This is the authors' version of a paper published as:
Kingham, S., Pearce, J., Dorling, D. and Faulk, N. (2008). The impact of the graduated driver licence scheme on road traffic accident youth mortality in New Zealand. Journal of Transport Geography, 16, 134-141.

The impact of the graduated driver licence scheme on road traffic accident youth mortality in New Zealand.

Kingham S[1], Pearce J[1], Dorling D[2] and Faulk M[1]

[1] GeoHealth Laboratory
Department of Geography,
University of Canterbury - Te Whare Wananga O Waitaha
Private Bag 4800,
Christchurch,
New Zealand,
Fax 00 64 3 364 2907
Email simon.kingham@canterbury.ac.nz

[2] Department of Geography,
University of Sheffield,
Sheffield,
UK

This is the authors' version of a paper published as:
Kingham, S., Pearce, J., Dorling, D. and Faulk, N. (2008). The impact of the graduated driver licence scheme on road traffic accident youth mortality in New Zealand. Journal of Transport Geography, 16, 134-141.

Abstract

This paper examines the impact of the introduction of New Zealand's Graduated Driving Licence System (GDLS) on patterns of road traffic accident mortality amongst the young driving population from 1980 to 2001. Results show that the mortality rate has declined, but that rates in New Zealand are three times greater than in England and Wales and twice those of Scotland. When the data is adjusted to take account of differences in the minimum driving age, rates remain consistently higher in New Zealand and the proportional reduction in road traffic accident youth mortality is not significantly better than that experienced in Great Britain.

1 Introduction

Globally, road traffic accidents are the ninth largest cause of death and disability; by 2020, they are expected to be the third largest cause (WHO 1996). Among younger people in developed countries, road traffic accidents are the major cause of death (NHC 1998) and research has shown that the younger the driver the greater the risk (Williams 1996). Consequently changing the legal age at which people are able to drive is a policy tool that could potentially have a significant impact on road traffic accident figures. In New Zealand people are permitted to drive at the age of fifteen, which is one of the lowest driving age restrictions in the world. At the same time, over 15 % of all deaths on New Zealand roads are attributed to the 15-19 age group (MoT 2006) despite accounting for only 7% of the total drivers. As a result there are frequent calls to raise the minimum driving age from the current age of fifteen. Rather than raising the age, the New Zealand government amended the driver licensing system and introduced a graduated scheme in 1987 (Begg and Stephenson 2003). This was followed by a reduction in young driver crashes which has been linked to the change in licence scheme (Begg et al. 2001).

The objectives of this study are to examine levels of road traffic accident related youth mortality amongst the 15-19 age-group in New Zealand between 1980 and 2001. This period is designed to cover the introduction of the Graduated Driving Licence Scheme (GDLS) in 1987 and the subsequent rule changes to the scheme (in 1999). This study will focus on the impact on road traffic accident youth mortality of these licence scheme changes.

In order to ascertain whether any improvements in road traffic accident youth mortality in New Zealand during the study period can be attributed to the GDLS or instead are merely reflections of global trends as a result of improved motor vehicle safety and road engineering the results are compared to a 'control' country. In this study the control country is Great Britain. A comparison with Great Britain is appropriate for three key reasons. First, both countries have similar practical driving tests and have only introduced a written test in the last decade (1996 in Great Britain and 1999 in NZ), and in both countries any legal car can be learnt in and anyone is able to supervise unlicensed drivers providing they meet certain criteria based on holding a full licence and having sufficient driving experience. Second, New Zealand has very close historical links to Great Britain including providing the greatest number of migrants (King 2003). For example, over a fifth of the New Zealand resident population were born overseas and the most common birthplace among this population was Great Britain (Statistics New Zealand 2006). The two countries also have comparable rates of child poverty and redistributive government spending on children (UNICEF 2005). Third, there are important similarities between the two countries in terms of health outcomes and health service provision. For example, New Zealand and Great Britain have similar life expectancies of around 80 years (OECD 2005) and both countries have high and increasing levels of inequalities in health (Pearce and Dorling 2006; Shaw et al. 2005). With respect to road traffic deaths, both countries have seen a decline in number over recent years with New Zealand having a road accident rate of 10 per 100,000 compared to Great Britain's 6; these figures see New Zealand ranking 15th equal out of 28 OECD countries, and Great Britain 4th equal (OECD 2006b). For road traffic injuries New Zealand has a lower rate with 255 per 100,000 people compared to the Great Britain's 356 (Transport Research Centre 2006); indicating that New Zealand relatively experiences fewer but more serious crashes. Further, New Zealand and Great Britain spend a similar proportion of GDP on health (8.3-8.4%) slightly below the OECD average of 8.9% (OECD 2006a).

1.1 Road accidents and health in New Zealand

In New Zealand, the biggest single cause of premature death in young adults is injury, particularly road traffic injury and this pattern exists even when socio-economic status is controlled for (NHC 1998). Kypri et al (2002) investigated the contribution of adolescent (age 15 to 19) injury to hospital admissions in New Zealand from 1987-1996 and found that road traffic crashes accounted for 28% of all hospitalisations for that age group (Kypri et al. 2002). They suggested that the likely reason for these high numbers is New Zealand's low driver licensing age and concluded that the "Graduated driver licensing shows promise as an injury prevention measure but remains inadequately implemented" (Kypri et al. 2002). However this study made no international comparisons. Further, it has been argued that "In terms of the theoretical potential to reduce the total injury mortality rate, priority must be given to 15-19 year olds who account for 61% of all New Zealand injury deaths. Priorities for this age group are motor vehicle traffic crashes" (Langley and Smeijers 1997, 195).

In every motorised society, young drivers are the most at risk to vehicle accidents and fatalities (Williams, 1996). In New Zealand 15-19 year olds make up 7% of licenced drivers but in the period 2003-05 accounted for 14 percent of drivers involved in minor injury crashes, 15 percent of serious injury crashes, and 14 percent of those involved in fatal crashes (MoT 2006). It has been estimated that 15 to 24 year old drivers are responsible for more than one third of the NZ$3 billion social cost associated with all injury crashes (MoT 2006). While a similar trend in youth road accident rates is displayed in all highly motorised countries, New Zealand has the highest fatality and injury rate, especially for young male drivers (Page, *et al*., 1992) and although like elsewhere New Zealand's figures have dropped significantly in recent years (MoT 2006) the international rank remains (MoT 2004).

1.2 Vehicle licensing in New Zealand

In New Zealand the minimum driving age has been fifteen since 1924. Other than two states in the USA, this is the youngest MDLA in the developed world (Shinar 1978). In August 1987, in an attempt to reduce young occupant road traffic accident fatalities, the Graduated Driver Licensing Scheme (GDLS) was introduced in New Zealand (Langley et al. 1996). The GDLS created separate rules for novice drivers through a series of licence classifications:

- Stage 1 - learner licence. The driver must be accompanied by a "supervisor" who must hold and have held a current full driver licence for at least 2 years. The driver is not permitted to drive between 10pm and 5am, and there is a very low (effectively zero) legal alcohol consumption limit.
- Stage 2 - restricted licence. Permitted to drive without supervision, but otherwise under the same learner licence conditions.
- Stage 3 - full licence. Permitted to drive at all times, with passengers.

A learner licence is required for a minimum of 6 months and a restricted licence for a minimum of 12 months, with the completion of an approved course for advanced driver skills. This scheme makes it possible in New Zealand to have a full driver licence, subject to general restrictions, by the age of sixteen and a half (LTSA 1997). By the age of sixteen, over half of all New Zealanders have driven a motor vehicle, and by the age of seventeen this figure is over

80% (LTNZ 2006). In comparison, in Great Britain, only 26% of 17-20 year olds have a driving licence (DfT 2005)

After the introduction of the GDLS there was an immediate reduction in car crash injuries for 15-19 year olds of 29% compared to 1986 (Langley et al. 1996). This reduction in fatal car crashes for 15-19 year olds continued for 2 years, before stabilising at 8% below 1986 levels (Williams 1996). However, New Zealand's car crash fatality rate remained higher than that of other developed nations and in 1993, the 15-24 year old car crash fatality rate was 37.2 per 100,000 compared to 28 in the US, 22.2 in Canada and 14.3 in Great Britain (Langley et al. 1996). In 1999 changes to the GDLS included the introduction of the full licence test, increases to minimum holding periods for learner and restricted licences, the abandonment of the oral test in favour of a more comprehensive written test, and stiffer penalties for breaching GDLS conditions (LTNZ 2006).

In addition to the introduction of the GDLS, the New Zealand Ministry of Transport also attribute the reduction in accident rates among the young to the decline in motorcycling and the targeted enforcement and advertising of the Supplementary Road Safety Package from late 1995 (MoT 2006). The latter consisted of additional Police enforcement and a hard-hitting national advertising campaign and followed on from the introduction in 1993 of compulsory breath testing and speed cameras (LTSA 2002). Langley et al (1996) suggest that the change in the licence scheme accounted for a 7% decline in car crash hospitalizations compared to a total decline of 23% between 1976 and 1992 (Langley et al. 1996). This figure is similar to the 8% reduction reported by (Frith and Perkins 1992). Further work by Begg and Stephenson (2003) that also considered the impact of the 1999 changes to the GDLS concluded "In the 12 years from 1987 to 1998 (inclusive), the number and rate (per 100,000 population) of fatally or seriously injured motor vehicle occupants aged 15–24 years of age has nearly halved" (Begg and Stephenson 2003, 104).

In comparison, Great Britain has a driving age of 17. A driving test has been required since 1935 (DSA 2004b). There has been no change in the licensing system comparable in likely impact to the introduction of the GDLS in New Zealand. The most significant change was the introduction of a formal theory test on Jan 1st 1997, replacing questions asked about the Highway Code during the practical test (DSA 2004b). There was no change in test pass rate in the following two years, although there has been a 3-4% decline in pass rate since 2000, which may be partly attributable to this (DSA 2004a). The theory test and the lower pass rate are the most plausible reasons for the noticeable decline since 1997 in the proportion of 17-24 year olds who have a valid driving licence. The UK government has commissioned research to examine the value of a graduated licence system (Baughan and Simpson 2001) but has determined that such a system is currently "not justified" (Ladyman 2005).

2 Methodology

Mortality data where the death was the result of a motor vehicle accident for motor vehicle drivers and passengers (not pedestrians or cyclists: ICD-9 codes E810-E819 and ICD-10 codes V03-V89) were extracted for New Zealand and Great Britain (WHO 1975; WHO 1994). For New Zealand annual mortality data were available for 1980-2003. For Great Britain, similar mortality data were supplied from 1990-2003 in England and Wales and 1980-2003 for

Scotland (for England and Wales for the period 1980-1989 data was only available in 5 year blocks). Age-specific population data for the census years 1981, 1991 and 2001 (and 1986 and 1996 for New Zealand) were used, with a linear interpolation algorithm applied to estimate values for the intervening years. With total mortality and total population it was then possible to calculate mortality rates for both the UK and New Zealand. These rates were calculated separately for those aged 15, 16, 17, and 18 to examine the road traffic accident youth mortality rates at specific ages. Temporal changes were examined in relation to the alterations in the New Zealand licence scheme, with a specific focus on the impact of the introduction of the GDLS in 1987 and subsequent amendments to the scheme in 1999. To give a better visual impression of the temporal changes, polynomial trend lines are presented, with the highest power for the independent variable set as six. Note, of course, that there is no underlying reason why the trend should necessarily be polynomial, but these lines can provide a good approximation of the trend and r^2 values are provided for them.

Comparison was then made to road traffic accident youth mortality rates in Great Britain to see if any changes in New Zealand road traffic accident youth mortality rates were different to those noted overseas. If the changes in the New Zealand licence scheme had significant positive impacts on road traffic accident youth mortality, it would be expected that such changes should be distinct from general improvements in road traffic accident youth mortality seen elsewhere, in this case Great Britain. In addition to comparing temporal changes in mortality rates, the ratios of rates (New Zealand: Scotland) were also calculated. The non-availability of the data in England and Wales meant this part of the analysis was only carried out between New Zealand and Scotland. This was done by dividing the rate in New Zealand by that in Scotland. A ratio above one therefore indicates mortality rates are higher in New Zealand, and below one, indicates they are higher in Scotland. Ratios were calculated based on three year moving averages to smooth out the resulting graph and make interpretation of the temporal patterns clearer. It might be argued that any positive impact as a result of global improvements in motor vehicle safety and traffic engineering on road traffic accident youth mortality would be seen in those ages who are able to drive. In the case of New Zealand this is fifteen, while in Great Britain this is seventeen. To examine this, mortality among 15 year olds in New Zealand was compared to that for 17 year olds in Great Britain, and to examine the impact of one years driving experience New Zealand 16 year olds were compared to 18 year olds in Great Britain.

3 Results

3.1 Youth mortality in New Zealand

A total of 2917 motor vehicle accident-related youth (aged 15-19) mortality events were recorded in New Zealand between 1980 and 2001. This number has declined over time, especially since 1987 when the GDLS was introduced, from 0.48 deaths per 1000 in 1987 to 0.23 deaths per 1000 in 2001 (Figure 1). This seems to suggest a significant positive impact of the introduction of the GDLS on road traffic accident youth mortality confirming the findings of Begg et al (2001). Further, among 15-year olds (arguably the target group with respect to the new policy measures), the mortality rates exhibit a very clear decline from 0.28 in 1987 to 0.12 in 1988, rising to 0.21 in 1989 and 1990, before dropping to 0.11 for the next three years followed by a slight rise from 1994 to 1996 before declining again (Figure 1). This broadly supports the work of Begg et al (2001) although the rise in 1989 and 1990 casts some slight

doubt on this. The changes in licensing in 1999 also seem to have a significant affect in this age group, with a sharp decline in 2000 and 2001.

3.2 New Zealand/Great Britain comparisons

While road traffic accident youth mortality rates in New Zealand have improved in recent years they are still significantly higher than in England, Wales and Scotland, all three having experienced a decline over the study period (Figure 2). It could be argued that this is an inappropriate comparison because in Great Britain the minimum driving age is 17 compared to 15 in New Zealand. To establish a more direct comparison, the data have been analysed at the specific ages for which driving is permitted (Figure 3). Still, the rates are consistently higher in New Zealand, although the gap between the countries' rates does narrow over time.

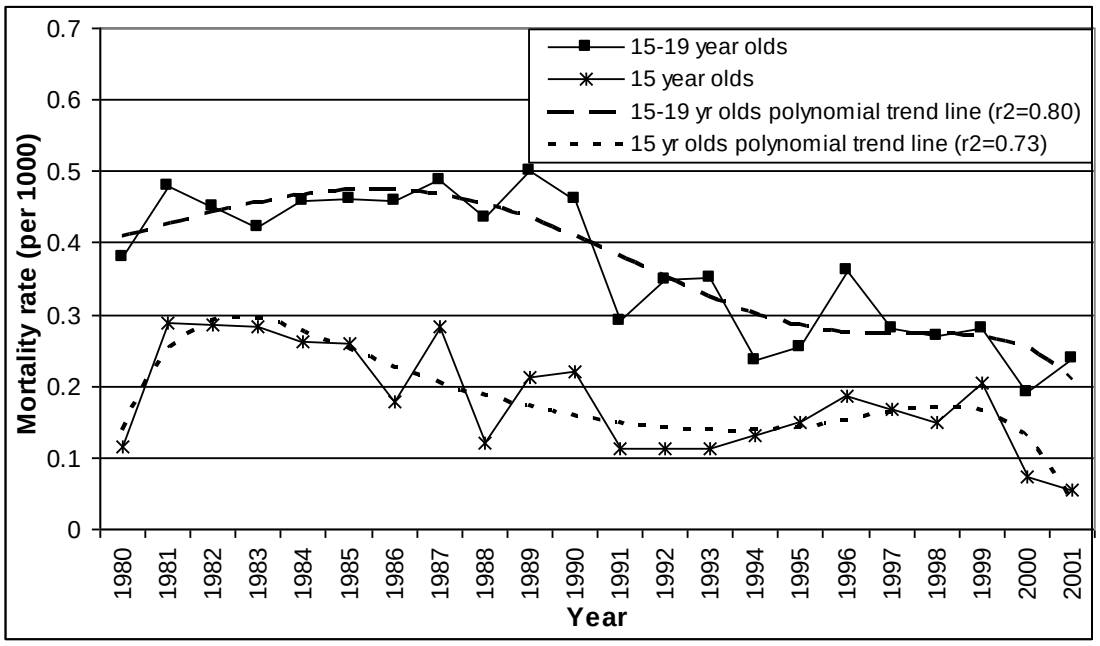

Figure 1: Road traffic accident mortality rates for 15-19 age group and 15 year olds only, New Zealand 1980-2001.

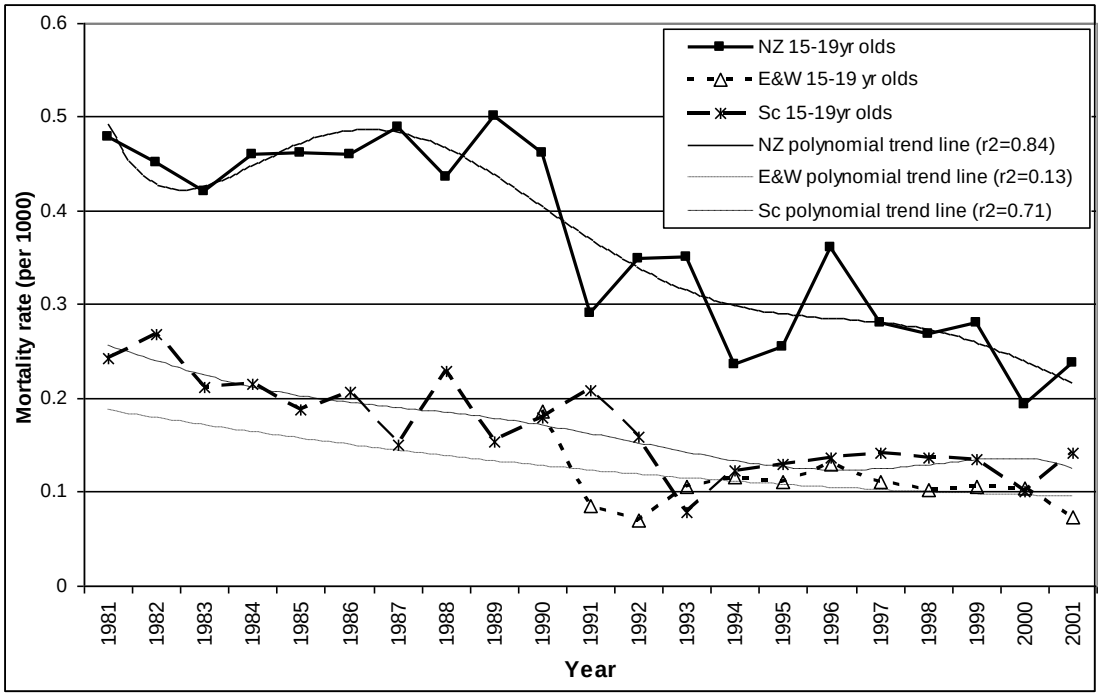

Figure 2: Total motor vehicle-related mortality rates comparison for 15-19 age groups in New Zealand, England and Wales, and Scotland.

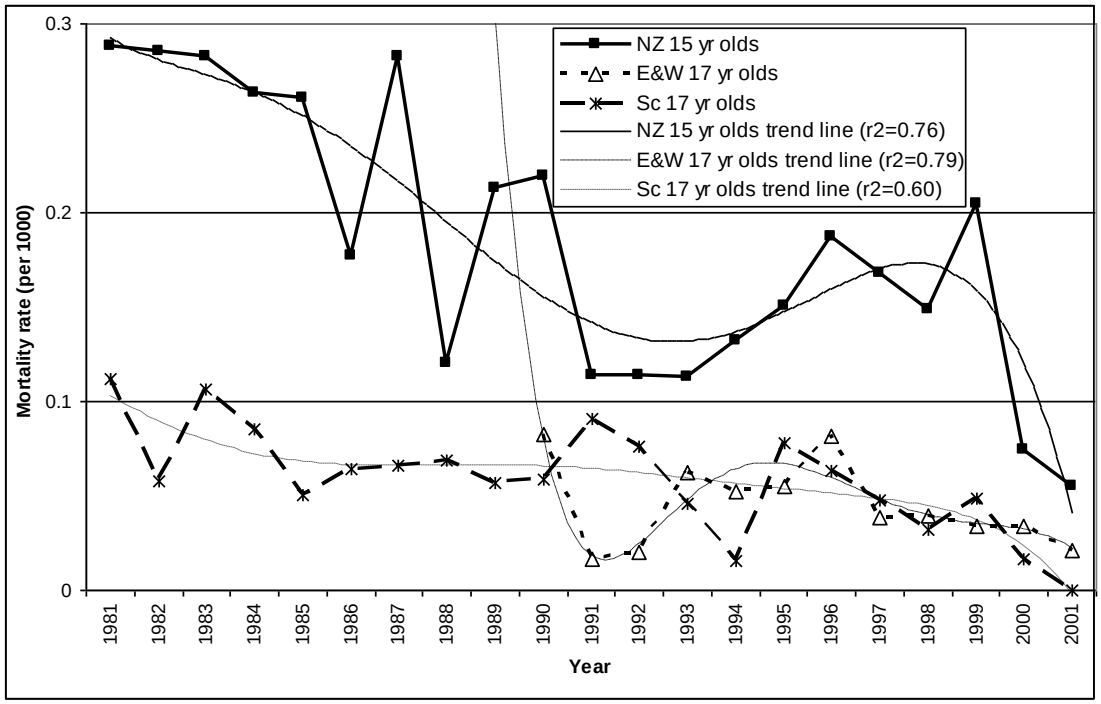

Figure 3: Road traffic accident mortality rates; comparison of 15 year olds in New Zealand to 17 year olds in England and Wales, and Scotland.

It is only when we examine populations who could have been driving for over a year (age 16 in New Zealand and 18 in Great Britain) (Figure 4) that we see overlapping similar mortality rates. A similar pattern exists for 17 and 19 year olds (i.e. two years experience driving). We can conclude that while the temporal trends indicate that the mortality rate for 15, 16 and 17 year

olds in New Zealand have declined since the introduction of the GDLS, the rates are still not generally as low as those experienced in Great Britain at the comparable driving experience ages.

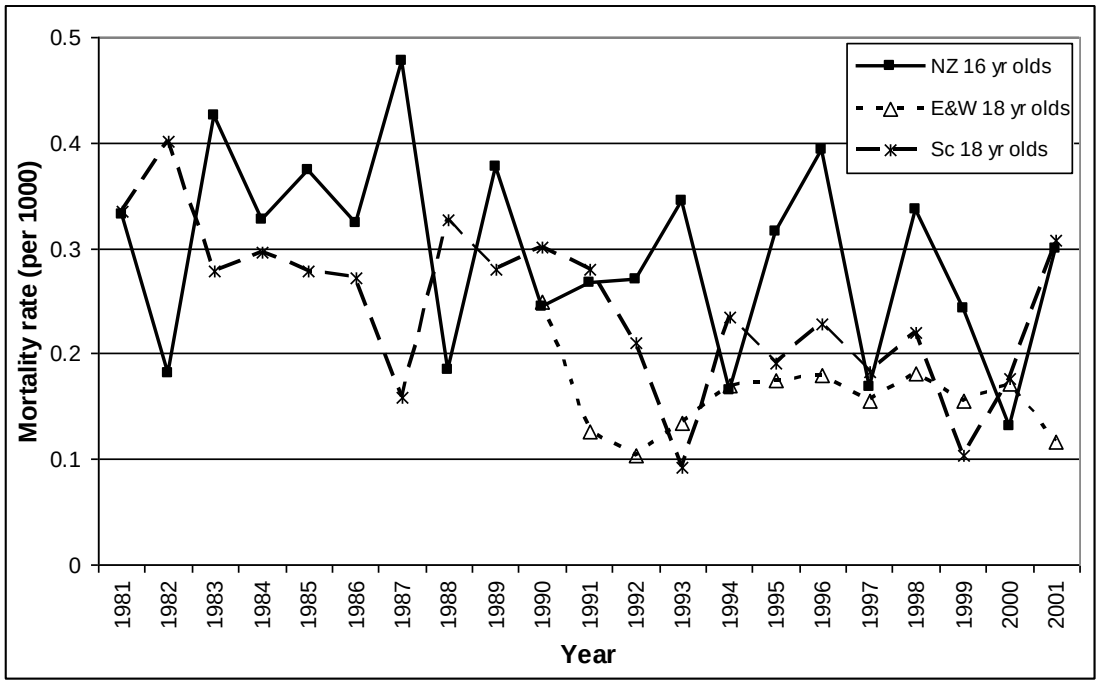

Figure 4: Total road traffic accident mortality rates: comparison of 16 year old in New Zealand to 18 year olds in EW and Scotland

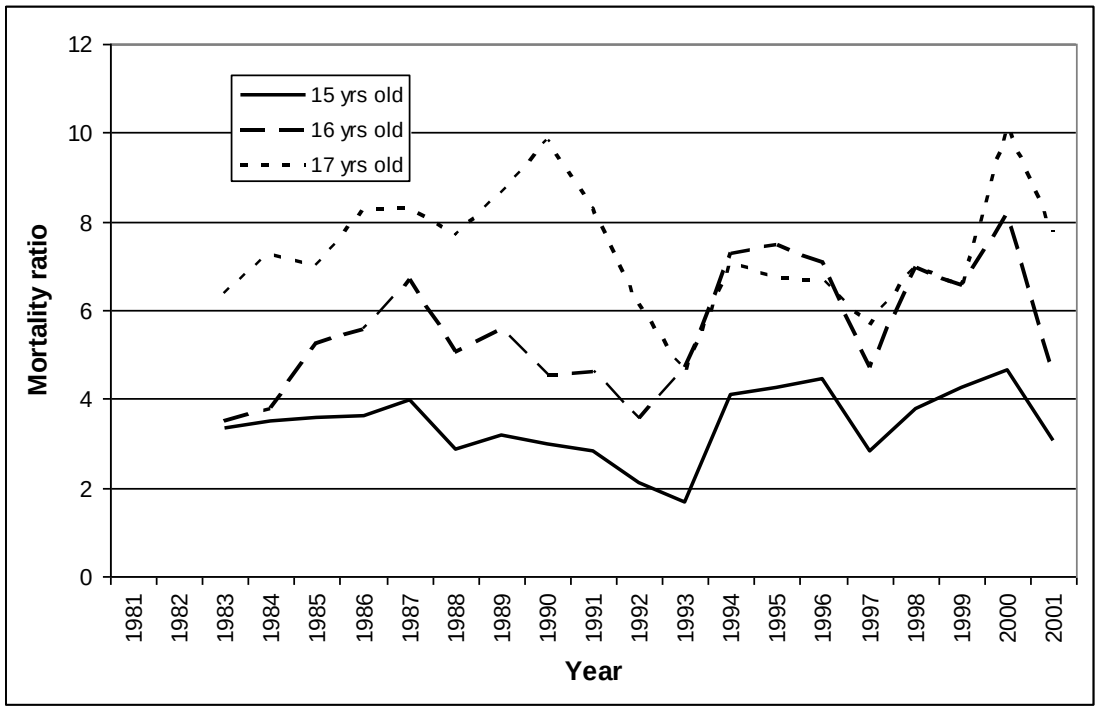

Figure 5: Road traffic accident mortality ratio of New Zealand to Scotland, ages 15, 16 and 17, 1981-2000 (3 year moving averages)

The final element to the time-series analysis is the comparison of New Zealand to Scotland using ratios of mortality. Figure 5 represents a direct age comparison by highlighting the mortality ratios of 15, 16 and 17 year olds in New Zealand and Scotland (a ratio above one indicates mortality rates are higher in New Zealand). The ratio of mortality for 15 and 16 year olds shows a marked decline from 1987 onwards, but with New Zealand consistently higher than Scotland in its rates. There appears to be a peak again in 1992-93 with a decline in 2000 after the rule changes to GDLS were applied in 1999. For the 17 year olds there appears to be a slight decline from 1987, but it then rises again before declining around 1990. Again there is a rise in the ratio around 1993, for which it is difficult to identify an obvious cause although we know that one outcome of this rise in New Zealand mortality was the introduction of the Supplementary Road Safety Package in late 1995 (MoT 2006) which will undoubtedly contribute to the subsequent decline in ratio that starts in 1997. For all ages, 2001 sees a decline in the ratios back towards the levels they were in 1983, (pre-GDLS) indicating that the rates in New Zealand and Scotland are again more closely aligned. On the face of it, this suggests that road traffic accident related youth mortality rates in New Zealand are reducing and beginning to approach those in Scotland, although it should be noted that at no point do the ratios go below one, which would indicate that mortality rates would have been greater in Scotland.

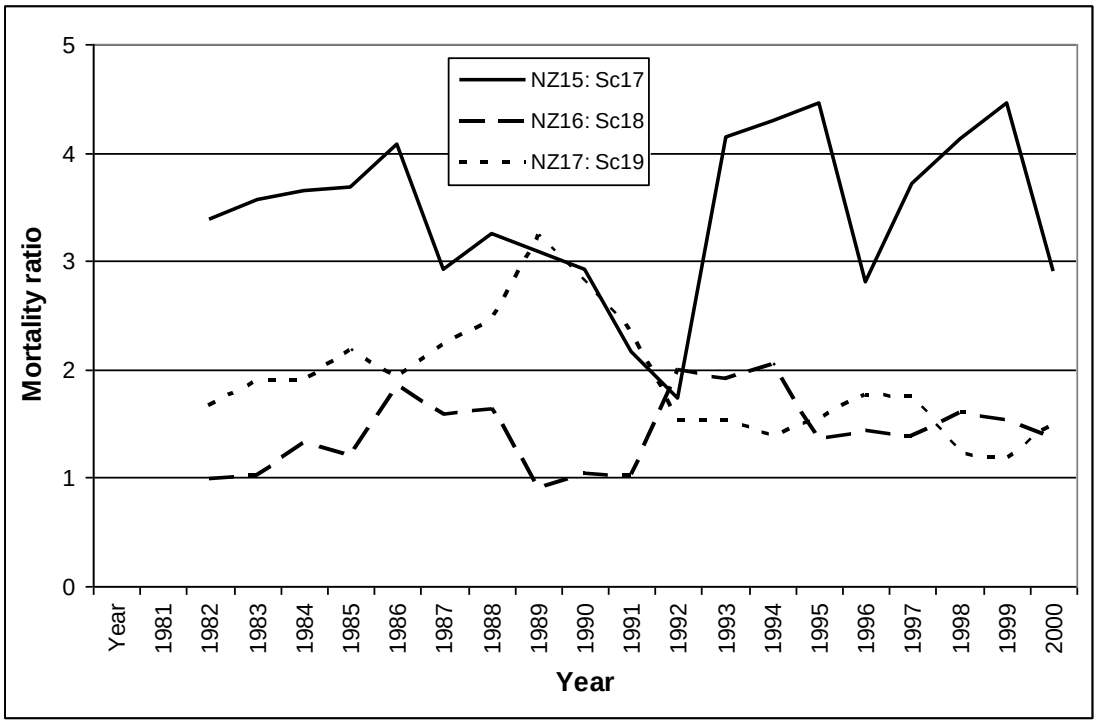

Figure 6: Road traffic accident mortality ratio of 15 year olds in New Zealand to 17 year olds in Scotland, and 16 to 18 year olds (3 year moving averages).

Of course, it could be argued that if it is the broader improvements in vehicle safety and traffic engineering that account for the reduction in road traffic accident youth mortality rather than the amendments in the GDLS, then the gap would narrow anyway as such general improvements would not help 15 year old Scots who are not legally permitted to drive. Put more simply, if motor driving is becoming safer for the vehicle occupants it should not be expected to especially

favour 15 year olds in Scotland who can legally only be vehicle passengers. Therefore, it can be argued that we should compare 15 year old New Zealanders with 17 year old Scots as this is the age that both can start to drive; 16 year olds with 18 year olds, and 17 year olds with 19 year olds. It can be noted that the road traffic accident youth mortality rate of 15 year old New Zealanders is generally at least three times that of 17 year old Scots (Figure 6). At the time of the introduction of the GDLS in 1987 the ratio was already declining, suggesting the road traffic accident rate mortality rate of new drivers in New Zealand may have been improving relative to their counterparts in Scotland. This decline continued until 1992, when the ratio increased again. At no point during the study period does the ratio dip below one, demonstrating that the rates in New Zealand are persistently greater than those in Scotland. Considering the 16 to 18 and 17 to 19 patterns, we again see that the ratios are nearly always above 1, but not as high as those for the 15 to 17 year olds. The key point here is that there seems to be no significant improvement in the relative road traffic accident youth mortality rate following the introduction of the GDLS in 1987 for young New Zealanders relative to their Scottish counterparts based on possible driving experience. This analysis obviously cannot simultaneously control for age but it does add to the suggestion that the 1987 changes may not have had as significant impact as previously reported.

Overall, while comparison of 15 year olds suggests an improvement in road traffic accident youth mortality in New Zealand relative to Great Britain, if we directly compare ages at which people have similar driving experience, we see no convincing evidence of an improvement in New Zealand. This casts some doubt on the apparent positive impact on road traffic accident youth mortality previously reported (Langley et al. 1996) of changes in the licensing scheme.

It may be suggested that there is some other factor such as change in engineering practice or the introduction of a piece of transport legislation in either New Zealand or Great Britain that is affecting the changes in mortality rates specifically post 1987. As far as we are aware there are no other legislative or other structural changes that may have such an impact. We know that the introduction of a formal theory test in 1997 occurred in Great Britain (DSA 2004b), and while it seems likely to be the cause of a reduction in the proportion of 17 to 24 year olds with a driving licence, it is of less relevance to the main hypothesis of changes post 1987.

It should be noted that as with all international comparative studies, there are some important limitations. New Zealand and Great Britain are different in a number of ways that may affect a comparison including New Zealand having a significantly smaller population, far fewer large urban areas, higher levels of car ownership and lower levels of public transport use. Nonetheless the comparison between New Zealand and Great Britain is of value for a variety of social and cultural reasons as outlined earlier; further the comparison with Scotland, with a similar population to New Zealand and a lower population density than the rest of Great Britain, addresses some of these concerns.

4 Conclusions

Since the introduction of the GDLS in 1987 there has been a reduction in mortality rates for the 15-19 population from 0.48 deaths per 1000 in 1987 to 0.23 deaths per 1000 in 2001. For the 'target' age of 15, mortality rates declined from 1987 to 1994, and while there was an increase

between 1994 and 1998, mortality rates have again fallen following the amendments to the licensing scheme in 1999.

However, when compared to Great Britain, the lowering of rates appears to be less effective. The average rates for the 15-19 target group over the 21-year study period are: 0.37 deaths per 1000 in New Zealand, 0.11 deaths per 1000 in England and Wales (12 year period) and 0.17 deaths per 1000 in Scotland. The New Zealand rates are over 3 times greater than England and Wales and over 2 times greater than Scotland. Examining mortality ratios with Scotland, there is some evidence of the expected decline in the ratio of mortality between New Zealand and Scotland for both ages 15 and 16 from 1987 onwards. The ratio is, however, consistently above 1 indicating higher rates in New Zealand for both 15 and 16 year olds. When controlling for driving experience and comparing a 15 year-old New Zealander to a 17 year old in Great Britain the rates are still consistently higher in New Zealand and the proportional reduction in road traffic accident youth mortality is no greater.

Since the GDLS was introduced the numbers and rates of mortality amongst 15-19 year olds in New Zealand have declined. However there is some suggestion they may have been declining anyway. Direct comparisons with Great Britain reveal that whilst falling, the rates are remaining significantly higher in New Zealand. This is still the case when driving experience is taken into account (i.e. 15 year old New Zealander compared to 17 year old in Great Britain). Whilst the expected decline in the mortality ratio between New Zealand and Scotland after 1987 does seem to occur, the ratios seem to rise again in recent years and the rates are consistently higher in New Zealand. This casts doubt on the belief that the implementation of the graduated licence scheme has seen a reduction in road traffic accident mortality among youth. This has possible implications for other countries who are investigating the value of a graduated licence system as a way of reducing accidents among young people (Baughan and Simpson 2001; Ladyman 2005). In essence, the aim of such a scheme is to improve driving performance especially among the young, of which an endpoint could be a reduction in traffic accident mortality among youth. This study has questioned whether such an impact has been demonstrated in New Zealand which has had such a scheme since 1987.

References

Baughan, C., and Simpson, H. (2001). "Graduated driver licensing - a review of some current systems. Prepared for Road Safety Division, Department for Transport, Local Government and the Regions." *TRL529*, Transport Research Laboratory Wokingham.

Begg, D., and Stephenson, S. (2003). "Graduated driver licensing: the New Zealand experience." *Journal of Safety Research*, 34, 99-105.

Begg, D. J., Stephenson, S., Alsop, J., and Langley, J. (2001). "Impact of graduated driver licensing restrictions on crashes involving young drivers in New Zealand." *Injury Prevention*, 7, 292-296.

DfT. (2005). "Transport Statistics Bulletin: National Travel Survey 2004 ", Department for Transport, London.

DSA. (2004a). "Driving test history Appendix A." Driving Standards Agency, UK.

DSA. (2004b). "Driving test timeline." Driving Standards Agency, UK.

Frith, W. A., and Perkins, W. A. "The New Zealand graduated driver licensing system." *National Road Safety Seminar*, Wellington, New Zealand, 256-278.

King, M. (2003). *The Penguin history of New Zealand*, Penguin Books, Albany, NZ.

Kypri, K., Chalmers, D. J., Langley, J. D., and Wright, C. S. (2002). "Adolescent injury morbidity in New Zealand, 1987-1996." *Injury Prevention*, 8, 32-37.

Ladyman, S. (2005). "Graduated Driver Licensing Scheme. Response to UK parliamentary question." Hansard 10 Oct 2005.

Langley, J., and Smeijers, J. (1997). "Injury mortality among children and teenagers in New Zealand compared with the United States of America." *Injury Prevention*, 3(3), 195-199.

Langley, J. D., Wagenaar, A. C., and Begg, D. J. (1996). "An evaluation of the New Zealand Graduated Driver Licensing System." *Accident Analysis & Prevention*, 28(2), 139-146.

LTNZ. (2006). "Getting your car licence." Land Transport Safety Authority, Wellington, NZ.

LTSA. (1997). "Land transport rules: driver licensing, proposed policy: proposed policy for Rule 91001, Driver Licensing (Obtaining and Renewing a Driver Licence), Rule 92001, Driver Licensing (Licensing of Service Providers)." Land Transport Safety Authority, Wellington, NZ.

LTSA. (2002). "Fascinating facts: The 20th century road toll." Land Transport Safety Authority, Wellington, NZ.

MoT. (2004). "International comparisons for road deaths." Ministry of Transport, Wellington, NZ.

MoT. (2006). "Young drivers." Ministry of Transport, Wellington, NZ.

NHC. (1998). "The Social, Cultural and Economic Determinants of Health in New Zealand: Action to Improve Health." National Advisory Committee on Health and Disability Wellington, New Zealand.

OECD. (2005). "OECD in figures - 2005 edition." OECD, Paris.

OECD. (2006a). "OECD Health Data 2006. How Does the United Kingdom Compare." OECD, Paris.

OECD. (2006b). "OECD in figures - 2006-07 edition." OECD, Paris.

Pearce, J., and Dorling, D. (2006). "Increasing geographical inequalities in health in New Zealand, 1980-2001." *International Journal of Epidemiology*, 35(3), 597-603.

Shaw, M., Davey Smith, G., and Dorling, D. (2005). "Health inequalities and New Labour: how the promises compare with real progress." *BMJ*, 330, 1016-1021.

Shinar, D. (1978). *Psychology on the road - the human factor in traffic safety*, John Wiley and Sons, New York.

Statistics New Zealand. (2006). "2006 Census QuickStats National highlights." Statistics New Zealand, Wellington, NZ.

Transport Research Centre. (2006). " International Road Traffic and Accident Database - Selected Risk Values for the Year 2004." Joint OECD/European Council of Ministers of Transport Transport Research Centre.

UNICEF. (2005). "Child poverty in Rich Countries 2005." Innocenti Research Centre, Report card No. 6, Florence: UNICEF.

WHO. (1975). "Manual of the international statistical classification of diseases, injuries and causes of death. Ninth revision." World Health Organisation, Geneva.

WHO. (1994). "International statistical classification of diseases and related health problems. Tenth revision." World Health Organisation, Geneva.

WHO. (1996). "Investing in Health Research and Development. Report to the Ad Hoc Committee on health research relating to future intervention options." *TDR/Gen/96.1*, World Health Organisation.

Williams, A. F. (1996). "Overview of the young driver problem in the United States. Graduated licensing: Past experiences and future status. ." *Transport Research Circular* 458, 5-8.