



DRINK-DRIVING LAW ENFORCEMENT AND THE LEGAL BLOOD ALCOHOL LIMIT IN NEW SOUTH WALES

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Abstract—This paper reports the results of a preliminary analysis of daily fatal crashes in New South Wales, Australia, between July 1975 and December 1986. The analysis unexpectedly uncovered a small but statistically significant decline in crashes coinciding with the introduction of a law lowering the legal blood alcohol concentration (BAC) from .08 to .05 g%. The original aim of the analysis was to develop for a larger study appropriate log-linear techniques to assess the impact of a range of government initiatives, including laws aimed at the drinking driver: increased penalties, the .05 law, and random breath testing (RBT). The analysis showed that RBT immediately reduced fatal crashes by 19.5% overall and by 30% during holiday periods, and that the .05 law, introduced two years before RBT, apparently reduced fatal crashes by 13% on Saturdays. There was no significant effect of the .05 law on any other day of the week, and there was no clear evidence that any other initiative had a statistically significant effect on accidents. Although the apparent impact of the .05 law was small, it is surprising that any effect was discernible, since the law was not extensively advertised and police enforcement was no more intense than is usual over Christmas. However, any effects of the .05 law may not have been sustained if RBT had not been introduced two years later.

As Zimring (1988) observes, since the mid-1960s traffic law policy has gradually assumed greater importance for governments in many Western democracies, and there is an emerging consensus among governmental and scholarly elites that the criminal law should be the major weapon against drinking and driving. Enforcement should be based on low per se blood alcohol concentrations (BAC), although debate rages fiercely as to how low is "low enough" (Donelson 1988; Howat, Sleet, and Smith 1991; Hurst 1985). Moreover, scholars seem agreed that there should be a reliance on "detection efforts and publicity" (Zimring 1988, p. 376) rather than on escalation of sanctions to enhance deterrence (Homel 1988; Ross 1982).

The aim of this note is to report the results of a preliminary analysis of the impact of 14 government initiatives (mainly laws and enforcement programs) that were judged to have the potential to affect the number of fatal crashes occurring in New South Wales over a period of nearly 12 years, from July 1, 1975 to December 31, 1986. Many of the initiatives were designed to intensify the deterrence of drinking drivers. These included increases in penalties, a lowering of the prescribed BAC from .08 to .05 g%, and the introduction of random breath testing (RBT).

However, the effects of other measures, such as the phased introduction of child restraint laws, were also modelled, to put the impact of alcohol counter-measures in perspective and to allow a more general statement about the impact of government road safety initiatives.

The analysis was undertaken originally as part of the development of techniques for a larger study planned to compare the effectiveness of different methods of enforcement of RBT across several Australian states. A specific aim was to test the usefulness of a log-linear analysis of daily accident data for assessing the impact of many legal interventions introduced over an extended period of time. The larger study has now been funded by the Federal Office of Road Safety, and future papers will report the results of more extensive analyses incorporating data from four states (New South Wales, Queensland, Tasmania, and Western Australia) and controlling for other exogenous variables such as weather conditions, drink-driving publicity, and police enforcement patterns.

In view of previous research (e.g. Homel 1988), it should come as no surprise that in the present analysis RBT was associated with the biggest decline in fatalities. Nonetheless, a new demonstration of

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the impact of RBT is important since a paper by Homel, Carseldine, and Kearns (1988) is the only other published time-series analysis bearing on this issue, and that paper did not incorporate an analysis of daily fatalities, the basis of the present article.* Perhaps more surprising than the impact of RBT is the finding that lowering the legal BAC in December 1980 apparently reduced fatalities at weekends, especially since official analyses carried out by the Traffic Authority of NSW suggested no discernable impact on traffic crashes (Arthurson 1985b). The present analysis appears to be the first time direct evidence has been assembled that a change in legal BAC may, on its own, reduce fatalities, although the overall size of the effect in NSW was not large.

EVALUATION OF THE IMPACT OF GOVERNMENT ROAD SAFETY INITIATIVES IN NEW SOUTH WALES

The fact that, unlike, say, education programs, legislative measures and publicity programs are usually intended to have an immediate impact means that they should be subjected to close scrutiny whenever they are introduced, using techniques such as interrupted time-series analysis (Cook and Campbell 1979). Statistical models offer the possibility of isolating the effects of a legal change while controlling for a number of threats to inferential validity, such as random fluctuations, regression to the mean, or long-term trends (Ross and McCleary 1983). In addition, although it is not usually done, time-series analyses have the potential to allow the researcher to estimate the cumulative effects of a series of legal interventions introduced at different times over a specified period. In this way, the individual effects of laws that are gradually added to a legislative package focussed on drink-driving or other road user behaviours can be assessed.

Interrupted time-series analyses of traffic safety interventions are usually based on data aggregated into months and utilise Box-Jenkins methods, following the approach of Box and Tiao (1975), incorporating a dummy variable and a transfer function to model the impact of the intervention (e.g. Hilton 1984; Ross, McCleary, and Epperlein 1982). However, as McCleary and Hay (1980) and others have pointed out, traffic fatalities are discrete, rare events and thus might be best analysed as Poisson outcomes. Following this approach, the analysis would ideally be based on daily, rather than weekly or

monthly data, and would explicitly model the Poisson process that underlies the generation of fatal traffic crashes.

A fundamental advantage of daily data is that changes in the time series immediately following the law may be investigated. As Ross and McCleary (1983) observe, change in a time series is not evidence of causality unless the change can be detected in the first post intervention observation, and for this reason data should be collected at the lowest possible level of temporal aggregation. A model based explicitly on the assumption that fatality data follow a Poisson distribution can be fitted to daily fatal crash data, using generalised linear modelling techniques (McCullagh and Nelder 1983), provided residuals are not autocorrelated. Use of the generalised linear model allows, in turn, the incorporation of a number of dummy variables representing the cumulative effects of a series of government initiatives.

For interventions aimed at drinking and driving, the effects of exogenous variables, such as weather conditions, the economy, and the number of registered vehicles, can be at least partly controlled by comparing the series for days when drink-driving rates are high (Fridays, Saturdays, and Sundays) with the series for other days of the week, or by comparing holiday periods (Christmas, New Year, Easter) with nonholiday periods. More refined controls can be introduced by decomposing the series into alcohol-related and nonalcohol-related crashes, based on blood tests of dead drivers, or based on times and days when drink-driving rates are known to be low or high (McLean, Holubowycz, and Sadow 1980). However, the preliminary analysis reported here is based on total daily fatal crashes over the period July 1, 1975 to December 31, 1986, undifferentiated by time of day or by alcohol involvement as measured by a blood test.*

Road safety initiatives, 1975-1986

The major new laws and enforcement and publicity campaigns in New South Wales between July 1, 1975 and December 31, 1986 are described below. All major changes are listed, including those not aimed specifically at drinking and driving. One new law (low BAC for novice drivers introduced on April 2, 1985) is not included in the analysis since the daily data were not differentiated by age group.†

*Analyses of data from the four-state study broken down in these ways will be reported in later papers.

†Child restraint laws were included in the analysis since the target population was judged to be sufficiently large to allow effects on total fatalities to be discerned if the laws had had a substantial effect.

*Arthurson (1985a) refers to a Box-Jenkins time series analysis used by the NSW Roads and Traffic Authority to evaluate the impact of RBT, but no details of this analysis are reported.

Increased hotel trading hours in December 1979 are included as one legal change, although this almost coincided with increased disqualification periods for drink-drivers, making it difficult to separate the effects of the two changes.

March 1, 1977: Child restraint law no. 1. The driver of a motor vehicle must not permit a child under the age of eight years to travel unrestrained if a suitable restraint is available in the vehicle. If a car or station wagon has front and rear seats, the driver shall not permit a child under the age of eight years to travel unrestrained in the front compartment if a rear seat position is available. There are no published evaluations of these laws.

December 17, 1978: Increased fines for drink-driving. The maximum fine was increased from \$400 to \$1,000. No published evaluation.

July 1, 1979: 100 km/h speed limit. This is an absolute speed limit, except where signposted. Previously a "derestricted system" operated in rural areas. No published evaluation.

December 7, 1979: Longer hotel trading hours. Sunday hotel sessions were introduced from noon to 10:00 P.M. Smith (1987b) found a marked increase in fatalities and serious injuries for the period 6:00 P.M. to midnight on Sundays, using as controls other days of the week, accidents from midnight to 11:59 A.M., and accidents in Queensland (to control for a general increase in Sunday accidents in other parts of Australia).

December 17, 1979: Minimum disqualification periods for drink-driving. A mandatory minimum disqualification period of three months was introduced for any driver convicted of drink-driving. No published evaluation.

July 15, 1980: Mandatory breath testing after a crash or 4-point traffic offence. Four-point offences cover all but minor offences. No published evaluation for NSW, but an evaluation of the intensified enforcement of a similar law in Victoria, focused on speeding at night, found changes in driver attitudes to speeding and reductions in self-reported drink-driving, although no effect on accidents could be demonstrated (Harrison 1989).

December 15, 1980: Reduction of the legal limit from .08 to .05 g%. Although the law received headline treatment in the newspapers on several occasions before Christmas, it was not supported by paid publicity, and police enforcement levels were no higher than usual for the Christmas period. Elliott and Shanahan (1983) present evidence that the law may have been largely unnoticed by many drivers, although my personal observations at the time lead me to believe that many drivers were aware of the law but chose to ignore it.

The effects of the lowering of the BAC in NSW and Queensland have been examined by Smith (1987a), who compared daytime and nighttime accidents (fatal, serious injury, minor injury, and property damage only) before and after the intervention. He concluded that effects were similar in both states, with hospitalization accidents down about 9% and fatalities down about 4%, but the changes in fatalities were not statistically significant. The present analysis, which is more powerful because it is based on a long series of data, shows that a significant effect on fatal crashes in NSW can be demonstrated for Saturdays.

March 1, 1981: T-junction rule. This rule requires the driver of a vehicle approaching an uncontrolled T-junction from the terminating street to give way to any vehicle that has entered or is approaching the intersection from the continuing street. No published evaluation.

January 8, 1982: Child restraint law no. 2. Children under eight years of age were prohibited from being carried unrestrained in the front seat of a motor vehicle, except where exempted on medical grounds or where no rear seat was available. No published evaluation.

July 2, 1982: Child restraint law no. 3. From this date a driver of a motor vehicle became responsible for ensuring that any child under the age of 14 years wears an available child restraint. No published evaluation.

December 17, 1982: Random breath testing. The RBT law was introduced with extensive media publicity and was enforced in a highly visible and energetic manner by police (Homel 1988). Coinciding with the introduction of RBT, the government increased penalties for drinking and driving and introduced compulsory blood tests for drivers admitted to hospital after an accident. However, these measures received almost no publicity, and only a minority of drivers were aware of the increased penalties (Homel 1988).

Motorists passing an RBT checkpoint are selected in a haphazard fashion, and all drivers who are pulled over are asked to take a preliminary roadside breath test, regardless of the type of vehicle they are driving or their manner of driving. No attempt is made to detect symptoms of alcohol use through observation, as is the practice in sobriety checkpoints in the United States after a driver has been pulled over. Once a driver is pulled over, no record checks are run (although in NSW licenses are sometimes checked), and no equipment checks are conducted. Drivers returning a negative breath test result are not detained and usually drive away after a delay of less than one minute. Drivers who test posi-

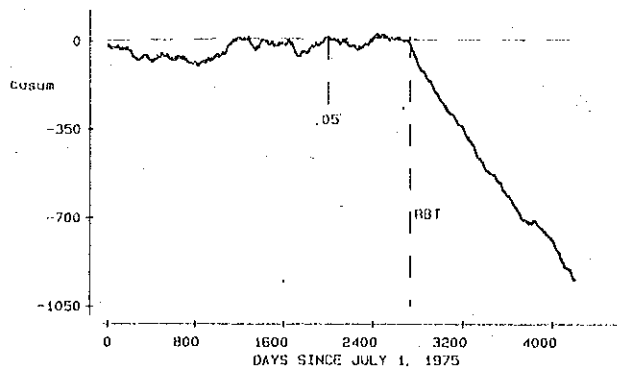


Fig. 1. Cumulative sum graph for daily fatal crashes in NSW, July 1, 1975 to December 31, 1986.

tive during the preliminary screening (generally about 0.4% of all those tested) are detained for a more detailed breath analysis, which provides a reading that can be tendered as evidence in court.

Based on an analysis of weekly data, Homel, Carseldine, and Kearns (1988) showed that immediately RBT was introduced, there was a 36% reduction in alcohol-related fatalities and serious injuries, and an overall reduction of 22% in fatal crashes, which was sustained for five years. More recent data show that there has been no subsequent increase in fatalities or serious injuries in New South Wales (Federal Office of Road Safety 1993). Barnes (1988) reported that RBT led to reductions in many different types of nighttime fatal and serious injury accidents, although there was no significant decrease in motorcycle or pedestrian accidents. The number of fatal accidents on main roads decreased more than that on side roads, and accident reductions at intersections depended on the type of priority control used (there was little reduction in accidents at traffic signals, and greater reduction at give way signs than stop signs).

January 13, 1984: Bus priority. Buses were given priority when leaving bus stops, bus bays, and bus zones. No published evaluation.

August 15, 1984: Publicity campaign on wearing seat belts announced. No published evaluation.

March 1, 1986: Demerit points plus fine. For speeding, not wearing a seat belt, permitting a child to travel unrestrained, or for a rider not wearing a motorcyclist helmet. No published evaluation.

RESULTS

Fatal crashes: descriptive analysis

Daily fatal crashes for the period (4,202 data points) are set out in a cumulative sum (CUSUM) graph in Fig. 1. A CUSUM is a series of numbers

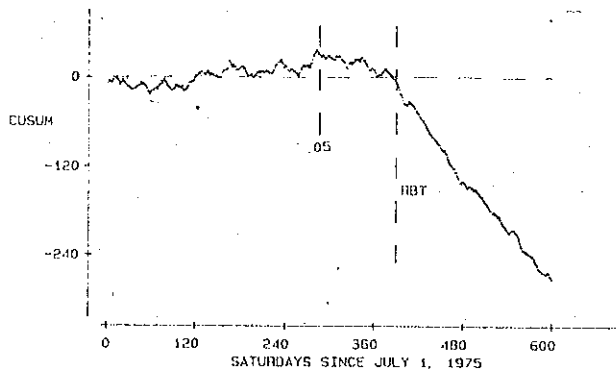


Fig. 2. Cumulative sum graph for Saturday fatal crashes in NSW, July 1, 1975 to December 31, 1986.

which are the cumulative sum of the differences between an observed series and the corresponding expected series (Woodward and Goldsmith 1964). In Fig. 1, the expected count was the average of the daily data for the seven years prior to RBT, since RBT was expected to have the biggest impact. However, the shape of the graph does not depend on the choice of the expected count. The date on which the legal BAC was reduced from .08 to .05 g% is also shown.

The key to interpreting Fig. 1 is to regard the number below the zero line as the "accumulated benefit" due to RBT at any time after its introduction. If the CUSUM graph maintains a downwards slope (which it generally does in Fig. 1), a benefit is still being derived from RBT, in comparison with the average accident level that would have prevailed if the law had not been introduced. If the graph becomes horizontal, a benefit is no longer being accumulated and accidents have reverted to their pre-RBT level. If the slope actually becomes positive, the accumulated benefit of RBT is being eroded by an accident rate higher than the average pre-RBT level.

It is clear from Fig. 1 that RBT has had a sustained impact in New South Wales and that the other intervention marked, the reduction in BAC from .08 to .05, had very little impact. However, Fig. 2, which is the CUSUM for Saturdays, suggests that the .05 law may have had an impact, although clearly RBT is still the major factor (as expected). The apparent effect of each of the interventions listed above is depicted graphically in Fig. 3. This diagram simply plots mean total daily fatal crashes and mean Saturday fatal crashes for the period each legal intervention applied before the next law was enacted. (Since they were so close together in time, the Sunday trading law and the mandatory disqualification law are not distinguished in the diagram.)

The purpose of the linear model analysis re-

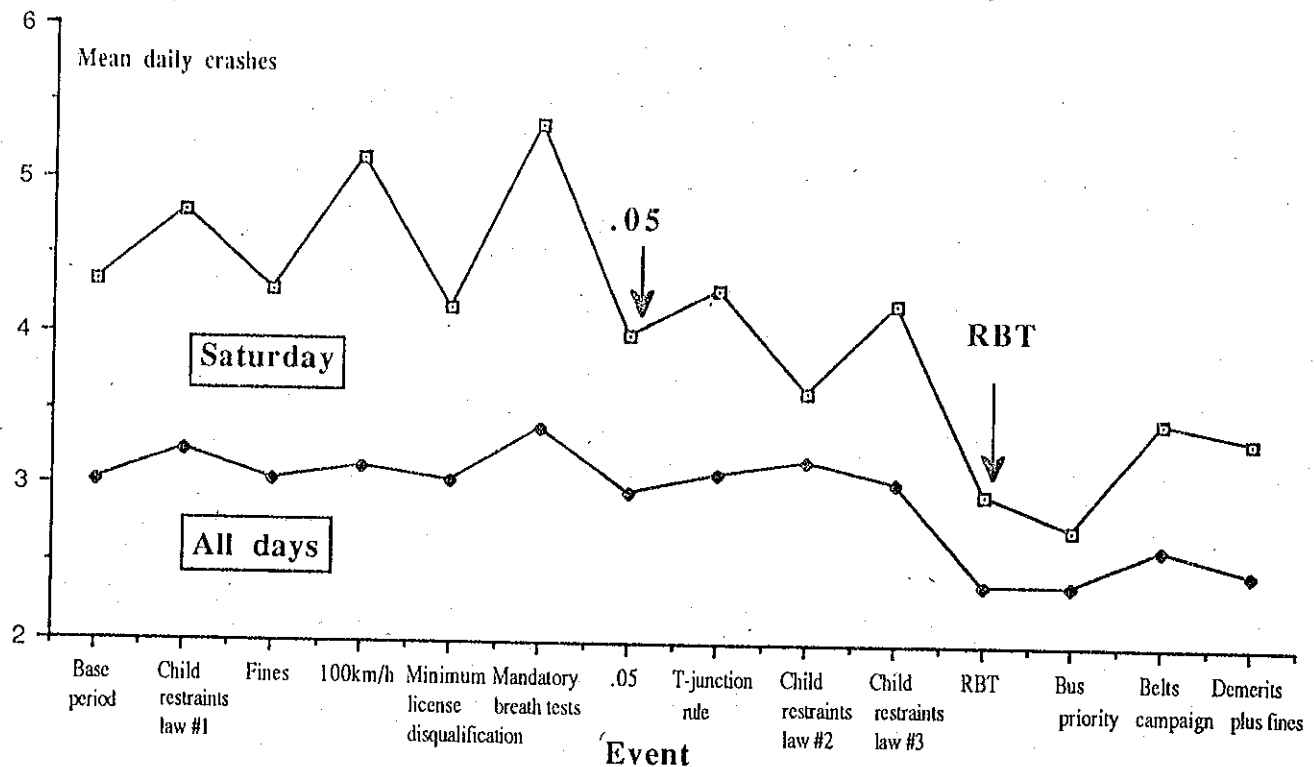


Fig. 3. Fatal crashes in NSW, July 1, 1975 to December 31, 1986 (Saturday and all other days).

ported below was to determine which laws corresponded to a permanent decline in fatal crashes, either across the whole week or on specific days or holiday periods (defined as days falling in the Easter, Christmas, or New Year breaks).

Log-linear analysis

The dependent variable to be explained is the number of daily fatalities. The analysis is based on a generalised linear model (McCullagh and Nelder 1983) that assumes that daily fatal crashes follow a Poisson distribution and that model residuals are not autocorrelated. Independent variables include the 14 interventions, the day of the week (DAYWEEK), the month (MONTH), and whether the day was during a public holiday period (HOLIDAY). Each of these variables is represented by one or more dummy variables. For example, DAYWEEK is a factor with 6 degrees of freedom (*d.f.*) represented by six dummy variables; HOLIDAY and each intervention are binary (1 *d.f.* each). As a way of minimizing possible autocorrelation of model residuals, fatalities on each of the preceding seven days were also incorporated in the model as seven covariates. The construction of these lagged covariates reduced the length of the series from 4,202 to 4,195 days.

It was hypothesized that the six alcohol-related interventions would have had more impact at times

when drinking and driving is more common, namely weekends and public holidays. These interventions were: (i) the increase in fines (FINES); (ii) minimum disqualification periods (DISQ); (iii) increased hotel opening hours (HOTELS); (iv) mandatory breath testing (MAND); (v) the .05 law (.05); and (vi) RBT. The differential effects of these interventions could be investigated either by analysing the data for each day of the week and for holiday periods separately, or by incorporating interaction terms in a single model for the entire series of 4,195 days. Since analysis of separate series entails a loss of statistical power (power is a function of the total number of fatal crashes), the interaction approach was adopted. However, this approach does have the disadvantage that since interactions have a term in common (DAYWEEK or HOLIDAY) they will tend to be highly correlated with each other. Thus when interactions between each of the alcohol-related interventions and DAYWEEK and HOLIDAY were added to the full model containing all interventions, two interactions had to be omitted due to multicollinearity (HOTELS \times HOLIDAY and .05 \times HOLIDAY).

The full model including interactions consisted of 79 *d.f.* and 34 terms: seven covariates, DAYWEEK, MONTH, and HOLIDAY, 14 interventions, and 10 interactions. This model, which

was fitted using maximum likelihood methods for a dependent variable following the Poisson distribution with a log link function, satisfied all statistical requirements, including linearity and independence of the residuals (the autocorrelation function for the residuals showed complete white noise, although the raw fatality data did show significant autocorrelation). The distribution of the residuals was consistent with the assumption of a Poisson distribution (confirmed by using the Anscombe transformation: McCullagh and Nelder 1983, p. 29), but the residual deviance was 4,697 with 4,115 *d.f.*, indicating a degree of overdispersion.

One approach to the analysis involves reducing the full model by backward elimination (with the restriction that terms marginal to an interaction are forced into the model while that interaction is present). Because this procedure is purely automatic, variables are treated systematically and no factor is given greater weight than any other. However, the automatic nature of the process means that no prior knowledge (e.g. the known impact of RBT) is built into the model, and a decision about which of two correlated factors to omit might be based on a very slight difference in statistical significance—a particular problem given the near collinearity of some of the interaction terms. Therefore, probably a better procedure is to build a model that adjusts the effects of all other terms for RBT and its interaction with HOLIDAY or DAYWEEK. Fortunately both approaches yield similar results.

All analyses were based on a significance level of .025, as a partial control for overdispersion and for Type I errors. Backward elimination yielded a model with the following terms (the covariates were nonsignificant and were dropped): DAYWEEK, HOLIDAY, FINES, FINES \times HOLIDAY ($p = .038$), DISQ, DISQ \times HOLIDAY ($p = .026$), RBT ($p \leq .001$), .05, and .05 \times DAYWEEK ($p = .008$).^{*} The model confirmed that the introduction of RBT coincided with a highly statistically significant drop in fatalities, and also revealed a statistically significant decline on Saturdays coinciding with the .05 law. Examination of CUSUMs verified that these declines coincided with the introduction of the laws (Figs. 1 and 2).

The interactions involving FINES and DISQ were more difficult to interpret. According to the model, there was an *increase* from a mean daily fatality rate of 4.48 (during holidays) to a mean of 4.94 after the law increasing fines was introduced, and a *decline* from 4.94 to 4.12 one year later after the minimum disqualification law came into force.

^{*}*p*-values are adjusted for all other terms in the model.

The disqualification effect was significant only relative to the increase that occurred after the law that increased fines. However, detailed examination of the CUSUM data for holidays suggested that these effects may be spurious, reflecting Type I errors or the operation of factors not included in the model. The trend in the data after each law was not consistently up or down; neither law coincided with an immediate and sustained fall or increase in fatalities during holiday periods.

There are other grounds for modifying the model produced by backward elimination. Apart from instability produced by multicollinearity, as noted earlier RBT had a much greater impact on alcohol-related accidents than on nonalcohol-related accidents, and it is therefore desirable that any reduced model incorporate either RBT \times DAYWEEK or RBT \times HOLIDAY to reflect this fact. However, the first of these interactions is not significant fitted after .05 \times DAYWEEK (and vice versa), although if Saturday fatalities are analysed as a separate series, both the RBT and .05 laws have statistically significant effects ($p = .0001$ and .041, respectively).

A compromise model was therefore constructed, removing the probably spurious terms from the backwards elimination model and building in an interaction with RBT which partly reflects the results of what is known about its impact and also avoids the problem of multicollinearity between .05 \times DAYWEEK and RBT \times DAYWEEK, although at the cost of including a term that is marginally statistically significant. This model was DAYWEEK, HOLIDAY, .05, .05 \times DAYWEEK ($p = .013$), RBT and RBT \times HOLIDAY ($p = .067$). It was verified that no other interventions or interaction terms were significant at .025 when added to this model.

It should be emphasized that no matter which model is adopted as the "final model", there is no question that RBT had a sustained impact on fatalities (Fig. 1), and that the .05 law coincided with a reduction in fatalities on weekends, which was also sustained, although with more fluctuations than was the case for RBT (Fig. 2).

Interpretation

Of the 14 road safety initiatives included in the present analysis, only RBT and the .05 law had any demonstrable effects on fatalities. Taking into account the effects of the .05 law, RBT corresponded to an overall 19.5% reduction in total daily fatal crashes ($p \leq .001$), consistent with the figure of 22% derived by Homel, Carseldine, and Kearns (1988) in an analysis of weekly fatal crashes (which in-

cluded an extra year of data but did not control for the .05 law). However, the effects of RBT were much more marked on weekends and during holidays, consistent with previous analyses which showed that RBT had a much greater effect on alcohol-related accidents.

Using the "compromise model" described above, during holidays RBT corresponded to a 30.3% decline in fatal crashes ($p \ll .001$), compared with an 18.8% decline during nonholiday periods ($p \ll .001$). These figures are consistent with the 36% decline in fatalities involving drivers with a BAC of .05 or higher found by Homel, Carseldine, and Kearns (1988). Careful examination of the CUSUM figures confirms that these reductions occurred in the first observation periods after the law (in fact it appears the decline due to RBT began six days before, due to the intense publicity, but accelerated after police enforcement began).

The .05 law could be shown to have a significant impact only on Saturdays, which is in itself noteworthy since the law had minimal paid publicity and was not the target of a special police enforcement campaign. The reduction in Saturday fatalities, controlling for the effects of RBT, was 13.0% ($p < .001$), which also began at the time the law was enacted. Expressed as a 95% confidence interval, the reduction on Saturdays was between 5.0% and 20.3%, or expressed in terms of the number of accidents, between about 10 and 42 deaths per annum. There was a reduction of 6.0% on Fridays, but this was not statistically significant ($p = .186$). For other days of the week there were nonsignificant increases, ranging from 1.4% on Sundays ($p = .78$) to 6.5% on Wednesdays ($p = .26$).

From Fig. 2, it appears the .05 law had a moderate effect on Saturday fatal crashes, but that the effect was greatly boosted by RBT. This is a reasonable interpretation, since many people did not become aware of the .05 law, or they did not become concerned about it, until RBT was introduced (Elliott and Shanahan 1983; Homel 1988). However, without collateral evidence, such as survey data, it is not possible to conclude positively that the .05 law *caused* the decline in fatalities.

CONCLUSION

There are many reasons for caution in interpreting the results of the present analysis. Although the size of the effects associated with RBT confirm and extend the results of previous research, the apparent impact of the .05 law was small and was restricted to Saturdays. In addition, the analysis involved some

statistical complications due to the use of a set of correlated interaction terms to model the impact of interventions on different days of the week. A further major limitation is the lack of a direct measure of alcohol-related accidents.

Despite these limitations, the analysis was innovative in that it was based on daily data, the lowest level of temporal aggregation available, and it tested simultaneously the impact of a range of government initiatives. The ability to isolate key drink-driving initiatives and to estimate their differential impacts on crashes occurring in holiday periods or on weekends suggests that Poisson modelling of daily accident data is a useful tool for determining the impact of legal interventions. The small but statistically significant effects associated with the .05 law may well not have been detected using more conventional techniques (Smith 1987a).

None of the survey research on the impact of RBT (Homel 1988) was done for the .05 law, so it is necessary to speculate on why it may have achieved an impact. My hypothesis is that if the weekend drop in fatalities was actually caused by the .05 law, then the mechanisms were much the same as for RBT—a direct deterrent effect for some drivers via increased perceptions of the chances of getting caught, and an indirect effect by providing an excuse for some drinkers to limit their consumption. However, because the law was not well publicised and because at that time enforcement was based on detection rather than general deterrence, the effect was necessarily limited. Thus the law probably increased the perceived probability of arrest because drinkers believed that they had a greater chance of failing the test if they continued to drink at their accustomed levels. This is especially likely in view of the fact that many drinkers believe that even a small amount of alcohol will put them over a limit as high as .10 (Hurst 1985).

For the same reasons, the law probably motivated even some heavy drinkers to cut their drinking relative to their normal consumption, even if they continued to drive over the limit (Weber 1987). Indeed, something of this kind must have happened, since it is hard to see how the apparent impact of the .05 law could have been achieved if only drivers under .08 or .10 had been influenced. This is because relatively few fatalities involve drivers between .05 and .08, or at any low BAC level (NSW Roads and Traffic Authority 1991).

The analysis presented in this paper suggests an argument for lower BAC levels rather different from those usually proposed. Much of the debate in North America and Australia has centred around relative crash risk curves, and whether people be-

tween .05 and .08 have their ability to drive impaired (Donelson 1988; Federal Office of Road Safety 1990; Howatt, Sleet, and Smith 1991; Moskowitz and Robinson 1988; Ryan and Holubowycz 1990). However, an implication of this paper is that if the aim is to deter potential offenders, especially high-risk offenders, then the rationale for setting the legal limit is, conceptually, that level that maximises deterrence (Weber 1987). Of course if drivers between .05 and .08 *definitely* posed no risk, then setting the limit at .05 on deterrence grounds would be hard to justify, but the epidemiological and experimental evidence, while not conclusive, is in my view sufficiently clear to allay this fear.

The manner in which an .05 law would be enforced is clearly critical, as well as the degree of public support for the lower limit. One advantage of the present analysis is that it suggests that .05 can have an effect in the absence of RBT and with minimal publicity, but that the effects are amplified by RBT. This suggests that jurisdictions without RBT could still expect benefits from a well-publicised and enforced .05 law, but that introducing both could be expected to maximise the traffic safety impact. Hurst (1970; 1985) has for many years urged strong enforcement, including random testing, but has argued that a limit that was too low would alienate the moderate drinkers, who are needed to maintain public support for the enforcement. However, surveys in Australia suggest that laws like RBT and .05 become more popular *after* they are enacted (Hommel 1988).*

There is clearly an urgent need to replicate the kind of analysis reported in this paper for other jurisdictions that have reduced their legal BAC levels. In the meantime, the evidence, limited as it is, that a .05 law can have a deterrent effect, together with the popularity of such laws with the public, should be presented to policy makers and politicians as reasons, additional to the epidemiological and experimental evidence, for lowering the legal limit.

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gress on Drinking and Driving held in Edmonton, Canada, March 28–30, 1990.

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