of ARTCs reported in Queensland was 5.55 (SD 0.61); this decreased to 5.27 (SD 0.84) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly ARTC rates per 100,000 licensed drivers. The MPC for the series was −0.01 (−0.20 to 0.19; p=0.953). As the MPC is not significant this suggests that the estimated monthly ARTC rate, after adjusting for the number of licensed drivers, does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

5.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

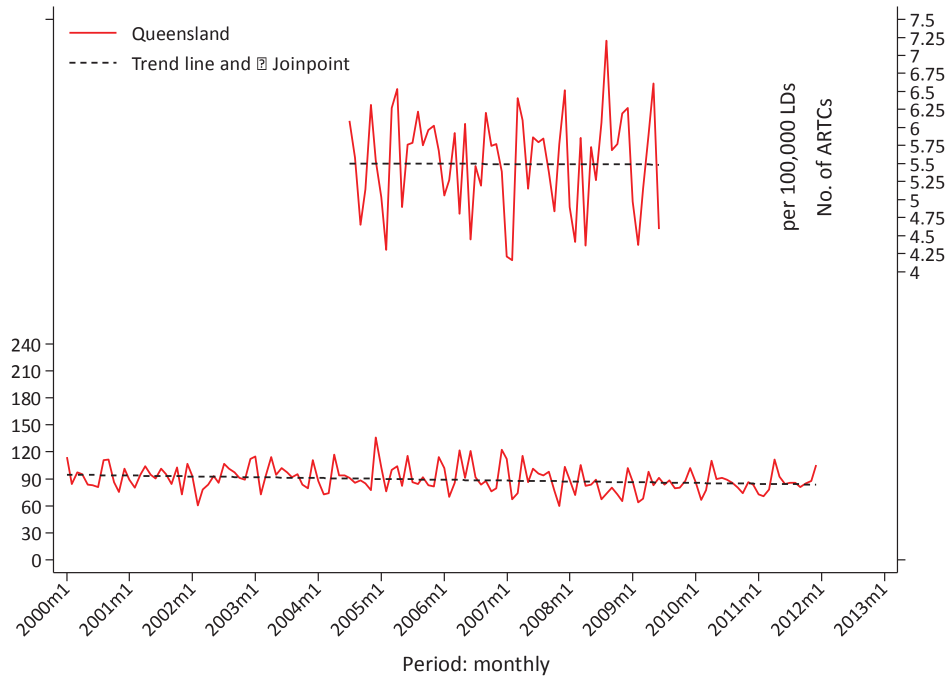

Figure 13. Queensland: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 13 highlights that, since January 2000, Queensland maintained a relatively stable monthly RBT rate. The RBT series shows no deviation across the 11 years with a mean monthly RBT rate of 90.17 (SD 14.08) per 1,000 licensed drivers. Annually, this translates to approximately 1082 RBTs per 1,000 licensed drivers which achieves Queensland targeted RBT to licensed driver ratio of 1:1. However, as noted, the MPC for the series significantly decreases by 0.08 per cent between any two consecutive months. This highlights that, whilst Queensland police are reaching the targeted RBT to licensed driver ratio of 1:1, the rate is decreasing over time. There is no significant deviation in the series for the monthly ARTC rate. The MPC for the series was not significant suggesting the estimated rate has remained flat for the five year period. The estimated monthly mean rate of ARTCs reported by Queensland police is 5.54.

5.5 Conclusion

Queensland's stable RBT rate appears to be reflected by a stable ARTC rate. Since January 2000, Queensland maintains a relatively stable monthly RBT rate, mean monthly RBT rate of 90.17 (SD 14.08) per 1,000 licensed drivers. While Queensland achieves a 1:1 RBT to licensed driver ratio, the rate is decreasing over time. The monthly ARTC rate has remained flat over the five year study period. The monthly mean ARTC rate reported by Queensland police is 5.54.

6 South Australia

With a total land area of less than 1 million km^2, South Australia (see Table 8) is the fourth largest of Australia's states and territories. With over 1.6 million people, South Australia ranks fifth in population in Australia. The majority of the people reside in the capital city, Adelaide, with 1.2 million people. There are 1.1 million licensed drivers in South Australia. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 38 per cent of South Australians drink alcohol at least once per week and in the past 12 months 13 per cent of South Australians reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, South Australia had a 1:2 RBT to licensed driver ratio.

Table 8. South Australia population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	1,639,614
Capital city (population)†	1,264,091
Geographical size#	0.98 million km^2
Proportion urban*	72.7%
Licensed drivers	1,141,912 (2011)
Current weekly drinkers‡	38% of population
Drink-driving last 12 months‡	13.00%
Odds Ratio of drivers admitting DUI p.a. ‡	1.63 ($p<0.001$)
RBT: licensed driver ratio	1:2

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

6.1 RBT: Introduction and current enforcement practices

RBT was first implemented in South Australia in October 1981. The experience of RBT in South Australia is unique because the introduction was surrounded by media controversy and limited resources were initially devoted to its enforcement. Unlike New South Wales which implemented RBT policy due to public pressure and support, the introduction of RBT was not only opposed by specific interest groups but by one of the two major daily newspapers (Homel, 1990). *The News* was so strongly opposed to the law that it referred to the first apprehended offender as a “victim” (Homel, 1988a). Partially due to media opposition, the initial enforcement of RBT was very low key with only two RBT units operating in the Adelaide metropolitan area and only very few officers trained to use the RBT equipment in rural areas. Homel (1988a) referred to this program as ‘Clayton’s RBT’ and is characterised by legislation but low levels of enforcement and limited official publicity.

Evaluations of the initial program consequently lead to redevelopments in 1986. The South Australian government aimed to emulate the New South Wales RBT strategy by intensifying enforcement and official publicity. The program aimed to increase testing to a target of one test per every three licensed drivers per annum. Further improvements focused on making RBT sites less predictable and making it more difficult for drivers to evade testing once it is in sight. Other significant developments to the RBT program included significantly increasing enforcement once again in 1997, the introduction of mobile RBT on a limited basis (i.e. long weekends, school holidays) in September 2003 and further enabling mobile breath testing to be conducted on a full-time basis in July 2005 (L. Wundersitz & Woolley, 2008).

Unlike other jurisdictions, independent surveys were conducted to evaluate the effects of drink-driving interventions. The NHMRC Road Accident Unit (RARU) conducted around 40,000 late night breath alcohol surveys of non-accident involved drivers in Adelaide between 1979 and 1993, and again in 1997. In an initial evaluation, there was a slight temporary decline in the proportion of drivers with a positive BAC reading and drivers above the legal limit (then 0.08 BAC) (Homel, 1990). However, by the third year of testing, drink-driving rates had returned to pre-testing levels.

After considerable changes to the RBT program beginning in 1986, the effectiveness of RBT in changing drink-driving behaviours and perceptions improved considerably. Kloeden and McLean (1997) found that from 1987 to 1997 there had been a reduction of 69 per cent in the proportion of drivers at or above 0.05 BAC and a reduction of 72 per cent in the proportion of drivers at or above 0.08 BAC. In addition, survey data revealed significant changes in drivers' perceptions towards drink-driving detection and behaviours. Specifically 75.2 per cent of drivers believed their risk of being caught by the police, at least occasionally, while over the limit in 1997, compared to 59.1 per cent in 1987 (Kloeden & McLean, 1997).

During the 1990s, there was a significant reduction in motorist fatalities where the driver had a known BAC of over 0.05. For example in 1993, 53.4 per cent of driving fatalities involved a driver over the legal limit compared to 26.92 per cent of driving fatalities in 1999 (2007). However significant improvements in alcohol-related fatalities have appeared to plateau since the start of the 21st century (2007; L. N. Wundersitz, Doecke, & Baldock, 2010). Over the period of 2000 to 2008 and for where the BAC is known, the percentage of fatally injured motorists with a BAC of 0.05 has fluctuated from 25 per cent to 40 per cent, but the overall trend is no reduction over the decade (L. N. Wundersitz et al., 2010).

Alcohol-related traffic crashes are defined as a motor vehicle accident where the driver or motorcycle rider involved has a BAC exceeding the legal limit. In 1985 the legal BAC level for learner and probationary drivers was set at zero. In 1991 the legal BAC limit for full licence holders changed from 0.08 to 0.05 BAC. A compulsory blood test is required for people over 14 years old involved in a traffic accident who is either seriously or fatally injured in the accident (L. Wundersitz & Woolley, 2008). Seriously injured 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" (Doecke & Grigo, 2011, p. 18). A fatality is a person who dies within 30 days of a crash as a result of injuries sustained in that crash.

Drink-driving enforcement is the responsibility of the South Australia Police's (SAPOL) 14 Local Service Areas in South Australia. Six LSAs are located in metropolitan Adelaide and eight LSAs are in rural South Australia (Doecke & Grigo, 2011). In 2010 the percentage of licensed drivers tested was 63.9 per cent, exceeding the SAPOL target level of testing one in every two drivers per annum (Doecke & Grigo, 2011). RBT strategies are different for metropolitan and rural South Australia. In the metropolitan areas, static testing is highly visible and is used mainly for general deterrence, especially used in conjunction with mobile testing to target motorists who may try to avoid obvert operations. However in rural communities the most useful strategy is best achieved through unpredictable, smaller, covert mobile operations (Doecke & Grigo, 2011). Wundersitz and Woolley (2008, p. 5) argue that covert mobile operations are valuable in that they "provide a solution to the limited police personnel available in rural regions and the ‘grapevine effect’ known to undermine the value of a highly visible static RBT station”.

In South Australia, the legislative provisions related to drink-driving offences are contained in Section 47 of the *Road Traffic Act 1961*. There are two offences related to drink-driving: driving while having prescribed concentration of alcohol (PCA) in blood and driving under the influence (DUI). DUI means that the driver is so much under the influence of alcohol as to be incapable of exercising effective control of the vehicle and is considered a more serious offence. If a person is charged with a drink-driving offence then they will be summoned to court. A magistrate will decide the length of licence disqualification and the fine amount.

The following table demonstrates the minimum licence disqualification and maximum penalties that may apply for a first time drink-driving offence:

Table 9. Penalties that may apply for a first time drink-driving offence in South Australia

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification/ Demerit points	Maximum term of imprisonment
Category 1 offence- between 0.05 and 0.079 *	$1,100	3 months/ 4 points	N/A
Category 2 offence- between 0.08 and 0.149	$1,300	6 months/ 5 points	N/A
Category 3 offence- 0.15 and over	$1,600	12 months/ 6 points	N/A
Driving under the influence	$1,600	12 months/ 6 points	3 months

* If a driver is alleged to have committed a category 1 offence that is a first offence, they are given the opportunity to expiate the offence in accordance with the *Expiation of Offences Act 1996*. Expiation imposes a penalty of an on the spot fine, 4 demerit points and no licence disqualification.

In South Australia if a driver refuses a breath or blood test they can be fined up to $1,100, lose three demerit points and lose their licence for a minimum period of 12 months. Furthermore, learner and provisional drivers face penalties for a breach of licence conditions in addition to drink-driving charges.

The penalties for repeat drink-driving offences within three years for category one offences and five years for all other offences can include:

- Having your licence disqualified for a minimum of three years for high range offences
- Being fined up to $2,900 or
- Being required to undertake an alcohol dependency assessment.

Drink-drivers charged with any of the offense listed below will have their licence immediately suspended if:

- They are charged with a category two or category three PCA offence (0.08 BAC and over)
- They are charged with a DUI offence or
- They fail to provide police with a specimen of breath or blood when requested.

The immediate suspension will end when the drink-driving charge has been dealt with by the court, is withdrawn or discontinued.

After their disqualification period has been served, drivers who commit serious drink-driving offences are required to have their car fitted with an alcohol interlock system for a period of time equivalent to their disqualification. This mandatory alcohol interlock scheme applies to drivers who have been charged with:

- A second or subsequent category two offence within a five year period
- A category three offence
- A DUI offence or
- Failing to provide police with a specimen of breath or blood when requested.

Whilst subject to the alcohol interlock scheme, a driver can only drive a vehicle fitted with the device and the cost of fitting the interlock device will be the responsibility of the driver.

6.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

6.2.1 Rate of RBTs

The South Australian RBT data spans January 2000 to August 2012 (see the lower data series in Figure 14). During this period the minimum monthly rate of RBTs conducted was 102,498 (May 2003); the maximum rate of RBTs was 104,381 (December 2004). The mean number of RBTs conducted across the period was 53,147 (SD 15,641). For the first six months of the series the average monthly rate of RBTs conducted in South Australia was 44,115 (SD 9,828); this decreased to 39,690 (SD 6,675) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates. The first section is between January 2000 and October 2010; the MPC for this section was 0.25 (0.12 to 0.38; $p<0.001$). The second section is between October 2010 and August 2012; the MPC for this section was −2.09 (−3.90 to −0.24; $p=0.026$). This suggests that the estimated monthly rate of RBTs significantly increases by 0.25 per cent between two consecutive months until October 2010, and then the estimated monthly RBT rate reduces to 2.09 per cent for the remainder of the series.

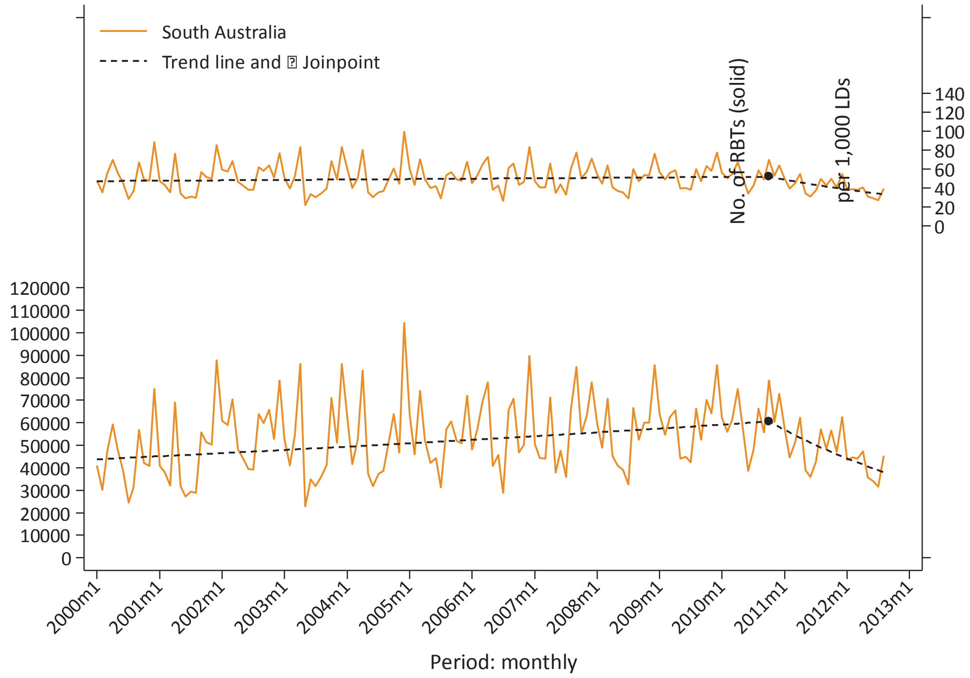

Figure 14. South Australia: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

6.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 14 represents the RBT rate after accounting for the population of licensed drivers in South Australia. The data spans January 2000 to August 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 22.16 (May 2003); the maximum rate of RBTs was 99.34 (December 2004). The mean rate of RBTs conducted across the period was 50.49 (SD 14.70). For the first six months of the series the average monthly rate of RBTs conducted in South Australia was 51.91 (SD 11.56); this decreased to 34.58 (SD 5.83) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates per 1,000 licensed drivers. The first section is between January 2000 and October 2010, and the MPC for this section was 0.07 (−0.06 to 0.20; p=0.265). The second section is between October 2010 and August 2012, and the MPC for this section was −1.99 (−3.79 to −0.16; p=0.032). This suggests that the estimated monthly rate of RBTs for the first section, after adjusting for the number of licensed drivers, does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the second section, the estimated monthly rate of RBTs significantly decreases by 1.99 per cent between two consecutive months.

6.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

6.3.1 Rate of ARTCs

The South Australian ARTC data spans January 2000 to August 2012 (see the lower data series in Figure 15). During this period the minimum monthly rate of ARTCs reported was 12 (April 2011); the maximum rate of ARTCs reported was 81 (November 2007). The mean number of ARTCs reported across the period was 39 (SD 11). For the first six months of the series the average monthly rate of ARTCs reported in South Australia was 36 (SD 10); this decreased to 24 (SD 2) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly ARTC rates. The first section is between January 2000 and November 2007; the MPC for this section was 0.22 (0.06 to 0.38; p=0.007). The second section is between November 2007 and August 2012; the MPC for this section was −1.46 (−1.79 to −1.13; p<0.001). This suggests that the estimated monthly rate of ARTCs significantly increases by 0.22 per cent between two consecutive months until November 2007, and then the estimated monthly ARTC rate reduces to 1.46 per cent for the remainder of the series.

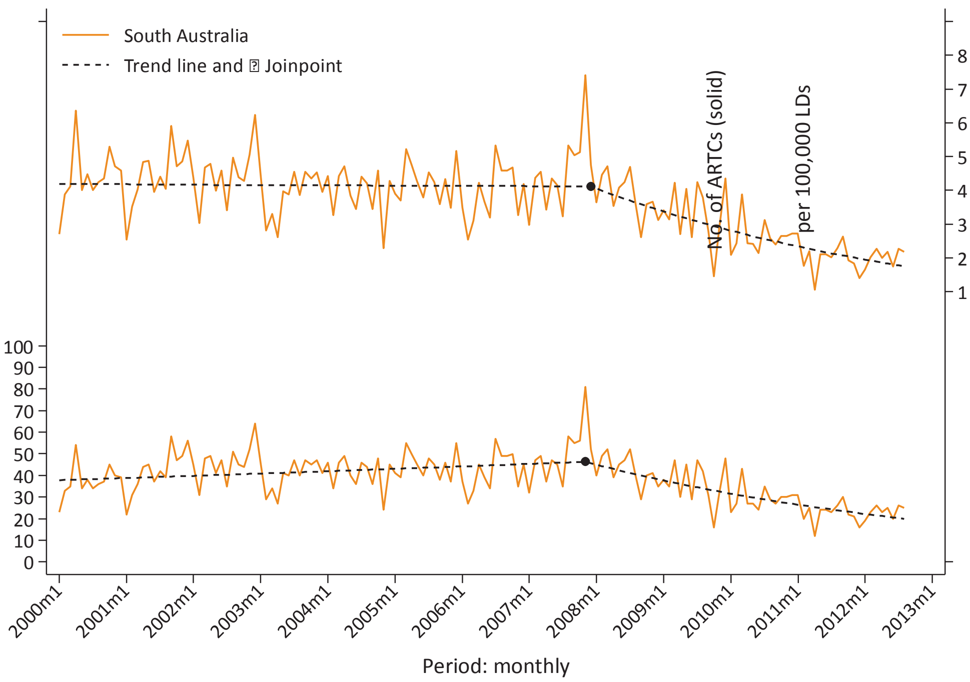

Figure 15. South Australia: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

6.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 15 represents the ARTC rate after accounting for the population of licensed drivers in South Australia. The data spans January 2000 to August 2012. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 1.06 (April 2011); the maximum rate of ARTCs was 7.41 (November 2007). The mean rate of ARTCs reported across the period was 3.71 (SD 1.11). For the first six months of the series the average monthly rate of ARTCs reported in South Australia was 4.26 (SD 1.19); this decreased to 2.11 (SD 0.20) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between January 2000 and December 2007; the MPC for this section was −0.02 (−0.17 to 0.14; p=0.832). The second section is between December 2007 and August 2012; the MPC for this section was −1.52 (−1.86 to −1.17; p<0.001). This suggests that the estimated monthly rate of ARTCs for the first section, after adjusting for the number of licensed drivers, does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the second section, the estimated monthly rate of ARTCs significantly decreases by 1.52 per cent between two consecutive months.

6.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

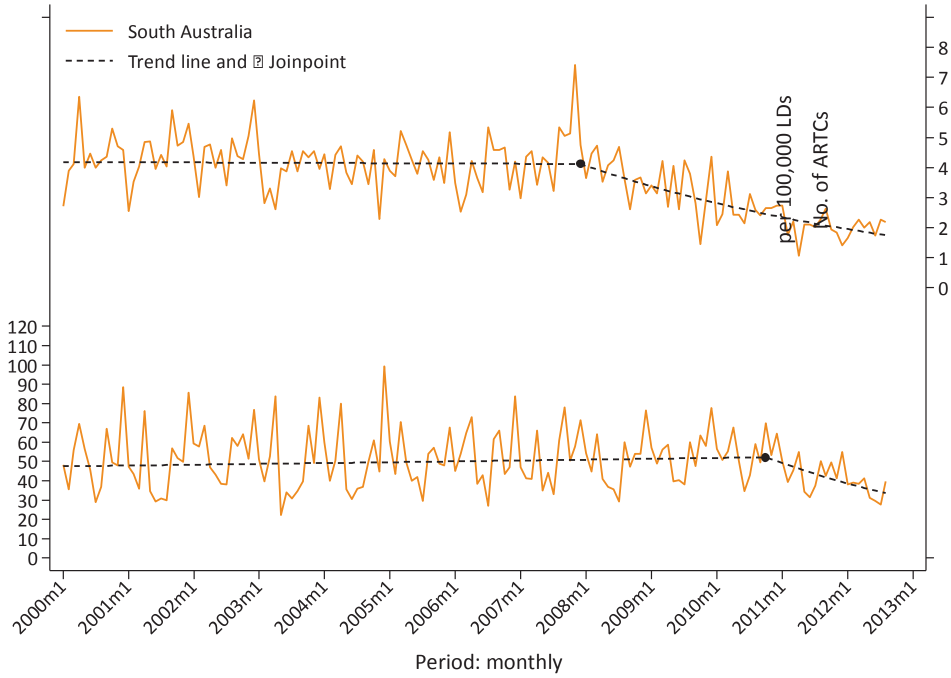

Figure 16. South Australia: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 16 highlights that, between January 2000 and October 2010, South Australia maintained a relatively stable, flat, monthly RBT rate. The mean monthly RBT rate for this period was 51.86 (SD 15.01) per 1,000 licensed drivers. Annually, this translates to approximately 622 RBTs per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.6:1. After October 2010 the estimated monthly RBT trend significantly decreases by 1.99 per cent between two consecutive months. For the six months commencing October 2010 the estimated monthly rate of RBTs was 53.71 (SD 11.49); by the end of the series (August 2012) the estimated monthly rate of RBTs for the last six months was 34.58 (SD 5.83). In the 22 months the estimated monthly rate of RBTs had dropped by 19.13 per 1,000 licensed drivers. Based on the estimated RBT rate of the last six months of the series this translates to an annual RBT rate of 415 per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.4:1.

There is one significant deviation in the series for the monthly ARTC rate. Between January 2000 and December 2007 the MPC for the series was not significant suggesting the estimated rate has remained flat for the eight year period. The estimated monthly mean rate of ARTCs reported by South Australia police for this period is 4.23 (SD 0.84). After December 2007 the estimated monthly ARTC trend significantly decreases by 1.52 per cent between two consecutive months. For the six months commencing December 2007 the estimated monthly rate of ARTCs was 4.20 (SD 0.53); by the end of the series (August 2012) the estimated monthly rate of ARTCs for the last six months was 2.11 (SD 0.20). In the four and a half years the estimated monthly rate of ARTCs had dropped by 2.09 per 100,000 licensed drivers.

In light of a stable, flat rate of monthly RBTs conducted in South Australia by the police between January 2000 and October 2010 a significant downward change in the ARTC rate was observed. This change in the ARTC rate occurred almost three years prior to the change in the rate of RBTs. Further, there was no observable effect in the ARTC rate following the observed change in the RBT rate occurring in October 2010.

6.5 Conclusion

During January 2000 to August 2012 the mean rate of RBTs conducted was 50.49 (SD 14.70) per 1,000 licensed drivers. After October 2010 the monthly RBT trend significantly decreased. By the end of the series (August 2012) the monthly rate of RBTs was 39.54. The ARTC rate remained flat for the eight year period, January 2000 and December 2007, monthly mean rate for this period is 4.23 (SD 0.84). After December 2007 the ARTC trend significantly decreases; by the end of the series (August 2012) the estimated monthly rate of ARTCs was 2.17. A significant change in the ARTC rate was observed between January 2000 and October 2010, most likely a reflection of a stable, flat rate of monthly RBTs conducted. The change in the ARTC rate occurred almost three years prior to the change in the rate of RBTs. Moreover, there was no observable effect in the ARTC rate following the observed change in the RBT rate occurring in October 2010.

7 Western Australia

Western Australia (see Table 10) is Australia' largest jurisdiction, geographically, 2.5 million km^2 occupying the entire western third of Australia. However, the majority of the population lives in the south west corner around its capital city, Perth, 1.8 million people. There are 1.4 million licensed drivers in Western Australia. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 43 per cent of Western Australians drink alcohol at least once per week and in the past 12 months 13 per cent of Western Australians reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, Western Australia had a 1:3 RBT to licensed driver ratio.

Table 10. Western Australia population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	2,353,409
Capital city (population)†	1,833,567
Geographical size#	2.5 million km^2
Proportion urban*	71.5%
Licensed drivers	1,456,480 (2011)
Current weekly drinkers‡	43.4% of population
Drink-driving last 12 months‡	13.87%
Odds Ratio of drivers admitting DUI p.a. ‡	1.76 ($p<0.001$)
RBT: licensed driver ratio	Less than 1:3

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

7.1 RBT: Introduction and current enforcement practices

Random Breath Testing was first introduced for Western Australia on 1 October 1 1988 (Stockwell, Maisey, & Smith, 1991). Before this, a form of RBT 'by the back door' was utilised by police, involving a roadblock and random stopping program (Homel, 1988a). Under this technique only around two per cent of drivers stopped actually underwent breath testing (Homel, 1988a). According to Western Australia Police Department 1988, this produced a six per cent reduction in night-time casualty crashes, however, a consequent survey and report by Loxley and Lo (1988) revealed that it was not an effective deterrent strategy, as only 18 per cent of drivers had ever been pulled over for a police breath test and 69 per cent thought it was unlikely they would be pulled over in the next month (Homel, 1989).

The perception drivers had about the chances of being required to submit to a RBT was also reflected in the rapid decline of media coverage. In the months preceding the program and immediately afterwards, a considerable amount of media attention and mass media campaigning created a high deterrence effect. However, media interest quickly died down in the first ten months of commencement, and a Traffic Board report published in 1989 found that this had an effect not only on drivers' perceptions but also on the proportion of serious night time to day time vehicle accidents (Stockwell et al., 1991).

Enforcement levels also went into rapid decline following the introduction of formal RBT, and until 1994, discretionary testing meant that only around half of all drivers pulled over were actually tested (Harrison et al., 2003). Although nationally the introduction of formal RBT corresponded to a 26 per cent reduction of single vehicle night-time accidents and 28 per cent reduction of fatal accidents (Henstridge et al., 1997), in Perth in particular, the program produced no significant change. This was partly due to 'low visibility', as both the public and the police viewed RBT as an extension of the de facto testing which preceded it (Henstridge et al., 1997).

Later, an increase in the number of tests and charges for drink-driving mirrored an increase in driver awareness and public support for the process. Still, little change was observed in the actual number of alcohol-related crashes (Ryan, Hendrie, & Allotey, 1997). Over the second year of implementation, although the number of drivers being stopped (46 in every 100) was adequate according to Homel's recommended one third, those actually tested was far below this mark (only 23 in every 100 drivers). A second year review showed that there was also significant variation between the regional areas, where approximately one in three drivers stopped were being breath tested, and the metropolitan area, where only 17 in 100 drivers were being tested (Stockwell et al., 1991).

The Traffic Board Report of 1989 indicates that the introduction of RBT in Western Australia corresponded with a reduction of 17.1 fatal, 87.1 serious, and 239.7 minor night time vehicle accidents annually (Stockwell et al., 1991). Overall serious accidents were seen to be reduced by 13 per cent, and fatal accidents by 28 per cent state wide. As mentioned above, statistics for Perth in particular are less indicative, showing only a 25 per cent reduction in single-vehicle night time crashes (Henstridge et al., 1997). Since then, Western Australia has adopted a strategic targeted approach, with less RBT testing and more arrests.

The effectiveness of this testing method is not clear. In the first 11 months of 2008, there were 833,998 RBT tests, with 260,854 Booze bus operations (Woolley & Baldock, 2009). During the 2010-2011 financial year, Western Australia Police conducted approximately 350,000 RBTs, less than 15 per cent of the driving population (Harvey, 2012). While the monthly rate of ARTCs significantly increased from 6.3 per month for the first six months of 2004 to 7.4 for the last six months of 2009, the average rate of RBTs per 1000 licensed drivers fell from 49 to 29 in the same time period (Ferris et al., 2013). According to a National Road Safety Council report (2011), in Western Australia the number of annual road deaths is 9.039 per 100,000 of the population from 2002 to 2011, significantly higher than the national average of 7.328. In terms of road deaths per jurisdiction, while New South Wales, Victoria and Queensland have experienced falls of 70, 60 and 55 per cent respectively, Western Australia has seen reductions of less than 20 per cent. In addition, deterrence is not high as Western Australians were the least likely to report having seen an RBT test being carried out in the last six months (Petroulias, 2011).

The current RBT program itself is still based upon a target of one million tests per year, with high visibility techniques including the use of booze buses, although in rural areas, RBT is primarily conducted from cars. Funding is managed from a specific percentage of state and district resources which is allocated for traffic enforcement, and local regions can apply for funding for a defined enforcement program if they are experiencing an identifiable traffic problem (Stockwell et al., 1991). During the test itself, police collect information on the driver's gender, whether the driver is on probation, whether he/she is breath tested, the result of the test, and any subsequent charges. Records are maintained on a weekly basis, and bimonthly reports containing enforcement results, crash trends and other road safety information is forwarded to senior police managers throughout the state for review.

The legislative provisions related to drink-driving offences are contained in the *Road Traffic Act 1974.* The following table show the penalties for first time drink-driving offences in Western Australia (Western Australia Police, 2014).

Table 11. Penalties that may apply for a first time drink-driving offence in Western Australia

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification/ Demerit points	Maximum term of imprisonment
Less than 0.02 (novice, probationary or extraordinary licences)	$300	3 points	N/A
Between 0.02 and 0.049 (see above)	$300	3 months	N/A
Between 0.05 and 0.059	$500	3 points	N/A
Between 0.06 and 0.069	$500	4 points	N/A
Between 0.07 and 0.079	$500	5 points	N/A
Between 0.08 and 0.089	$1,500	6 months	N/A
Between 0.09 and 0.109	$1,500	7 months	N/A
Between 0.11 and 0.129	$1,500	8 months	N/A
Between 0.13 and 0.149	$1,500	9 months	N/A
0.15 and over	$2,500	10 months	N/A

7.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

7.2.1 Rate of RBTs

The Western Australian RBT data spans January 2000 to August 2012 (see the lower data series in Figure 17). During this period the minimum monthly rate of RBTs conducted was 33,117 (February 2009); the maximum rate of RBTs was 119,661 (December 2000). The mean number of RBTs conducted across the period was 63,893 (SD 17,291). For the first six months of the series the average monthly rate of RBTs conducted in Western Australia was 92,245 (SD 11,233); this decreased to 53,355 (SD 9,683) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly RBT rates. The first section is between January 2000 and July 2008; the MPC for this section was −0.41 (−0.52 to −0.31; p<0.001). The second section is between July 2008 and October 2008; the MPC for this section was −10.63 (−43.13 to 40.44; p=0.623). The third section is between October 2008 and August 2012; the MPC for this section was 0.65 (0.29 to 1.01; p<0.001).This suggests that the estimated monthly rate of RBTs significantly decreases by 0.41 per cent between two consecutive months until July 2008. In the second section, the estimated monthly RBT rates do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months until October 2008. In the third section, the estimated monthly RBT rate then increases to 0.65 per cent for the remainder of the series.

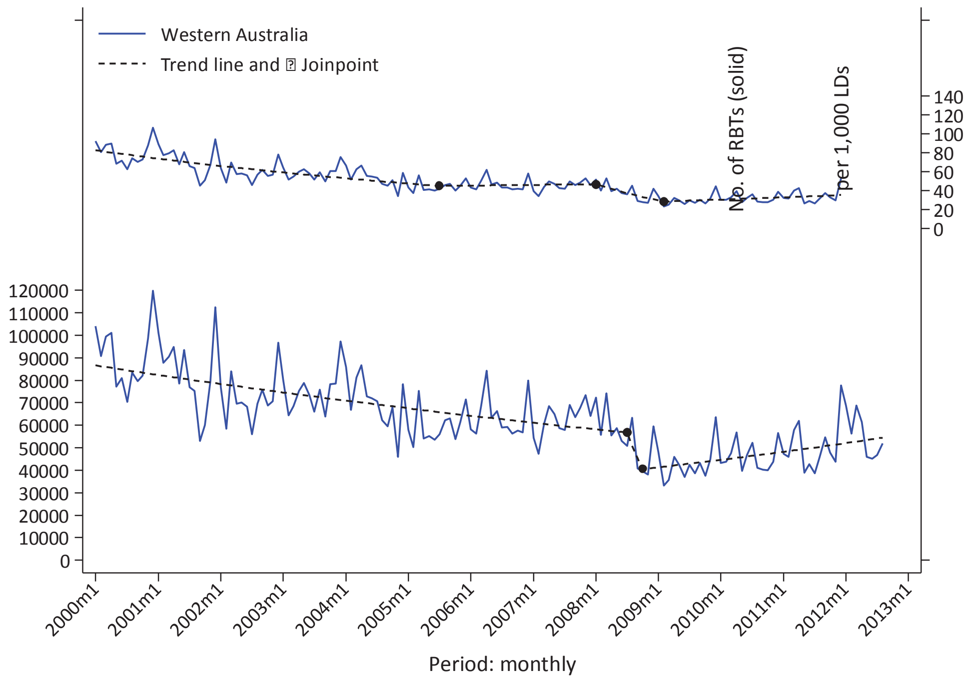

Figure 17. Western Australia: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

7.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 17 represents the RBT rate after accounting for the population of licensed drivers in Western Australia. The data spans January 2000 to December 2011. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 23.52 (February 2009); the maximum rate of RBTs was 106.46 (December 2000). The mean rate of RBTs conducted across the period was 49.88 (SD 17.21). For the first six months of the series the average monthly rate of RBTs conducted in Western Australia was 82.07 (SD 9.99); this decreased to 35.39 (SD 9.52) for the last six month period.

The trend line suggests that there were three significant deviations across the series in the monthly RBT rates per 1,000 licensed drivers. The first section is between January 2000 and July 2005, and the MPC for this section was −0.91 (−1.11 to −0.71; p<0.001). The second section is between July 2005 and January 2008, and the MPC for this section was 0.14 (−0.56 to 0.83; p=0.699). The third section is between January 2008 and February 2009; the MPC for this section was −3.71 (−6.19 to −1.17; p=0.004). The fourth section is between February 2009 and December 2011; the MPC for this section was 0.62 (0.07 to 1.17; p=0.025). This suggests that the estimated monthly rate of RBTs for the first section, after adjusting for the number of licensed drivers, significantly decreases by 0.91 per cent between two consecutive months until July 2005. For the second section, the estimated monthly RBT rates do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the third section, the RBT rate significantly decreases by 3.71 per cent until February 2009 and finally in the last section, the RBT rate increases to 0.62 per cent for the remainder of the series.

7.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

7.3.1 Rate of ARTCs

The Western Australian ARTC data spans January 2001 to December 2010 (see the lower data series in Figure 18). During this period the minimum monthly rate of ARTCs reported was 50 (at multiple months: January 2001, July 2003); the maximum rate of ARTCs reported was 128 (November 2008). The mean number of ARTCs reported across the period was 86 (SD 16). For the first six months of the series the average monthly rate of ARTCs reported in Western Australia was 71 (SD 14); this increased to 76 (SD 7) for the last six month period. The trend line suggests that there were three significant deviations across the series in the monthly ARTC rates. The first section is between January 2001 and March 2003; the MPC for this section was 28.86 (−10.56 to 85.65; p=0.169). The second section is between March 2001 and January 2003; the MPC for this section was −0.61 (−1.53 to 0.31; p=0.190). The third section is between January 2003 and November 2008; the MPC for this section was 0.62 (0.47 to 0.78; p<0.001). The fourth section is between November 2008 and December 2010; the MPC for this section was −1.70 (−2.40 to −1.00; p<0.001). This suggests that the estimated monthly rate of ARTCs for the first two sections, do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the third section, the ARTC rate significantly increases by 0.62 per cent until November 2008 and in the last section, the ARTC rate significantly decreases by 1.70 per cent for the remainder of the series.

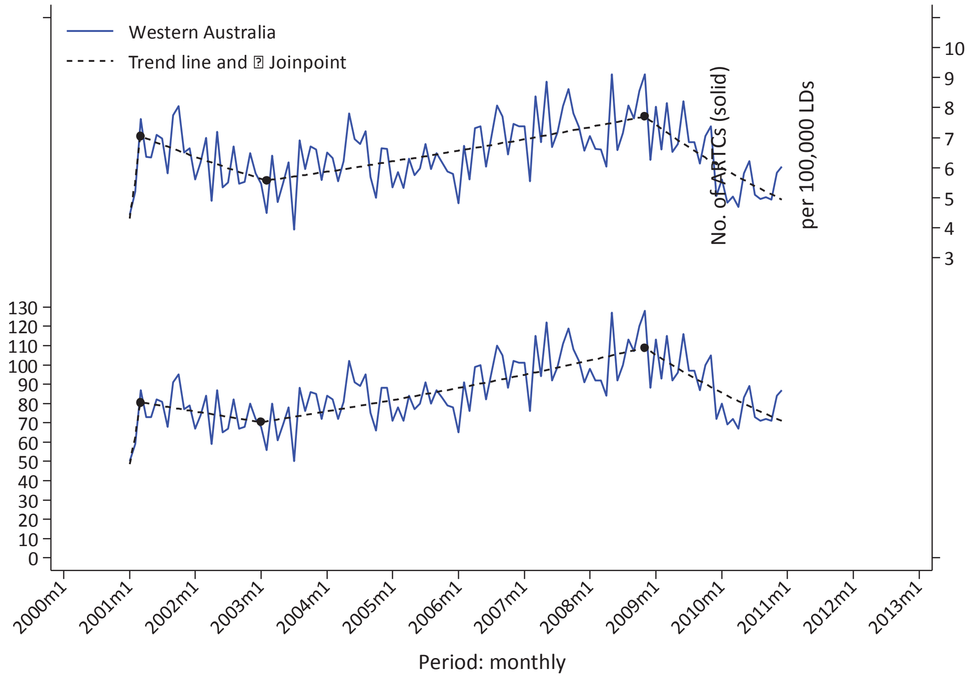

Figure 18. Western Australia: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

7.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 18 represents the ARTC rate after accounting for the population of licensed drivers in Western Australia. The data spans January 2001 to December 2010. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 3.94 (July 2003); the maximum rate of ARTCs was 9.12 (November 2008). The mean rate of ARTCs reported across the period was 6.46 (SD 1.07). For the first six months of the series the average monthly rate of ARTCs reported in Western Australia was 6.17 (SD 1.18); this decreased to 5.31 (SD 0.49) for the last six month period.

The trend line suggests that there were three significant deviations across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between January 2001 and March 2001; the MPC for this section was 28.01 (−10.68 to 83.46; p=0.174). The second section is between March 2001 and February 2003; the MPC for this section was −1.02 (−1.86 to −0.17; p=0.018). The third section is between February 2003 and November 2008; the MPC for this section was 0.47 (0.31 to 0.63; p<0.001). The fourth section is between November 2008 and December 2010; the MPC for this section was −1.77 (−2.46 to −1.07; p<0.001). This suggests that the estimated monthly rate of ARTCs, after adjusting for the number of licensed drivers, for the first section does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months. For the second section, the ARTC rate significantly decreases by 1.02 per cent until February 2003. In the third section the ARTC rate increases by 0.47 per cent until November 2008 and in the last section, the ARTC rate per 100,000 licence drivers significantly decreases by 1.77 per cent for the remainder of the series.

7.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

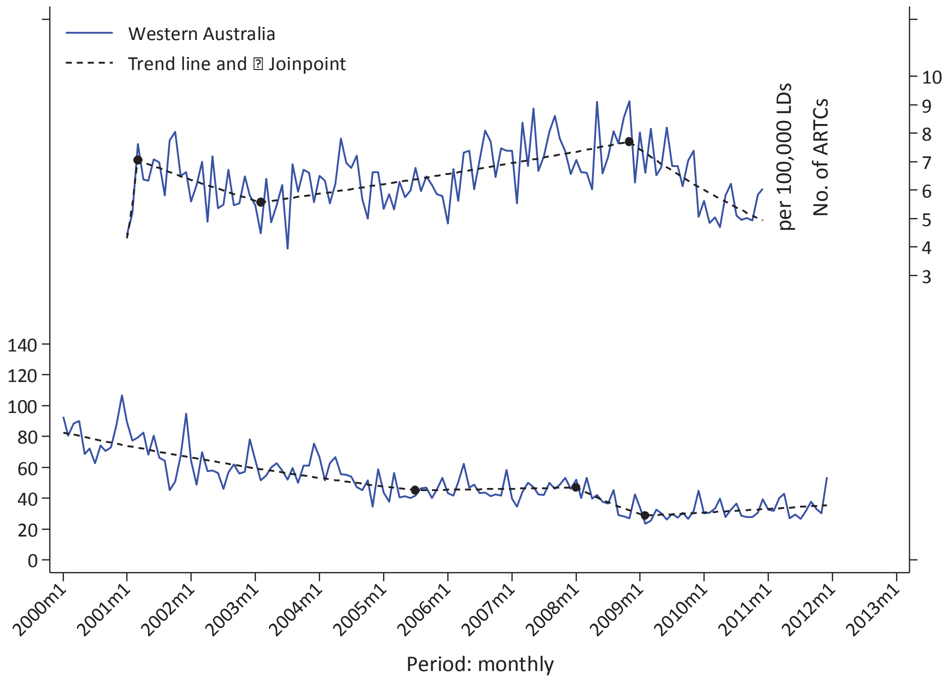

Figure 19. Western Australia: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 19 highlights that substantial variability in the RBT rate in Western Australia across the 11 years series. Between January 2000 and July 2005 the RBT rate significantly decreases by 0.91 per cent between two consecutive months. For the six months commencing January 2000 the estimated monthly rate of RBTs was 82.07 (SD 9.99); by the end of the segment (July 2005) the estimated monthly rate of RBTs for the last six months was 42.98 (SD 6.74). In the five and a half years the estimated monthly rate of RBTs had dropped by 39.09 per 1,000 licensed drivers. Between July 2005 and January 2008 the MPC for the series was not significant suggesting the estimated rate has remained flat for the two and a half year period. The estimated monthly mean rate of RBTs for this period is 46.25 (SD 5.69). After January 2008 the RBT rate in Western Australia decreased again by 3.71 per cent between two consecutive months until February 2009. For the six months commencing January 2008 the estimated monthly rate of RBTs was 44.23 (SD 6.71); by the end of the segment (February 2009) the estimated monthly rate of RBTs for the last six months was 30.73 (SD 6.67). In this one year period the estimated monthly rate of RBTs had dropped by 13.51 per 1,000 licensed drivers. In the last segment, commencing February 2009 until December 2011, the RBT rate significantly increases by 0.62 per cent between two consecutive months. For the six months commencing February 2009 the estimated monthly rate of RBTs was 27.93 (SD 3.44); by the end of the series (December 2011) the estimated monthly rate of RBTs for the last six months was 35.39 (SD 9.52). In this three and a half year period the estimated monthly rate of RBTs increased by 7.46 per 1,000 licensed drivers. Based on the estimated RBT rate of the last six months of the series this translates to an annual RBT rate of 425 per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.4:1.

There are three significant deviations in the series for the monthly ARTC rate. Between January 2001 and March 2001 the MPC for the series was not significant suggesting the estimated rate remained flat for the three month period. The estimated monthly mean rate of ARTCs reported by Western Australia police for this period is 5.75 (SD 1.67). After March 2001 the estimated monthly ARTC trend significantly decreases by 1.02 per cent between two consecutive months until February 2003. For the six months commencing March 2001 the estimated monthly rate of ARTCs is 6.70 (SD 0.65); by the end of the segment (February 2003) the estimated monthly rate of ARTCs for the last six months is 5.54 (SD 0.64). In the two years the estimated monthly rate of ARTCs had dropped by 1.16 per 100,000 licensed drivers. Between February 2003 and November 2008 the estimated monthly ARTC trend significantly increases by 0.47 per cent between two consecutive months. For the six months commencing February 2003 the estimated monthly rate of ARTCs is 7.79 (SD 1.14); by the end of the segment (November 2008) the estimated monthly rate of ARTCs for the last six months was 7.86 (SD 0.92). In the five and three-quarter years the estimated monthly rate of ARTCs increased by 2.64 per 100,000 licensed drivers. In the last segment, commencing November 2008 until December 2010, the ARTC rate significantly decreases by -1.77 per cent between two consecutive months. For the six months commencing November 2008 the estimated monthly rate of ARTCs is 7.45 (SD 1.15); by the end of the series (December 2010) the estimated monthly rate of ARTCs for the last six months was 5.31 (SD 0.49). In this two year period the estimated monthly rate of ARTCs decreased by 2.14 per 100,000 licensed drivers.

Substantial variability in both the monthly RBTs and the monthly ARTCs were observed in Western Australia between January 2000 and December 2011. Overall, the data presented in Figure 19 depicts the monthly rate of RBTs in Western Australia has been decreasing; for a substantial proportion of this time there were an observable increases in the rate of ARTCs.

7.5 Conclusion

Of all jurisdictions, Western Australia shows the greatest variability in monthly RBTs and ARTC rates between January 2000 and December 2011. Overall, the monthly rate of RBTs show decreases and for a substantial proportion of this time display increasing ARTC rates. During the study period (January 2000 to December 2011) the mean rate of RBTs conducted across the period was 49.88 (SD 17.21) per 1,000 licensed drivers. The trend for monthly RBT rates changes across the series. Between January 2000 and July 2005 the RBT rate significantly decreases, between July 2005 and January 2008 the rate remained flat, after January 2008 the rate decreased again. The mean rate of ARTCs reported across the period was 6.46 (SD 1.07). The trend line suggests significant deviations across the series after March 2001 there were significant decreases until February 2003, after which the trend increases until November 2008. Between November 2008 and December 2010 the trend decreases. In summary, it appears that for Western Australia the RBT rate shows a general declining trend and for a substantial proportion of the period an increasing ARTC trend with a turn to decline between November 2008 and December 2010.

8 Tasmania

Tasmania (see Table 12) is an island state located to the south of Australia. It has a population of over 500,000 people with almost half of which reside in the capital city of Hobart. There are 360,000 licensed drivers in Tasmania. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 40 per cent of Tasmanians drink alcohol at least once per week and in the past 12 months 12 per cent reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, Tasmania had a 1.4:1 RBT to licensed driver ratio.

Table 12. Tasmania population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	511,483
Capital city (population)†	216,273
Geographical size#	68 401 km^2
Proportion urban*	Unknown
Licensed drivers	367,489 (2011)
Current weekly drinkers‡	40% of population
Drink-driving last 12 months‡	12.49%
Odds Ratio of drivers admitting DUI p.a. ‡	1.56 ($p<0.001$)
RBT: licensed driver ratio	1.4:1

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

8.1 RBT: introduction and current enforcement practices

Tasmania introduced RBT a month after New South Wales, and began enforcing and publicising at a remarkably intense level, in what Homel referred to as a 'Boots and All' approach (1988a). In 1985 more than 200,000 roadside tests were conducted, even though the driving population was a mere 268,887 (Homel, 1988a). Tasmania, like Victoria, occasionally underwent massive blitz operations, the public announcements about which were only made by the authorities after their completion. Extensive publicity was conducted through newspapers, including a daily list of the names of convicted drink-drivers (Homel, 1988a). Largely a product of such intense enforcement, between 1983 and 1988 there was a marked decline in alcohol-related casualty crashes, with 42 per cent less fatal crashes in the three years post RBT period than for six years prior (Homel, 1988a).

A comparative study between Tasmania's RBT program and that of four states in the eastern United States served to show that the consistency and intensity with which the program in Tasmania was first enforced made for a remarkably powerful and effective initiative (Sutton, Farrar, & Campbell, 1987). In Tasmania, although there is a national target of about 300,000 preliminary breath tests per year, each district has a locally controlled Traffic Services Unit that performs most of the traffic-related work, as opposed to a centrally-controlled drink-driving unit (Harrison et al., 2003). This means that each district has a benchmark and must provide feedback about enforcement activity in its own area. Paired with the use of additional funding sources to fund specific traffic enforcement programs, these provisos can act as an encouragement to districts to perform targeted, planned operations, which can lead to less of a deterrent effect (Harrison et al., 2003).

In the rural areas in particular, the preferred detection method uses covert techniques, whereas overt bus operations are generally used to meet RBT targets. Districts have even developed techniques to detect drivers attempting to avoid the RBT, such as running a RBT on a main road for a short period of time and then shifting to minor roads. Additionally, Tasmania designates "control" sites where enforcement occurs at regular intervals and which provide an ongoing measure of offence rates (Harrison et al., 2003).

Crash data analysis in the 2000s showed that despite existing deterrent laws and penalties, drivers were deliberately flouting the drink-driving laws. This led to an amendment in 2007-8 of the *Road Safety (Alcohol and Drugs) Act 1970*, where police were given the power to serve an Excessive Drink-driving Notice (EDDN) to serious repeat offenders. 763 EDDNs were issued in the first six months of the amendment. The rate of RBTs steadily rose from 438,326 in 2003 to 702,362 in 2007 (Department of Police and Emergency Management, 2008). However, in 2007 to 2008, the proportion of drivers exceeding the prescribed level on the breath test increased from 5,923 to 6,390, even though less RBTs were actually conducted (Department of Health and Human Services, 2011). In the same period, the National Survey of Community Satisfaction with Policing 2007-2008 displayed a similar 12 per cent increase in the number of Tasmanian respondents who indicated that in the previous six months they have sometimes driven when 'possibly' over the legal blood alcohol limit (Department of Police and Emergency Management). In 2010-211, this number had again increased by nine per cent from 2009-2010 (Department of Police and Emergency Management, 2011)

Some of this may be attributed to the low proportion of static Random Breath Tests. In 2004, just over 20 per cent of breath tests conducted were static, as opposed to around 70 per cent in Queensland and 65 per cent in Victoria (L. Wundersitz & Woolley, 2008). While mobile testing methods may produce more arrests, stationary RBT methods are of higher visibility and are more suited to general deterrence (Hart, 2005).

In Tasmania, it is not compulsory to perform a blood test if a person over 15 is involved in a motor vehicle accident and attends hospital for treatment, and unlike other states, in Tasmania police officers have the power to impound a vehicle (Hart, 2005). The legislative provisions related to drink-driving offences are contained in section 17 of the *Road Safety (Alcohol and Drugs) Act 1970*. The following table outlines the maximum penalties for first time drink-driving offences.

Table 13. Penalties that may apply for a first time drink-driving offence in Tasmania

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Maximum licence disqualification	Maximum term of imprisonment
Less than 0.05 (learner, probationary or provisional licences)	$1,300	12 months	3 months
Between 0.05 and 0.099	$1,300	12 months	3 months
Between 0.10 and 0.149	$2,600	18 months	6 months
0.15 and over	$3,900	36 months	12 months

8.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

8.2.1 Rate of RBTs

The Tasmanian RBT data spans July 2003 to June 2012 (see the lower data series in Figure 20). During this period the minimum monthly rate of RBTs conducted was 30,435 (June 2005); the maximum rate of RBTs was 75,572 (December 2006). The mean number of RBTs conducted across the period was 49,689 (SD 9,282). For the first six months of the series the average monthly rate of RBTs conducted in Tasmania was 37,776 (SD 1,072); this increased to 44,999 (SD 5,137) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates. The first section is between July 2003 and December 2006; the MPC for this section was 1.42 (1.08 to 1.75; p<0.001). The second section is between December 2006 and June 2012; the MPC for this section was −0.39 (−0.55 to −0.23; p<0.001). This suggests that the estimated monthly rate of RBTs significantly increases by 1.42 per cent between two consecutive months until December 2006, and then the estimated monthly RBT rate reduces to 0.39 per cent for the remainder of the series.

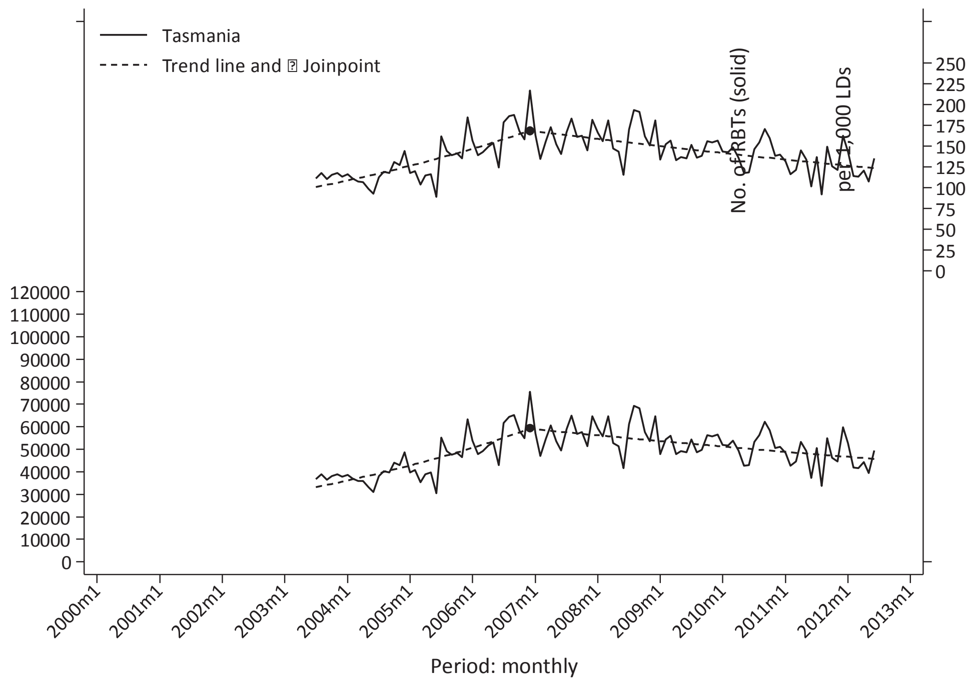

Figure 20. Tasmania: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

8.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 20 represents the RBT rate after accounting for the population of licensed drivers in Tasmania. The data spans July 2003 to June 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 89.32 (June 2005); the maximum rate of RBTs was 217.04 (December 2006). The mean rate of RBTs conducted across the period was 140.85 (SD 25.14). For the first six months of the series the average monthly rate of RBTs conducted in Tasmania was 114.34 (SD 3.09); this increased to 122.53 (SD 13.92) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates per 1,000 licensed drivers. The first section is between July 2003 and December 2006, and the MPC for this section was 1.26 (0.93 to 1.60; $p<0.001$). The second section is between December 2006 and June 2012, and the MPC for this section was −0.47 (−0.63 to −0.31; $p<0.001$). This suggests that the estimated monthly rate of RBTs for the first section, after adjusting for the number of licensed drivers, significantly increases by 1.26 per cent between two consecutive months until December 2006 and then the estimated monthly RBT rate decreases by 0.47 per cent for the remainder of the series.

8.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

8.3.1 Rate of ARTCs

The Tasmanian ARTC data spans June 2005 to September 2012 (see the lower data series in Figure 21). During this period the minimum monthly rate of ARTCs reported was 9 (September 2012); the maximum rate of ARTCs reported was 49 (at multiple months: November 2007 and March 2009). The mean number of ARTCs reported across the period was 33 (SD 9). For the first six months of the series the average monthly rate of ARTCs reported in Tasmania was 31 (SD 6); this decreased to 21 (SD 8) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly ARTCs rates. The first section is between June 2005 and January 2009; the MPC for this section was 1.07 (0.53 to 1.62; $p<0.001$). The second section is between January 2009 and July 2012; the MPC for this section was −1.30 (−1.87 to −0.73; $p<0.001$). The third section is between July 2012 and September 2012; the MPC for this section was −34.20 (−64.67 to 22.53; $p=0.180$). This suggests that the estimated monthly rate of ARTCs significantly increases by 1.07 per cent between two consecutive months until January 2009, and in the second section, the estimated monthly ARTC rate reduces to 1.30 per cent until July 2012. For the third section, the estimated monthly ARTC rates do not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

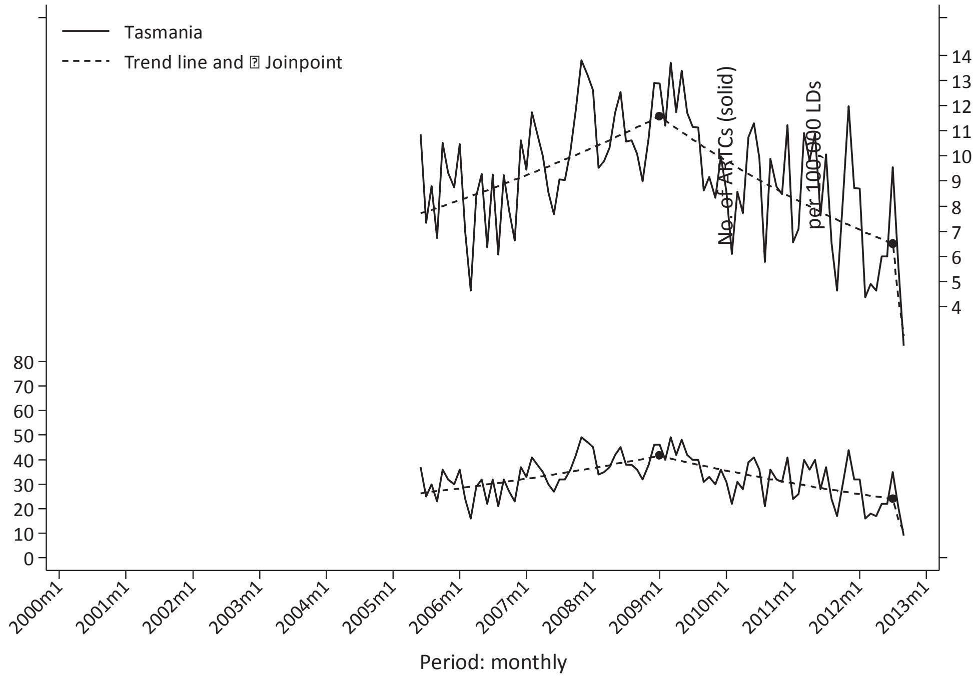

Figure 21. Tasmania: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

8.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 21 represents the ARTC rate after accounting for the population of licensed drivers in Tasmania. The data spans June 2005 to September 2012. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 1.06 (September 2012); the maximum rate of ARTCs was 2.45 (November 2007). The mean rate of ARTCs reported across the period was 9.19 (SD 2.38). For the first six months of the series the average monthly rate of ARTCs reported in Tasmania was 8.92 (SD 1.66); this decreased to 5.72 (SD 2.30) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between June 2005 and January 2009; the MPC for this section was 0.95 (0.41 to 1.49; p=0.001). The second section is between January 2009 and July 2012; the MPC for this section was −1.36 (−1.93 to −0.79; p<0.001). The third section is between July 2012 and September 2012; the MPC for this section was −33.96 (−64.44 to 22.67; p=0.182). This suggests that the estimated monthly rate of ARTCs, after adjusting for the number of licensed drivers, significantly increases by 0.95 per cent between two consecutive months until January 2009, and in the second section, the estimated monthly ARTC rate reduces to 1.36 per cent until July 2012. For the third section, the estimated monthly ARTC rates per 100,000 licensed drivers does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

8.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

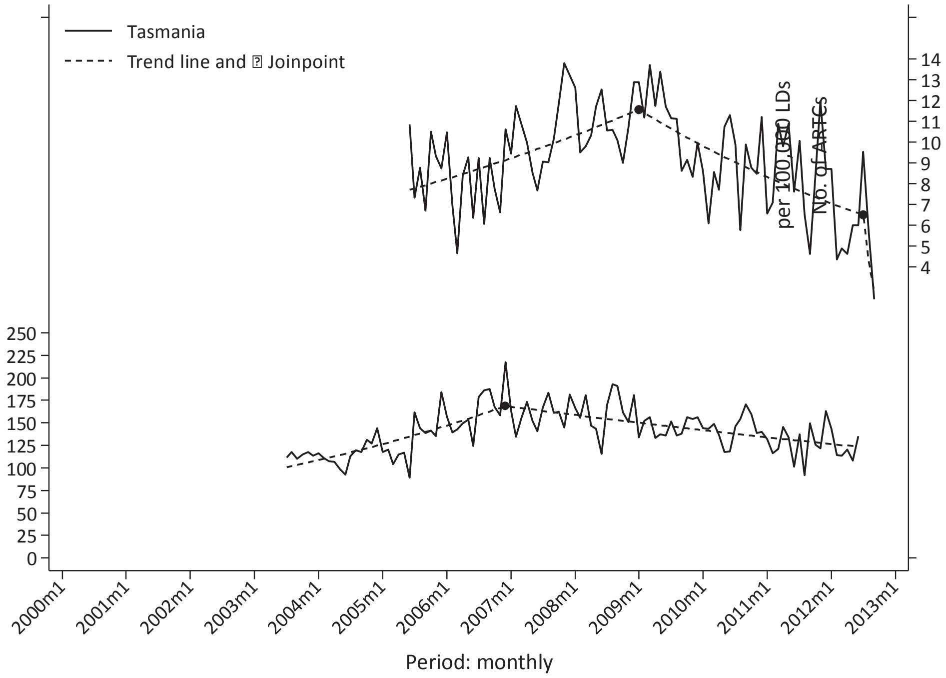

Figure 22. Tasmania: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 22 highlights there is one significant deviation in the series for the monthly RBT rate in Tasmania between July 2003 and June 2012. Between July 2003 and December 2006 the estimated monthly RBT trend significantly increased by 1.26 per cent between two consecutive months. For the six months commencing July 2003 the estimated monthly rate of RBTs was 114.34 (SD 3.09); by the end of the segment (December 2006) the estimated monthly rate of RBTs for the last six months was 182.60 (SD 20.28). In the three year and three month period the estimated monthly rate of RBTs increased by 68.26 per 1,000 licensed drivers. Following December 2006 the monthly RBT rate significantly decreases; the estimated monthly RBT trend decreases by -0.47 per cent between two consecutive months. For the six months commencing December 2006 the estimated monthly rate of RBTs was 166.02 (SD 28.08); by the end of the series (June 2012) the estimated monthly rate of RBTs for the last six months was 122.53 (SD 13.92). In the five and half year period the estimated monthly rate of RBTs decreased by 43.50 per 1,000 licensed drivers. Based on the estimated RBT rate of the last six months of the series this translates to an annual RBT rate of 1470 per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 1.5:1.

There are two significant deviations in the series for the monthly ARTC rate. Between June 2005 and January 2009 the estimated monthly ARTC trend significantly increased by 0.95 per cent between two consecutive months. For the six months commencing June 2005 the estimated monthly rate of ARTCs was 8.57 (SD 1.37); by the end of the segment (January 2009) the estimated monthly rate of ARTCs for the last six months was 11.03 (SD 1.56). In the three and a half year period the estimated monthly rate of ARTCs increased by 2.46 per 100,000 licensed drivers. Following January 2009 the monthly ARTC rate significantly decreases until July 2012; the estimated monthly

ARTC trend decreases by -1.36 per cent between two consecutive months. For the six months commencing January 2009 the estimated monthly rate of ARTCs was 12.43 (SD 1.03); by the end of the segment (July 2012) the estimated monthly rate of ARTCs for the last six months was 5.90 (SD 1.91). In the three and half year period the estimated monthly rate of ARTCs decreased by 6.53 per 100,000 licensed drivers. The final segment commencing July 2012 to the end of the series (September 2012) was not significant. The estimated monthly mean rate of ARTCs for this segment was 5.90 (SD 3.54). Although there appears to be a slight temporal difference for when the significant joinpoint occurs in both the RBT and the ARTC series, the Tasmanian ARTC rate appears to reflect the RBT rate.

8.5 Conclusion

The data spans July 2003 to June 2012. The mean rate of RBTs conducted across the period was 140.85 (SD 25.14) per 1,000 licensed drivers. The trend line suggests the monthly rate of RBTs for the first section (July 2003 – December 2006) significantly increases until December 2006 and then the RBT rate decreases for the remainder of the series. The mean rate of ARTCs reported across the period was 9.19 (SD 2.38). The trend line for the monthly rate of ARTCs significantly increases until January 2009 and then declines across the rest of the series. While there appears to be a slight difference between the timing of the significant joinpoint, both the RBT and the ARTC series show similar trends.

9 Northern Territory

The Northern Territory (see Table 14) is a federal Australian territory in the central northern region of Australia. It is 1.3 million km^2 with a population of 230,000 people, with almost half living in the capital city of Darwin. There are 175,000 licensed drivers in the Northern Territory. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 44 per cent of Territorians drink alcohol at least once per week and in the past 12 months 15 per cent reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, the Northern Territory had a 1:1 RBT to licensed driver ratio.

Table 14. Northern Territory population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	231,292
Capital city (population)†	129,106
Geographical size#	1,349,129 km^2
Proportion urban*	Darwin is classified as Outer Regional
Licensed drivers	175,383 (2012)
Current weekly drinkers‡	44.7% of pop
Drink-driving last 12 months‡	14.95%
Odds Ratio of drivers admitting DUI p.a. ‡	1.92 ($p<0.001$)
RBT: licensed driver ratio	1:1 (pop from 2002 with RBTs from 2004)

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

9.1 RBT: Introduction and current enforcement practices

There is little known about the effect of the Northern Territory's RBT program since it was introduced in 1980 (Federal Office of Road Safety, 1998), except that the program began with a low level of enforcement and low level of publicity (Homel, 1988a). According to the Federal Office of Road Safety in 1986, the effect of the program was small but statistically significant (Homel, 1988a). Current RBT practises involve large scale high profile day time RBT to re-enforce the road safety message on major roads, and targeted and random RBT during other times focussing on licensed premises and 'hot spots' (NT Police and Services 2011).

The Traffic Ordinance regulation in place in the Northern Territory until the 1960s was a particularly limiting factor on the police-driver relationship. For instance, an officer would only be able to pull over a driver for having alcohol in his/her body if they had been involved in an accident owing to the presence of a motor vehicle and having alcohol in their blood (Australian Law Reform Commission, 1976). The Traffic Ordinance even made a provision for drivers who had tested over the legal limit on a breathalyser to request a second test. However, of all the states' legislations at the time, it also converged the most stringent penalties on offenders (Australian Law Reform Commission, 1976)

There is a gap in information about RBT effectiveness and alcohol-related traffic accidents for the first 20 years after it was introduced, although more modern data is available. One study of Australia's driver and pedestrian fatalities from 1990 to 1997 estimated that around 71 per cent of fatalities were alcohol-related during this time, in comparison to 33 per cent in South Australia and Western Australia, and 27 per cent in Victoria (T Chikritzhs, T Stockwell, P Heale, P Dietze, & M Webb, 2000). Skipping to 2004, research suggests that 55 per cent of driver, rider and pedestrian fatalities and 15 per cent of serious injuries were alcohol-related (Faulks & Irwin, 2007).

A more recent report by the ABC revealed that over 11,000 out of 155,000 Random Breath Tests in 2013 were over the legal limit, with figures appearing to show one drink-driving offence in every 50 tests (Di Stefano, 2014). Furthermore, there have been reported cultural issues in some Indigenous communities, where proactive policing of traffic and offences and alcohol offences is not welcome (Pilkington, 2009) and RBTs are commonly avoided (2007; Anthony & Blagg, 2012). Recent initiatives, such as the production of new booze buses, the Alcohol Ignition Lock (AIL) Program and population-based alcohol harm reduction programs show an attempt to strengthen the effectiveness of RBT testing (Northern Territory Police Fire and Emergency Services, 2011). The effort has also seen a substantial rise in the number of RBT tests being performed from 5,476 in 2004 (M. R. J. Baldock, Wundersitz, & McLean, 2007) to a reported 155,000 in 2013. An AAMI study in 2011 also showed that there is a high level of community awareness of drunk driving, as 79 per cent of people identified it as the dominant cause of road crashes(Petroulias, 2011).

According to the Department of Transport (2013), on average alcohol causes 50 per cent of all road fatalities and up to 20 per cent of serious injuries in the Northern Territory. Between 1997 and 2008, alcohol was a factor in 313 deaths on the Territory's roads. A large portion of drivers involved in these accidents were high-range drink-drivers with BAC of over 0.15 – over three times the legal limit (Department of Transport, 2013).

As to the drivers themselves, Northern Territory drivers are the most likely to drive or have driven while over the legal limit (2007). More than half (54%) of those surveyed admitted to having driven while over the limit, and in 2009-10 out of 168,972 Random Breath Tests on the Territory's roads, 3,553 drivers were caught with a BAC over the legal limit. Drivers from the Northern Territory are similarly the least likely to be aware of the maximum number of drinks they can have to and remain below the legal limit. Almost half of the Northern Territory drivers (44%) said "three or more" is the maximum number of drinks that could be consumed to remain below the legal limit (2007).

Procedurally, it is a requirement that any person 15 years and over who has attended or been admitted to a hospital as a result of injuries sustained in a road accident is to have a blood sample taken for analysis (Northern Territory, 2012). The taking of blood samples from unconscious road accident victims or from persons incapable of giving consent is authorised, however, there is a 12 hour limit from the occurrence of the road accident within which the sample can be taken (Northern Territory, 2012). Unlike in other states, in the Northern Territory, a police officer may not pull over a driver to perform a breath test unless he/she has reasonable ground to suspect that the driver has been drinking (L. Wundersitz & Woolley, 2008).

The legislative provisions related to drink-driving offences are contained in part V of the *Traffic Act 2012*. Penalties in the Northern Territory include fines, licence suspension or cancellation, and occasionally a prison term.

The following table outlines the maximum penalties for first time drink-driving offences.

Table 15. Penalties that may apply for a first time drink-driving offence in the Northern Territory

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Minimum licence disqualification	Maximum term of imprisonment
Less than 0.05 (learner, probationary or provisional licences, and drivers of particular motor vehicles)	$650	N/A	3 months
Low range- between 0.05 and .079	$650	N/A	3 months
Medium range- between 0.08 and 0.149	$975	Unlimited (minimum 6 months)	6 months
High range- 0.15 and over	$1,300	Unlimited (minimum 12 months)	12 months
Driving under influence	$1,300	Unlimited (minimum 12 months)	12 months

Drivers who have had a licence suspended or cancelled on a drink-driving charge must complete drink-driver training courses before re-applying for their licence. These courses are not imposed by the court, but are required by the Registrar of Motor Vehicles to confirm that the driver is fit to hold a licence again (Department of Transport, 2013). An outcome evaluation in 1998 of the drivers who complete the program suggests there's a re-offending rate of 12.8 per cent within two years following re-licensing (Palk, Sheehan, & Davey, 2004).

9.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

9.2.1 Rate of RBTs

The Northern Territory RBT data spans January 2006 to June 2012 (see the lower data series in Figure 23). During this period the minimum monthly rate of RBTs conducted was 1,991 (February 2007); the maximum rate of RBTs was 24,947 (December 2010). The mean number of RBTs conducted across the period was 10,859 (SD 5,070). For the first six months of the series the average monthly rate of RBTs conducted in the Northern Territory was 3,464 (SD 915); this increased to 13,117 (SD 3,321) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly RBT rates. The first section is between January 2006 and February 2007; the MPC for this section was −0.86 (−4.30 to 2.70; p=0.624). The second section is between February 2007 and May 2007; the MPC for this section was 45.58 (−25.78 to 185.55; p=0.266). The third section is between May 2007 and June 2012; the MPC for this section was 0.92 (0.57 to 1.27; p<0.001). This suggests that in the first two sections, the estimated monthly rate of RBTs does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months until May 2007. In the third section, the estimated monthly RBT rate then increases by 0.92 per cent between any two consecutive months for the remainder of the series.

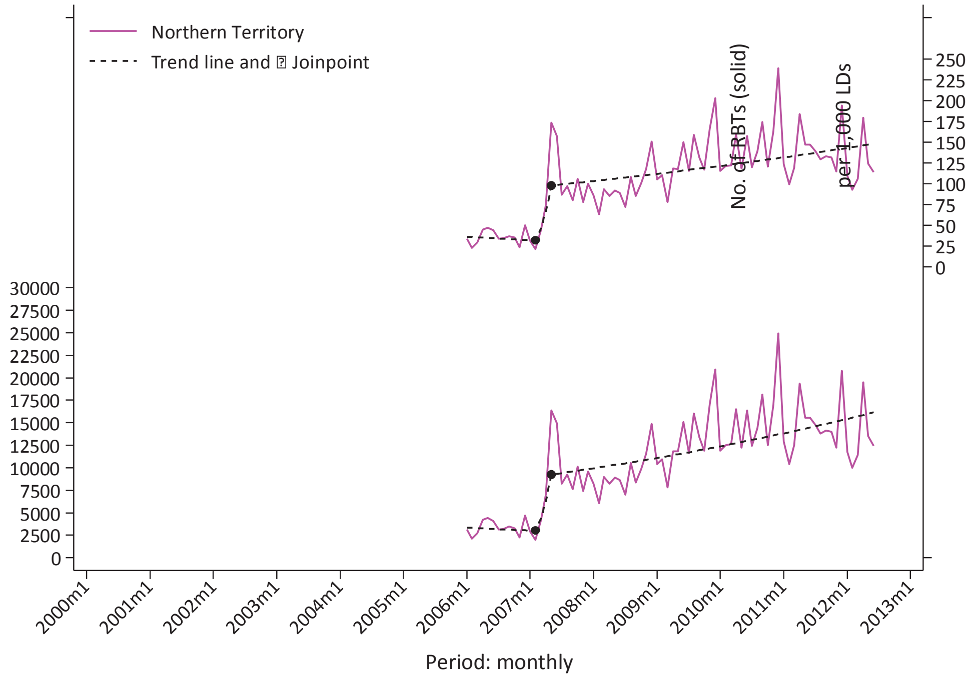

Figure 23. Northern Territory: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

9.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 23 represents the RBT rate after accounting for the population of licensed drivers in the Northern Territory. The data spans January 2006 to June 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 21.16 (February 2007); the maximum rate of RBTs was 238.92 (December 2010). The mean rate of RBTs conducted across the period was 107.00 (SD 47.35). For the first six months of the series the average monthly rate of RBTs conducted in the Northern Territory was 37.26 (SD 9.80); this increased to 121.18 (SD 30.44) for the last six month period. The trend line suggests that there were two significant deviations across the series in the monthly RBT rates per 1,000 licensed drivers. The first section is between January 2006 and February 2007; the MPC for this section was −0.97 (−4.38 to 2.56; p=0.579). The second section is between February 2007 and May 2007; the MPC for this section was 45.36 (−25.57 to 183.86; p=0.265). The third section is between May 2007 and June 2012; the MPC for this section was 0.68 (0.34 to 1.03; p<0.001). This suggests that in the first two sections, the estimated monthly rate of RBTs, after adjusting for the number of licensed drivers, does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months until May 2007. In the third section, the estimated monthly RBT rate per 100,000 licensed drivers then increases by 0.68 per cent between any two consecutive months for the remainder of the series.

9.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

9.3.1 Rate of ARTCs

The Northern Territory ARTC data spans January 2002 to December 2011 (see the lower data series in Figure 24). During this period the minimum monthly rate of ARTCs reported was seven (at multiple months: June 2002 and April 2003); the maximum rate of ARTCs reported was 36 (June 2008). The mean number of ARTCs reported across the period was 17 (SD 5). For the first six months of the series the average monthly rate of ARTCs reported in the Northern Territory was 12 (SD 4); this increased to 15 (SD 4) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly ARTC rates. The first section is between January 2002 and June 2011; the MPC for this section was 0.46 (0.31 to 0.62; p<0.001). The second section is between June 2011 and December 2011; the MPC for this section was −9.49 (−20.29 to 2.77; p=0.120). This suggests that the estimated monthly rate of ARTCs significantly increases by 0.46 per cent between two consecutive months until June 2011. The second section does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

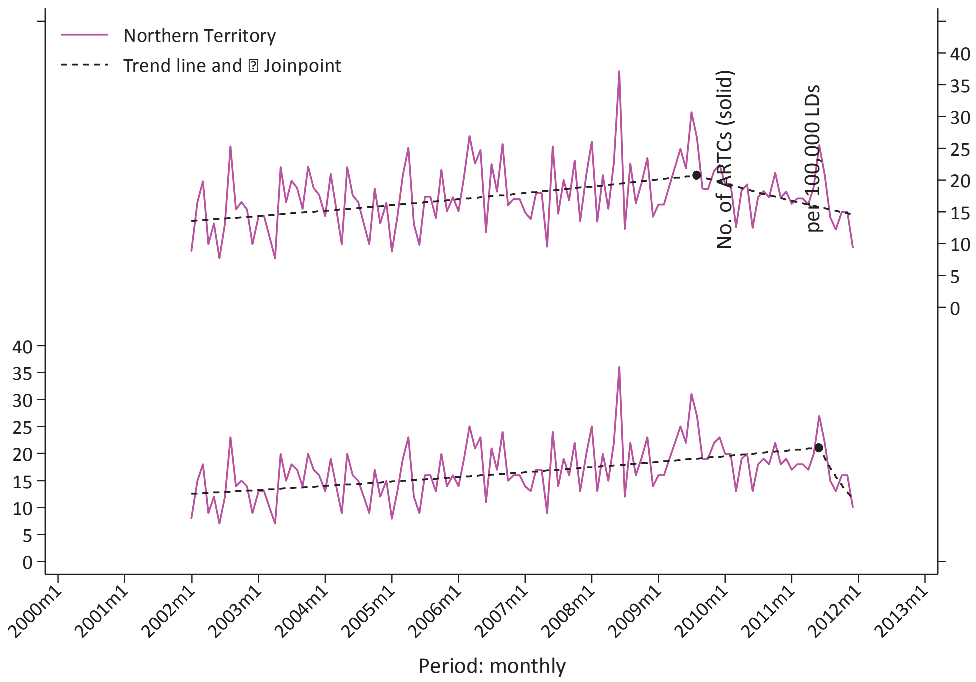

Figure 24. Northern Territory: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

9.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 24 represents the ARTC rate after accounting for the population of licensed drivers in the Northern Territory. The data spans January 2002 to December 2011. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 7.71 (June 2002); the maximum rate of ARTCs was 37.11 (June 2008). The mean rate of ARTCs reported across the period was 17.60 (SD 4.94). For the first six months of the series the average monthly rate of ARTCs reported in the Northern Territory was 12.66 (4.76); this increased to 14.41 (SD 3.79) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly ARTC rates per 100,000 licensed drivers. The first section is between January 2002 and August 2009; the MPC for this section was 0.47 (0.25 to 0.68; p<0.001). The second section is between August 2009 and December 2011; the MPC for this section was −-1.25 (−2.47 to −0.01; p=0.046). This suggests that the estimated monthly rate of ARTCs, after adjusting for the number of licensed drivers, significantly increases by 0.47 per cent between two consecutive months until August 2009 and then the estimated monthly ARTC rate reduces to 1.25 per cent for the remainder of the series.

9.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

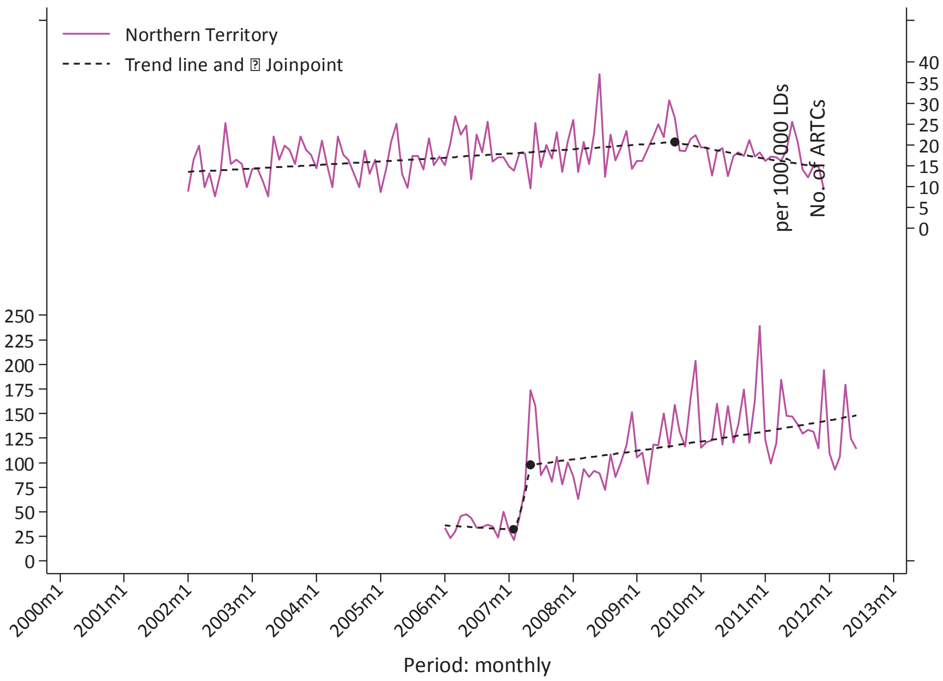

Figure 25. Northern Territory: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 25 highlights the variability in the RBT rate in the Northern Territory across the six and a half year series. Between January 2006 and February 2007 the RBT maintained a relatively stable, flat, monthly RBT rate. The mean monthly RBT rate for this period was 35.06 (SD 9.06) per 1,000 licensed drivers. Annually, this translates to approximately 421 RBTs per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.4:1. Between February 2007 and May 2007 there was a substantial increase in the estimated monthly RBT rate however this was not significant. The mean monthly RBT rate for this period was 78.25 (SD 67.09) per 1,000 licensed drivers. Annually, this increase translates to approximately 939 RBTs per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.9:1. In the last segment, commencing May 2007 until June 2012, the RBT rate significantly increases by 0.68 per cent between two consecutive months. For the six months commencing February 2009 the estimated monthly rate of RBTs was 116.99 (SD 38.98); by the end of the series (June 2012) the estimated monthly rate of RBTs for the last six months was 121.18 (SD 30.44). In this five year period the estimated monthly rate of RBTs increased by 4.20 per 1,000 licensed drivers. Based on the estimated RBT rate of the last six months of the series, the annual RBT rate is 1,454 per 1,000 licensed drivers, which is equivalent to an RBT to licensed driver ratio of 1.5:1.

There is one significant deviation in the series for the monthly ARTC rate. Between January 2002 and August 2009 the estimated monthly ARTC trend significantly increases by 0.47 per cent between two consecutive months. For the six months commencing January 2002 the estimated monthly rate of ARTCs is 12.66 (SD 4.76); by the end of the segment (August 2009) the estimated monthly rate of ARTCs for the last six months is 24.22 (SD 4.12). In the seven and a half year period the estimated monthly rate of ARTCs increased by 11.57 per 100,000 licensed drivers. The final segment commencing August 2009 to the end of the series (December 2011) significantly decreases by 1.25 per cent between two consecutive months. For the six months commencing August 2009 the estimated monthly rate of ARTCs is 21.21 (SD 3.08); by the end of the series the estimated monthly rate of ARTCs for the last six months is 14.41 (SD 3.79). In the two year and four month period the estimated monthly rate of ARTCs had decreased by 6.79 per 100,000 licensed drivers.

9.5 Conclusion

The data spans January 2006 to June 2012. In the Northern Territory, there were initially low rates of RBTs undertaken, a substantial increase in RBTs occurred in February 2007 and this rate has been increasing. While the ARTC rate was increasing there was a significant down turn in the rate commencing August 2009; two years after the increasing rate of RBTs.The mean rate of RBTs conducted across the period was 107.00 (SD 47.35) per 1,000 licensed drivers. The trend line suggests two significant deviations across the series, the first section, between January 2006 and February 2007 and the second section, February 2007 and May 2007 are flat trends and the third section, between May 2007 and June 2012 shows an increasing trend. The ARTC data spans January 2002 to December 2011. There is one significant deviation in the series for the monthly ARTC rate. Between January 2002 and August 2009 the ARTC trend significantly increases. The final segment commencing August 2009 to the end of the series (December 2011) significantly decreases. In summary, following the initial low rate of RBTs, a substantial increase in RBTs occurred in February 2007 and continued. While the ARTC rate had been increasing there was a significant down turn commencing August 2009; this was two years after the increasing rate of RBTs.

10 Australian Capital Territory

The Australian Capital Territory (see Table 16) is a small territory (2,358 km^2) in the south east of Australia surrounded by New South Wales. Canberra, Australia's capital city is the only city in the territory. The population of the Australian Capital Territory is 380,000 most of who live in Canberra. There are 314,866 licensed drivers in the Australian Capital Territory. According to the National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011) 38 per cent of people drink alcohol at least once per week and in the past 12 months 14 per cent reported driving a motor vehicle while under the influence of or affected by alcohol. In 2013, the Australia Capital Territory had a 1:3 RBT to licensed driver ratio.

Table 16. Australian Capital Territory population, geographic, driver and drinker characteristics

Jurisdiction characteristics	
State (population)†	383,375
Capital city (population)†	367,752
Geographical size#	2,358 km^2
Proportion urban*	99.8%
Licensed drivers	314,866 (2012)
Current weekly drinkers‡	38% of population
Drink-driving last 12 months‡	14.56%
Odds Ratio of drivers admitting DUI p.a. ‡	1.86 ($p<0.001$)
RBT: licensed driver ratio	1:3

† See Australian Bureau of Statistics (2012a)

See Geoscience Australia (2014)

* See Australian Bureau of Statistics (2012b)

‡ See National Drug Strategy Household Survey 2010 (Australian Institute of Health and Welfare, 2011). Reference category is New South Wales

10.1 RBT: Introduction and current enforcement practices

RBT was introduced in the Australian Capital Territory in December 1982. The program was characterised by legislation but low levels of enforcement and official publicity. Thus Homel (1988a, p. 109) referred to this program as Clayton's RBT' in reference to a non-alcohol beverage advertised in Australia as "the drink you have when you're not having a drink". The target arrangements reported for the Australian Capital Territory are 105,000 preliminary tests per year within 3,500 hours of RBT operations (Harrison et al., 2003). In the Australian Capital Territory there is a considerable variation in the number of tests administered by yearly quarter. This reflects shifts between targeted testing in known hot-spots for drink-drivers, during some periods, and general deterrent-oriented testing of drivers in other periods (McDonald, 2012).

There was a small but statistically significant reduction in the number of motorists hospitalised and driving fatalities in the first three months after RBT policy was introduced (Homel, 1990). In their examination of alcohol-related road injuries in Australia, Chikzitzhs and colleagues (2000) found that in the Australian Capital Territory, alcohol-related serious injuries declined between 1990 and 1997[5]. In addition, significant changes in driving behaviours were identified since the introduction

[5] However, they noted that the reporting of BAC levels in the ACT were inconsistent thus proxy measures were used to identify if a crash was likely to have involved alcohol.

of RBT and alcohol-focused initiatives. For example when the BAC limit was reduced from 0.08 to 0.05, RBTs showed a 34 per cent reduction in the number of drivers with a BAC between 0.15 and 0.20, and a 58 per cent reduction in the number with a BAC above 0.20 (Brooks & Zaal, 1992). Further self-report data from the National Survey of Community Satisfaction with Policing (NSCSP) indicates that 0.8 per cent of people from the Australian Capital Territory reported to driving while suspecting they are over the limit. This is below the national average of 1.3 per cent (ACT Policing, 2013).

The rate of ARTC in the Australian Capital Territory has remained relatively consistent over the last decade. Analysing collision data provided by the Australian Capital Territory police (Australian Capital Territory Policing PROMIS, 2012), between 2000 and 2009 the percentage of collisions involving alcohol has varied from 12.9 per cent in 2001 to 7.8 per cent in 2009. Every though 2009 had the lowest ARTC rate; there was no overall reduction trend over the decade.

Alcohol-related traffic crashes are defined as a traffic collision in which at least one driver involved was charged with a drink-driving offence (exceeding the legal limit). From the 1 December 2010, the prescribed concentration for drivers classed as 'special drivers' was reduced from 0.02 BAC to zero. Further in the Australian Capital Territory, a compulsory blood test is required for people over 15 years old involved in a traffic accident and is either seriously or fatally injured in the accident (L. Wundersitz & Woolley, 2008).

In 2012-13, 100,791 Random Breath Tests were conducted in the Australian Capital Territory, equating to approximately one in every three drivers being tested annually (ACT Policing, 2013). Of the tests conducted, 1,259 drivers were over the prescribed limit of alcohol indicating a detection rate of 1.2 per cent. One of the key strategies of the RBT program in the Australian Capital Territory includes strategically targeting drink-driving hotspots at peak times and locations (ACT Policing, 2013). Hotspots are identified by the information generated from the “last place of drink” question asked of offenders when they are caught drink-driving. This strategy enables the Australian Capital Territory police to effectively allocate resources to proactively target drivers under the influence of alcohol.

The legislative provisions related to drink-driving offences are contained in the *Road Transport (Alcohol and Drugs) Act 1977*. There are two drink-driving offences in the Australian Capital Territory, being over the BAC limit and DUI with the later considered a more serious offence. DUI means that the driver is so much under the influence of alcohol as to be incapable of exercising effective control of the vehicle and is considered a more serious offence. If a person is charged with a drink-driving offence then they will be summoned to court. A magistrate will decide the length of licence disqualification and the penalties.

The following table shows the maximum penalties that may apply for a first time drink-driving offence.

Table 17. Penalties that may apply for a first time drink-driving offence in the Australian Capital Territory

Blood/breath alcohol concentration (BAC)	Maximum fine amount	Minimum licence disqualification	Maximum term of imprisonment
Level 1- less than 0.05 0.01 and 0.049 (learner, provisional and restricted licences, and drivers of particular motor vehicles)	$700	1 months	N/A
Level 2- between 0.05 and 0.079	$700	2 months	N/A
Level 3- between 0.08 and 0.149	$1,400	3 months	6 months
Level 4- 0.15 and over	$2,100	6 months	9 months
Driving under the influence (DUI)	$4,200	6 months	6 months

The penalties for repeat drink-driving offences can include:

- Having your licence disqualified for a minimum of 12 months for a high range offence
- Being fined up to $4,200
- Have your car fitted with an alcohol interlock system or
- Being sentenced to a maximum imprisonment term of 12 months.

In the Australian Capital Territory if a driver refuses a breath test, breath analysis or blood analysis they can be fined up to $4,200 and be sentenced up to six months imprisonment. Further, people convicted of drink-driving are ordered to complete a mandatory alcohol awareness course (Australian Capital Territory Government, 2013).

10.2 Monthly Random Breath Testing rates: Absolute numbers and per 1,000 licensed drivers

10.2.1 Rate of RBTs

The Australian Capital Territory RBT data spans July 2004 to October 2012 (see the lower data series in Figure 26). During this period the minimum monthly rate of RBTs conducted was 226 (April 2005); the maximum rate of RBTs was 16,762 (April 2006). The mean rate of RBTs conducted across the period was 7,013 (SD 3,277). For the first six months of the series the average monthly rate of RBTs conducted in the Australian Capital Territory was 4,534 (SD 3,488); this increased to 6,631 (SD 2,430) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates. The first section is between July 2004 and June 2006; the MPC for this section was 5.65 (2.27 to 9.14; $p<0.001$). The second section is between June 2006 and October 2012; the MPC for this section was −0.11 (−0.65 to 0.44; $p=0.695$). This suggests that the estimated monthly rate of RBTs significantly increases by 5.65 per cent between two consecutive months until June 2006. After June 2006, the MPC is non-significant and does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

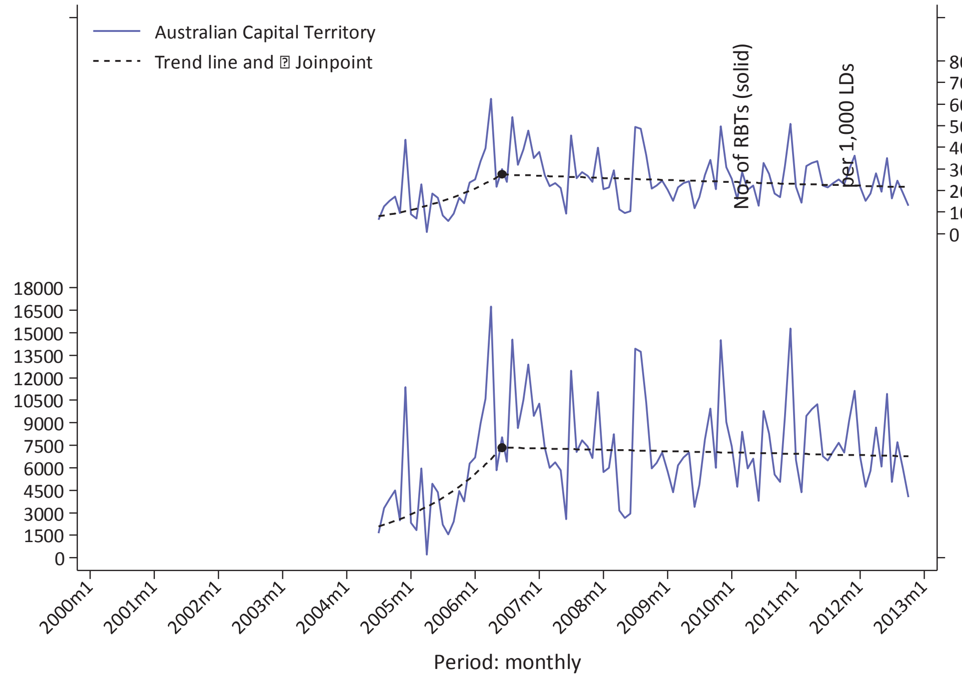

Figure 26. Australian Capital Territory: Monthly rate of RBTs. The lower series represents absolute numbers the top series represents proportion per 1,000 licensed drivers

10.2.2 Rate of RBTs per 1,000 licensed drivers

The upper data series of Figure 26 represents the RBT rate after accounting for the population of licensed drivers in the Australian Capital Territory. The data spans July 2004 to October 2012. The following RBT information is relative to the estimated number of licensed drivers. Data is presented per 1,000 licensed drivers. During this period the minimum monthly rate of RBTs conducted was 0.86 (April 2005); the maximum rate of RBTs was 62.53 (April 2006). The mean rate of RBTs conducted across the period was 24.61 (SD 11.63). For the first six months of the series the average monthly rate of RBTs conducted in South Australia was 17.42 (SD 13.35); this increased to 21.22 (SD 7.82) for the last six month period. The trend line suggests that there was one significant deviation across the series in the monthly RBT rates per 1,000 licensed drivers. The first section is between July 2004 and June 2006; the MPC for this section was 5.50 (2.12 to 8.98; p=0.001). The second section is between June 2006 and October 2012; the MPC for this section was −0.32 (−0.85 to 0.23; p=0.246). This suggests that the estimated monthly rate of RBTs, after adjusting for the number of licensed drivers, significantly increases by 5.50 per cent between two consecutive months until June 2006. After June 2006, the MPC is non-significant and does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

10.3 Monthly alcohol-related traffic crash rates: Absolute numbers and per 100,000 licensed drivers

10.3.1 Rate of ARTCs

The Australian Capital Territory ARTC data spans January 2000 to October 2012 (see the lower data series in Figure 27). During this period the minimum monthly rate of ARTCs reported was one (at multiple months: May 2000, January 2001, January 2010 and October 2011); the maximum rate of ARTCs reported was ten (June 2000). The mean number of ARTCs reported across the period was five (SD 2). For the first six months of the series the average monthly rate of ARTCs reported in the Australian Capital Territory was five (SD 3); this was four (SD 2) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly ARTC rates. The MPC for the series was −0.09 (−0.27 to 0.08; p=0.298). As the MPC is not significant this suggests that the estimated monthly ARTC rate does not significantly differ from a flat trend; that is an MPC of 0 between any two consecutive months.

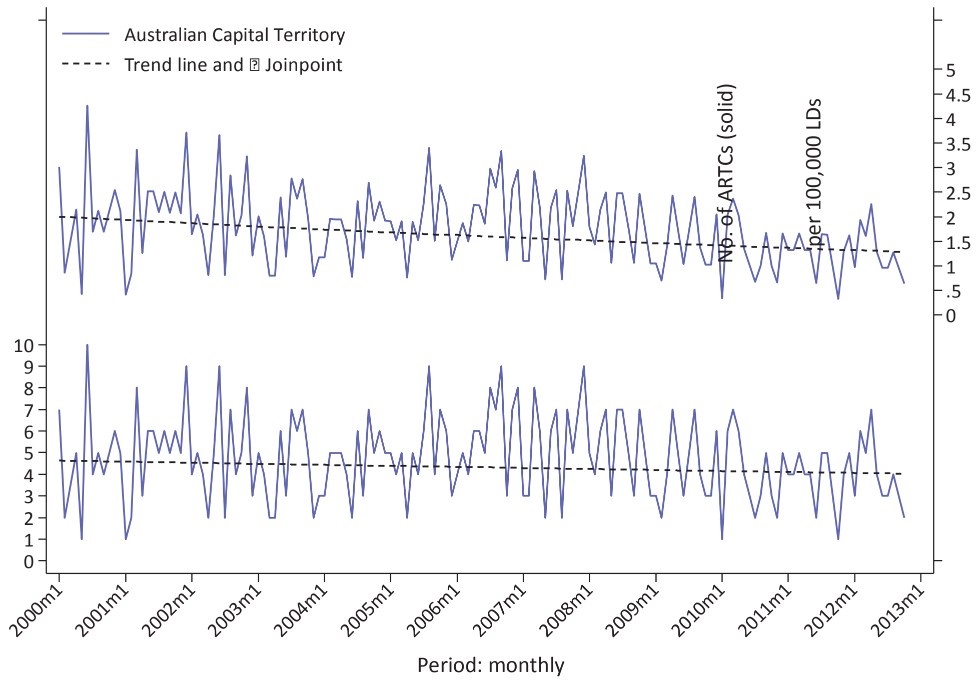

Figure 27. Australian Capital Territory: Monthly rate of ARTCs. The lower series represents absolute numbers the top series represents proportion per 100,000 licensed drivers

10.3.2 Rate of ARTCs per 100,000 licensed drivers

The upper data series of Figure 27 represents the ARTC rate after accounting for the population of licensed drivers in the Australian Capital Territory. The data spans January 2000 to October 2010. The following ARTC information is relative to the estimated number of licensed drivers. Data is presented per 100,000 licensed drivers. During this period the minimum monthly rate of ARTCs reported was 0.33 (October 2011); the maximum rate of ARTCs was 4.26 (June 2000). The mean rate of ARTCs reported across the period was 1.79 (SD 0.76). For the first six months of the series the average monthly rate of ARTCs reported in the Australian Capital Territory was 2.07 (SD 1.42); this decreased to 1.23 (SD 0.56) for the last six month period. The trend line suggests that there was no significant deviation across the series in the monthly ARTC rates per 100,000 licensed drivers. The MPC for the series was −0.29 (−0.46 to −0.11; p=0.001). This suggests that the estimated monthly ARTC rate, after adjusting for the number of licensed drivers, significantly decreases by 0.29 per cent between any two consecutive months.

10.4 Monthly rate of RBTs per 1,000 licensed drivers and monthly rate of ARTCs per 100,000 licensed drivers

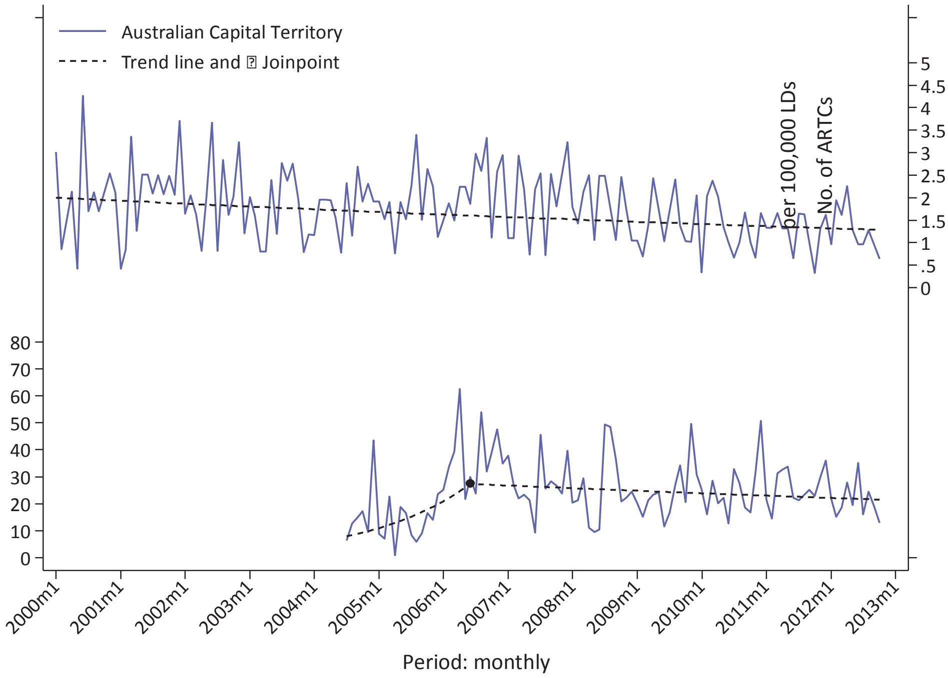

Figure 28. Australian Capital Territory: Monthly rate of ARTCs and monthly rate of RBTs proportional to the annual rate of licensed drivers

Figure 28 highlights there is one significant deviation in the series for the monthly RBT rate in the Australian Capital Territory between July 2004 and October 2012. Between July 2004 and June 2006 the estimated monthly RBT trend significantly increased by 5.50 per cent between two consecutive months. For the six months commencing July 2004 the estimated monthly rate of RBTs was 17.42 (SD 13.35); by the end of the segment (June 2006) the estimated monthly rate of RBTs for the last six months was 35.42 (SD 14.67). In the two year period the estimated monthly rate of RBTs had increased by 35.42 per 1,000 licensed drivers. Following June 2006 the monthly RBT rate was flat. The mean monthly RBT rate for this period was 26.24 (SD 10.25) per 1,000 licensed drivers. Annually, this translates to approximately 314 RBTs per 1,000 licensed drivers which is equivalent to an RBT to licensed driver ratio of 0.3:1.

There is no significant deviation in the series for the monthly ARTC rate. The estimated monthly ARTC trend significantly decreases by 0.29 per cent between two consecutive months. For the six months commencing January 2000 the estimated monthly rate of ARTCs 2.14 (SD 1.57); by the end of the series (October 2010) the estimated monthly rate of ARTCs for the last six months was 1.12 (SD 0.35). Across the series the estimated monthly rate of ARTCs dropped by 1.02 per 100,000 licensed drivers.

10.5 Conclusion

The rate of ARTCs in the Australia Capital Territory has fallen since January 2000 regardless of the increase in RBTs by police between July 2004 and June 2006 and the subsequent plateau in RBTs rates. The mean RBT rate conducted across the period was 24.61 (SD 11.63) per 1,000 licensed drivers. The RBT trend line suggests one significant deviation across the series, the first section between July 2004 and June 2006; shows increases until June 2006. After June 2006, the trend is flat. The ARTC data spans January 2000 to October 2010. The mean rate of ARTCs reported across the period was 1.79 (SD 0.76). The trend line suggests that there was no significant deviation across the series in the monthly ARTC rates per 100,000 licensed drivers, the monthly ARTC rate significantly decreases across the series. In summary, it appears the RBT trend increases between July 2004 and June 2006 and is then flat to the end of the series. ARTC rates have declined since January 2000 regardless of the increase and plateau in RBT rates.

11 Australia: Comparison of jurisdictions

RBT in Australia is a central and important law enforcement initiative, embraced by all jurisdictions since the 1980s. In terms of crash reductions international comparative research considers Australia to have the most successful RBT program (Erke et al., 2009). Nevertheless, our report and previous research by Homel and others shows within Australian jurisdictions RBT implementation and effectiveness varies considerably. The relationship between RBT and ARTC rates varies over time and across all Australian jurisdictions.

New South Wales has maintained a stable yet increasing RBT rate from 2000 to 2011. The increasing RBT rate appears to be reflected by a flat to declining ARTC trend. The first and third sections (between January 2000 and May 2002 and May 2004 and July 2007) of the trend show a flat trend and the second and last sections (between May 2002 and May 2004 and July 2007 until the remainder of the series) show significant decreases in ARTC rates.

Victoria has sustained significant increases in RBT rates over time prior to the 2011 Victorian police industrial action. Following this, RBT rates stabilised. ARTC rates showed increasing trends between January 2001 and April 2004 and again between April 2004 and October 2005. Following October 2005 until December 2011, the ARTC rate significantly decreased.

Queensland's stable RBT rate over time appears to be reflected by a stable ARTC rate. Since January 2000, Queensland has maintained a relatively stable monthly RBT rate and the monthly ARTC rate has remained flat over the five year study period.

For almost ten years South Australia maintained a stable flat RBTs rate. After October 2010 the monthly RBT trend significantly decreased. The ARTC rate remained flat for the eight year period, January 2000 and December 2007, after which the ARTC trend significantly decreased. A significant change in the ARTC rate was observed between January 2000 and October 2010, most likely a reflection of a stable, flat rate of monthly RBTs conducted. The change in the ARTC rate occurred almost three years prior to the change in the rate of RBTs. Moreover, there was no observable effect in the ARTC rate following the observed change in the RBT rate occurring in October 2010.

Of all jurisdictions, Western Australia shows the greatest variability in monthly RBTs and ARTC rates between January 2000 and December 2011. Overall, the monthly rate of RBTs show decreases and for a substantial proportion of this time displays increasing ARTC rates. In Western Australia it appears that as the RBT rate decreases, the ARTC rate increases.

Interestingly, Tasmanian ARTC trends appear to follow RBT trends. The monthly rate of RBTs for July 2003 to December 2006 significantly increases and then decreases for the remainder of the series. While there appears to be a slight difference between the timing of the significant joinpoint, both the RBT and the ARTC series show similar trends. The monthly rate of ARTCs significantly increases until January 2009 and then declines across the rest of the series.

Initially there were low rates of RBTs undertaken in the Northern Territory, a substantial increase in RBT rates occurred in February 2007 and continued for the remainder of the series. Similarly, from 2006 the ARTC rate increases however there was a significant down turn in the rate commencing August 2009; following the increasing rate of RBTs in 2007. In the Northern Territory it appears that as the RBT rate increases the ARTC rate decreases.

In the Australian Capital Territory the ARTC rate has steadily declined since January 2000 irrespective of the increases in RBT rates between July 2004 and June 2006 and the subsequent flat rate in RBTs following June 2006. This suggests that in light of no significant change in the RBT rates following June 2006 the ARTC rate in the Australian Capital Territory has been steadily declining.

Table 18 shows the ARTC trends relative to RBT trends for each jurisdiction.

Table 18. Jurisdictions summary of RBT and ARTC trends

State	ARTC rates	RBT rates
New South Wales	Flat to declining	Increasing
Victoria	Increasing, then decline after 2005	Increasing, then flat and stable after 2011
Queensland	Flat and stable	Flat and stable
South Australia	Flat and stable, then declining after 2008	Flat and stable, then declining after 2010
Western Australia	Increasing	Declining RBT rates
Tasmania	ARTC rates follows RBT rates. Both increase early in the series, then decline for the remainder	ARTC rates follow RBT rates. Both increase early in the series, then decline for the remainder.
Northern Territory	Increasing until 2009, downturn in rates after 2009	Increasing from 2007
Australian Capital Territory	Steadily declining since 2000	Increasing from 2004-2006, then plateauing after 2006

11.1 Jurisdiction variations between RBT ratios and ARTCs

It is absolutely critical to interpret the relationship between RBT ratios and ARTC rates at the individual jurisdiction level. Trends for both RBT ratios and ARTC rates are likely to be influenced by geographic differences, varying levels of RBT publicity and educational campaigns, responses for recidivist drink-drivers (rehabilitation), and drink-driving penalties. The Northern Territory has maintained a relatively high ARTC rate despite having the greatest variability in the RBT ratio (in one month the Northern Territory had the highest RBT ratio). By comparison Victoria has some of the lowest ARTC rates despite a varied RBT ratio; although the lowest ARTC rates are typically associated with RBT ratios of 1:1.3 or less. In a number of jurisdictions, such as New South Wales, Victoria, Western Australia and Queensland as the RBT ratio increases, the ARTC rate decreases. By contrast, in Tasmania the ARTC rate increases as the RBT ratio increases.

The ARTC rate for the Australian Capital Territory and South Australia is curve-linear which means that initially the ARTC rate reduces as the RBT ratio increases and at some point the ARTC trend turns upward as the RBT ratio continues to increase. In the Australian Capital Territory this turn-point occurs at an RBT ratio less than 1:4, in South Australia this is around the RBT ratio of 1:3. By comparison large geographic jurisdictions including, Queensland, Western Australia and Northern Territory appear to benefit from having RBT ratios of 1:1 or greater. Tasmania is an anomaly as it has one of Australia's highest RBT ratio's and yet also has the one of Australia's highest ARTC rates. It is plausible that the population in Tasmania is being exposed to more targeted RBT in highly populated areas such as Hobart and Launceston and the ARTCs may be largely occurring outside these areas in rural and remote parts of Tasmania.

In summary, these data suggest that the relationship between RBT and ARTC rates is not as clear cut across all jurisdictions. While the expected pattern between RBT and ARTC rates is observed for jurisdictions such as New South Wales, Victoria, Queensland and Western Australia; where an increase in RBT rates is associated with a decrease in ARTC rates, this pattern is not observed for the other jurisdictions.

11.2 Implications for alcohol policy

As outlined in the introduction (Section 1.1.2) for an RBT strategy to be effective it must be perceived as truly random and ever present by the general community and testing must be highly visible, unpredictable, and difficult to evade (Homel, 1988a, 1988b). This is achieved through best practice principles (Homel, 1988a, 1988b; Papafotiou-Owens & Boorman, 2011);(Delaney et al., 2006); (Freeman & Watson, 2006) of:

- jurisdiction-wide *random* RBT
- jurisdiction-wide *strategically deployed* RBT
- jurisdiction-wide *enforcement* of the program
- a credible RBT program ('no one gets off')
- jurisdiction-wide *publicity* and targeted *responses* for recidivist drink-drivers.

It is critical that the RBT best practice principles are consistently monitored and maintained for RBT to be an effective drink-driving deterrent.

The findings of this report suggest for smaller jurisdictions (i.e. geographical or population size) such as South Australia and the Australian Capital Territory that the RBT ratio of between 1:4 to 1:1 may be adequate to maintain low rates of ARTCs potentially due to high visibility of RBT by the public in highly populated areas. For example, a booze bus operation during morning peak hour. Nevertheless the National Drugs Strategy Household Surveys data (Australian Institute of Health and Welfare, 2011) show higher levels of reported drink-driving in these jurisdictions compared with jurisdictions with higher RBT ratios (greater than 1:1; see Table 19). It is possible that drivers in these jurisdictions may have learnt to avoid RBT operations and therefore the perceived risk of detection has been diluted. RBT programs can lose their deterrent effect if the public perceive RBT not to be random. To prevent driver evasion of RBTs, police should be strategically located and supported by mobile patrol vehicles to intercept drivers attempting to perform U-turns or turning into side streets to evade breath testing.

In larger jurisdictions (i.e. geographical or population size) such as New South Wales, Victoria, Queensland, Western Australia and Northern Territory, higher RBT ratios (greater than 1:1) may be required to maintain high RBT exposure due to the size of the population and the geographical spread of the population. New South Wales, Victoria and Queensland are good examples of jurisdictions that have maintained flat to declining ARTC trends alongside stable to increasing RBT ratios and also report lower percentages of the population drink-driving.

Table 19 provides an overview for Australian jurisdictions. Jurisdictions are ranked, based on the following scoring criteria:

1. RBT ratio: jurisdictions with a current 1:1 (or better) RBT ratio are ranked higher. RBT ratio 1:1 or better (12 points), RBT ratio of 1:2 (8 points) and RBT ratio of 1:3 (4 point).
2. ARTC trend: jurisdictions with decreasing trends are ranked higher, particularly where the trends are maintained over the series or for several years. Constantly decreasing ARTC trends (4 points), decreasing after a stable trend (3 points), constant stable trends (2 points) and decreasing but after an increasing trend (1 point).
3. National Drug Strategy Household Surveys (Australian Institute of Health and Welfare, 2011) reported drink-driving in the past 12 months: the percentage of reported drinking driving in a jurisdiction is an indicator of the success of 'general deterrence' by RBT operations. General deterrence occurs when the community avoids drink-driving because of the perceived risk of detection and the perceived certainty, severity and swiftness of the punishment following detection. Jurisdictions with lower percentages of reported drink driving are ranked higher. A score of 5 is allocated to a jurisdiction where the percentage change[6] is less than 10% (i.e, between 0 and 9.99%). For each successive 10% difference the score decreased by 0.5, for example, a jurisdiction with a percentage change between 10 and 19.99% will get a score of 4.5, and so forth.

Jurisdictions with RBT ratios of 1:1 or greater, New South Wales, Queensland, Victoria, Tasmania and the Northern Territory report stable to declining ARTC trends.

New South Wales, Queensland, Victoria and Tasmania report lower percentages of the population driving a motor vehicle while under the influence of or affected by alcohol (8.38 to 12.49 per cent; Australian Institute of Health and Welfare, 2011) compared to jurisdictions where the RBT ratio is greater than 1:1. For these four jurisdictions the current ARTC rates are between 1.32 and 5.72.

The results for the Northern Territory are inconsistent with the other jurisdictions where the RBT ratio is 1:1. The Northern Territory reports: 1) a higher percentage of the population driving a motor vehicle while under the influence of or affected by alcohol (14.95 per cent; Australian Institute of Health and Welfare, 2011) and 2) an ARTC rate more than double that of Tasmania at 14.41 (current ARTC rates for other jurisdiction are between 1.32 and 5.72 per 100,000 LD per month).

Jurisdictions with an RBT ratio of 1:2 or 1:3, South Australia, Australian Capital Territory and Western Australia, also report declining ARTC trends however results show a higher percentage of the population driving a motor vehicle while under the influence of or affected by alcohol (13 to 14.56 per cent; Australian Institute of Health and Welfare, 2011).

[6] The percentage change for each jurisdiction was calculated against New South Wales (8.38 per cent) as this was the lowest drink-driving percentage.

Table 19: Jurisdiction overview for current RBT ratio, ARTC rates and trends and reported drink-driving in 2012.

Jurisdiction	Current RBT ratio	ARTC trend	Drink-driving (%)	Criterion score	ARTC rate for last 6 months of series/ 100,000 LD†
New South Wales	1:1	Decreasing after July 2007	8.38	**20**	2.78
Queensland	1:1	Stable	9.30	**18.5**	5.27
Victoria	1:1	Decreasing after October 2005	9.50	**17.5**	1.32
Tasmania	1.4:1	Decreasing after January 2009	12.49	**16**	5.72
Northern Territory	1:1	Decreasing after August 2009	14.95	**14.5**	14.41
South Australia	1:2	Decreasing after December 2007	13.00	**13.5**	2.11
Australian Capital Territory	1:3	Decreasing	14.56	**9.5**	1.23
Western Australia	1:3	Decreasing after November 2008	13.87	**7**	5.31

† ARTC rate/month for the last six months of the series is presented in this table in order to provide context for current RBT practice, this measure was not however used in calculating the criterion scores.

11.3 Limitations

With the exception of the industrial actions reported by Victoria Police, there are no caveats provided by any of the jurisdiction's data custodians. Although, it is still important to acknowledge that there is an under-reporting of breath testing by police at road crashes (T Chikritzhs et al., 2000; Stevenson & Ridolfo, 2001). The researchers acknowledge that the under-reporting of BACs may occur and at different rates between the jurisdictions which could bias the numbers of ARTC.

The researchers also acknowledge that differences in operational crash-reporting and policies for taking blood and breath alcohol tests from drivers could produce ARTC numbers that are not directly comparable between jurisdictions, and thus potentially bias the results.

The fitted model (see Equation 1) has not been modelled to account for any auto-correlation associated with time or any clustering effects by jurisdiction. However, the purpose of this report is to demonstrate the relationship between ARTCs per 100,000 licensed drivers and the ratio of RBTs to number of licensed drivers, and from this aim we simply demonstrate the modelling structure of the data.

11.4 Future research

11.4.1 Saturated/random RBT and Strategically deployed/targeted RBT

It is possible that the variation in ARTC trends between jurisdictions are the result of a number of factors other than RBT ratios such as police operations, geography and community perceptions of being detected drink-driving. Key questions for future research include:

- What is the impact of employing varying levels of *saturated/random* RBT and *strategically deployed/targeted* RBT operations (detection of drink-drivers) on 1) ARTC rates and 2) community perceptions of being detected drink-driving?
- Why do smaller sized jurisdictions with lower RBT ratios and ARTC rates also report higher percentage of drink-driving? Are these jurisdiction drink-drivers avoiding RBT operations and not crashing? Or is there an under-reporting of ARTC in these jurisdictions?
- What are the key geographic factors which facilitate lower RBT ratios whilst maintain low ARTC rates?

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13 Appendices

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13.2 List of Figures

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ISBN 978-0-9942641-0-7