

Alcohol in New Zealand Road Trauma

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Abstract

Alcohol impaired driving is one of the major contributing factors for fatal and serious crashes in New Zealand. To curb the high level of road trauma resulting from drink-driving, a Compulsory Breath Test (CBT) programme was introduced in 1993 and a Supplementary Road Safety Package, that focused primarily on drink-driving and speeding, was introduced in 1995/96 to enhance road safety enforcement and advertising activities. These interventions have resulted in a substantial reduction in alcohol-related road trauma. The proportion of fatal crashes that are alcohol-related fell from 40% in 1991 to 26% in 2001. This paper discusses three drink-driving interventions during this period and discusses their impacts.

1. INTRODUCTION

Alcohol impairment is a major contributor to fatal crashes in New Zealand. The percentage of fatal crashes that are alcohol-related has fallen from 40% in 1991 to 26% in 2001. Over the same time period the contribution of alcohol related crashes to the total social cost of crashes has fallen from 31% to 20%. These reductions are likely due to societal changes in attitudes and drink-driving behaviours related to the increases and improvements in both enforcement and advertising activities.

Alcohol consumption affects the cognitive ability and behaviour of a driver and, hence, the risk of being involved in a crash. This is well documented in the literature. In a recent study, analysing New Zealand data, Keall et al. (2002) demonstrated that risks increase exponentially with Blood Alcohol Concentration (BAC) under 200 mg/dL and less than exponentially thereafter. They also found that the risks at all BAC levels were higher for younger drivers. These results are broadly consistent with other studies (e.g., Maycock 1997 and Zador et al. 2000).

A number of interventions that focus on law enforcement and safety education and promotion have been put in place in New Zealand to curb the high level of alcohol related road trauma. The following three interventions have been discussed and analysed in this paper.

- In April 1993, the law was changed to allow the introduction of Compulsory Breath Tests (CBT). Under this system Police discretion is removed and all drivers stopped at designated CBT checkpoints are breath tested.
- A Supplementary Road Safety Package (SRSP) was introduced in 1995/96 to enhance road safety enforcement and advertising activities to discourage risk taking behaviour (particularly drink-driving and speeding). The package continued for 5 years to 1999/2000.
- In December 1999, the legal minimum drinking age was lowered from 20 years to 18 years. This could have an effect on drink driving activity not only on 18-20 year olds but also on younger drivers.

2. PAST EVALUATIONS OF THE INTERVENTIONS

2.1 The Compulsory Breath Test (CBT) programme

The effectiveness of the programme was first reviewed by Mara et al. (1996). By comparing high (10pm-3am) and low alcohol periods they found sustained effects associated with the CBT programme. For instance they reported a 38% reduction in fatal and serious injury crashes in high alcohol hours in urban areas compared to a 17% reduction in low alcohol hours. These effects were significant at the 5%-10% level. For a similar breath test programme introduced in 1982 in New South Wales, Australia, Homel (1994) found a comparable effect.

2.2 The Supplementary Road Safety Package (SRSP)

Taking into account the trend effect, vehicle and road improvements, economic conditions and the major interventions, Guria and Leung (2002) found the SRSP was highly effective and prevented at least 285 road fatalities over the five years to June 2000. This is broadly consistent with Cameron and Vulcan (1998) who estimated that about 109 lives were saved during the first two years of the programme. Although enforcement and advertising directed to drink driving was a major part of the SRSP, these studies did not separately identify the effectiveness of this component of the package. However, there was a considerable reduction in alcohol-related fatalities following the introduction of the package. The number (percentage) of drivers killed with excess blood alcohol fell from 93 (30%) in 1995 to 55 (21%) in 2001.

Analysing the number of evidential breath tests (EBTs), Macpherson and Lewis (1998) questioned the effectiveness of the advertising campaign. However, their analysis ignored the effect of changes in police enforcement. As enforcement became more targeted to risk, the number of EBTs detected was expected to increase even if the actual violation rate might have fallen. Studying the campaign in more detail, Tay (1999) on the other hand, concluded that the hard-hitting SRSP advertising campaign had a greater impact in reducing drink-driving activities than the previous campaign.

2.3 Lowering of the legal drinking age

To date, no formal evaluation of the law change on alcohol-related road trauma has been carried out. However, the number of 14 to 17 year old drivers as a percentage of total prosecutions for driving with excess alcohol has increased from 4.2% in 1998-99 to 5% in 2000-01. For those between 18 and 19 years old, the percentage also increased, from 10.3% during 1998-99 to 11.8% during 2000-01. Both increases are statistically significant at the 5% level. As mandatory carriage of photographic licences (enacted in May 1999) provides easy identification of drivers under 20 years old, who are subject to the youth limit of 30 mg/dL, part of the increase could be due to an increase in the detection rate.

On the other hand, measurements of drivers breath alcohol show no obvious trend for drivers aged 15-19. The proportion with a breath alcohol level over the limit has fluctuated between 2% and 3% since 1998 (Keall 2002).

3. FURTHER ANALYSIS

Surveys show that New Zealanders' awareness of the risks of drink-driving has increased (LTSA 2001) and that the proportion of drivers on the road with illegal breath alcohol levels has decreased since 1995 (Keall 2002). Despite a relatively stable per capita alcohol consumption (Habgood et al 1998), a substantial increase in traffic and a large increase in alcohol related enforcement, the number of convictions for driving with excess alcohol has

remained almost static at around 20,000 per year. These indicate that drink-driving behaviour has improved over time.

For drivers involved in fatal crashes, the percentage with alcohol cited as a contributing factor has fallen since the inception of CBT in April 1993 and the SRSP in 1995/96. For 15-17 year old drivers involved in fatal crashes, the percentage with alcohol cited as a contributing factor has increased from 14% in the 24 months before the drinking age was lowered to 35% in the 24 months after the change (Table 1). This increase is significant at the 5% level. However, no significant change for drivers aged 18-19 was found. Though not reported here, similar effects (with slight differences in magnitude) were also found from injury (including fatal) crashes.

Table 1: Drivers involved in fatal crashes

Interventions	Periods of comparison	Drivers involved in fatal crashes			
		Percentage of drivers with alcohol recorded as a contributing factor (percentages within each driver group)			
		National	Female drivers	Male drivers	Young drivers aged 15 to 17
CBT CBT& SRSP	Before: 1990-1992	33%	16%	37%	
	After: 1993-1995	28% *	13%	33% *	
	After: 1996-2001	20% *	11% *	23% *	
Lowering of drinking age	Before: 1998-1999				14%
	After: 2000-2001				35% *

Note: An asterisk indicates the estimate is a significant change from the previous estimate at the 5% level.

To further evaluate the effects of the introduction of SRSP and the change in the minimum drinking age from 20 years to 18 years, Cusum analyses were applied. The basic principle of the analysis is to compare successive values of road trauma measures with their mean value for a period prior to an intervention. If the slope of the Cusum plot becomes negative, there is a decrease in the road trauma measures. To determine a shift in the process in the presence of serial correlation, a V-mask with amendments to the estimated standard deviations providing the V-mask boundaries is used (Lucas 1973 and Lu and Reynolds 2001). The variables examined are the numbers and proportions of drivers involved in fatal crashes that are alcohol-related. Each measurement is based on quarterly crash data, where alcohol was a contributing factor.

3.1 SRSP effects

We take the pre-SRSP period (from 1990 to 2nd quarter of 1995) as the baseline for establishing whether a change has occurred in the number of drivers involved in alcohol-related fatal crashes as a result of the introduction of the SRSP. Figure 1 shows that the number of drivers involved in alcohol related fatal crashes during the pre-SRSP period was reasonably stable with some general decline over the period. This is evident from the Cusum plot, which shows an initial rise followed by a slow fall during this period. However, the slope of the Cusum declines more rapidly from around the time of the introduction of the SRSP. This indicates a drop away from the level of fatal crashes in the period immediately prior to the introduction of the SRSP. The V-mask superimposed on the plot could be progressively placed over the plotted data to indicate when the change from the earlier six-year period had become significant. The earliest point that is indicated is, approximately, the start of 1996.

3.2 Minimum drinking age effect

An amended Cusum chart is considered to determine any potential effect of the lowering of the minimum legal drinking age (from 20 to 18 years). We took the period between the introduction of the SRSP and the lowering of the minimum legal drinking age (1996 to mid 1999) as a baseline to separate the ongoing effect of the SRSP on alcohol related fatal crashes. Figure 2 gives the Cusum plot for all drivers involved in alcohol related fatal crashes during the 1996-2001 period. This shows a drop in the number of drivers involved, but the V-mask does not indicate significance at any particular point. However, the Cusum plot for drivers aged 15-17 does show a significant change (Figure 3). The change is signalled by the V-mask, at around the third or fourth quarter of 1999. This almost coincides with the change in the minimum drinking age.

Figure 1: Drivers in alcohol-related fatal crashes: all drivers (base: 1990-96)

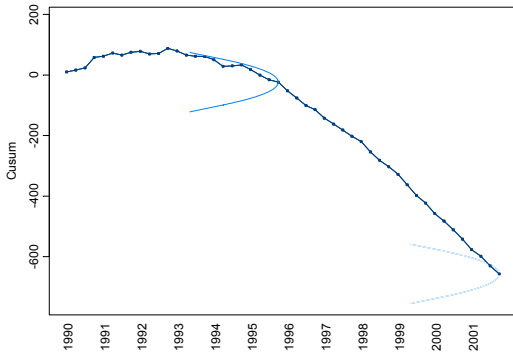


Figure 2: Drivers in alcohol-related crashes: all drivers (base: 1996-99)

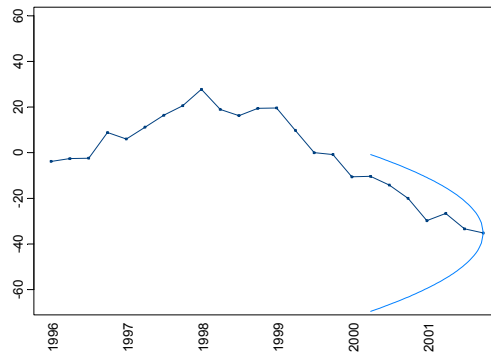


Figure 3: Drivers in alcohol related fatal crashes: 15-17 year old drivers (base: 1996-99)

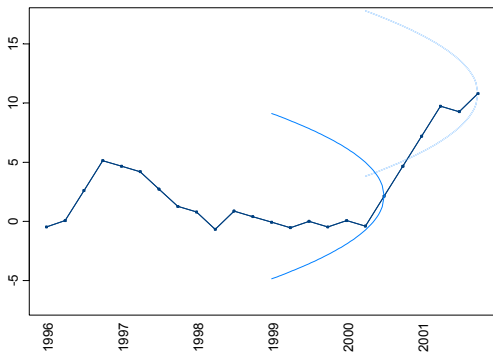
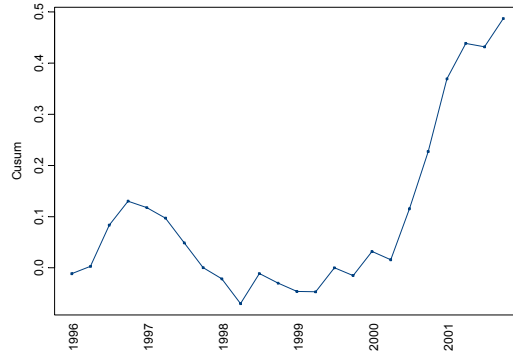


Figure 4: Proportion of 15-17 year old drivers in alcohol related fatal crashes



On the other hand, the Cusum chart for non-alcohol involved crashes does not show any significant effect. Thus, it is likely that the law change has resulted in an increase in the number of alcohol related fatal crashes involving 15-17 year old drivers, possibly due to better accessibility of alcohol to young drivers. To determine whether the same apparent increase in driver involvement in fatal crashes occurred for 18-19 year old drivers, a similar analysis was conducted but no such sharp increase was found.

Figure 4 shows a Cusum chart for the proportion of 15-17 year old drivers for the post SRSP period. We have not applied the V-mask here because the normal approximation is not valid

for very small proportions. However, the dramatic increase in the proportion since late 1999 contributes to the argument that the minimum drinking age change had an impact on the youngest drivers, even though they are not legally permitted to purchase alcohol. This conforms to the results discussed earlier that after the reduction of the legal minimum age for purchasing alcohol, the risk of 15-17 year old drivers being involved in a fatal crash increased significantly.

4. CONCLUSION

The analysis covered evaluations of three alcohol-related interventions in New Zealand. We have shown that the CBT programme and the SRSP have both contributed to the reduction in alcohol related crashes in recent years.

There is also some evidence for an increase in drink-driving and subsequent alcohol related crash involvement for drivers under 18 years, following the lowering of the drinking age from 20 years to 18 years. The number of alcohol-related prosecution cases involving young adults aged 14 to 17 has increased. For drivers under 18 years involved in fatal crashes, there was a statistically significant increase in the proportion within their age group with alcohol cited as a contributing factor since 1999. Given that there were no significant changes in non-alcohol related fatal crashes by this group, the significant increase in alcohol related fatal crashes indicate the likelihood of this being due to the reduction in drinking age in 1999.

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Drink-driving, breath tests, advertising, legal drinking age, Cusum charts