

Trends in alcohol-related harms and offences in a liberalized alcohol environment

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ABSTRACT

Aim To assess alcohol-related harms and offences in New Zealand from 1990 to 2003, a period of alcohol policy liberalization, that included the lowering of the purchase age from 20 to 18 years in 1999. **Design, setting and participants** Time trend analyses were carried out on routinely collected data for prosecutions for driving with excess alcohol; alcohol-involved vehicle crashes (all and fatal) and prosecutions for disorder offences. These were carried out separately for those aged 14–15, 16–17, 18–19, 20–24 and 25 years and over. **Measurements** Rates of: prosecutions for driving with excess alcohol (1990–2003); rates of alcohol-involved vehicle crashes (all and fatal) (1990–2003); and rates of prosecutions for disorder offences (1994–2003). **Findings** Effects of alcohol policy liberalization: positive trends were found in the rates of prosecutions for disorder in the 16–17, 18–19, 20–24 and 25+ age groups; with 18–19-year-olds and 16–17-year-olds having the largest rates and largest positive trend in rates. For 16–17-year-olds, there was a positive trend in the rates of prosecutions for excess breath alcohol. Negative trends in rates were found for alcohol-related crashes (all and fatal) among all age groups. Negative trends for those over 16–17 years were found for prosecutions for driving with excess breath alcohol (this was prior to the lowering of the purchase age). Effects of lowering the minimum purchase age: the lowering of minimum purchase age coincided with an increase in the trend of alcohol-related crashes for 18–19-year-olds; the next largest increase was among the 20–24-year-olds (all other age groups also increased but at a much lower rate). A similar result was found for driving with excess alcohol for those aged 18–19 (and those aged 20–24 years). An increase in the rates of prosecutions for disorder offences occurred for the 14–15-year-old group following the lowering of the purchase age. **Conclusion** The liberalization of alcohol throughout the 1990s may have influenced younger people more, as reflected in increases in their disorder offences and drink driving. The lowering of the minimum purchase age may have led to an increase in drink-driving among the 18–19-year-olds (those directly affected by the change in purchase age).

Keywords Alcohol policy, alcohol-related harm, liberalized alcohol environment, minimum purchase age, offences, young people.

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Submitted 16 March 2005; initial review completed 9 May 2005; final version accepted 18 August 2005

INTRODUCTION

In New Zealand between 1990 and 1999 there have been a series of liberalizing alcohol changes, including a reduction in the minimum purchase age from 20 to 18 years in 1999. Internationally, liberalized alcohol environments have been linked with increases in alcohol-related harm for young people (Wagenaar & Toomey 2002) and heavier drinking (Rahkonen & Ahlstrom 1989; Measham 1996; Hughes *et al.* 1997; Roberts *et al.* 1999; Jackson *et al.* 2000; Andersson *et al.* 2002; Wagenaar & Toomey 2002; Weitzman *et al.* 2003).

Changes in the alcohol environment from 1990 onwards in New Zealand has seen the number of licences to sell alcohol increase from 6000 in 1990 to 14 000 in 2002 (Marriott-Lloyd & Webb 2002). This increase is due to relaxed conditions for obtaining a licence to sell alcohol, along with the sale of wine being allowed in supermarkets and grocery outlets.

Advertising of brands of alcohol was allowed in the broadcast media for the first time from February 1992 which led to a fourfold increase in televised alcohol advertising (Casswell 1995). In the late 1990s the alcohol marketing environment in New Zealand followed global

trends; for example, marketing in ways that were attractive to young people (Casswell 2004). New products were developed and an extensive range of ready-to-drinks (RTDs) were introduced onto the New Zealand market in 1995 (RTDs are premixed spirit-based drinks that are often flavoured to suit the youth palette). [In 1995 approximately 2 million litres of RTDs were available for consumption in New Zealand; in 2000 this amount had increased to 24.5 million litres. This increase was not matched by any other type of beverage during the same time period (Statistics New Zealand 2000).]

On 1 December 1999 the legal purchase age for alcohol was lowered from 20 to 18 years. At this time beer was allowed to be sold in supermarkets and grocery outlets and Sunday trading was permitted.

Some restrictive changes occurred, such as the introduction in 1989 of a policy linking alcohol taxation to inflation to maintain the real price of alcohol (Zhang & Casswell 1999); the introduction of compulsory breath testing in April 1993; and a reduced limit level for drivers under 20 years (150 micrograms of alcohol per litre of breath) (Land Transport Safety Authority 2004). On a smaller scale, and in response to perceptions of increased alcohol-related disorder among young people, some city councils have enacted 'alcohol free zones' (liquor bans). Currently liquor bans are in operation on the weekend in at least five large central business districts (Webb *et al.* 2004).

There is limited research examining alcohol-related harms and offences over time in New Zealand. Studies to date include 10 years of survey data from Auckland, the most populous region in New Zealand, found a positive trend in alcohol-related harm for those aged 14–19 years (Casswell & Bhatta 2001). National survey data (1995 and 2000) showed marked increases in alcohol-related harms for those aged 16–17 years (Habgood *et al.* 2001). A study from a hospital emergency department in New Zealand has also found an increase in 18–19-year-olds presenting with intoxication following the lowering of the purchase age in 1999 (Everitt & Jones 2002). A study looking at alcohol-related crashes and prosecutions for drink driving over time found an increase in some measures for those aged 15–17 years of age following the lowering of the minimum purchase age (Guria *et al.* 2003); this study did not, however, take into account changing population numbers.

This paper will report trends in rates of all and fatal alcohol-related crashes, driving with excess alcohol and disorder behaviour in New Zealand. It will do so during a period of increasing alcohol liberalization, which included the lowering of the legal purchase age. The analysis reported here is important as, to our knowledge, there is no published time trend analysis completed on these data that (a) takes into account changing population numbers

and (b) assesses the effects of a liberalized alcohol policy environment from 1990 onwards in New Zealand that included the lowering of the legal purchase age.

METHODS

Routinely collected data

Prosecuted cases for driving with excess alcohol were obtained from the Research and Evaluation Unit of the Ministry of Justice. Data excluded cases where the offender was prosecuted for driving under the influence of drugs. These data are collected via a national computer system that records all prosecutions in court. If a prosecution was initiated by police, it is in the data. If there is proof that a person has been driving while over the legal limit, they will be prosecuted. The legal breath alcohol limit for driving in New Zealand is 400 µg/l for people aged 20 years and over, and in 1993 a limit of 150 µg/l was introduced for people under 20 years. In May 1999 drivers were required to produce their driving licence at the request of an officer. This meant that drivers under 20 years old, who had a lower legal limit, were identified more effectively and the testing equipment was more likely to be set correctly to the level of their legal limit.

Alcohol-involved vehicle crashes (all and fatal) where the driver had been drinking were obtained from the Land Transport Safety Authority of New Zealand. In the case of non-fatal crashes a breath test is obtained to determine the involvement of alcohol in the crash. In some cases drivers who are likely to be over the legal limits leave the scene of the crash and cannot be breath-tested; they are not included in this data. There is therefore likely to be some underestimation of non-fatal alcohol-involved crashes. In the case of fatal crashes a blood test is obtained at autopsy.

Apprehensions resulting in prosecutions for disorder offences came from the New Zealand police; these data represent offences and it is possible that one or more offences may have been committed by one person or multiple people may have been apprehended for one offence. Disorder behaviours are an indicator of alcohol-related offending. While not all the disorder offences will be alcohol-related, in New Zealand people committing disorder offences may be more likely to have been drinking when the offence was committed (Lash 2002). Police do not have a formal definition for 'disorder'; rather, it is a label for a group of offences, each with their own definitions appearing in criminal legislation (personal communication, New Zealand Police 18 May 2005). Disorder offences broadly include obstructing/hindering/resisting, inciting/encouraging offences, behaviour offences, language offences, miscellaneous disorder offences and disorderly assembly offences. Further subcategorization of these broad groups can be found at: <http://>

www.stats.govt.nz/products-and-services/table-builder/crime-statistics/default.htm. These categories of disorder have remained stable over time. Data are collected using a national computer system; if a prosecution was initiated by police then it will be in the data. Police use the same computer systems across the entire country to manage individual cases.

Data were obtained for each year from 1990 to 2003 (year ended 31 December) except for disorder offences, where data were available only from 1994 onwards due to a change in data collection practice which meant that data prior to 1994 were not comparable.

Statistics New Zealand data

National resident population estimates from 1991 to 2003 for years ended 31 December were obtained. These estimates are based on census counts adjusted by births, deaths and migration (Statistics New Zealand 2004). National resident population estimates for 1990 were not available from Statistics New Zealand so the population data for this year were based on the numbers surviving to 1991 plus an estimate of attrition between 1990 and 1991. The latter was estimated using the attrition between 1991 and 1992. There are two interesting phenomena in Table 1: (1) the large increase in the oldest age group and (2) the decrease in population for the 16–17-, 18–19- and 20–24-year-olds in the mid-1990s. The latter effect means that analysing counts, without taking into effect population numbers, may be misleading.

Analysis

Routinely collected data

The model used for these data tried (1) to capture any linear trends to match the increasingly liberalized environment that occurred between 1990 and 2003 and (2) to capture any change in trend that matched the lowering of the purchase age in December 1999. This type of model is commonly called a 'broken stick' model. There were four responses of interest: (1) the number of prosecutions with excess alcohol; (2) the number of prosecutions for disorder offences; (3) the number of all alcohol-involved vehi-

cle crashes; and (4) the number of fatal alcohol-involved vehicle crashes. These count data were analysed using Poisson regression with an identity link function and the model allowed for over-dispersion. The explanatory variables were adjusted by a factor equal to the yearly population divided by 100 000 so that the effective response was number of events per 100 000 of the population, i.e. the model, as represented to computer software, is $\text{count}_i \sim \text{Poisson}(\lambda_i)$ and $\lambda_i = \beta_0 \times p_i + \beta_1 \times (\text{year}_i - 1999.5) \times p_i + \beta_2 \times (\text{year}_i - 1999.5) \times \text{period}_i \times p_i$, where $p_i = \text{population}_i / 100\,000$, year_i being an explanatory factor and period_i a binary variable with value 1 after 1999, otherwise 0. However, the interpretation of interest, the population rate per 100 000, is $\lambda_i/p_i = \beta_0 + \beta_1 \times (\text{year}_i - 1999.5) + \beta_2 \times (\text{year}_i - 1999.5) \times \text{period}_i$ where, in this representation, β_0 represents the break-even population rate per 100 000, β_1 is the trend or yearly increase/decrease in the population rate per 100 000 prior to the break-even point and β_2 is the change in trend after the break-even point.

The data were analysed using SAS version 8.02 (SAS Institute 2001) and graphs drawn in R version 1.8.1 (CRAN 2005).

Significance is declared for any test with a *P*-value of less than 0.05.

RESULTS

Table 2 lists the parameter estimates and their *P*-values for the four responses and for each age group as well as the over-dispersion parameter. For the age group 14–15 the total number of fatal crashes was seven, so that this group was not analysed for this response.

Disorder offences

All age groups showed a positive trend in the rates of disorder offences before 1999 (the lowering of the purchase age and the break-even point), except 14–15-year-olds. Observation of the estimates show that the largest rates and the largest trends were among those aged 18–19 years, followed by the 16–17-year-olds. Following 1999 the 14–15-year-olds showed a significant increase in trend and the 18–19-year-olds showed a non-significant decrease (Fig. 1).

Prosecutions for driving with excess alcohol

The 16–17-year age group showed a positive trend in the rate of prosecutions which remained unchanged after 1999. The 18–19-year age group showed a flat trend in the rate of prosecutions until 1999, at which point there was an increase in the trend. The 20–24-year age group had a negative trend in the rate of prosecutions prior to 1999 but then the trend had a significant increase after 1999. The 25+ age group had a negative trend in their

Table 1 National resident population estimates from Statistics New Zealand.

Age group	Year		
	1991	1997	2003
14–15	105 590	107 460	121 390
16–17	113 560	109 920	117 290
18–19	120 810	107 010	117 690
20–24	288 460	273 850	278 770
25+	2 112 280	2 368 310	2 551 870

Table 2 Model coefficients.

	Age group (years)	Break-even value			Slope prior to break-even point			Slope change after break-even point			Scale
		Estimate	SE	P-value	Estimate	SE	P-value	Estimate	SE	P-value	
Disorder	14–15	755	21	<0.0001	12	6	0.0581	50	16	0.0013	1.2
	16–17	2092	50	<0.0001	84	15	<0.0001	7	37	0.8481	1.8
	18–19	2912	74	<0.0001	144	22	<0.0001	–96	54	0.0767	2.3
	20–24	1879	33	<0.0001	35	10	0.0005	33	25	0.1797	1.9
	25+	340	8	<0.0001	15	2	<0.0001	7	6	0.2392	3.3
Excess breath alcohol	14–15	20	3	<0.0001	0	1	0.9250	3	2	0.1140	1.2
	16–17	813	39	<0.0001	23	7	0.0006	38	27	0.1611	2.7
	18–19	1970	66	<0.0001	–3	12	0.8187	112	46	0.0143	2.9
	20–24	1222	56	<0.0001	–110	11	<0.0001	105	37	0.0047	4.5
	25+	591	24	<0.0001	–10	5	0.0382	–17	16	0.2702	9.0
All crashes	14–15	7.6	1.8	<0.0001	–1.2	0.4	0.0021	2.7	1.3	0.0426	1.1
	16–17	64.0	4.3	<0.0001	–7.4	0.9	<0.0001	8.8	2.9	0.0024	1.0
	18–19	102.2	6.9	<0.0001	–20.0	1.5	<0.0001	30.7	4.7	<0.0001	1.2
	20–24	86.2	7.2	<0.0001	–19.3	1.5	<0.0001	24.2	4.9	<0.0001	2.0
	25+	28.8	1.4	<0.0001	–4.4	0.3	<0.0001	4.6	0.9	<0.0001	2.1
Fatal crashes	14–15										
	16–17	2.4	1.2	0.0408	–0.5	0.2	0.0362	1.4	1.0	0.1494	1.3
	18–19	2.8	0.8	0.0008	–1.2	0.2	<0.0001	2.0	0.6	0.0013	0.8
	20–24	3.7	0.6	<0.0001	–1.6	0.1	<0.0001	1.9	0.4	<0.0001	0.8
	25+	1.8	0.2	<0.0001	–0.3	0.0	<0.0001	0.3	0.1	0.0053	1.1

rate of prosecutions that remained unchanged following 1999 (Fig. 2).

For prosecutions for driving with excess alcohol there was a large year-to-year variation in the numbers of people prosecuted where the age was unknown, the extremes being 13 (0.1% of total) in 1998 and 608 (2.9% of the total) in 2001 with a median of 70. To check whether the unknowns had an effect on the parameter estimates, the unknowns were split among the age groups according (1) to the proportion of prosecutions that age group had and (2) how large the population of that age group was. In both cases, these changes had very little effect on the significant parameters, except for the break-even value for the second case for the 14–15-year age group, which changed by 21%.

The scale factor measures over dispersion which can be (1) larger variation than expected or (2) excess variation due to a poorly fitting model. In all cases, excluding the points prior to 1995 reduces the scale factor greatly, e.g. for the 25+ age group from 9.0 to 3.1. From observation, the points prior to 1995 seem to follow the general pattern of the line, therefore we do not believe these large scale factors indicate a problem with the model.

All crashes involving alcohol

All age groups had negative trends in rates of alcohol involved vehicle crashes prior to 1999 and all had an

increase in trends afterwards. Observing the estimates shows that the largest increases in trends were found among the 18–19-year-old group; followed by the 20–24-year-old age group. The increase in trend for these groups was more than 2.5 times higher than the 16–17-year-olds (the next highest increase).

Fatal vehicle crashes involving alcohol

All age groups showed a negative trend before 1999. After 1999 all groups showed an increase in trends (although the increase for the 16–17-year-olds was non-significant). Observing the estimates shows that the largest change in trends were in the 18–19- and 20–24-year-old age groups. The increases were 6 times higher than in the 25+ age group, who had the other significant increase in trend (Fig. 3).

DISCUSSION

This study cannot assess directly the effects of other external factors that are associated with drinking behaviour, which may influence harm and offending, such as the real price of alcohol or economic effects in New Zealand during the period evaluated.

Disorder offence data used in this analysis may be influenced by policing effort. This may have been more variable following the lowering of the legal purchase age

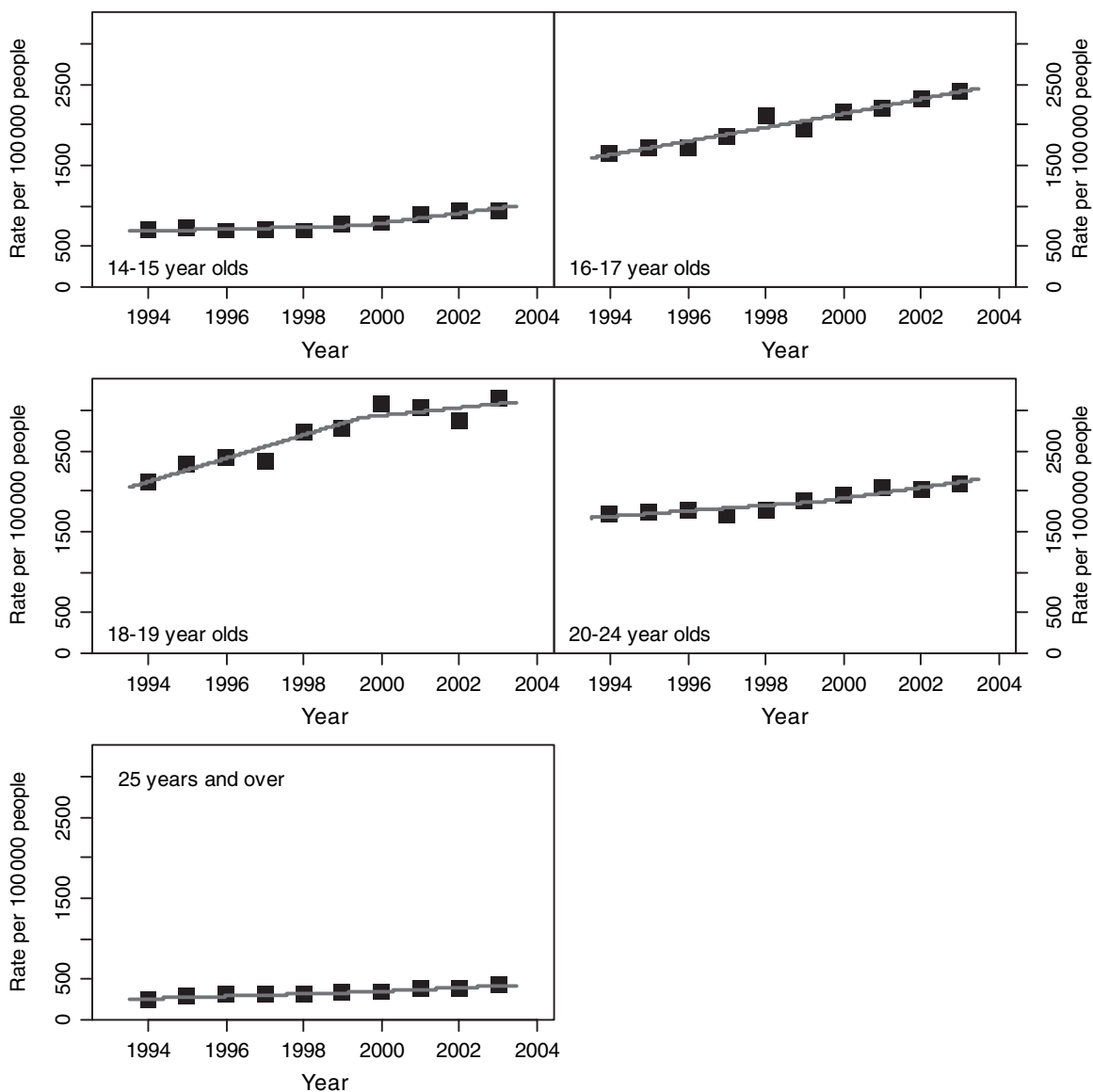


Figure 1 Trends in rates of prosecutions for disorder offences

in 1999 due to increased publicity about alcohol-related harm for young people at this time.

Assessing effects of alcohol policy liberalization

Positive trends were found in the rates of prosecutions for disorder in the 16–17, 18–19, 20–24 and 25+ age groups. Observation of the estimates shows that the 16–17- and 18–19-year-olds had the largest rates and largest positive trend in rates. For 16–17-year-olds, there was a positive trend in the rates of prosecutions for excess breath alcohol.

These results are in keeping with survey results from a series of surveys from 1990 to 2000 showing (1) positive trends in self-reported alcohol consumption among all groups, but especially for younger groups and (2)

increases in related harm for those aged 14–19 years (Casswell & Bhatta 2001).

In this analysis those aged 16–17 years were the only group to show increasing trends over time in both offence indicators; prosecutions for driving with excess alcohol and disorder offences. This is due probably to marked increases in alcohol consumption for this age group. National New Zealand alcohol surveys have shown marked increases in consumption and related harm, particularly for the 16–17-year-old age group compared with other age groups in the population between 1995 and 2000 (Habgood *et al.* 2001).

Prosecutions for driving with excess alcohol (excluding 16–17-year-olds) and alcohol-involved crash data (all and fatal) generally showed decreasing trends over

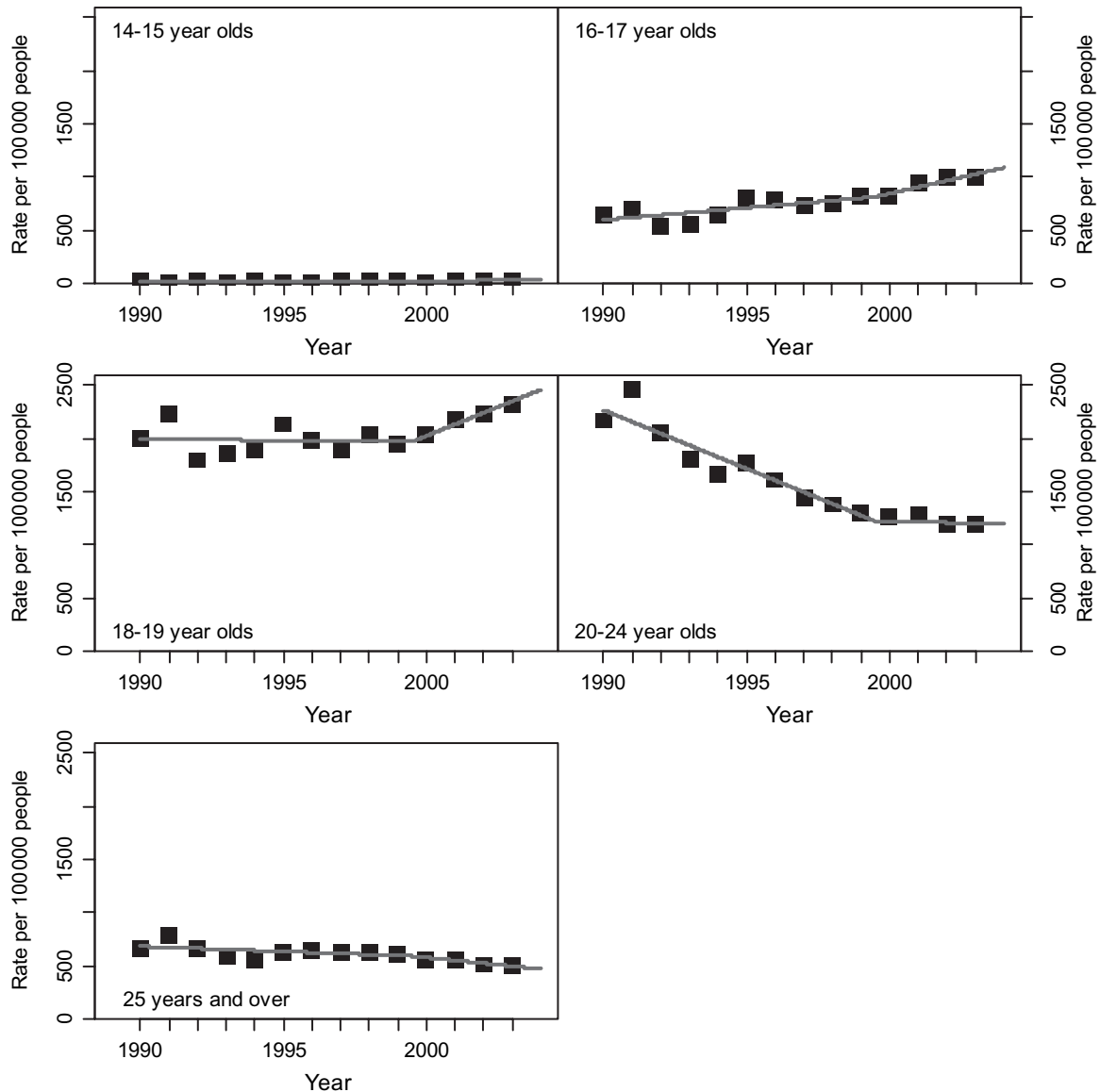


Figure 2 Trends in rates of prosecutions for excess breath alcohol

this time (this was prior to the lowering of the purchase age in 1999). However, this is likely to be linked to the introduction of compulsory breath testing (CBT) in New Zealand in April 1993. At the same time the legal alcohol level for driving for those under 20 years was lowered substantially, from 400 μg of alcohol per litre of breath to 150 μg of alcohol per litre of breath, while the level for those over 20 remained at 400 μg (Land Transport Safety Authority 2004). Alongside the compulsory breath-testing operations, advertising campaigns to deter people from drinking and driving occurred, as did substantial and continual enforcement of compulsory breath testing legislation by police. The effect of CBT on lowering drink-driving offences and related crashes has been found previously in New Zealand (Guria *et al.* 2003). There was also a police safety campaign (SRSP)

introduced in 1995/1996 that is likely to have contributed to the reduction in alcohol-related crashes (Guria *et al.* 2003). This suggests that the introduction of compulsory breath testing (and SRSP) countered the effects of the alcohol policy liberalizations on traffic statistics for most groups at this time.

Assessing the lowering of the minimum purchase age

Specific changes were found following 1999 and the lowering of the minimum purchase age from 20 years to 18 years. The increases found in the drink-driving statistics do suggest an impact on those aged 18–19 years, those affected directly by the law change. This age group showed a large increase in the trend for driving with excess alcohol and all alcohol-related crashes. An increase was also found for fatal alcohol-related crashes.

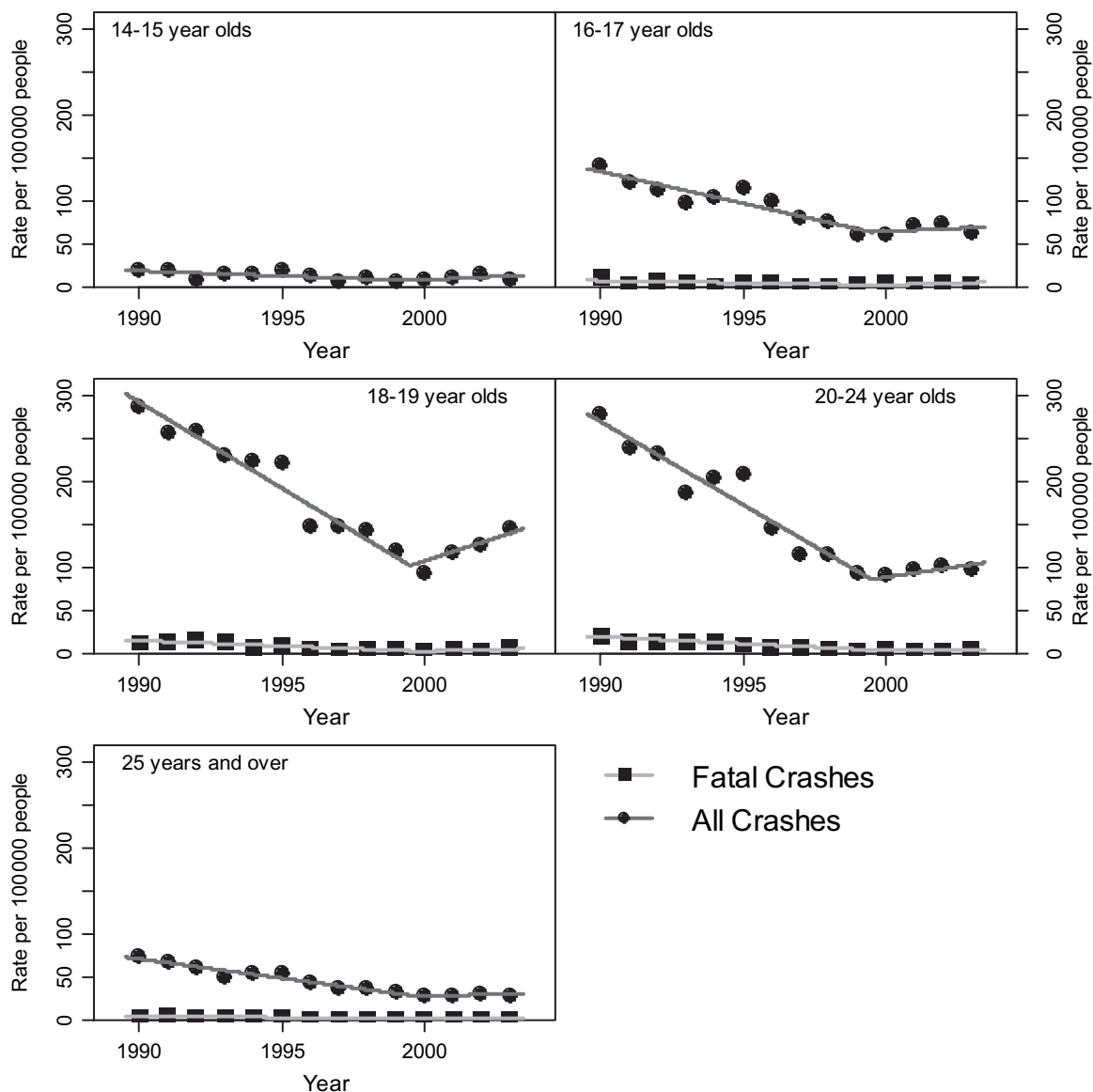


Figure 3 Trends in rates of all and fatal crashes

For prosecutions for driving with excess alcohol, a change in police practice occurred in 1999. Drivers were required to produce their driving licence at the request of an officer. This meant that drivers under 20 years old, who had a lower legal limit, were easier to identify and the equipment was more likely to be set to the correct level for testing their legal limit. This may have resulted in more under 20s being identified as over their legal limit than were so previously. While this change in police practice cannot be separated from the changes in the alcohol environment in 1999, it is likely that the finding of increases in 18–19-year-olds prosecuted for drink driving is due, for the most part, to the lowering of the purchase age. This is supported by the corresponding increases in alcohol-related crashes found in this analysis following 1999 for this age group. It is also supported

by other findings from New Zealand; a previous analysis of admissions to the emergency room of one metropolitan hospital which showed a significant increase in alcohol-related admissions among 18–19-year-olds after the law change on minimum purchase age (Everitt & Jones 2002).

It should be noted that the lowering of the purchase age also occurred in the context of ‘the millennium’; at the same time beer was introduced into supermarkets and grocery outlets and there is no way to way to separate these effects. There is some evidence to suggest that the introduction of beer into grocery stores (Valli 1998) and extended days of trading increase consumption among young people (Norstrom & Skog 2001), so these factors could have contributed potentially to some of the increase.

Increases were also found for 20–24-year-olds in prosecutions for driving with excess alcohol and all and fatal crashes after 1999. It may be that the Sunday trading and beer in supermarkets/grocery outlets had a greater effect on this age group, or that the lowering of the purchase age or ‘millennium’ celebrations created a generally more liberal alcohol environment which affected the consumption of this age group. The drink-driving-related statistics also suggest some impact, albeit less on the oldest age group.

After the change in the minimum purchase age the disorder trends show that the youngest age group, 14–15 years, experienced a significant increase in trend. This result probably reflects an increase in access to alcohol due to the law change (some in this age group may look old enough to buy alcohol, or obtain from older friends who were now able to buy). New Zealand alcohol survey data from 2000 indicated an increase in 14–15-year-old males who drank in some licensed premises including sports clubs from 1995. The same survey data has shown that 71% of those aged 14–15 years were given alcohol in the last 12 months (46% had been given alcohol by friends). Furthermore, an increase in amount consumed on a typical drinking occasion was found for males aged 14–15 years between 1995 and 2000 (Habgood *et al.* 2001).

For the 18–19-year-olds a non-significant decrease in trend in disorder behaviour was found after 1999. This may reflect their new ability to drink on licensed premises, where there is less risk of being arrested for disorderly behaviour compared to drinking in a public place.

CONCLUSION

The liberalization of alcohol throughout the 1990s may have influenced younger people more, as reflected in increases in their disorder offences and drink driving. The lowering of the minimum purchase age may have led to an increase in drink-driving among the 18–19-year-olds (those directly affected by the change in purchase age).

Acknowledgements

We would like to acknowledge all the agencies, the Land Transport Safety Authority, the New Zealand Police and the Ministry of Justice, that provided data for this analysis and assistance with questions regarding the data.

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