Effects of a Reduced Alcohol Limit for Driving

Chris Brooks and Dominic Zaal Federal Office of Road Safety, Australia

Summary

Data from police random breath testing (RBT) and alcohol tests of crash-involved drivers were used to assess the effects of a reduction in the maximum permitted blood alcohol concentration (BAC) for driving.

Most debate on selection of legal drink-driving limits has focused on the assessment of driving impairment and crash risks at BACs below the current legal limit in the relevant jurisdiction. However, some previous research has indicated that one of the major benefits of a lower BAC limit may be a reduction in drink driving at very high BAC levels, well above the original limit. Results from this study support that hypothesis.

The maximum legal BAC for driving in the Australian Capital Territory (ACT) was changed from .08 to .05 on 1 January 1991.

RBT results for 1991 showed a reduction of 41 per cent in the incidence of drink driving at BACs above .15, compared to 1990, as well as a reduction of about 90 per cent in drink-driving at BAC levels between .05 and .08. There was a small reduction in drink-driving in the .10 to .15 BAC range, but this was not statistically significant.

Analysis of monthly RBT data showed a sharp reduction in high-BAC drink driving in January 1991, with no evidence of a reversion to former drink driving patterns as the year progressed.

Data from post-crash testing showed a 35 per cent reduction in the number of drivers above a BAC of .10, with no clear evidence that this reduction was restricted to the very high BAC ranges.

Comparisons between 1990 and 1991 data were only available for selected BAC ranges. Final evidentiary tests were used for BACs above .10, and a combination of evidentiary and roadside screening results for the .05 to .08 range.

There had been no change in penalties for driving above .08 BAC, and the results were not attributable to changes in the amount or timing of RBT enforcement.

Background

Until recently, some Australian States and Territories had a maximum *per se* BAC limit of .08 for driving, while others have had a .05 limit for many years. In 1990 the Federal Government sought the agreement of all States and Territories to a maximum .05 limit, with a .02 limit for young drivers in their first three years of driving. This was part of a package of measures linked to Federal funding for treatment of road crash "black spots". All jurisdictions have now adopted the new limits.

Most debate on the selection of legal drink-driving limits has focused on the possible direct effects of reducing drink driving at BACs below the current legal limit.

A number of studies (reviewed in FORS 1990 and Howat, Sleet and Smith 1991) indicate that driving skills are significantly impaired at BACs in the .05 to .08 range.

However, some previous evaluation studies suggest that the most important effect of a lower BAC limit may be a reduction in the incidence of drink driving at levels well above .08:

- Smith (1988) reviewed the effect of the change to a .05 BAC limit in Queensland, in 1983. His data show a 12% reduction in the number of crash-involved drivers with BACs above .15, and an 8% reduction in the .08 to .15 range.

- Homel (1990) after reviewing data from New South Wales and Queensland, noted that crash reductions observed after the introduction of .05 limits appeared to be too large to be due solely to a reduction in drink driving in the .05 to .08 range: he inferred that a significant reduction must have occurred at higher BAC levels.

- McLean and Kloeden (1992) found an initial reduction of 21% in the proportion of Adelaide drivers with a BAC over .08, following the change to a .05 limit in South Australia in July 1991, but their analysis indicates that this improvement was not sustained.

- Other, indirect, evidence is available from inter-jurisdictional comparisons: in 1988, Australian States with a .08 limit had a higher incidence of fatal crashes involving drink-drivers *above* .08 than States with a .05 limit (FORS 1991).

There are number of reasons why a lower limit might affect the incidence of drink driving above the old limit:

- General reinforcement of the anti drink-driving message, and a change in relevant social pressures and expectations.

- Increased perceived risk of prosecution after a given number of drinks (in particular, changed behaviour of drivers who would have incorrectly assessed themselves as being below a .08 limit).

- Compliance with a BAC limit requires that people make a responsible decision: either to stop drinking before they reach the limit, or to avoid driving. People close to the higher .08 limit may be less likely to behave in this responsible fashion.

- The lower limit may provide an additional incentive to make special arrangements to avoid drink driving (such as nominating one member of a social group to be the sober driver for the others).

The ACT data

After consultation with the Australian Federal Police, the Federal Office of Road Safety (FORS) was able to obtain road-side RBT screening data and evidentiary testing data for 1990 and 1991. (Drivers above the legal limit at the roadside screening test are brought to a central point for testing on a more sophisticated evidentiary machine.) Evidentiary data for crash-involved drivers was also obtained.

No detailed breakdown of BAC readings was available for the roadside screening data, but it did provide information on the total number of screening tests conducted each month. Information on the number of screening results between .05 and .08 was available for 1990, and could be estimated for 1991.

Most comparisons were based on evidentiary tests. Before analysing this data, it was predicted that a reduction in drink-driving would only be observed for drivers with a BAC of .10 or more, because evidentiary test statistics at lower BACs are not directly comparable between the two periods:

- The evidentiary statistics for 1991 include drivers who had screening test results between .05 and .08 (as well as some drivers subject to the new .02 limit for young novice drivers and other special categories); such drivers were not included in the 1990 evidentiary statistics.

- Hence, if there had been no change in drivers' drinking patterns, the 1991 evidentiary data would have shown a large increase in evidentiary test results below .08, and also some increase above this level - since some drivers who tested below .08 at the roadside would have reached higher levels by the time they were given the evidentiary test.

- However, it seemed unlikely that this would have a significant effect on the number of evidentiary results above .10.

There was no change between 1990 and 1991 in the penalties for offences above .08 BAC: a fine of up to $1000, up to six months gaol, and license suspension for three months on a first offence. The penalty for the new offence of driving with a BAC between .05 and .08 is an automatic fine of $500 on a first offence. For second and subsequent offences at any BAC, the penalties are more severe.

The overall level of RBT enforcement decreased slightly from 1990 to 1991: there were approximately 92,000 roadside RBT tests conducted by police in 1990, and 82,000 in 1991 (in a region with a population of 300,000 and 157,000 vehicles).

Analysis

The χ^2 values and probabilities quoted below are based on logit modelling of the RBT data, with the number of offences per screening test as the dependent variable. Analysis was undertaken using the generalised linear modelling package GLIM, and quoted χ^2 values correspond to the reduction in scaled deviance between relevant model equations. In effect, the analysis assumes that the *number* of positive RBT results in a given time period has a Poisson distribution, with a mean proportional to the number of screening tests conducted.

The number of tests conducted per month varied widely: from 2,262 to 16,991 in 1990, and from 2,222 to 13,952 in 1991. The assumption that the proportion of positive RBT results was statistically independent of the number of tests conducted was checked and confirmed for the month by month RBT data, at various BAC cutoffs.

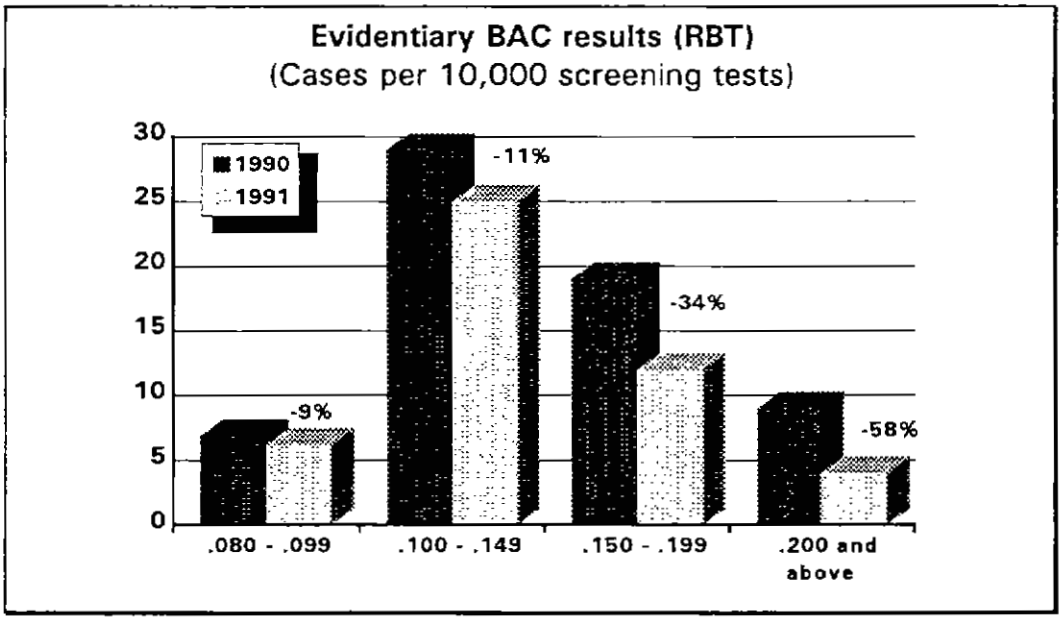
Analysis of data for crash-involved drivers assumed a Poisson distribution for the absolute number of crash-involved intoxicated drivers in a given time period.

High-range RBT results

There was a substantial drop in the incidence of high RBT readings in 1991, compared to 1990.

The total incidence of BAC readings above .10 (measured as cases per 10,000 roadside tests) decreased by 26% ($p < .001$).

Figure 1



However, as **Figure** 1 shows, this decrease occurred mainly at BAC levels above .15 and was particularly pronounced at levels above .20.

The interaction evident in Figure 1 (bigger reductions at higher BAC levels) is statistically significant ($p < .001$). Taken individually, the small reduction in the BAC range from .10 to .15 is not statistically significant ($p > .10$), but the reductions above .15 and above .20 are both significant ($p < .001$).

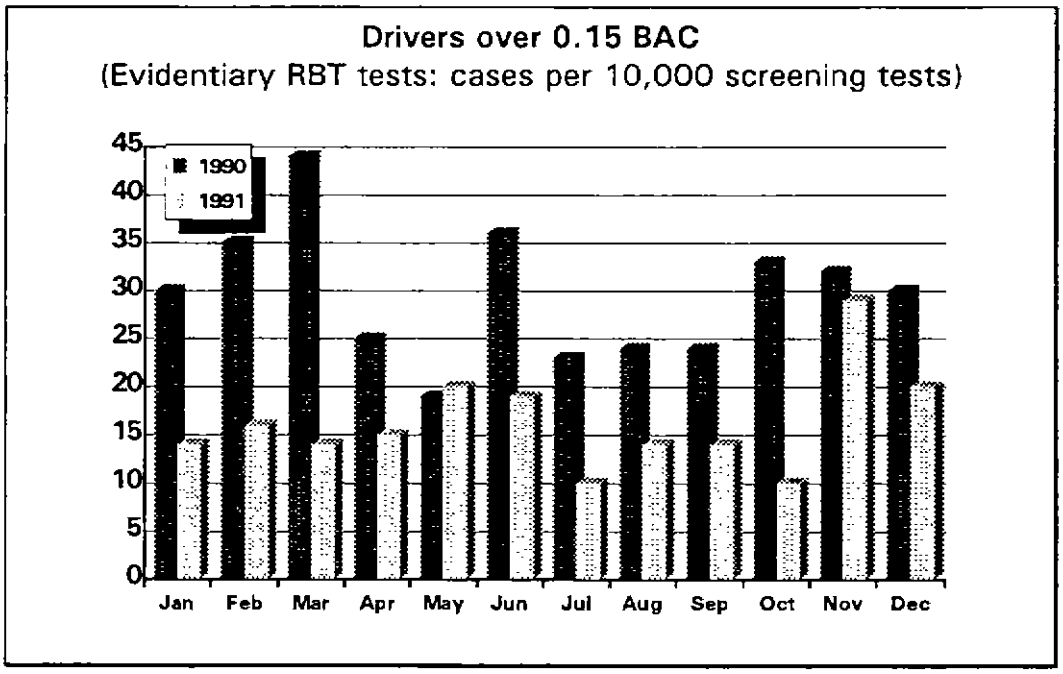
Figure 2 shows the results month by month for BAC levels above .15. It is evident that there was a sharp reduction in drink-driving in January 1991: the first month after the .05 BAC limit was proclaimed. The results also show that

for eleven out of twelve months the offence rate above .15 BAC was lower in 1991 than in the corresponding month of 1990.

Fairly strong seasonality in the incidence of drink-driving had been expected, but this was not evident in the results above .15 BAC. The main effect for *month* entered as a twelve-level factor was not significant, but polynomial analysis showed a weak linear trend: offence rates tended to be slightly higher toward the end of both years. (This trend is not obvious from visual inspection of Figure 2, which does not reflect differences in monthly sample sizes.)

Importantly, there was no evidence that the effect of the new limit declined after the initial reduction in drink-driving: the *year by month* linear interaction effect did not approach significance (χ^2 =.09, df=1) .

Figure 2



There was also no evidence that testing had been concentrated in months with seasonally low offence rates in 1991, or seasonally high rates in 1990: adding a *year* effect to a model already containing *month* gave almost the same χ^2 value as adding *year* to the constant model.

Table 1 summarises the statistics obtained from this and other analysis. Very similar results were obtained from an analysis of BAC readings above .20.

Although the decrease in the .10 to .15 BAC range was not significant, analysis of the results for all BACs above .10 is of interest for comparison with the results obtained in South Australia (see discussion below). There was a strong seasonal trend in this series, with low values in the middle of the year (**Figure 3** and Table 1). All but one of the 1991 results was below the 1990 trend line, and once again there was no evidence that the upward trend toward the end of 1991 was steeper than in 1990 ($\chi^2 = .08$ for the linear interaction).

The data were disaggregated by driver age, to test the possibility that the decrease in high BAC readings might have been due mainly to the introduction of a "zero" BAC limit (actually .02) for some drivers under 25 years old, rather than the general .05 limit.

Figure 3

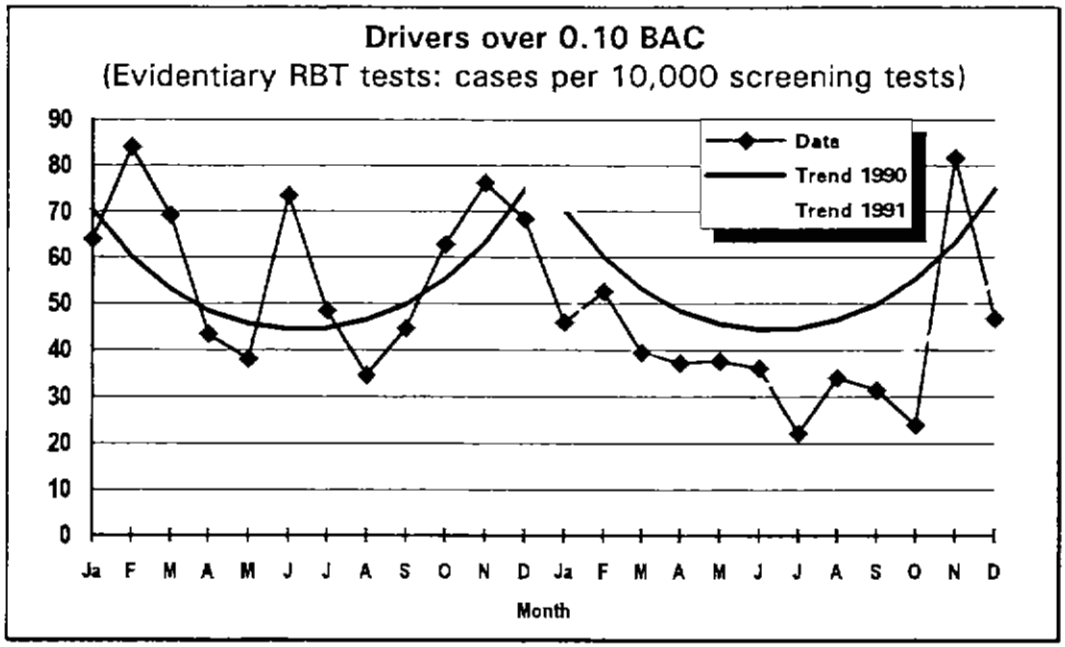
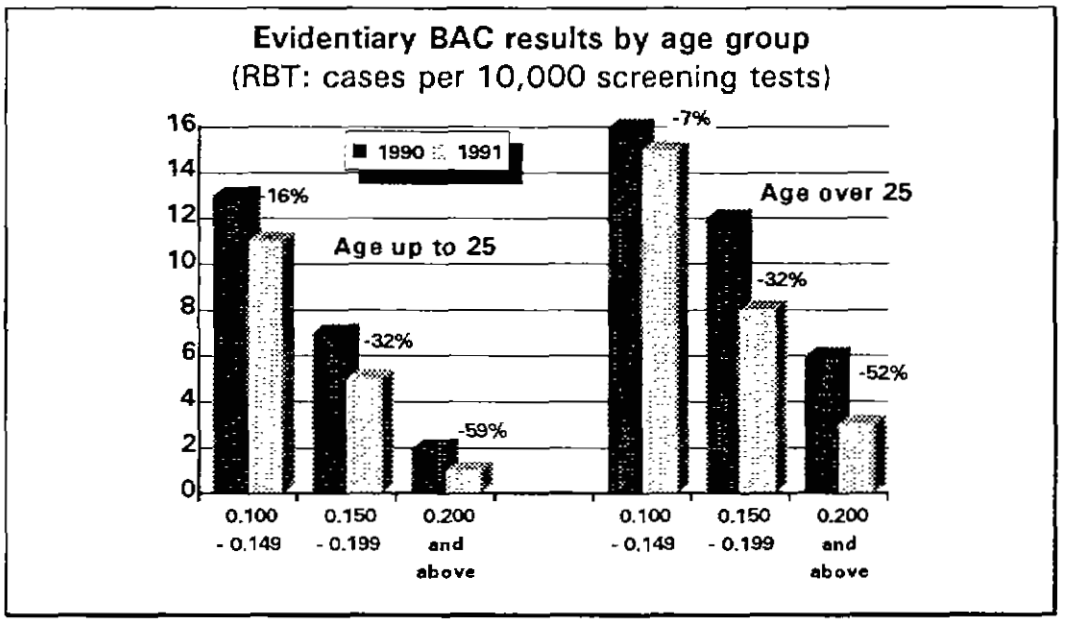
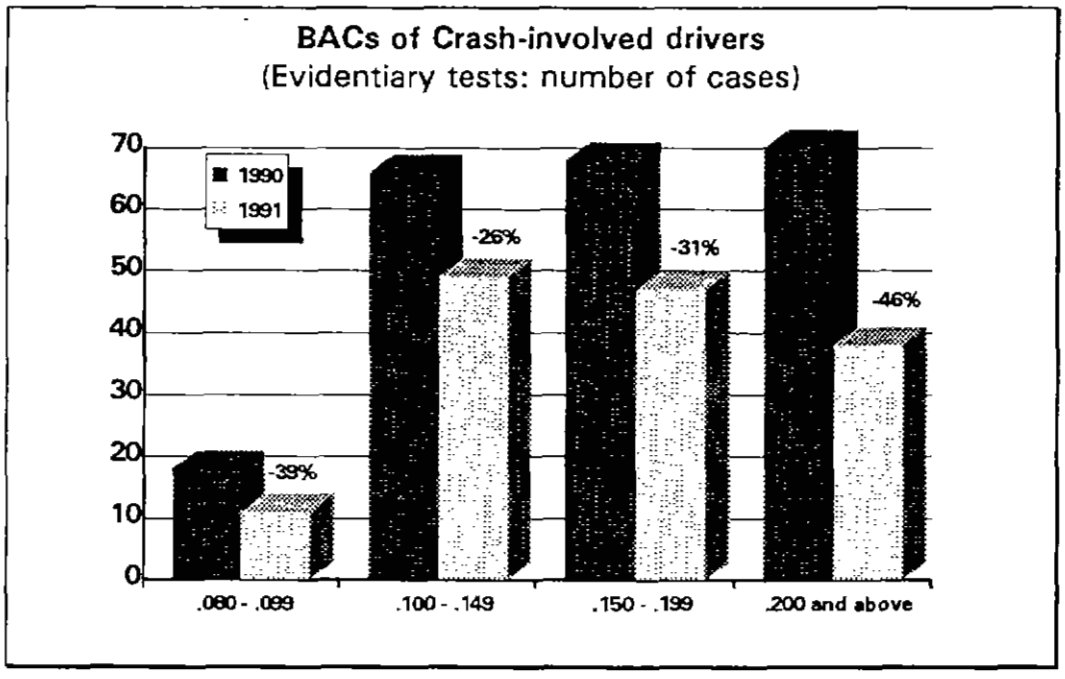


Figure 4



As **Figure 4** shows, there was no evidence at all that the reduction was restricted to younger drivers. (The graph shows BAC results for both age groups as a proportion of all drivers tested, not of drivers in the relevant age group.)

Figure 5



Low-range RBT results

Although no detailed breakdown of the RBT screening results was available, the 1990 data did record the number of drivers in the .05 to .08 range. For 1991, the numbers in this range could be estimated, by subtracting the number of drivers with *evidentiary* results above .08 from the total number with *screening* results above .05.

The results indicate a massive reduction in the number of drivers in this range: from 363 cases per 10,000 tests in 1990, to an estimated 34 in 1991.

Crash-involved drivers

The data for drivers involved in crashes provides an independent test of the effects of the lower BAC limit. Results are shown in **Figure 5**. The overall reduction in the number of crash-involved drivers with a BAC above .08 was statistically significant (χ^2=.16.3, df=1, p<.001). As with the RBT data, the observed reduction was greatest at the highest BAC readings, but the interaction was not statistically significant (χ^2=.1.43, df=3).

The reduction in each of the BAC ranges shown in Figure 5 was considerably greater than the reduction of 6% in total police-reported crashes in the ACT over the same period.

Analysis of the month by month data for crash-involved drivers above a BAC of .10 showed no evidence that the reduction tended to be smaller toward the end of the year (χ^2=.0.008, df=1 for the linear interaction *month* by *year*)

Discussion

The results provide further evidence that a reduction in the maximum legal BAC limit from .08 to .05 leads to a reduction in drink-driving at BAC levels well above the original .08 limit. In this case, there was a substantial reduction at BAC levels above .15, and even above .20: where crash risks are extremely high.

This was in addition to a very large reduction in drink driving within the .05 to .08 range. This second result is important for three reasons:

- There is evidence (cited above) that drivers in this BAC range have an increased risk of crash involvement.
- The result is an indication of the high level of compliance of most drivers with alcohol limits (backed by RBT), and suggests that many drivers can adjust their behaviour to a specific BAC limit with some accuracy.
- It also has implications for the police workloads involved in implementing the new limit: the total number of people failing the primary screening test increased slightly in 1991, but the increase was much smaller than a projection from the 1990 data might have suggested.

Three hypotheses about possible artefacts affecting the observed decrease in high-BAC drink driving were tested, and rejected:

- that the overall level of RBT enforcement might have increased significantly in 1991
- that testing in 1991 might have been concentrated in months with seasonally low offence rates
- that the changes might have been due to the introduction of a "zero" limit for young novice drivers, rather than the general .05 limit.

With the data collated for this study, it was not possible to test for other possible variations in RBT schedules: such as the distribution of tests by time of day, day of week, or location. The ACT is however a small and relatively homogeneous jurisdiction: this decreases the possibility that unidentified changes in the geographic deployment of RBT resources could have contributed to the changed outcomes.

Analysis of comparable data on reductions in drink-driving in previous years would have been desirable, but resources precluded this. However, the decreases in drink-driving found in this study are very large, and it seems most unlikely that they could be in line with any previously established long-term trend in the ACT data.

McLean and Kloeden (1992) found an initial reduction of 21% in the proportion of Adelaide drivers with a BAC over .08, following the change to a .05 limit in South Australia in July 1991, but their analysis indicates that this improvement was not sustained, with a reduction of only 7% reported for the second half of their follow-up period (7 November to 2 December 1991, compared to data collected in April and May 1991). Their results were based on special surveys in selected locations at night, rather than police RBT results.

Because they had not previously conducted a survey in the latter half of the year, McLean and Kloeden were unable to assess the possible effects of seasonal variations on these results: though they note that they found negligible variation from the first to the second half of their first survey of 1991 (February/March, compared to April/May).

The data reported here, based on less systematic sampling but a much larger number of observations covering a full 24 months, indicate quite strong seasonal variation for BACs above .10, with an increase toward the end of both years. If a similar underlying seasonal trend applied in South Australia, the apparent reduction in the effect of the new limit after five months would be spurious.

The fact that the fine for a first offence below .08 BAC in the ACT is five times that in South Australia may also have contributed to a more clear-cut outcome in the Territory.

It is not clear why the changed BAC limit in the ACT appeared to have a greater impact on drink driving at very high BAC levels (above .15) than in the .10 - .15 range (Figure 1).

It is possible that this is an artefact of the two-stage screening process. That is, drivers with a screening result below .08, who would not have been given an

evidentiary test in 1990, may have produced evidentiary results above .10 in 1991. However, it seems unlikely that the this would have been common.

Numbers in the South Australian study were too small for assessment of results at very high BACs, but the data presented by Smith (1988) for Queensland do show a relatively large reduction for very high BACs.

It is possible that a .05 limit does have a particular impact on those people who tend, once they pass a certain initial BAC level, to drink very heavily. While it seems implausible that a large percentage of Canberra's heavy drinkers suddenly became abstemious on January 1 1991, it may well be that a significant minority of them are now finding ways to avoid driving after drinking.

Of the other possible mechanisms listed in the introduction for effects above .08 BAC, it seems unlikely that the main factor is a change in the behaviour of drivers who would have incorrectly assessed themselves as being below a .08 limit: since this effect would have been concentrated at moderate BACs.

Table 1
Summary of analysis of RBT data

EFFECT	df	BAC .10 to .15		BAC >.10		BAC >.15		BAC >.20	
		χ^2	p	χ^2	p	χ^2	p	χ^2	p
YEAR	1	1.62		18.92	<.001	25.93	<.001	18.32	<.001
YEAR /MONTH	1	2.18		18.91	<.001	23.68	<.001	13.36	<.001
MONTH	11	56.06	<.001	59.03	<.001	14.17		12.56	
M1	1	5.16	<.05	9.64	<.01	4.46	<.05	3.02	
M2	1	27.14	<.001	21.47	<.001	1.25		0.47	
M1 + M2	2	32.30	<.001	31.11	<.001	—		—	
M1•YEAR	1	.08		.02		0.09		0.17	

NOTES:

χ^2 values are for the change in scaled deviance compared to a simpler model.

YEAR /MONTH = YEAR adjusted for MONTH (month treated as a factor with 11 df)

M1 = linear term for month (compared to constant model)

M2 = quadratic term for month (compared to M1 model)

M1•YEAR = linear month by YEAR interaction
tested against the model equation YEAR+M1+M2 if M2 was significant, otherwise YEAR+M1. (Tests controlling for MONTH as a factor (11 df) gave similarly small χ^2 values)

References

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