

Crash Profile of New Zealand Novice Drivers

Ben Lewis-Evans & Carolina Lukkien¹

Strategy and Sustainability, Ministry of Transport

Acknowledgements - Lynley Povey and Wayne Jones

This paper does not necessarily represent the views of the Ministry of
Transport.

¹Corresponding author: Ministry of Transport, Private Bag 3175, Wellington,
New Zealand.

Telephone: 64-4-439-9064

Fax: 64-4-439-9063

Email: c.lukkien@transport.govt.nz

Abstract:

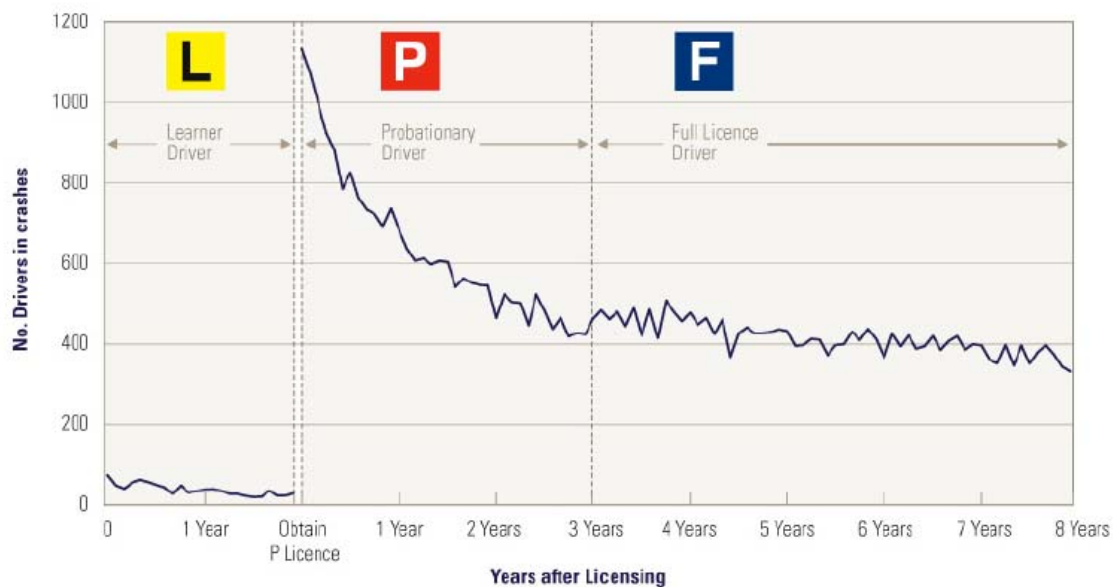
The New Zealand Graduated Driver Licensing System (GDLS) is designed to allow novice drivers to mature and gain driving experience under conditions of reduced risk. To examine the effectiveness of the GDLS, the Ministry of Transport undertook an analysis to understand how the crash involvement of novice drivers change as they moved through the New Zealand GDLS. Crash profiles were created by data matching of the New Zealand licence and crash databases, covering a time period from 1999-2006. These crash profiles show that the initial learner period of the GDLS is relatively safe and the time at which novice drivers are involved in the highest number of crashes, is during the first few months of solo driving. In addition, individuals who gained a full licence within 12-18 months of holding a restricted licence had a higher risk of crashing than individuals who gained a full licence after 18 months. Analysis using logistic regression also showed an effect of age and gender with younger drivers and males both having higher levels of crash risk. Ultimately the crash profiles demonstrate the importance of both age and experience on the crash involvement of novice drivers and the benefits of the learner period and restricted period of the New Zealand GDLS.

1. Introduction

Young novice drivers have an elevated crash rate, which is most apparent over the first few months and kilometres of solo driving (Mayhew, 2007; Preusser & Tison, 2007). Within New Zealand, in 2006, 15 to 24 year old drivers were at fault in 94 fatal crashes, 628 serious injury crashes and 2894 minor injury crashes. These crashes resulted in 108 deaths, 821 serious injuries and 4329 minor injuries (Ministry of Transport, 2007a). Research suggests that novice driver crashes are mainly due to inexperience in driving, leading to visual search and attention errors (Mayhew, 2007). There are clear drops in crash risk associated with increased driving experience (Hartling, Wiebe, Russell, Petruk, Spinola & Klassen, 2004; Senserrick 2006; Williams 2005). Self-reported accident rates drop by almost half after 250 miles driven and by almost two-thirds after 500 miles (McCartt, Shabanova, & Leaf, 2003). In addition to lack of driving experience, a lack of maturity contributes to behaviours amongst young novice drivers that can result in an increased level of crash risk (Hartling, et al, 2004; Senserrick 2006; Williams 2005). Recent research has suggested a link between age-related behaviour and the continued maturation of the pre-frontal cortex until the age of approximately 25. This area of the brain has been linked to the inhibiting of impulses and the ability to weigh the consequences of decisions, and its underdeveloped nature in young novice drivers possibly contributes to their increased crash risk (Gogtay, Giedd, Lusk, Hayashi, Greenstein, Vaituzis, Nugent III, Herman, Clasen, Toga, Rapoport, & Thompson, 2004).

One intervention used to address the risks posed by young and novice drivers is a graduated driver licensing system (GDLS) such as the one that operates in New Zealand. The rationale behind the licence restrictions within the GDLS are to allow novice drivers to gain experience while preventing them from driving in situations that increase the risk of an accident occurring, such as night time driving and having passengers in the car, in particular teenage passengers (Chen, Baker, Braver, & Li, 2000; Doherty, Andrey, & MacGregor, 1998; Keall, Frith & Patterson 2004; Preusser, Ferguson, & Williams, 1998; Ulmer, Williams, & Preusser, 1997; Williams, 2003, 2007).

It has been suggested that crash risk for young drivers can be reduced up to 40% through the use of a GDLS (Shope, 2007). International research suggests that the initial supervised driving phase of a GDLS is related to the lowest level of crash involvement (OECD-ECMT, 2006). Conversely, the next step in the GDLS process, allowing for solo driving, is associated with the period of highest crash involvement for young novice drivers, especially in the first six months of solo driving (Hartling et al, 2004; Mayhew, Simpson, & Pak, 2003; Senserrick 2006; Williams 2005). This, quite large, shift in crash involvement has been well illustrated using data from Victoria in Australia (White, 2005) as shown in figure 1.



Source: VicRoads

Figure 1. Crash profile of Victorian novice drivers by time and changing licence status.

The New Zealand GDLS consists of three phases; the first phase requires drivers to spend a minimum of 6 months under a learner licence, available at the age of 15. This allows the holder to drive only when under supervision of an individual who has held their full New Zealand drivers licence for more than two years. In addition the learner licence holder must display an 'L' plate when driving. At the end of the learner phase, the learner must pass a restricted licence test. The second phase allows the holder to solo drive without

passengers between the hours of 6am and 10pm under a restricted licence. The restricted phase lasts for a minimum of 18 months unless the licence holder completes an approved time-reducing educational course which shortens the period to 12 months. In order to move to the final stage the restricted driver must pass a full licence test. In the final phase of the GDLS, all restrictions previously placed upon the driver are lifted and the driver holds a full licence (Land Transport New Zealand, 2006). Under the current New Zealand licensing system, people can apply for a full drivers licence after 18 months of being on a restricted licence if under the age of 25, whilst people can apply for a full drivers licence after 6 months of being on a restricted licence if aged 25 or older.

It is important to investigate the effectiveness of the New Zealand GDLS where the minimum driving age is 15. This is lower than Victoria where the minimum driving age is 16. In particular, it is important to consider that the age of unsupervised driving is therefore lower in New Zealand. Since the GDLS was introduced in New Zealand in 1987, it has been shown to have reduced the amount of crashes amongst novice drivers by 8 percent (Begg & Stephenson, 2003). The present paper provides more detailed New Zealand data on the crash involvement of novice drivers in the GDLS. The number of crashes per driver are examined as a function of age, time of licensure, gender, and as a function of time on the different licensing phases.

2. Method

Driver records and crash data for all New Zealand drivers who obtained a restricted licence in between 01/03/1999 and 31/12/2003 were examined. The details of all the drivers who obtained a restricted licence in New Zealand between 01/03/1999 and 31/12/2003 were obtained from the Driver Licence Register (Land Transport New Zealand, 2006); and data on police reported fatal and injury crashes between 01/01/1997 and 31/12/2005 were obtained from the Crash Analysis System (CAS) at the Ministry of Transport (Ministry of Transport, 2006). This enabled analysis of crashes for a full two years after the restricted licence was gained.

The data obtained from the licensing database were categorised by the year the drivers gained their restricted licence, and the age of the drivers at the time they gained their restricted licence. Further, it was recorded if the drivers gained a full licence by 25/03/2006. Three "licence path groups" were then produced; drivers who gained their full licence after less than 18 months on their restricted licence, drivers who gained their full licence after 18 months or longer on their restricted licence, and drivers who had not gained a full licence by the end of the study. (All drivers were followed for a minimum of two years from their restricted licence date). Crash data were matched to licensing data using the driver licence number.

Crash data was adjusted to take account of changes over the period of the study in reported crash rates for drivers under 25. For the first twelve months after the restricted licence was gained, all drivers aged under 25 remained on a restricted licence, so the licence path groups are directly comparable over this period. SAS Proc Genmod was used to fit a logistic regression model to these data, to examine the effects of age, gender and time since licensing.

The experience of the groups diverges during the period of 12-18 months after the restricted licence was gained, when the early licensing group gain their full licences. A second logistic regression model was fitted to compare the groups in this period.

3. Results

The records of 206123 drivers (92310 females and 113809 males) and of 10704 crashes were available for analysis.

An overall crash profile of New Zealand novice drivers is provided in figure 1. The figure shows a low crash involvement during the learner licence period. This is followed by an increase in crash involvement during the restricted phase. Over time this high level of crash involvement starts to drop off.

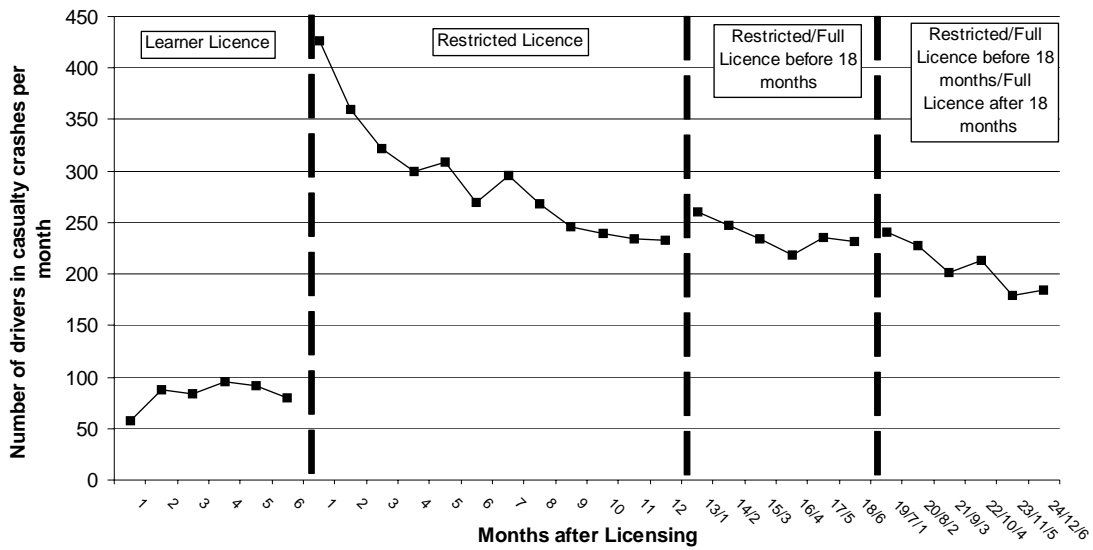


Figure 2. Crash profile of New Zealand novice drivers over time 1999 -2005

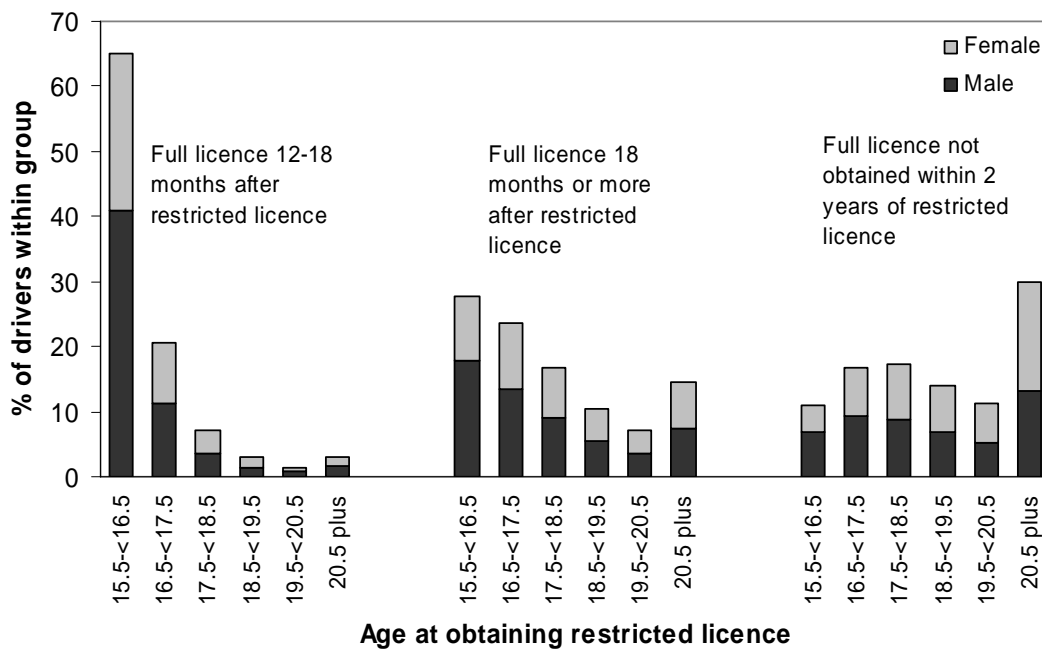


Figure 3. Profiles of licence paths.

As shown in Figure 3, the age and sex composition of the licence path groups varies markedly. For instance, drivers in the youngest age group dominate the fast-tracked group.

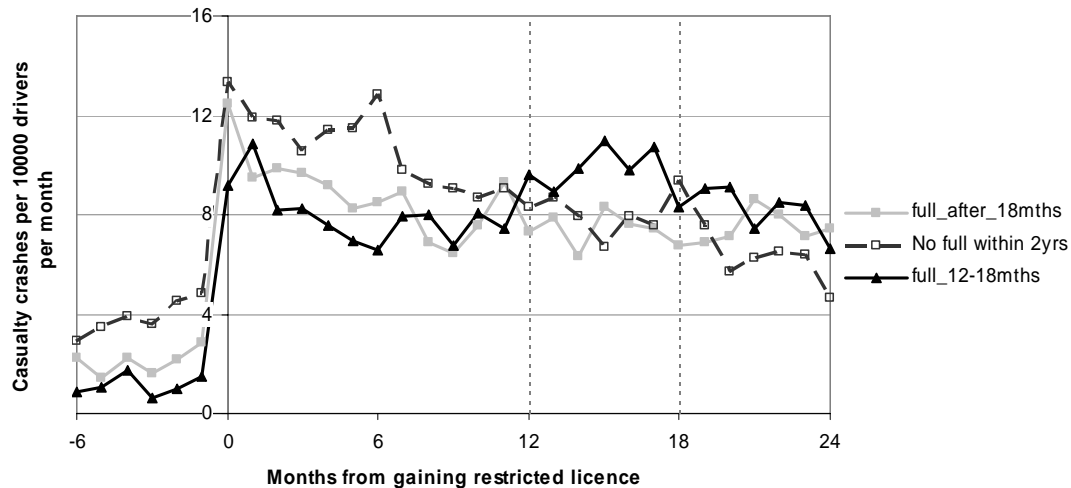


Figure 4. Risk per 10000 drivers (adjusted for change in underlying crash rate).

Figure 4 shows how per-driver crash rate (adjusted for change in the underlying crash rate) changes over time since obtaining a restricted licence, for each licence path group. There is a clear increase in crash rate associated with the transition from learner (supervised) to the restricted (unsupervised) phase. For the group that obtained their full licence in 12-18 month (“fast track group”), there is an apparent increase in crash rate associated with this period. There appears to be some reduction in crashes per driver, over time.

Logistic regression models were fitted to each licence path group, using data for the first twelve months after obtaining a restricted licence. The adjusted crashes per driver per month were modelled against age, gender and time since obtaining the restricted licence. Reasonable fits were obtained for all first-order models, with no evidence of over dispersion. (The inclusion of second-order effects was tested and did not significantly improve the fits).

In all licence path groups, female drivers had significantly fewer crashes than male drivers (males had 1.2 – 1.4 times the crash rate of females, depending on the licence path group). No age effects were identified in the fast track group. In the group who obtained a full licence after 18 months, drivers under 20 had significantly more crashes than those over 20. In the group that had not obtained a full licence, there was a clear age gradient, with the youngest age group having the most crashes per driver.

Increasing time since obtaining a restricted licence was associated with a decrease in the number of crashes per driver. In the fast-track group, this was significant at the 10% level; in the other two groups it was significant at the 1% level.

To investigate differences in crash rate between the three licence path groups during the period 12-18 months after obtaining a restricted licence, a logistic regression model was used to fit crash rate to status, age, gender and time since obtaining the restricted licence.

When age, gender, time since R licence and significant two-factor interactions were taken into account, the crash rates of the 'full licence after 18 months' and 'no full licence within 2 years' groups were indistinguishable, but being in the fast track group was associated with an increase in crash rate of 2.9 times that of the 'full licence after 18mths' group ($p < 0.01$).

4. Discussion

Overall, the results show that, as expected, the learner phase of the New Zealand GDLS protects the individual from a high crash risk by allowing the novice driver to drive only when under supervision of an individual who has held their full New Zealand drivers licence for more than two years. The results show that crash risk increases when the novice driver moves to the restricted phase despite the elimination of some of the documented dangers associated with being a novice driver, such as driving alone, driving at night, and driving with peers in the car (Keall, Frith & Patterson 2004). There appears to be a higher crash risk associated with gaining a full licence between 12 and 18 months after restricted licensure compared to gaining a full licence after 18 months, after taking into account the underlying differences between the groups. This suggests that despite the completion of an approved time-reducing educational course for those who gained their full licence between 12 and 18 months of restricted licensure, there is greater benefit in remaining on the

restricted licence for the full 18 month period. The practice of offering a time-reduction off licensing as an incentive for completing driver education is not common internationally, and is generally considered to be counter-productive as part of a licensing system (Mayhew & Simpson, 1997; Mayhew & Simpson 2002; and Mayhew, Simpson & Singhal, 2005).

During the first 12 months after restricted licensure the gender of the driver or has an effect on crash risk for all licence path groups. The overall higher crash rates of young male drivers are largely due to increased risk-taking involving peers, typically at night (OECD-ECMT, 2006), factors which are reduced during the restricted licence phase but clearly are still present. Further, younger drivers have more crashes than older drivers. This group does have an overall higher risk of crashing after gaining their full licence. This suggests that crash risk for younger drivers can be lowered by increasing the age at which the restricted licence can be gained, by lengthening the learner phase or by increasing the age at which individuals can enter the GDLS.

There are some obvious additional solutions to an overall increase in crash involvement levels at the restricted phase. The data shows that there appears to be some reduction in crashes per driver, over time. A requirement, rather than a recommendation, for learner drivers to complete a certain amount of hours of supervised driving could address potential differences in time spent driving during the learner phase. Such a requirement is in place in some Australian states. For example, in July of 2007 Victoria introduced a requirement that learner licence holders under the age of 21 gain 120 hours of supervision on road driving, 10 of which must occur at night. To enforce this, Victoria requires that a practice diary be kept with a declaration signed by the learner driver and a supervising driver (Arrive Alive!, 2007). Another way to increase driving hours would be to increase the levels of competencies that individuals must demonstrate during the driving test required to graduate to the restricted phase. For example, commentary driving, which is currently part of the test requirement to graduate to the full licence phase, could become part of the earlier restricted licence driving test.

Yet another option is positioning novice driver education efforts to occur before solo driving begins. Currently, many of the education programmes offered in New Zealand, such as 'defensive driving' or 'streettalk' courses, are completed during an individual's restricted licence phase and often after the first 6 months. The crash profile, as shown in Figure 2, seems to suggest that that potential benefits could be maximised by positioning the course earlier. There is one large scale education programme offered during the learner phase within New Zealand, the 'Practice Programme'. An evaluation of this programme has shown that people who participate in this programme have a significantly lower level of traffic offending (such as demerits, disqualifications and suspensions) (Lewis-Evans, 2006). However, this programme is voluntary and uptake is not high.

Initiatives to increase compliance amongst novice drivers with the conditions of the GDLS could also assist with reducing crash involvement. The number of individuals detected breaching the conditions of their restricted licence has increased markedly over the last few years (MOT, 2007c). It may be that the current penalty for breaching the GDLS conditions is not acting as enough of a deterrent for novice drivers. The conditions of the GDLS are designed to protect the drivers from being exposed to high risk situations and if they are not complied with this intention is undermined (Keall, Frith & Patterson 2004).

It should also be noted that the crash data used in this paper comes from a police report based system and includes only injury or fatal crashes that are reported. Not all injury crashes are reported. Therefore, the crash involvement reported in this study is likely to be an underestimate.

5. References

- Arrive Alive! (2007). *Information for Learners*. Arrive Alive!, Victoria, Australia.
http://www.arrivealive.vic.gov.au/c_youngGLS_3.html Retrieved 7 August 2007.
- Begg, D. and Stephenson, S. (2003). Graduated driver licensing: the New Zealand experience. *Journal of Safety Research*, 34, 99 – 105.
- Chen, L., Baker, S.P., Braver, E.r., and Li, G. (2000). Carrying passengers as a risk factor for crashes fatal to 16-17 year old drivers. *Journal of the American Medical Association*, 283, 1578 – 1617.
- Doherty, S. T., Andrey, J. C., and MacGregor, C. (1998). The situational risks of young drivers: The influence of passengers, time of day, and day of the week on accident rates. *Accident Analysis and Prevention*, 30, 45 - 52.
- Gogtay, N., Giedd, J.N, Lusk, L., Hayashi, K.M., Greenstein, D., Vaituzis, A.C., Nugent III, T.F., Herman, D.H., Clasen, L.S., Toga, A.W., Rapoport, J.L, & Thompson, P.M. (2004). Dynamic mapping of human cortical development during childhood through early adulthood. *Proceedings of the National Academy of Sciences in the United States of America*, 101 (21), 8174 – 8179.
- Hartling, L., Wiebe, N., Russell, K., Petruck, J., Spinola, C., and Klassen, T.P. (2004). Graduated driver licensing for reducing motor vehicle crashes among young drivers. *The Cochrane Library*, 2
- Keall, M.D., Frith, W.J., Patterson, T.L. (2004) The influence of alcohol, age and number of passengers on the night-time risk of driver fatal injury in New Zealand. *Accident Analysis and Prevention*, 36, 49-61.
- Land Transport New Zealand (2006). *Factsheet 45 – Learning to drive: How to get your car licence*. Land Transport New Zealand, Wellington, New Zealand. <http://www.landtransport.govt.nz/factsheets/45.html> Retrieved 7 August 2007.
- Lewis-Evans, B, (2006). An examination of what the currently available data can tell us about the effects on offence and crash history of two drivers education programs. *Proceedings of the Australasian Road Safety Research, Policing and Education Conference 2006*, Queensland, Australia.

- Mayhew, D. R., & Simpson, H.M. (1997). *Effectiveness and role of driver education and training in a graduated licensing system*. Traffic Injury Research Foundation, Ottawa, ON, Canada.
- Mayhew, D. R., & Simpson, H.M., (2002). The safety value of driver education and training. *Injury Prevention, 8 (Supplement II)*, 3-8.
- Mayhew, D.R., Simpson, H.M., & Pak, A. (2003). Changes in collision rates among novice drivers during the first months of driving. *Accident Analysis and Prevention, 35*, 683-691.
- Mayhew, D.R., Simpson, H.M., & Singhal, D. (2005). *Best Practices for Graduated Driver Licensing in Canada*. Traffic Injury Research Foundation, Ottawa, ON, Canada.
- Mayhew, D.R. (2007). Driver education and graduated licensing in North America: Past, present, and future. *Journal of Safety Research, 38*, 229-235.
- McCartt, A.T., Shabanova, V.I., & Leaf, W.A. (2003). Driving experience, crashes and traffic citations of teenage beginning drivers. *Accident Analysis and Prevention, 35*, 311 – 320.
- Ministry of Transport (2007a). *Young Drivers: Crash statistics for the year ended 31 Dec 2006*. Ministry of Transport, Wellington, New Zealand. <http://www.transport.govt.nz/young-index/> Retrieved 10 August 2007.
- Ministry of Transport (2007b). *Driver Travel – Household Travel Survey*.
- Ministry of Transport (2007c). *Internal statistics*. Ministry of Transport, Wellington, New Zealand.
- Ministry of Transport, Wellington, New Zealand. <http://www.transport.govt.nz/assets/NewPDFs/Driversfinalv1.2.pdf>, Retrieved 7 October 2007.
- Preusser, D. F., Ferguson, S. A., and Williams, A. F. (1998). The effect of teenage passengers on fatal crash risk of teenage drivers. *Accident Analysis and Prevention, 30*, 217 – 222.
- Preusser, D. F and Tison, J. (2007). GDL then and now. *Journal of Safety Research, 38*, 159 – 163.
- OECD-ECMT (2006). *Young Drivers – The Road to Safety*. ECMT Publications, Paris, France.
- Senserrick, T.M. (2006). Reducing young driver road trauma: guidance and

- optimism for the future. *Injury Prevention*, 12 (Suppl 1), i56-i60.
- Shope, J. T. (2007). Graduated driver licensing: Review of the evaluation results since 2002. *Journal of Safety Research*, 38, 165 – 175.
- Ulmer, R. G., Williams, A. F., and Preusser, D. F. (1997). Crash involvements of 16-year-old drivers. *Journal of Safety Research*, 28, 97 – 103.
- White, J. (2005). *Counting the Cost of Inexperience*. Presentation to the FIA Foundation International Policy Forum: “Road Safety and Young Drivers”, Budapest, 16 June 2005.
- Williams, A. F. (2003). Teenage drivers: patterns of risk. *Journal of Safety Research*, 34, 5 – 15.
- Williams, A.F. (2005). Next Steps for Graduated Licensing. *Traffic Injury Prevention*, 6, 199-201.
- Williams, A. F. (2007). Contribution of the components of graduated Licensing to crash reductions. *Journal of Safety Research*, 37 (2).