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TMR9815 – EVALUATION OF QUEENSLAND'S GRADUATED LICENSING SYSTEM

FINAL REPORT TO

DEPARTMENT OF TRANSPORT AND MAIN ROADS QUEENSLAND GOVERNMENT

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Introduction

Young and novice drivers have a much higher crash and crash injury risk than experienced adult drivers. The aim of a graduated licensing system (GLS) is to address this by introducing driving in a supervised learner stage with low risk conditions. Exposure to higher risk conditions is then gradually introduced through the unsupervised provisional licence stage then the open licence stage as age and experience increases. A variety of GLS models have resulted, with differing levels of association with crash reductions depending on the components included.

From 1 July 2007, the Department of Transport and Main Roads (TMR) made several changes aiming to strengthen Queensland's GLS. This included extending the learner period and introducing a supervised driving requirement (100 logbook hours), as well as a restriction on mobile phone use (no use at all by drivers and no loudspeaker use by passengers). The three-year provisional stage was divided into two phases, with the first year (P1) also including the phone restrictions, as well as a restriction from driving high-powered vehicles and limited passenger carriage at night (only one passenger aged <21 allowed during 11pm to 5am). During the remaining two years (P2) the phone and night passenger restriction are lifted but the high-powered vehicle restriction remains. To aid enforcement of these initiatives, display of L-plates and P-plates (red for P1, green for P2) was made mandatory.

The overarching objective of the current project was to determine, first, whether the changes in QLD's GLS were associated with reductions in novice (learner and provisional driver) crashes and crash injuries (deaths and serious injuries) overall and, second, to identify what specific GLS initiatives were contributing to these outcomes. (A full list of specific aims is included on page 4.)

Methodology

The study examined linked crash, licensing and offence data routinely collected by Queensland Police and TMR. The overall study design was to assess any changes in crashes (rates by licensed drivers) involving a novice driver in the years following introduction of the new GLS compared to previous years under the old GLS using interrupted time series analyses. Several approaches to analyses were applied: trends in crashes and crash casualties involving novice drivers; novice driver trends relative to those of the overall driving population in Queensland; and comparisons between novice drivers completing only the new GLS learner and provisional stages (the New-GLS group) to those of novices completing the equivalent previous GLS stages (the Old-GLS group). Given the change in the GLS occurred at the time of the global economic downturn, additional age-based analyses explored trends for provisional-licensed drivers only and for 25-29-year-old open-licensed drivers only for more narrow age and life-stage comparisons.

The analyses examined trends in all crashes, as well as killed or serious injury (KSI) only crashes, and the casualties arising from these. Single-vehicle crashes (involving only the novice) were also explored as a proxy for at-fault status. To explore potential contributions of specific aspects of the new GLS, analyses also were performed for night crashes and passenger crashes (due to the night passenger restriction, with numbers too low to only include passenger crashes at night) and alcohol crashes. Comparisons of novice drivers under the new GLS and previous GLS focused on differences in crash trends during the learner stage, in the peak in crashes in the first month of provisional licensure (a specific target of GLSs), and on differences in the decline in provisional licence crashes over time. Offence data was also examined to explore any potential issues with GLS compliance.

Results

The first set of results examined monthly crash rates per 10,000 licensed drivers from July 1999 to June 2012 and compared the trend pre and post introduction of the new GLS from 1 July 2007. The following trends in novice driver crashes were found following the introduction of the New GLS:

- A significant decline in novice driver crashes (all) at a rate of 1.1% per month or 13.1% per year.
- A significant decline in novice driver crashes (all) relative to the overall licensed driver population in Queensland at a rate of 0.2% per month or 3.0% per year.
- A significant decline in provisional-licensed driver crashes (all) at a rate of 0.8% per month or 9.3% per year.
- A significant decline in 25-29-year-old open-licensed driver crashes (all) at a rate of 0.6% per month or 6.7% per year.
- A significant decline in novice driver KSI crashes at a rate of 0.4% per month or 5.4% per year.
- No significant decline in novice driver KSI crashes relative to the overall licensed driver population in Queensland.
- A significant decline in provisional-licensed driver KSI crashes at a rate of 0.3% per month or 3.6% per year.
- A significant decline in 25-29-year-old open-licensed driver KSI crashes at a rate of 0.2% per month or 2.4% per year.

In terms of specific crash types, the following trends in novice driver crashes also were found following introduction of the new GLS:

- A significant decline in novice driver single-vehicle crashes at a rate of 1.0% per month or 11.5% per year.
- A significant decline in novice driver KSI single-vehicle crashes at a rate of 0.4% per month or 4.5% per year.
- A significant decline in novice driver night crashes at a rate of 1.3% per month or 15.9% per year.
- A significant decline in novice driver KSI night crashes at a rate of 0.8% per month or 9.1% per year.
- A significant decline in novice driver passenger crashes at a rate of 1.1% per month or 13.5% per year.
- A significant decline in novice driver KSI passenger crashes at a rate of 0.4% per month or 5.3% per year.
- A significant decline in novice driver alcohol crashes at a rate of 1.5% per month or 18.6% per year.
- A significant decline in novice driver KSI alcohol crashes at a rate of 0.8% per month or 9.4% per year.

The trends in crash casualties involving novice drivers following introduction of the new GLS were very similar to the crash trends. The following trends were found:

- A significant decline in novice driver crash casualties (all) at a rate of 1.2% per month or 13.9% per year.
- A significant decline in novice driver crash casualties (all) relative to the overall licensed driver population in Queensland at a rate of 0.2% per month or 2.9% per year.
- A significant decline in novice driver KSI crash casualties at a rate of 0.4% per month or 5.2% per year.
- No significant decline in novice driver KSI crash casualties relative to the overall licensed driver population in Queensland.
- A significant decline in novice driver single-vehicle crash casualties at a rate of 1.0% per month or 12.1% per year.
- A significant decline in novice driver KSI single-vehicle crash casualties at a rate of 0.3% per month or 3.8% per year.
- A significant decline in novice driver night crash casualties at a rate of 1.4% per month or 17.1% per year.
- A significant decline in novice driver KSI night crash casualties at a rate of 0.7% per month or 8.5% per year.
- A significant decline in novice driver passenger crash casualties at a rate of 1.2% per month or 14.2% per year.

- A significant decline in novice driver KSI passenger crash casualties at a rate of 0.4% per month or 5.4% per year.
- A significant decline in novice driver alcohol crash casualties at a rate of 1.7% per month or 20.4% per year.
- A significant decline in novice driver KSI alcohol crash casualties at a rate of 0.8% per month or 9.7% per year.

The second set of results examined monthly crash rates per 10,000 licensed drivers from July 1999 to June 2012 comparing only the New-GLS novices with the Old-GLS novices, pre and post the time of P licensure. Analyses first compared the crash trends of the New-GLS and Old-GLS novice drivers prior to the P licence, that is during the learner period. Relative to the Old-GLS learner crashes, the New-GLS learner crashes were:

- 2.0% lower per month for all crashes, which approached statistical significance ($p<.06$).
- Not different for KSI crashes.
- Not different for single-vehicle crashes.
- 6.3% lower per month for night crashes, which was statistically significantly different.
- Not different for passenger crashes.
- Not different for alcohol crashes.

Next comparisons of the New-GLS and Old-GLS novice drivers focused, first, on the peak crash rates in the first month of the P licence and, second, on the decline in crashes from the time of provisional licensure. Comparisons of peak crash rates found that New-GLS drivers experienced the following reductions in crash risk in the first month of the P licence relative to Old-GLS drivers:

- A significant decline of 14.2% in all crashes.
- No significant difference in KSI crashes.
- A significant decline of 12.2% in single-vehicle crashes.
- A significant 28.7% decline in night crashes.
- A significant decline of 22.9% in passenger crashes.
- A non-significant decline of 21.5% in alcohol crashes.

New-GLS drivers relative to Old-GLS drivers also experienced the following differences in crash trends over time from the time of the P licence:

- A significant difference of 0.4% per month or 4.9% per year in crashes (all).
- No significant difference in KSI crashes.
- No significant difference in single-vehicle crashes.
- No significant difference in night crashes.
- A significant difference of 0.8% per month or 9.4% per year for passenger crashes.
- No significant difference in alcohol crashes.

Examination of police-recorded offences found those regarding display of L and P plates increased steadily after the new GLS was introduced, only declining from late 2013. Otherwise overall, rates of GLS-specific offences were generally low and decreases were found following the introduction of the new GLS, with any increases typically followed by decreases in recent years. The exception was passenger carriage offences, which showed potential to be increasing but at a very low offence rate level (12 per 100,000 licences). More moderate rates were found for mobile phone offences (40/100,00) at about half the rate of 25-29-year-old open licence holders, and for alcohol offences (50/1000,000), although these were higher than for 25-29-year-old open licence holders.

Further we explored whether the increased GLS requirements and conditions potentially resulted in more unlicensed driving, including specifically as never licensed or disqualified drivers. In fact, never licensed offences decreased. Disqualified driving offences initially decreased, before fluctuating upwards from 2010 and reducing again in 2014. We also explored offences not specific to GLS in terms of speeding offences

and the total of all offences. Similar increases were found from 2010, which were associated with an increase in Queensland Police covert speed enforcement at the same time.

Additionally, we explored whether limiting some of the GLS conditions only to those aged under 25 years was appropriate. The crash rates for novices 25 years or older were lower than for novices aged under 25 years in all comparisons; that is, for all crashes, single-vehicle crashes, passenger crashes and night crashes.

We also explored whether a reputed shift in young people delaying licensure was evident in the age of novices under the old and new GLS. No difference was found, with both groups averaging 20 years of age, with median ages a little under 18 years.

Discussion

Broadly, in keeping with the first research objective, our examination of crashes and injuries among the entire QLD licensed driver population following changes in the GLS identified declines in both novice driver crashes and casualties arising from their crashes. Significant declines in crashes of all severities were found for novices, including relative to the overall licensed driver population. The results suggested that, while the crash trend declined for all drivers over the study period, the new GLS contributed to a greater decline among novice drivers.

There also was a significant decline in KSI crashes among novice drivers following introduction of the new GLS, although this decline as a proportion of all such crashes in Queensland was not statistically significant. When including a more narrow age comparison group, however, it was found that the significant decline in KSI crashes for provisional-licensed drivers was greater than that for 25-29-year-old open licensed drivers.

Single-vehicle crashes and KSI single-vehicle crashes also were found to decline significantly for novice drivers following the introduction of the new GLS. Specific to features of the new GLS, significant declines were found for novice driver night crashes and night KSI crashes, passenger crashes and KSI passenger crashes and also alcohol and KSI alcohol crashes. The same pattern of findings for trends in novice driver crashes was found when examining the trends by casualties arising from novice driver crashes.

To further meet the second research objective, trends in crashes of only those novice drivers completing all standard learner and provisional components of the new GLS were compared to those of novice drivers who had completed all standard learner and provisional components of the previous GLS. These findings were more mixed than for the total population analyses. The crash trends for New-GLS learner drivers were slightly lower than for the Old-GLS learner drivers for all crashes, likely due to the significantly lower rate of night crashes. This was despite the introduction of the 100 logbook hours requirement, which might be expected to increase driving exposure and therefore crashes. However, the requirement also included a minimum of 10 hours of night driving and it is unknown whether this might have changed the relative amount of night driving achieved. It is also possible that the new phone restrictions for learner drivers and their passengers contributed to reductions. In any case, the protective role of supervisory drivers in keeping crash rates low for learner drivers appeared to be sustained.

Further, the peak in all crashes in the first month on a provisional licence – the extreme height of risk for all novice drivers and therefore a particular target of GLS initiatives – was much lower following the new GLS. This also was found for single-vehicle crashes, night crashes and passenger crashes, but not for KSI crashes or alcohol crashes; albeit alcohol restrictions were already in place in the previous GLS. When examining the crash trends from the time of provisional licensure over the several years of data available, the declining trend in all crashes was statistically significantly greater for the New-GLS drivers than for the Old-GLS drivers; also found for passenger crashes. However, other crash comparisons (KSI, single-vehicle, night and alcohol crashes) were not statistically significantly different.

Overall therefore, when examining trends for all novice drivers over time, in keeping with previous GLS evaluation approaches, significant declines were found for crashes, and fatalities and serious injuries. A "purer" evaluation of the new versus old GLS based only on those completing all aspects of either the previous or the new GLS, but not then accounting for other potential contributing factors over time, also

found declines associated with the new GLS, but predominantly for the very high-risk peak in crashes in the first month of provisional licensure and when comparing all crashes from that month over time. Passenger crashes also achieved a statistically significant difference over time from the P licence, suggesting the new GLS night passenger restriction in particular was contributing to the overall declines.

Notably all other comparison figures also indicated that the trends were tracking at a greater decline for the New-GLS group relative to the Old-GLS group, just not to a statistically significant extent. Given that only a limited number of years of data were available to track trends for the New-GLS group compared to additional years of data for the Old-GLS group, should these trends for New GLS drivers continue to decline more rapidly, it is likely that significant findings will be confirmed as additional data becomes available in future years.

Encouragingly, the pattern of offences over time did not identify any pointed issue with compliance for any one particular aspect of the new GLS, although the passenger offences should be monitored. No continual, escalating increase in old or new GLS offences since introduction of the new system was found, nor in never licensed, disqualified or all unlicensed driving offences, which in fact showed decreases. GLS offence rates were considerably lower than that for the non-GLS offence of speeding.

Given the various crash rates for novice drivers aged 25 years or older were consistently significantly lower than for novice drivers aged under 25, this also suggested that this age distinction for restrictions was appropriate. There was no clear imperative to extend the additional conditions and restrictions for novices aged under 25 to novices aged 25 and older. However, compared to novices, the offence data showed considerably higher offence rates for 25-29-year-old open licence holders for mobile phone use (i.e. hand-held use) and particularly speeding offences. Further examination and incentives to improve compliance might be warranted, such as a reduced demerit point threshold to reduce repeat offences.

Further, no age difference was found for new provisional drivers in the New-GLS and Old-GLS groups. This dispels reputed public opinion that young people are delaying licensure. However, this does not account for the other reputed opinion that some young people are not gaining licensure at all or perhaps are driving less. By including rates per licensed drivers in the analyses, we were able to control for the former (i.e. if there were different numbers of drivers over time), however, no measure or proxy of driving hours or mileage was available to account for the latter.

A key limitation in interpreting all the findings however relates to the timing of the introduction of the new GLS at the same time as the global economic downturn, to which Queensland was not immune. Some limited research on the link between economic downturns and reduced road crashes has suggested youth might be particularly affected due to assumed greater difficulty in gaining employment, with this research particularly focusing on young males. This concern was partly addressed by limiting some of the comparative analyses to provisional drivers (of any age) versus 25-29 year-old open licensed drivers only, with risk reductions for New-GLS provisional drivers evident in all comparisons. Future research could seek to model potential links with relevant economic datasets (such as employment data and sales of alcohol, fuel, old and new vehicles, for example) and examine whether any differences are evident by specific age and gender groups.

Additional limitations of the study were an inability to account for changes in the recording of serious injuries that might have reduced records for 2006 to 2007, the lack of an appropriate control jurisdiction and imperfect comparison groups, and a lack of information on any changes in police enforcement practices during the study period. Conservatively, 2006 and 2007 records were retained, alternative comparison groups were included, and some preliminary discussions with Queensland Police were undertaken to address these limitations as best possible during the study. Overall, the consistent finding of reductions in crashes and injuries identified (irrespective of the size of the associations), including larger reductions for New-GLS novices than the comparison groups, increases confidence that the changes to QLD's GLS contributed to reductions in road trauma over and above any other contributing factors.

Conclusions

In conclusion, we found that the new GLS was associated with declines in overall crashes and overall fatalities and serious injuries involving novice drivers. Learner driver crashes at night were significantly lower for New-GLS drivers compared to Old-GLS drivers, irrespective of any increase in exposure associated with the 100 logbook hours requirement. The combined impact of the learner and P1 licence stage initiatives were also associated with a large drop in peak crashes during the first month of the P1 licence, including among novice-driver-only (single-vehicle) crashes and night crashes, in addition to passenger crashes. With this transitional month a specific target of GLS initiatives, this finding is particularly important in attributing the GLS changes as a key contributing factor to the reductions identified. During the provisional phase, the night passenger restriction in particular was consistently associated with significant declines in all analyses of crash and injury rates involving novices carrying passengers (i.e. passenger crashes, KSI passenger crashes, passenger casualties and KSI passenger casualties relative to all other QLD licence holders; passenger crashes for the New-GLS versus Old-GLS group; and for declines from the time of the P licence).

Given no dire compliance issues or disbenefits for novices aged 25 and older were detected, no changes to extend all of the new GLS requirements and restrictions to all aged drivers are recommended. Notwithstanding this, further investigation into the high rate of mobile phone use and particularly speeding offences by 25-29-year-old open licence holders should be considered. Further research could also model potential confounding influences for specific age and gender groups due to the economic downturn coinciding with the introduction of the GLS changes. It is recommended the current system continues, with future evaluation likely to determine even stronger findings of benefits with additional years of data, although it is also acknowledged that the impact of GLS initiatives can plateau over time. Future directions for the QLD GLS based on strong evidence of effectiveness in international evaluations, would be to strengthen the night passenger restriction by extending the passenger restriction to all times of day and restricting all night driving for P1 drivers unless a supervisory driver is present. Even stronger would be to restrict carriage of any peer passengers in the first months of P licence driving and, ultimately, to raise the minimum provisional driving age to 18 years. These specific crash types should continue to be monitored and strengthened restrictions introduced should they be identified as clear issues for QLD.

1. Introduction

1.1 Novice Driver Crash Risk and Graduated Licensing Systems

Young and new drivers are over-represented in road trauma statistics globally, including in Australia and Queensland (QLD) more specifically. For example, in 2015 in QLD, provisional licence holders comprised just 5.2% of the licensed driver population [1] but more than double that proportion (11.5%) of those killed on the road [2]. The youngest novices are most at risk, with 16-24-year-old drivers/riders on average representing one-quarter of all QLD road fatalities (e.g. 24.7% in 2014 [3]).

It has been well established, both in Australia and internationally, that crash risk increases sharply when first transitioning from driving as a learner under supervision to driving independently [4]. Crashes peak but rapidly decline in the first year, and more gradually in subsequent years. To address this, Australian jurisdictions, including QLD, have introduced graduated licensing systems (GLS). In a GLS, the supervised learner stage is followed by a provisional licensing stage, which allows unsupervised driving, but with some restrictions to lower-risk driving conditions, before the open licence stage. Figure 1 presents these crash patterns and licensing stages visually for QLD for the years 2001 to 2003 [5].

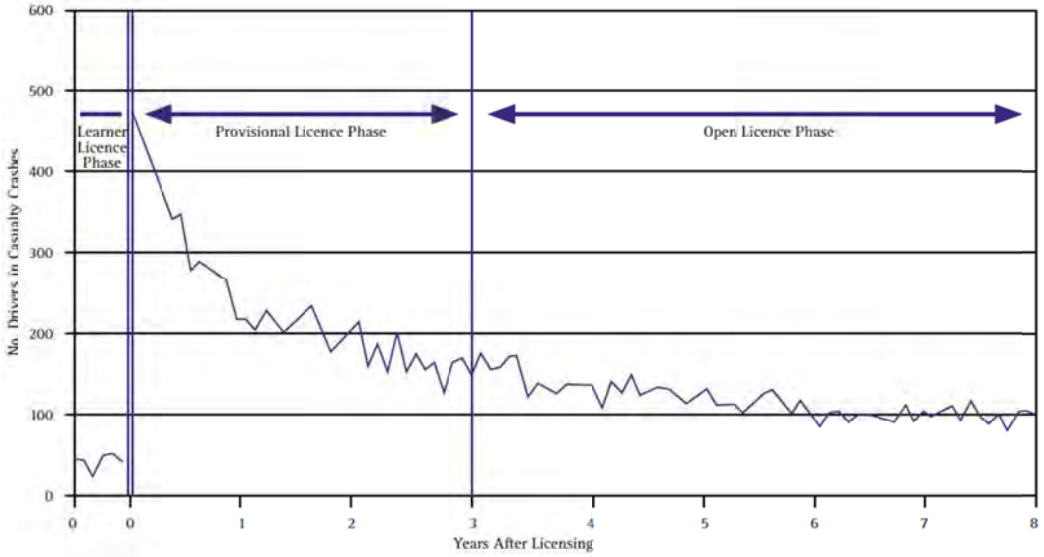

Figure 1: Drivers in casualty crashes by years and stage of licensure, QLD 2001-2003

A variety of GLS models have resulted in Australia, with no two systems the same and with differing levels of impacts on crashes associated with the differing component requirements and restrictions [6]. A recent systematic search of literature on GLS effectiveness identified the following as the best evaluated components associated with crash and injury reductions [6]:

- a minimum learner age of 16 years;
- a minimum learner period of 12 months;
- a minimum provisional age greater than 16 years, with increasing benefits with increasing age;
- night driving restrictions for the early provisional licence period
- peer passenger restrictions for the early provisional licence period; and
- a zero blood alcohol concentration limit for provisional drivers.

There was some but as yet inconclusive support for a high number of supervised logbook hours for learner drivers, and also a lack of support for driver education programs that reduce learner tenure, as well as for high powered vehicle restrictions for provisional drivers. Otherwise the evidence base for most other GLS initiatives was lacking. Australian evaluations were particularly lacking, with only two preliminary evaluations identified, but in part due to the limitation of insufficient years of data to have statistical power for evaluation. This report therefore fills an important gap in the field but providing the first complete Australian evaluation.

1.2 Queensland's Graduated Licensing System

At the time of Figure 1, QLD had a single three-year provisional stage. From 1 July 2007, the Department of Transport and Main Roads (TMR) strengthened QLD's GLS by revising the learner and provisional stage requirements and restrictions, in particular, extending the learner period and dividing the provisional stage into two phases: the first year P1, and the remaining two years P2. A summary of the changes is presented in Figure 2.

The main changes to the learner stage were a six-month extension of the minimum period (to 12 months) with a corresponding six-month reduction in the minimum age (to 16 years) and introduction of new requirements: 100 hours of logged supervised practice driving, restriction from any use of a mobile phone (i.e. including hands-free) by the driver, as well as loudspeaker function use by passengers. By dividing the three-year provisional stage into P1 and P2 phases, additional conditions could apply in the first high-risk year. These included the same phone restrictions as for learners and, in addition, a night-time peer passenger restriction (only one passenger aged under 21 years from 11pm to 5am excluding family). A high-powered vehicle restriction was also introduced for the three years. These changes primarily applied to drivers aged under 25 years, with some attenuation if aged 23-24 years.

The following points are also of note:

- The introduction of the 100 hours logbook requirement for learners includes a requirement for a minimum of 10 hours at night and also a "3-for-1" scheme, such that one hour with a professional driving instructor can count as three hours for the first 10 hours of lessons; thereby reducing the actual minimum to 80 hours.
- The four-point demerit point threshold is lower than the threshold for drivers on an open licence (who have a 12-point threshold). For all drivers irrespective of licence type, if reached the driver has a choice between a three-month licence suspension or a one-year "good driving behaviour" period, during which no more than one demerit point can be accumulated. If breached, a six-month suspension applies.
- Provisional drivers under a good driving behaviour condition or returning to driving following a licence suspension/disqualification (including as a result of reaching the demerit point threshold) have a late night driving restriction from 11pm to 5am.
- Changes were also made to motorcycle, interstate and overseas licence requirements in July 2007, which are not applicable to the current study and are not addressed further in this report.
- Special legislative allowances were made for anyone turning 16.5 years of age between 1 June 2007 and 31 December 2007 and who were applying for their first learner licence between 1 July 2007 and 31 December 2007. These allowances included requiring a minimum of six months only on the learner licence and a minimum of 60 hours only of supervised driving.

- Following the initial changes in 2007, the zero alcohol restriction that applied to all learner and provisional drivers aged under 25 years of age (both in the former and new GLS) was subsequently extended to apply to all new learner and provisional drivers from 1 July 2010.

Learner Stage	
Pre-July 2007	**Post-July 2007**
Learner Theory Test	Learner Theory Test
Minimum age **16.5 years**	Minimum age **16 years**
Hold minimum **6 months**	Hold minimum **12 months**
Zero alcohol limit (if age <25)	Zero alcohol limit (if age <25 until 1 July 2010; thereafter **all learners**)
Must be supervised	Must be supervised
Must display L plates	Must display L plates
Must not accumulate 4 or more demerit points	Must not accumulate 4 or more demerit points
Must carry licence	Must carry licence
	Record 100 hours in logbook (if age <25)
	Must not use mobile in any way including on loudspeaker function (if age <25)
	Passenger(s) must not use mobile on loudspeaker function (if age <25)

Provisional Licence Stage	**P1 Provisional Licence Stage**	**P2 Provisional Licence Stage**
Pre-July 2007	**Post-July 2007**	**Post-July 2007**
Practical Driving Assessment	Practical Driving Assessment	Hazard Perception Test
Minimum age 17 years	Minimum age 17 years	Minimum age 18 years
Must be held **3 years** (if age <23); 2 years (if age 23); 1 year (if age ≥24)	Must be held **minimum 1 year** (if age <25; if ≥25 go to P2)	Must be held **2 years** (if P1 issued at age <23 and now <25); 1 year (if age ≥25; P1 issued at age 23 and now age ≥24; P1 issued at age 24 go to open licence)
Must not accumulate 4 or more demerit points	Must not accumulate 4 or more demerit points	Must not accumulate 4 or more demerit points
Zero alcohol limit (if age <25)	Zero alcohol limit (if age <25 until 1 July 2010; thereafter **all learners**)	Zero alcohol limit (if age <25 until 1 July 2010; thereafter **all learners**)
	Must display red P plates	Must display green P plates
	High-powered vehicle restriction (if age <25)	High-powered vehicle restriction (if age <25)
	Must not use mobile in any way including on loudspeaker function (if age <25)	
	Passenger(s) must not use mobile on loudspeaker function (if age <25)	
	Only **1 passenger < 21 years 11pm-5am** (excl. immediate family member) (if age <25)	

Figure 2: Queensland's Graduated Licensing System pre and post July 2007 (changes in bold)

1.3 Preliminary Evaluation of Queensland's New GLS

A preliminary evaluation of the potential impact on QLD's revised GLS was conducted in 2009 [7]. The before-after study compared the crashes of novice (learner and provisional) drivers to open-licensed 25-35 year-olds, controlling for exposure by person months of licensure. The results demonstrated considerable reductions in crashes and particularly fatalities, including the following:

- 30% reduction in fatal crashes involving novice drivers.
- 13% reduction in fatal and serious injury crashes involving novice drivers.
- 26% reduction in fatal and serious injury crashes involving learner drivers.
- 30% reduction in fatal crashes involving first-year provisional drivers.

More years of data were required, however, to determine the potential impact of the individual initiatives. This was in part because during the transition to the new GLS only some and not all components applied to all novice drivers, depending on when and at what age they entered the licensing process. Since sufficient years of data are now available, including for a cohort of novices subject to all of the new GLS learner and provisional initiatives, a full evaluation is possible.

1.4 Project Aims and Objectives

The targeted outcome of QLD's new GLS was to achieve a reduction in the number of people killed or seriously injured through involvement in a young driver crash. For the purposes of the current project, serious injury was to be determined by hospitalised casualty as reported in the police crash data held by TMR. The broad objectives of the current project were to evaluate whether the new GLS was achieving this outcome, and to determine what specific GLS initiatives were contributing to this outcome.

In terms of overall outcomes of the new GLS, specific aims were to determine any reduction in the following rates:

- Crashes involving novice drivers (learner and provisional drivers).
- Fatal and serious injury crashes involving novice drivers.
- Novice drivers killed or seriously injured in crashes.
- People killed or seriously injured in crashes involving novice drivers.

For these overall comparisons, the proportions of novice drivers involved in crashes and crash casualties relative to the overall licensed driver population in QLD were also explored. In addition, as a proxy for "at-fault" status, we examined "single-vehicle" crashes, that is, crashes involving only the novice driver's vehicle and no other vehicle or road user.

In terms of potential roles of individual GLS initiatives, additional objectives were to answer the following questions in relation to these crash, fatality and serious injury outcomes:

- Are the GLS changes increasing experience during the learner stage, that is, younger minimum age, longer holding period and 100 logbook hours practice driving requirement, associated with reduced crash and injury risk when first transitioning from the learner to the provisional (P1) stage and during the P1 licence stage overall?
- Are the GLS changes restricting exposure to risky driving conditions during the P1 stage in terms of using a mobile phone or passenger loudspeaker phone use and limiting young passenger carriage at night associated with reduced crash and injury outcomes during the P1 stage?
    - Is this evident in crashes involving passengers?
    - Is this evident in crashes at night?

- What is the related pattern of phone use offences?
- What is the related pattern of night passenger carriage offences?
- What other patterns of provisional driver offences occurred, including P1-plate display, indicating likely levels of compliance?

- Are these GLS changes restricting exposure to risky driving during the P1 stage associated with reduced crash and injury risk during the P2 stage?
  - Is this evident by sustained lower crash and injury risk for drivers under the new GLS compared to those under the previous GLS at 13-36 months following provisional licensure?

  Are all of these GLS changes restricting risky driving exposure during the provisional stage associated with reduced crash and injury risk once transitioning to the open licence stage?
  - Is this evident by sustained lower crash and injury risk for drivers under the new GLS compared to those under the previous GLS from 37 months following provisional licensure?
- Is the change for the zero alcohol requirement for learners and provisional drivers to apply to all drivers (i.e. not just those aged <25 years) associated with a reduction in reduced alcohol-related crash and injury outcomes during the learner and provisional periods and transition to early open licence period?
  - What is the related pattern of alcohol-related offences during the learner and provisional periods and transition to early open licence period?
- Is the condition of "if under age 25" acceptable where applicable or should there be additional conditions for novices aged 25 and older?

1.6 Report Structure

The following chapter, Chapter 2, summarises the project methodological details, including the overall study design, participant definitions, data sources and analytic plan.

Chapter 3 summarises the results for analyses of trends in crashes involving novices over time, including just for novice drivers, for novice drivers relative to the overall driving population in QLD, and for provisional-licensed novice drivers compared to 25-29-year-old open-licensed drivers. Chapter 4 details the results for analyses comparing crashes involving novices on the new GLS introduced in July 2007, compared to those on the previous GLS.

Chapter 5 then reports on the results regarding traffic offences for novice drivers and for 25-29 year-old open licence drivers for comparison. Additional analyses exploring other age-related issues, including the implications for the findings for novice drivers aged under 25 years compared to those age 25 years or older, and an exploration of a potential delay in licensure by young people in recent years, are included in Chapter 6.

A discussion of the overall findings, their implications and the recommendations arising from these form Chapter 7. All citations included throughout the report are numbered and listed in Chapter 8 References.

2. Methodology

2.1 Study Design

The overall study design was to assess any changes in crashes involving a novice driver (learner or provisional driver) in the years following introduction of the new GLS compared to previous years under the old GLS using an interrupted time series analysis. Interrupted time series analysis is argued to be the strongest quasi-experimental research design [8]. The trends in an outcome over time are compared before and after an intervention to determine if the trend after the intervention is different to the trend that would be expected should the pre-intervention trend continue unchanged.

Trends were examined by rates of licensed drivers per month to account for different numbers of licence holders over time (detailed further in section 2.5), in several ways:

- Crashes and crash casualties involving novice drivers over the study period.
- Crashes and crash casualties involving novice drivers relative to those of the non-novice licensed driver population in Queensland over the study period.
    - This acted as a control for other potential influences on outcomes over time, such as general improvements to roads and vehicle occupant protection.
    - For the main analyses exploring of trends in all crashes and in all KSI crashes over time, we additionally examined trends for provisional-licensed drivers only and 25-29 year-old open licensed drivers only, as a more narrow age control comparison given that the change in the GLS occurred at the same time of the global economic downturn.
- Comparison of crashes and crash casualties involving novice drivers completing the new GLS learner and provisional stages to those of novice drivers completing the equivalent previous GLS stages.
    - This allowed closer examination of potential differences in outcomes at each stage of licensing associated with the previous and new GLS policies (although without the control of other potential influences over time).

The current study examined trends in all crashes, combined killed or serious injury (KSI) crashes and casualties arising from these. Single-vehicle crashes (involving only the novice) were also explored as a proxy for at-fault status. To explore potential contributions of specific aspects of the new GLS, these analyses were also performed limited to night crashes, passenger crashes and alcohol crashes. (There were too few crashes to analyse night passenger crashes only.)

Offence data were also examined as an indication of compliance over the study period, for novice drivers and also 25-29-year-old open licence drivers as a comparison group when applicable. Specific GLS offences examined were failure to display the applicable L or P plates, mobile phone use, passenger carriage and alcohol offences, as well as night driving offences following a licence disqualification. To check how these compared to other offences, we examined speeding offences and rates of all (any) driving offences over the study period.

We also explored the potential for the new GLS to result in more unlicensed driving offences by young people. A risk of increasing requirements for licensure is that more young people might avoid the GLS system altogether and drive without ever having a licence, potentially delaying until they reach the age 25 when the additional requirements no longer apply. This might include disaffected youth just at the age threshold when the new changes were introduced, for example, or disadvantaged youth who might view the new licensure requirements as unachievable (e.g. finding supervisors or vehicles to gain the 100 hours of supervised learner driving and not being able to

afford sufficient professional lessons). Additionally, the new GLS has the potential to increase the number of young people being disqualified from driving due to more categories of offences to reach the 4-point demerit threshold quicker and, correspondingly, resulting in more people driving while disqualified. Therefore, we examined all unlicensed driving offences, and separately those for never licenced drivers and for disqualified drivers.

The protocol was submitted to, and approved by, the UNSW Human Research Ethics Advisory (HREA) Panel H Science and Engineering (Approval number: HC16011).

2.2 Participant Definitions

"Novice drivers" comprised all learner and provisional licence holders, for which varying conditions applied depending on the date and age at which they obtained the licence (i.e. some might have had age-based exemptions from some components of the previous or new GLS, including those under special allowance conditions during the change to the new GLS).

To compare outcomes for drivers under the new GLS compared to those under the previous GLS, only those who completed the learner and provisional requirements under all applicable GLS conditions were included in the analyses. Those who completed the new GLS learner, first year of provisional (P1) and second-third year of provisional (P2) licence stages under all of the new requirements and conditions applicable from July 2007 were termed the "New-GLS group". Those who completed the learner and provisional stage of the previous GLS under all the old GLS requirements and conditions were termed the "Old-GLS group".

2.3 Data Sources

Data was sourced from routinely collected police records maintained by TMR: a licensing and traffic offence dataset and a crash dataset.

The TRAILS licensing data and traffic infringements dataset includes records of when licences are acquired and police-recorded traffic offences. Key variables for the current study included birth date, and start and end date (when applicable) of holding each applicable licence (learner, provisional, P1, P2, and open) for car drivers. (Other licences, such as heavy vehicle licences, and any records showing that drivers originally obtained a licence in another state or country were excluded.) Key infringement variables included offence dates for all GLS and non-GLS offences and demerit points or exceeding the demerit point threshold. Offences of interest included failure to display L or P plates, mobile phone use, night passenger carriage, alcohol use, night driving following a licence disqualification, unlicensed driving, speeding and total offences. Unlicensed driving offences include a range of offences involving driving without a valid licence, which could include driving with an inappropriate licence (e.g. driving a heavy vehicle with only a car class licence or a learner driving without a supervisory driver present), a disqualified licence (by magistrate order following a drink, drug or dangerous driving offence or criminal use of a motor vehicle) or without ever having held a licence. This latter category, "never licensed", was introduced as a separate code to the other unlicensed offences from 17/04/2003 and therefore was able to be explored separately from that time. For these analyses, the age group 16-24 years was used to represent the typical age range of novices and was compared to 25-29 year-olds.

The Queensland Road Crash Database (QRCD) dataset includes detailed information regarding crashes and police records of whether a hospitalised casualty was involved. The main outcomes of interest for the current study were crashes and crash injuries derived from the QRCD. Key variables included the crash date and the crash severity. The five categories of crash severity applicable to the

current project are as follows, as included in the preliminary GLS evaluation [7], with the months of data available differing by category as also indicated:

1. Fatal: a crash from which at least one person was killed (available data up to 31 Dec 2015).
2. Serious Injury: a crash from which at least one person was admitted to hospital but no-one was killed (available data up to 31 Dec 2013).
3. Medical Treatment: a crash from which at least one person was injured requiring medical treatment but no one was killed or seriously injured (available data up to 31 June 2012).
4. Minor Injury: a crash from which at least one person sustained a minor injury but no one was killed or seriously injured or had a medically treated injury (available data up to 31 June 2012).
5. Non-Injury/property damage only: a crash from which no one was injured (available data up to 31 December 2010).

Analyses either included all crashes (all categories 1 through 5) or KSI (categories 1 and 2 only).

As elements of the previous GLS were introduced from 1 July 1999, all available records commencing from this date were the focus. Records from the TRAILS and QRCD datasets were linked using independent identifiers included in the datasets by TMR (based on licence numbers, de-identified to protect privacy). As non-injury (property damage only) crashes and crash casualties were available only to end 2010, severely limiting the ability to examine outcomes over time since introduction of the new GLS, these were excluded from all analyses. As data on serious injury crashes were available to end 2013 only, analyses of KSI crashes and crash casualties were limited up until this date.

2.4 Outcome Variable Definitions

All analyses focused on crashes involving novice drivers holding a C Learner or Provisional licence while driving a car type vehicle. Crashes involving novice drivers while driving other vehicles, particularly heavy vehicles and motorcycles, were excluded from all analyses.

The following crash outcomes were the focus of the crash analyses:

- All crashes: all crashes in the QRDC dataset irrespective of severity, excluding property damage only crashes.
  KSI crashes: crashes in which at least one person was either killed or admitted to hospital.
- Single-vehicle crashes: crashes involving only the novice driver's vehicle and no other vehicle or road user, comprising codes "hit parked vehicle", "hit fixed obstruction or temporary object" and "overturned".
- Night crashes: crashes occurring between the hours of 11pm and 5am.
- Passenger crashes: crashes involving vehicles driven by novice drivers in which at least one passenger (in addition to the driver) was present.
- Alcohol crashes: crashes involving novices with a positive (greater than zero) blood alcohol concentration (BAC).

The following offences were the focus of the offence analyses:

- Failure to display L or P plates: applicable to learner and provisional drivers only.
- Mobile phone use: hand-held offences only for open-licensed drivers and additionally hands-free or speaker function uses by drivers or passengers for novices.
- Night passenger carriage: applicable to provisional drivers only.
- Alcohol use: zero for novices and 0.05% BAC or greater for open-licensed drivers.
- Night driving: applicable only to provisional licence holders returning to driving following licence disqualification.

- Never licensed driving: applicable to drivers who have never obtained any licence, grouped by age into 16-24 year-olds and 25-29 year-olds to be comparable with the typical GLS novice age range and 25-29-year-old open licence comparison group.
- Disqualified driving: applicable to drivers who have their current licence disqualified.
- Unlicensed driving: applicable to any driver without a current valid licence or driving beyond the terms of their current licence (e.g. a learner driving without a supervisor). Never licensed offences by 16-24 year-olds were included in the "novices" group and those of 25-29 year-olds were including in the "25-29-year-old open licence" group for this comparison.
- Speeding: applicable to all drivers.
- Total offences: all recorded offences.

2.5 Data Analysis

To examine the overall trends in novice crashes, involving drivers on learner or provisional licences, over time relative to the start of the new GLS system in July 2007, an interrupted time series analysis was conducted for the log of the ratios of numbers of licenced novice drivers (per 10,000) as the offset and also with all crashes as the offset. An autoregressive error process to account for serial correlation was estimated and this model has the form:

$$\log y_{ti} = \beta_0 + \beta_1 t + \beta_2 gls_i + \beta_3 t \times gls_i + e_{ti}$$

where e_{ti} is the autoregressive process. The coefficient β_2 is a measure of whether the rate "shifted" up or down and β_3 is an indication if the trend changed with the introduction of the new GLS.

To compare the New-GLS and Old-GLS groups, an interrupted time series model using segmented Poisson regression [9] was fit for the number of crashes λ_{tij} at time t, before ($i = 0$) or after ($i = 1$) receiving the first provisional licence (P licence), and GLS program (old: $j = 0$, new: $j = 1$). The time variable was centred at the P-licence month, i.e. $t = 0$, and can be interpreted as the months since obtaining the P licence. Time does not correspond to any specific month or year. The other model covariates included indicator variables for P licence (p_i) and GLS program (g_i) and the offset N_{tij} was the number of drivers at-risk at a given time for each group. Each driver was considered at-risk for each month between obtaining their learner licence (L-licence) until the end of study period (June 2012 for all crashes or December 2013 for KSI crashes). For the P licence month, the amount of time at-risk was prorated for the proportion of days with a P licence for that month.

The model had the form:

$$\log \lambda_{tij} = \beta_0 + \beta_1 t + \beta_2 p_i + \beta_3 g_j + \beta_4 t^2 + \beta_5 t^3 + \beta_6 t p_i + \beta_7 t g_j + \beta_8 p_i g_j + \beta_9 t^2 p_i + \beta_{10} t^3 p_i + \beta_{11} t p_i g_j + \log\left(N_{tij}/10000\right)$$

The outcome of this model can be interpreted as the number of crashes per 10,000 drivers. Separate models were fit for all crashes and for fatal, serious injury, combined KSI, single-vehicle, night, passenger and alcohol crashes.

The primary analysis is a comparison of the peak rate of crashes for the new versus old GLS. The peak rate has historically occurred immediately after obtaining a P licence, i.e. $t = 0$. Using the model notation above, the peak for the new GLS on the log scale is:

$$\log \lambda_{011} = \beta_0 + \beta_2 + \beta_3 + \beta_8$$

and for the old GLS is:

$$\log \lambda_{010} = \beta_0 + \beta_2$$

Therefore, a direct comparison of the peaks is the log rate ratio given by:

$$\log \frac{\lambda_{011}}{\lambda_{010}} = \log \lambda_{011} - \log \lambda_{010} = \beta_3 + \beta_8$$

These parameters are estimated by maximum likelihood and statistical inference (i.e. confidence intervals, p-values) was performed using likelihood-based methods. Analyses were performed using SAS version 9.4 (SAS Institute, 2016) and R version "Sock it to me".

Offences of novice drivers and also 25-29-year-old drivers on an open licence were compared as a rate per 100,000 licences. The rates of crashes involving new GLS provisional drivers aged under 25 years were also compared to those involving new GLS provisional drivers aged 25 or older. These comparisons included different crash types including: single vehicle crashes, passenger and night time crashes. Potential differences in age distribution of New GLS and Old GLS novice drivers were examined by comparing mean age, median, upper and lower quartile for each group.

2.5.1 Interpreting data analysis outputs

The key features of an interrupted time series analysis are the estimation of changes in level and/or slope (see Figure 3). The direction and magnitude of level or slope changes depend on the outcome variables measured and the nature of the intervention. In particular, level changes occur for interventions with an immediate impact while slope changes occur for interventions that are adopted gradually. For example, an immediate decrease in motorised vehicle fatalities would be expected for seat belt legislation while improved infrastructure would decrease fatalities gradually.

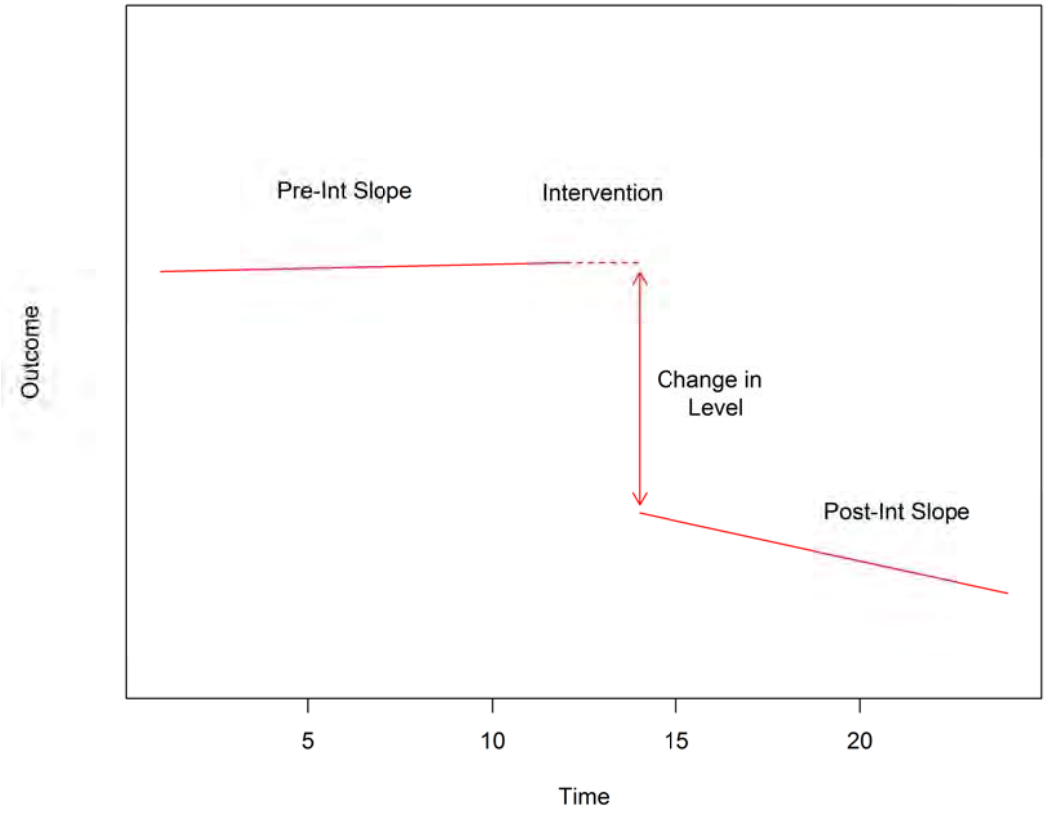

Figure 3: Key features of an interrupted time series analysis

For our analyses, estimates of changes in level and slope are taken from the models described above. Tabulated summary statistics for analyses of crash trends for the licensed driver population (Chapter 3) include the estimate, 95% confidence intervals (CI) and p significance level. The estimates "Change in post GLS trend" correspond to the estimates of monthly and yearly changes in rates, such that these can be computed from the model estimate by:[1]

% monthly change = exp(Estimate) – 1

% yearly change = exp(12*Estimate) – 1

Tabulated summary statistics for the comparison of the New-GLS and Old-GLS crashes (Chapter 4) include the mean estimate, 95% CI and p significant level. Differences between the crash trends for the New-GLS versus Old-GLS groups prior to the time of P licence (learner period) are determined from the Mean Estimate "pre-p: new vs old -- slope", for peak crashes in the first month of the provisional period from the Mean Estimate "new vs old" and for the crash trends from the time of P licence from the Mean Estimate "new vs old -- slope" by subtracting from 1 and multiplying by 100 to convert to a percentage.[2]

For all analyses, statistical significance was set at the 5% level, that is, p-values less than 0.05. This is a scientific convention for identifying results that are "real" and not attributed to chance. However, p-values in isolation should not be the sole arbiter of importance. Effect sizes, such as percentage changes in rates, are also forms of evidence that should be used to determine if a result is important or not. For example, a reduction in fatalities of 10% or more may be considered important while an increase in fines of 0.1% may be considered unimportant irrespective of their p-values.

[1] For example, where the Estimate=-0.0017, the estimated monthly and yearly changes are:
exp(-0.0017) – 1 = -0.002
exp(12*-0.0017) – 1 = - 0.03

[2] For example, where the Mean Estimate =0.858, the corresponding difference is:
(1 – 0.858) * 100 = 14.2

3. Results: Trends in Novice Driver Crashes over Time

3.1 All Crashes

3.1.1 Novice driver crashes

The changes in Queensland novice driver crashes over time are depicted in Figure 4 and summary statistics in Table 1. Trends analysis results shows that while the introduction of the new GLS did not result in an immediate significant shift in rates of crashes involving novice drivers, the post-GLS trend significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease in crashes involving novice drivers per 10,000 novice licences, at a rate of 1.1% per month or 13.1% per year.

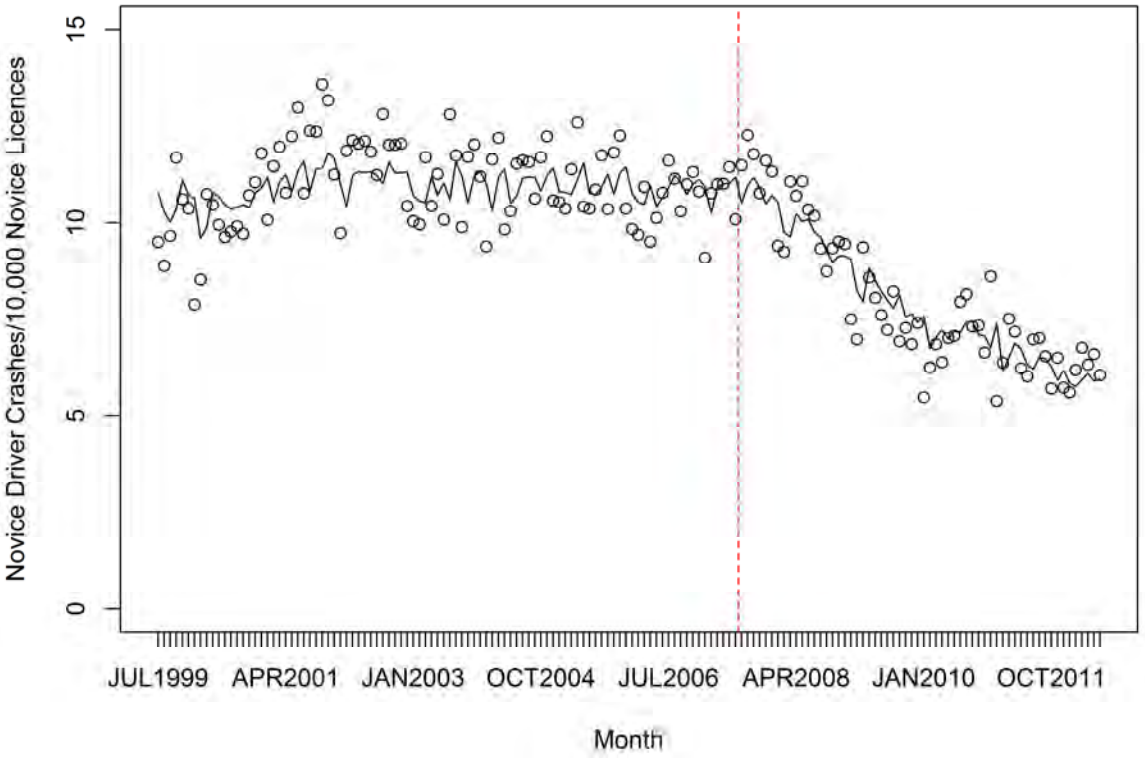

Figure 4: Crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 1: Summary statistics of crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre-GLS trend	0.00028	-0.0005	0.0010	0.47
GLS shift	-0.0213	-0.0897	0.0471	0.5429
Change in trend post-GLS	-0.0113	-0.0130	-0.0096	<.0001

3.1.2 Novice driver crashes relative to other driver crashes

The changes in Queensland novice driver crashes over time relative to the overall licensed driver population in Queensland are depicted in Figure 5 and summary statistics in Table 2. Trend analysis of crashes involving novice drivers as a proportion of all crashes also shows that while the introduction of GLS did not result in an immediate significant shift in rates of crashes involving novice drivers, the post-GLS trend significantly changed compared to the pre-GLS period. The post GLS trend shows a gradual decrease in crashes involving novice drivers as a proportion of all crashes. The post-GLS rate of decline was 0.2% per month or 3.0% per year. This was much slower compared to that of crashes involving only novice drivers per 10,000 novice licences.

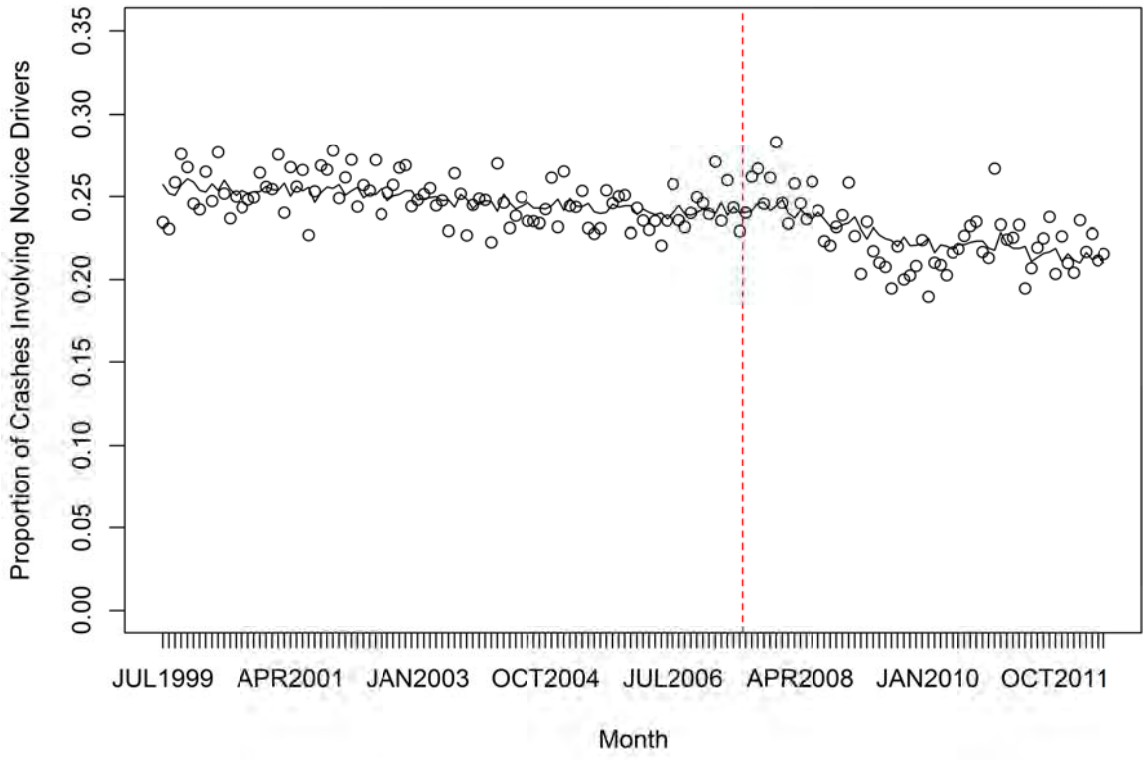

Figure 5: Crashes Involving novice drivers as a proportion of all crashes, Queensland, Jul 1999-Jun 2012

Table 2: Summary statistics of crashes involving novice drivers as a proportion of all crashes, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	-0.0008	-0.0012	-0.0003	0.0011
GLS shift	0.0160	-0.0248	0.0568	0.4410
Change in post GLS trend	-0.0017	-0.0027	-0.0007	0.0016

3.1.3 Provisional-licensed driver crashes

The changes in Queensland provisional-licensed driver crashes over time are depicted in Figure 6 and summary statistics in Table 3. The post-GLS trend in crashes involving drivers on a P licence per 10,000 P licences, significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 0.8% per month or 9.3% per year.

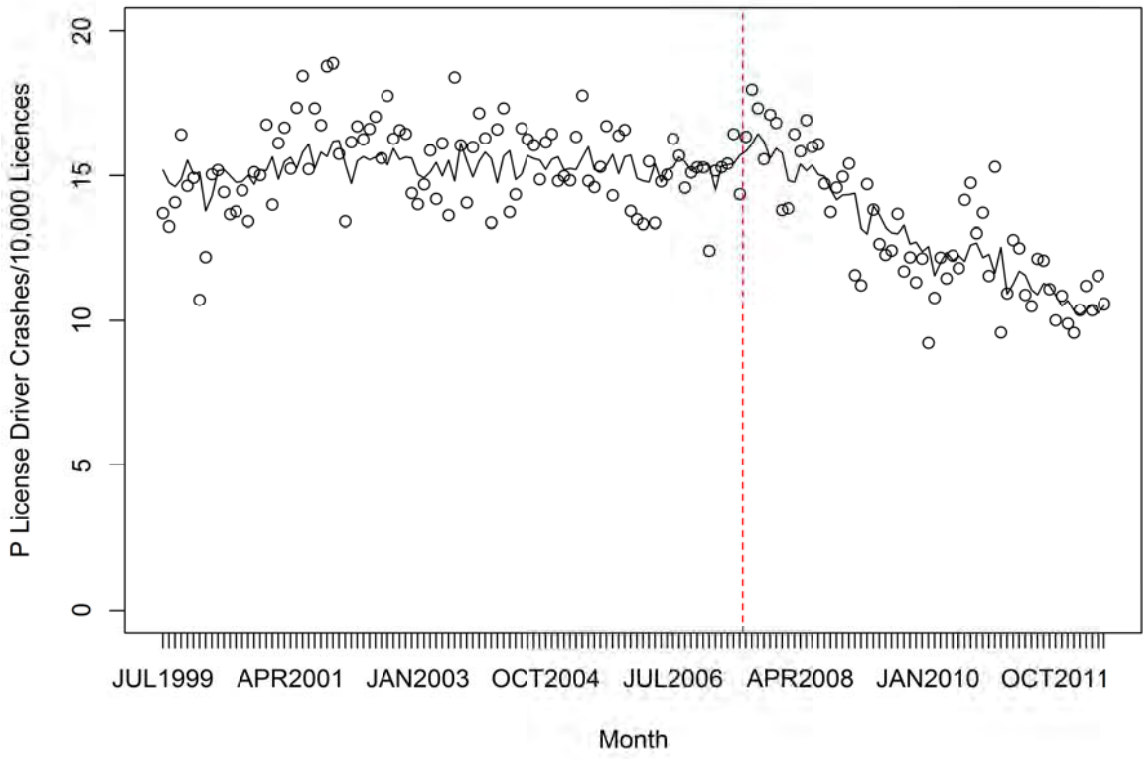

Figure 6: Crashes involving drivers on a P licence per 10,000 P licences, Queensland, Jul 1999-Jun 2012

Table 3: Summary statistics of crashes involving drivers on a P licence per 10,000 P licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0002	-0.0006	0.0009	0.6747
GLS shift	0.0483	-0.0178	0.1144	0.1533
Change in post GLS trend	-0.0080	-0.0096	-0.0063	<.0001

3.1.4 25-29-year-old open-licensed driver crashes

The changes in Queensland 25-29-year-old open-licensed driver crashes over time are depicted in Figure 7 and summary statistics in Table 4. The post-GLS trend in crashes involving drivers aged 25-29 years on an open licence per 10,000 licences, significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 0.6% per month or 6.7% per year. This was lower than that of crashes involving drivers on P licence; provisional-licensed driver crashes decreased by an additional 0.2% per month or 2.6% per year.

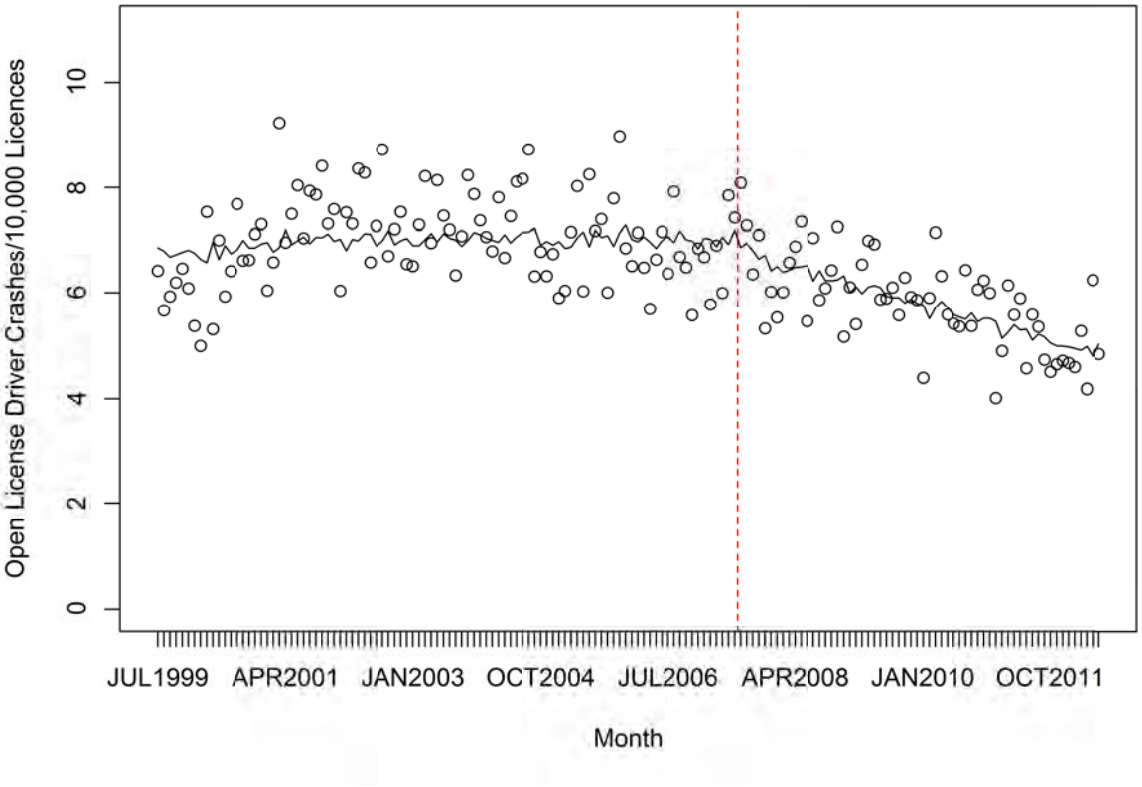

Figure 7: Crashes involving drivers aged 25-29 years on an open licence per 10,000 licences, Queensland, Jul 1999-Jun 2012

Table 4: Summary statistics of crashes involving drivers aged 25-29 years on an open licence per 10,000 licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0004	-0.0005	0.0012	0.4418
GLS shift	-0.0385	-0.1181	0.0411	0.3437
Change in post GLS trend	-0.0060	-0.0080	-0.0040	<.0001

3.2 All KSI Crashes

3.2.1 Novice driver KSI crashes

The changes in Queensland novice driver KSI crashes over time are depicted in Figure 8 and summary statistics in Table 5. Trend analysis indicated that the post-GLS trend significantly changed compared to the pre-GLS period. There was a gradual decrease in the rate of KSI crashes involving novice drivers per 10,000 novice licences post-GLS of 0.4% per month or 5.4% per year (lower than that of all crashes).

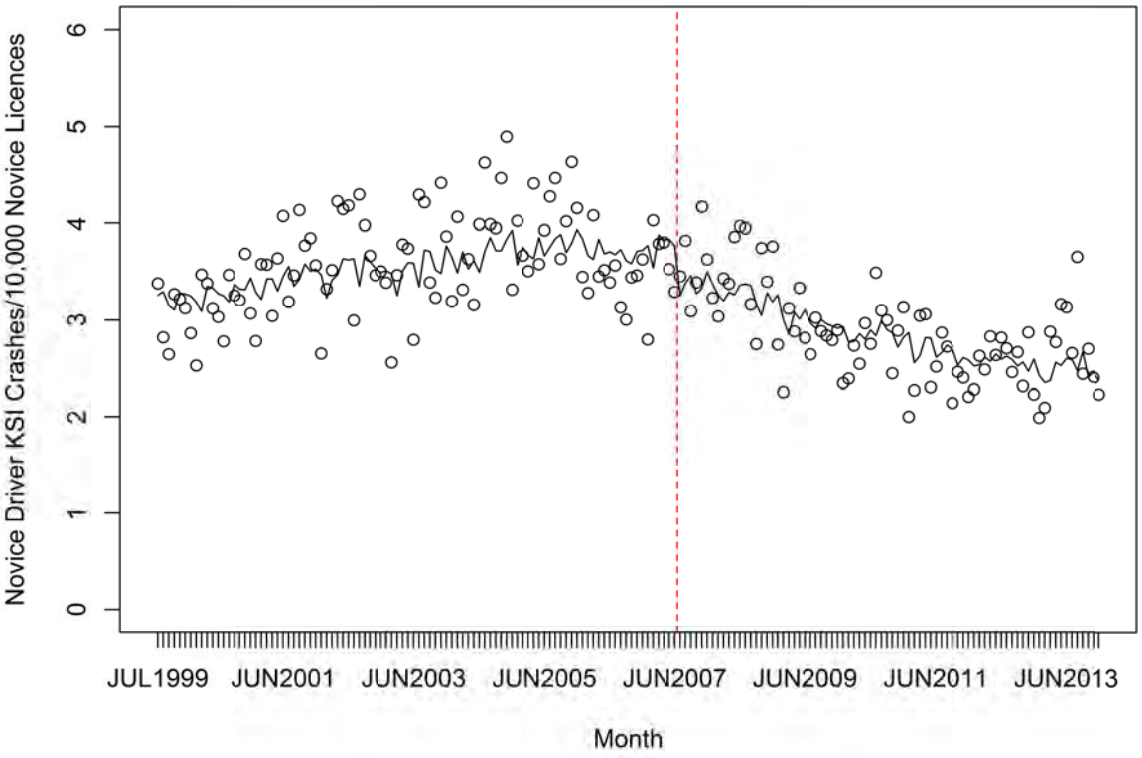

Figure 8: KSI crashes Involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 5: Summary statistics of KSI crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999- Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0018	0.0008	0.0028	0.0004
GLS shift	-0.1361	-0.2180	-0.0542	0.0014
Change in post GLS trend	-0.0063	-0.0080	-0.0046	<.0001

3.2.2 Novice driver KSI crashes relative to other driver crashes

The changes in Queensland novice driver KSI crashes over time relative to the overall licensed driver population in Queensland are depicted in Figure 9 and summary statistics in Table 6. The trend in KSI crashes involving novice drivers as a proportion of all KSI crashes during the post-GLS period did not vary significantly compared to that of the pre-GLS period.

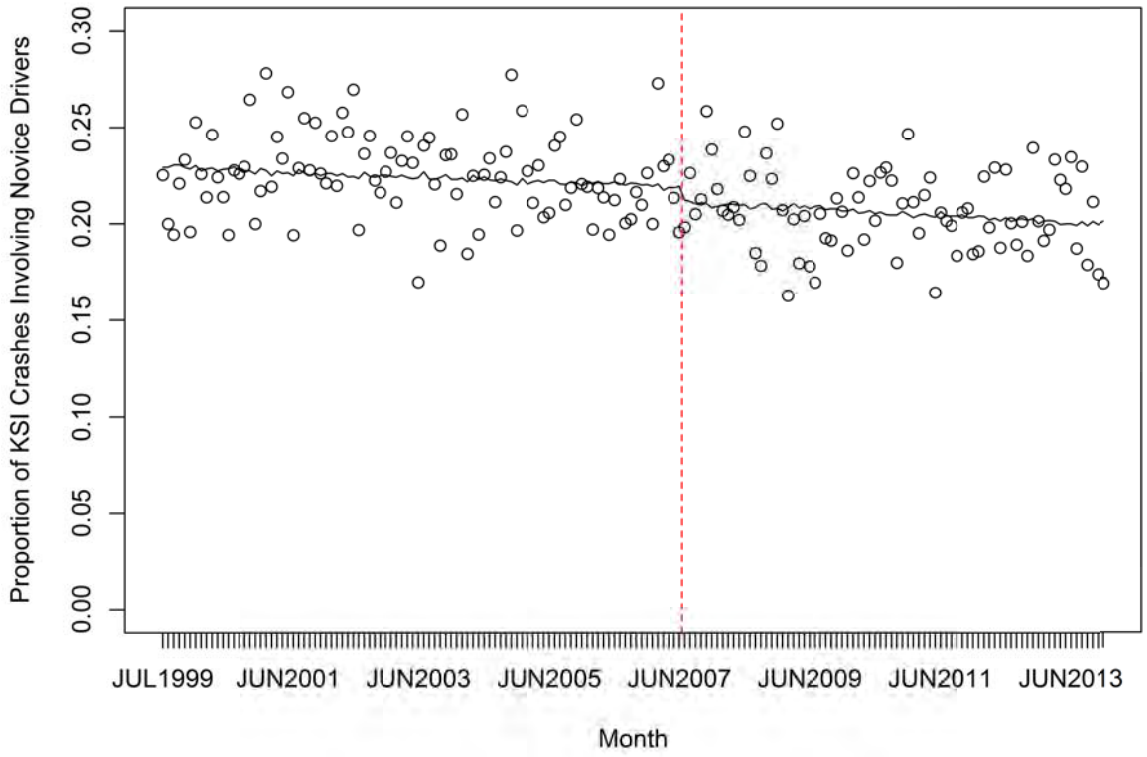

Figure 9: KSI crashes Involving novice drivers as a proportion of all KSI crashes, Queensland, Jul 1999-Dec 2013

Table 6: Summary statistics of KSI crashes involving novice drivers as a proportion of all crashes, Queensland, Jul 1999- Dec 2013

	Estimate	95% CI		P
Pre GLS trend	-0.0005	-0.0012	0.0003	0.2035
GLS shift	-0.0364	-0.0960	0.0232	0.2334
Change in post-GLS trend	-0.0003	-0.0015	0.0010	0.685

3.2.3 Provisional-licensed driver KSI crashes

The changes in Queensland provisional-licensed driver KSI crashes over time are depicted in Figure 10 and summary statistics in Table 7. The post-GLS trend in rates of KSI crashes involving drivers on a P licence per 10,000 P licences following the introduction of the new GLS significantly changed compared to the pre-GLS period. There was a gradual decrease of 0.3% per month or 3.6% per year during the post-GLS period.

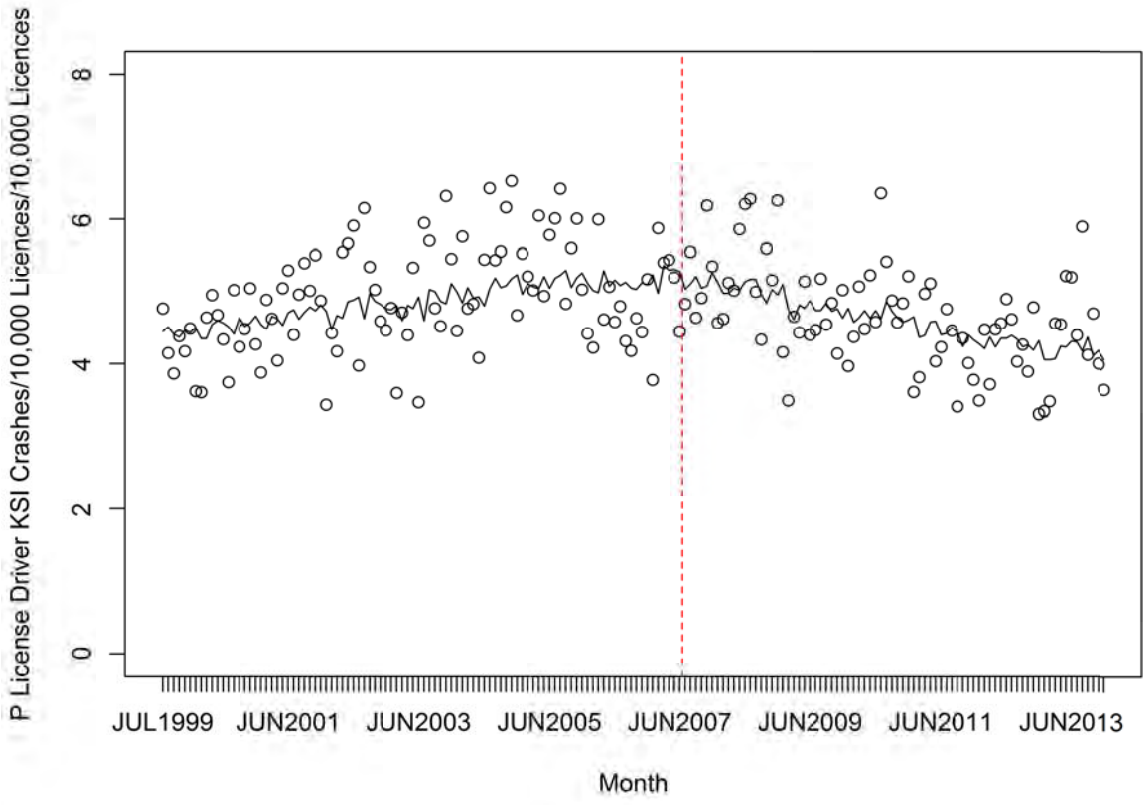

Figure 10: KSI crashes involving novice drivers on P licence per 10,000 P licences, Queensland, Jul 1999- Dec 2013

Table 7: Summary statistics of KSI crashes involving drivers on P licence per 10,000 P licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0018	-0.0048	0.0065	0.0005
GLS shift	-0.0238	-0.2272	0.0106	0.5818
Change in post GLS trend	-0.0049	-0.0004	-0.0128	<.0001

3.2.4 25-29-year-old open-licensed driver KSI crashes

The changes in Queensland 25-29-year-old open-licensed driver KSI crashes over time are depicted in Figure 11 and summary statistics in Table 8. The post-GLS trend in KSI crashes involving drivers aged 25-29 years on an open licence per 10,000 licences, significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 0.2% per month or 2.4% per year. This was lower than that of KSI crashes involving novice drivers on a P licence; provisional-licensed driver KSI crashes decreased by an additional 0.1% per month or 1.2% per year.

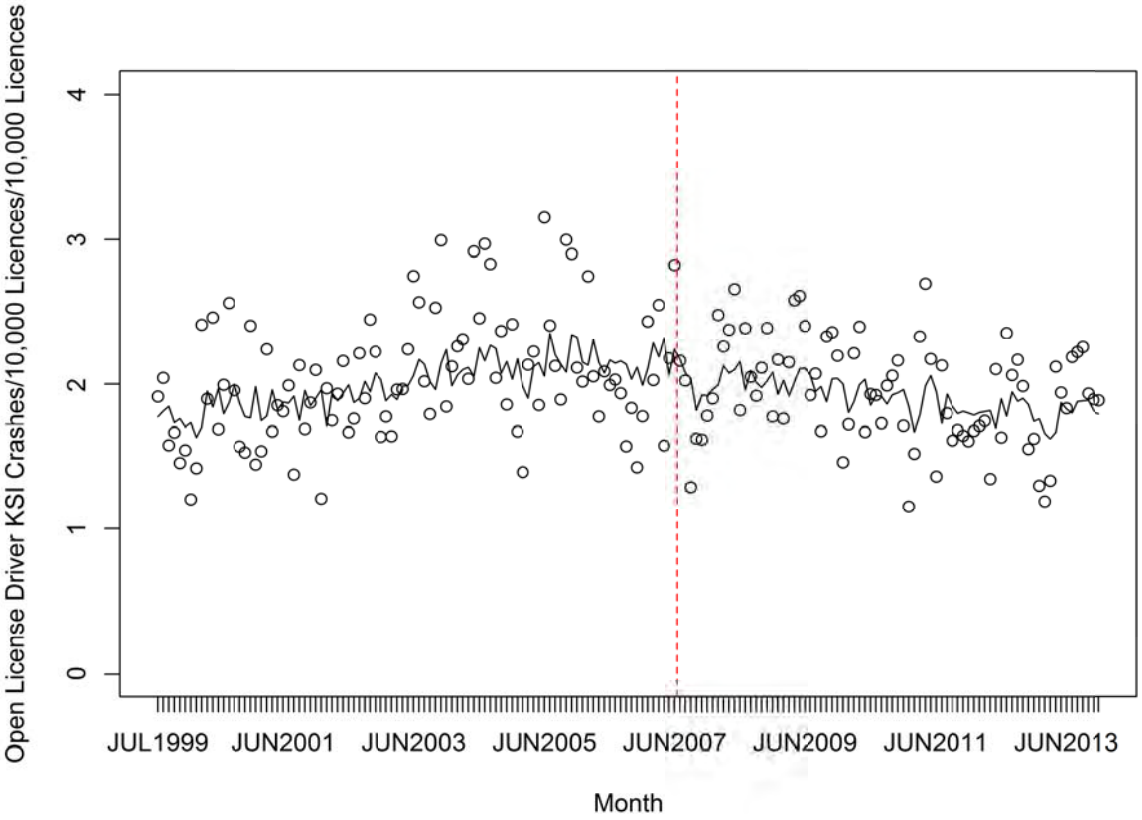

Figure 11: KSI crashes involving drivers aged 25-29 years on open licence per 10,000 licences, Queensland, Jul 1999- Dec 2013

Table 8: Summary statistics of KSI crashes involving drivers aged 25-29 years on open licence per 100,000 licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0025	0.0011	0.0039	0.0006
GLS shift	-0.0886	-0.2048	0.0276	0.1371
Change in post GLS trend	-0.0045	-0.0069	-0.0022	0.0002

3.3 Single-vehicle Crashes

3.3.1 Novice driver single-vehicle crashes

The changes in Queensland novice driver single-vehicle crashes over time are depicted in Figure 12 and summary statistics in Table 9. While the introduction of GLS did not result in an immediate significant shift in rates of single-vehicle crashes involving novice drivers, the post-GLS trend significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease in single-vehicle crashes involving novice drivers per 10,000 novice licences, at a rate of 1.0% per month or 11.5% per year.

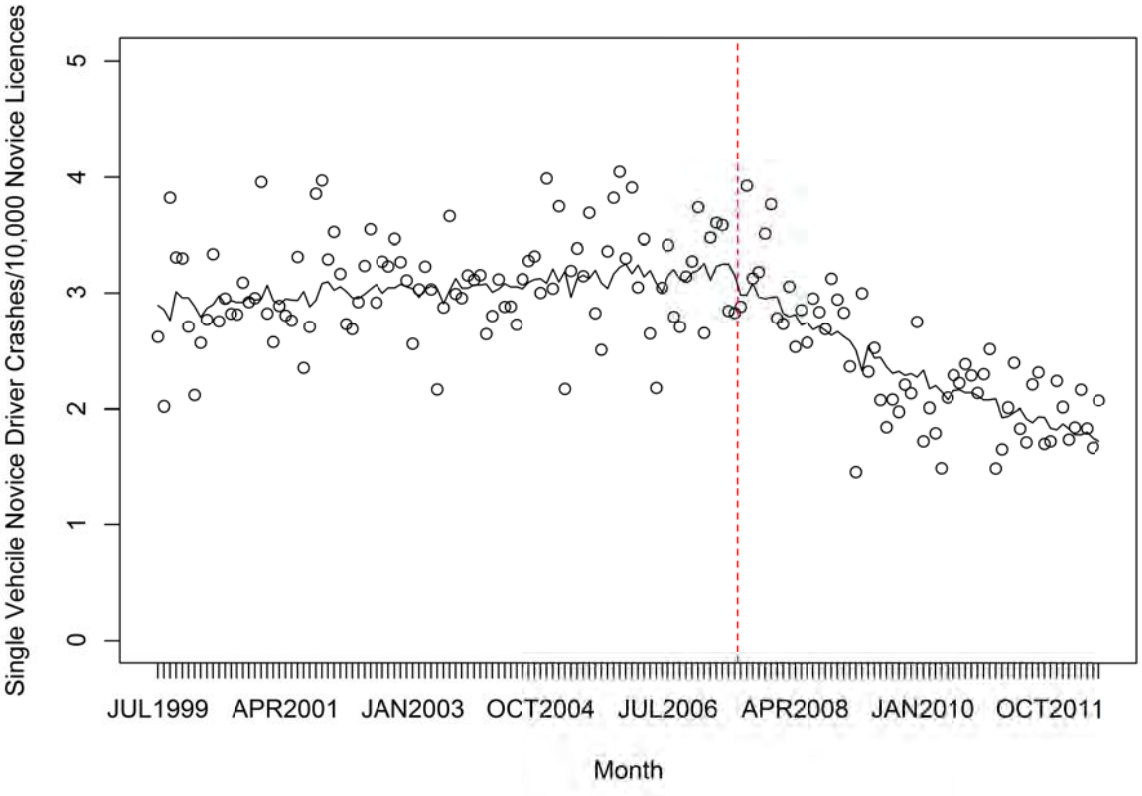

Figure 12: Single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 9: Summary statistics of single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.001	0.0000	0.0022	0.0575
GLS shift	-0.0509	-0.1493	0.0475	0.3120
Change in post GLS trend	-0.0107	-0.0132	-0.0082	<.0001

3.3.2 Novice driver KSI single-vehicle crashes

The changes in Queensland novice driver KSI single-vehicle crashes over time are depicted in Figure 13 and summary statistics in Table 10. It seems that the introduction of GLS resulted in an immediate significant shift in rates of KSI single-vehicle crashes involving novice drivers and the post-GLS trend significantly changed compared to the pre-GLS. There was a gradual decrease in the rate of KSI single-vehicle crashes involving novice drivers per 10,000 novice licences post-GLS of 0.4% per month or 4.5% per year. The rate of this decrease was lower than that of all single-vehicle crashes involving novice drivers.

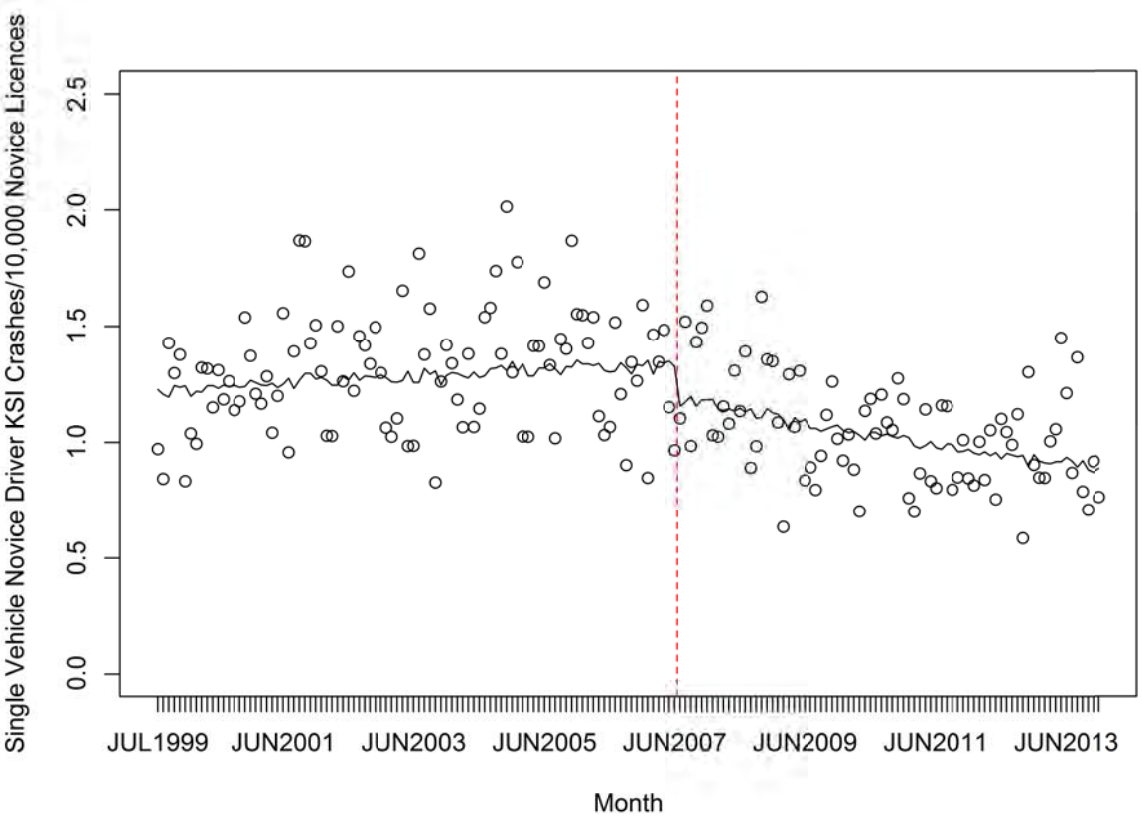

Figure 13: KSI single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999- Dec 2013

Table 10: Summary statistics of KSI single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0009	-0.0005	0.0024	0.205
GLS shift	-0.1264	-0.2475	-0.0053	0.0426
Change in post GLS trend	-0.0047	-0.0072	-0.0023	0.0002

3.4 Night Crashes

3.4.1 Novice driver night crashes

The changes in Queensland novice driver night crashes over time are depicted in Figure 14 and summary statistics in Table 11. No immediate significant shift in rates of night crashes (11pm-5am) involving novice drivers was observed but the post-GLS trend significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease in night crashes involving novice drivers per 10,000 novice licences at a rate of 1.3% per month or 15.9% per year.

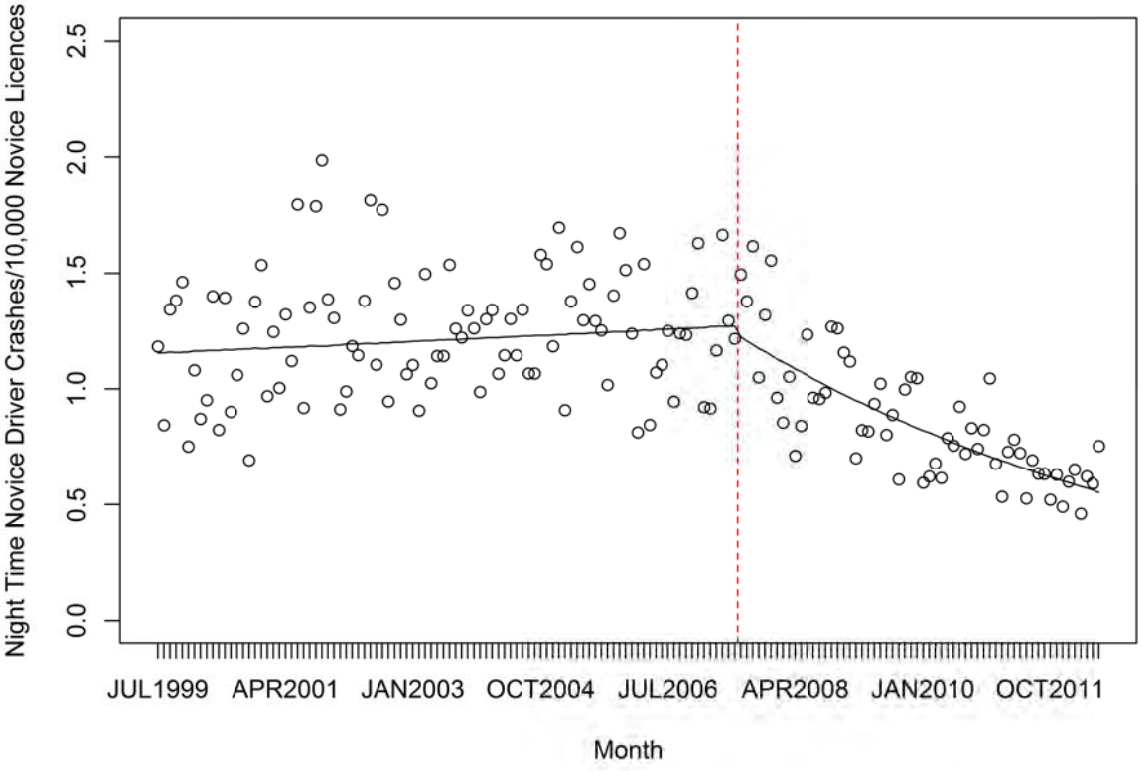

Figure 14: Night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 11: Summary statistics of night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.00102	-0.0005	0.0025	0.1834
GLS shift	-0.0316	-0.1653	0.1021	0.6442
Change in post GLS trend	-0.0144	-0.0178	-0.0110	<.0001

3.4.2 Novice driver KSI night crashes

The changes in Queensland novice driver KSI night crashes over time are depicted in Figure 15 and summary statistics in Table 12. The observed immediate shift in rates of KSI night crashes following the introduction of GLS was not significant. However, the post-GLS trend significantly changed compared to the pre-GLS. The post-GLS rate decreased gradually by 0.8% per month or 9.1% per year.

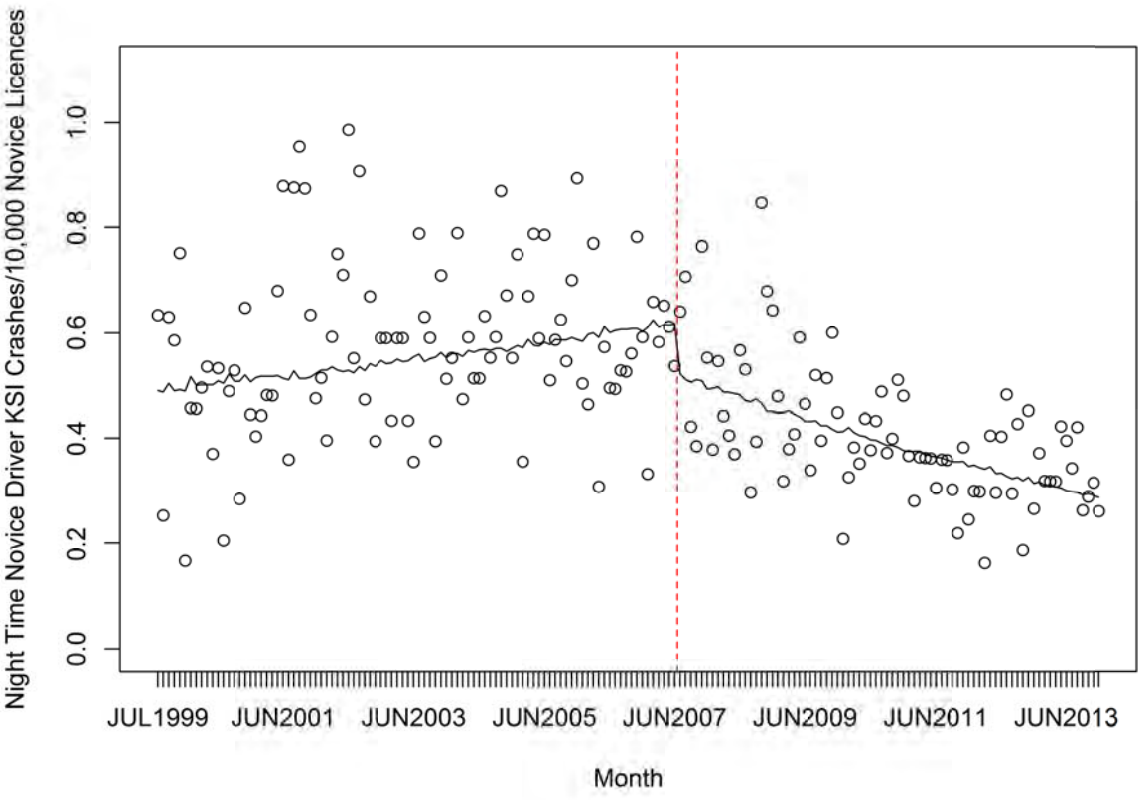

Figure 15: KSI night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999- Dec 2013

Table 12: Summary statistics of KSI night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.002419	0.0003	0.0045	0.0232
GLS shift	-0.1694	-0.3407	0.0019	0.0544
Change in post GLS trend	-0.01	-0.0135	-0.0065	<.0001

3.5 Passenger Crashes

3.5.1 Novice driver passenger crashes

The changes in Queensland novice driver passenger crashes over time are depicted in Figure 16 and summary statistics in Table 13. Post-GLS trend in crashes involving novice drivers carrying at least one passenger per 10,000 novice licences significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 1.1% per month or 13.5% per year.

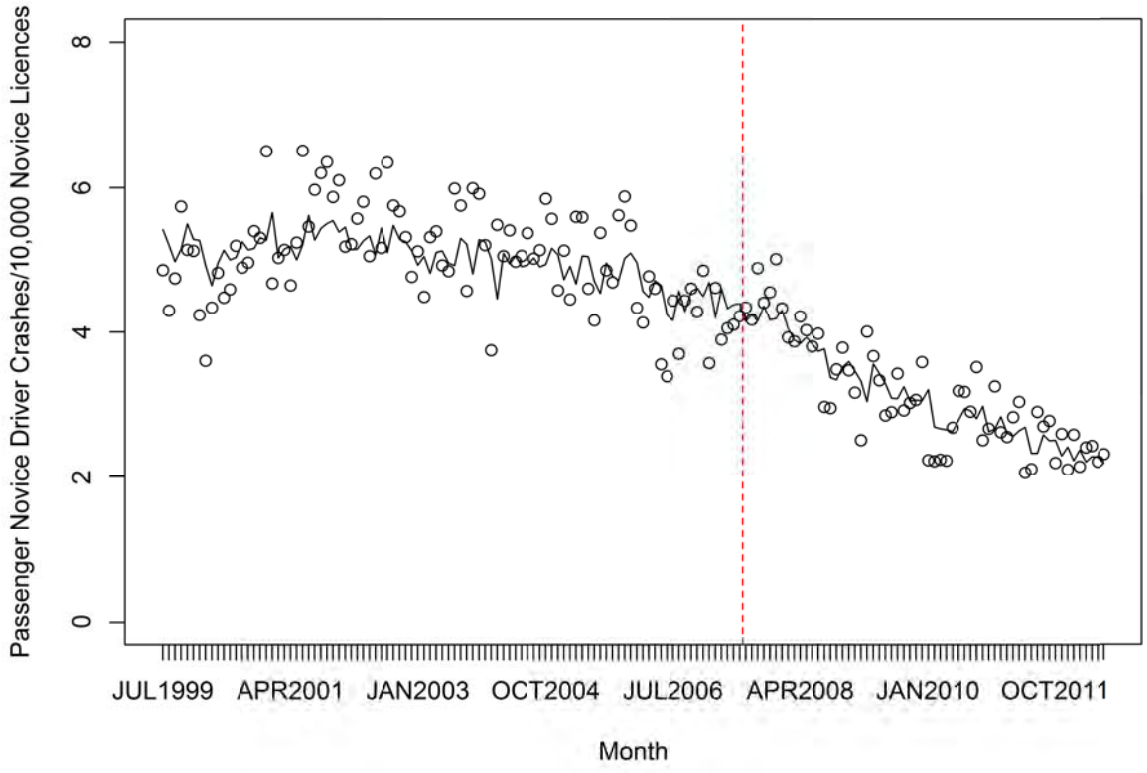

Figure 16: Crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999- Jun 2012

Table 13: Summary statistics of crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	-0.001782	-0.0028	-0.0008	0.0006
GLS shift	-0.0685	-0.1571	0.0201	0.1322
Change in post GLS trend	-0.009527	-0.0118	-0.0073	<.0001

3.5.2 Novice driver KSI passenger crashes

The changes in Queensland novice driver KSI passenger crashes over time are depicted in Figure 17 and summary statistics in Table 14. The post-GLS trend in rates of KSI crashes carrying at least one passenger following the introduction of GLS significantly changed compared to the pre-GLS period. There was a gradual decrease of 0.4% per month or 5.3% per year in the rate of KSI crashes involving novice drivers carrying at least one passenger per 10,000 novice licences during the post-GLS period.

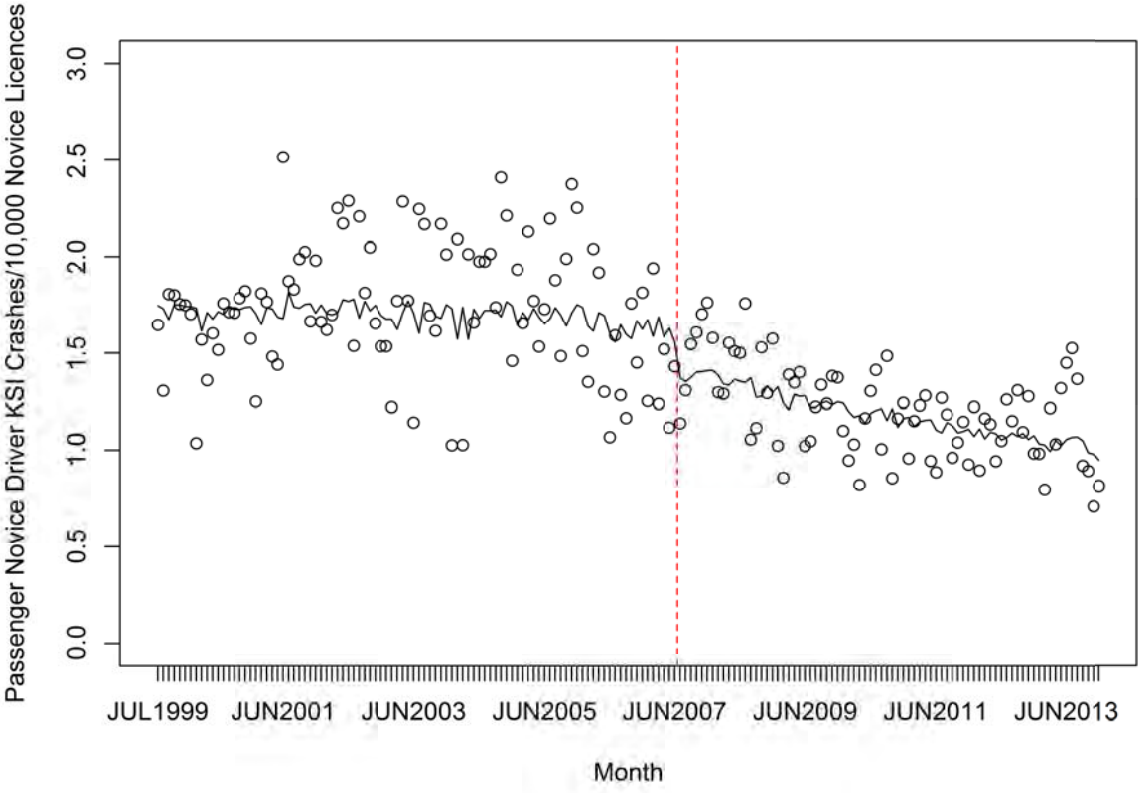

Figure 17: KSI crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 14: Summary statistics of KSI crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	-0.000629	-0.0020	0.0008	0.3854
GLS shift	-0.1609	-0.2781	-0.0437	0.0079
Change in post GLS trend	-0.003834	-0.0062	-0.0014	0.002

3.6 Alcohol Crashes

3.6.1 Novice driver alcohol crashes

The changes in Queensland novice driver alcohol crashes over time are depicted in Figure 18 and summary statistics in Table 15. The post-GLS trend in crashes involving novice drivers with a positive BAC per 10,000 novice licences significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 1.5% per month or 18.6% per year.

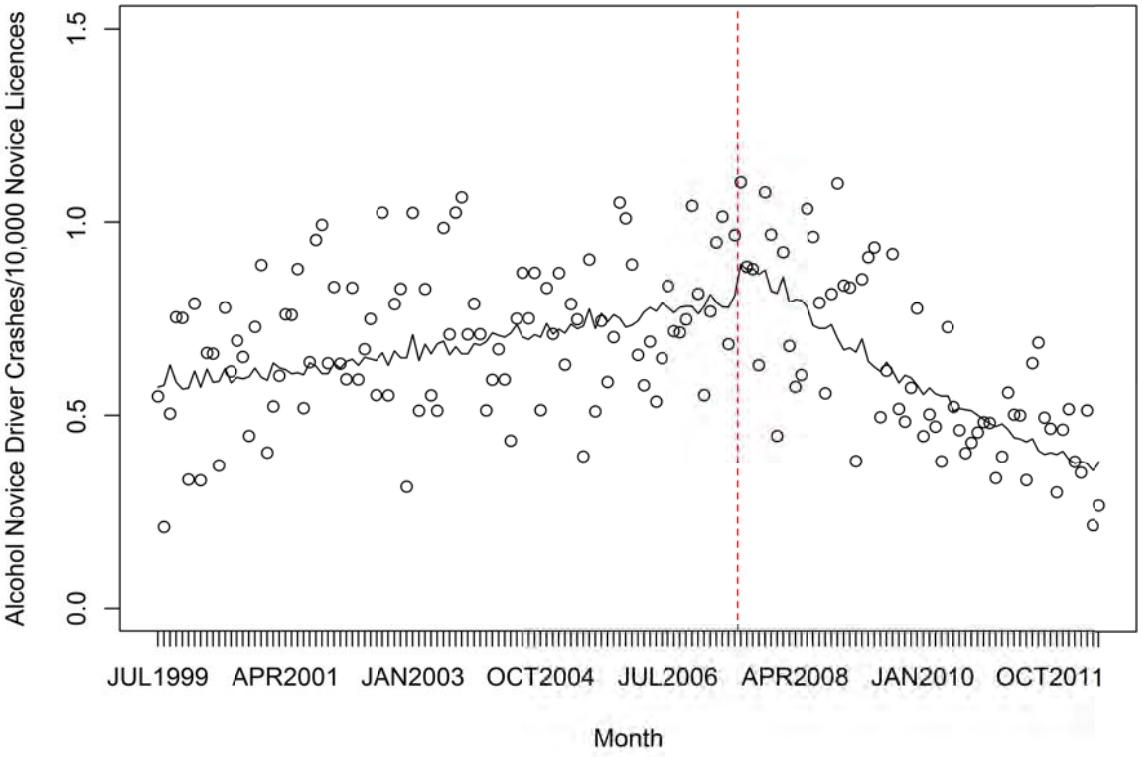

Figure 18: Crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 15: Summary statistics of crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0035	0.0015	0.0055	0.0008
GLS shift	0.1335	-0.0451	0.3121	0.1445
Change in post GLS trend	-0.0191	-0.0236	-0.0146	<.0001

3.6.2 Novice driver KSI alcohol crashes

The changes in Queensland novice driver KSI alcohol crashes over time are depicted in Figure 19 and summary statistics in Table 16. The trend in rates of KSI crashes with a positive BAC per 10,000 novice licences following the introduction of GLS significantly changed compared to the pre-GLS period. The rates decreased gradually by 0.8% per month or 9.4% per year during the post-GLS period.

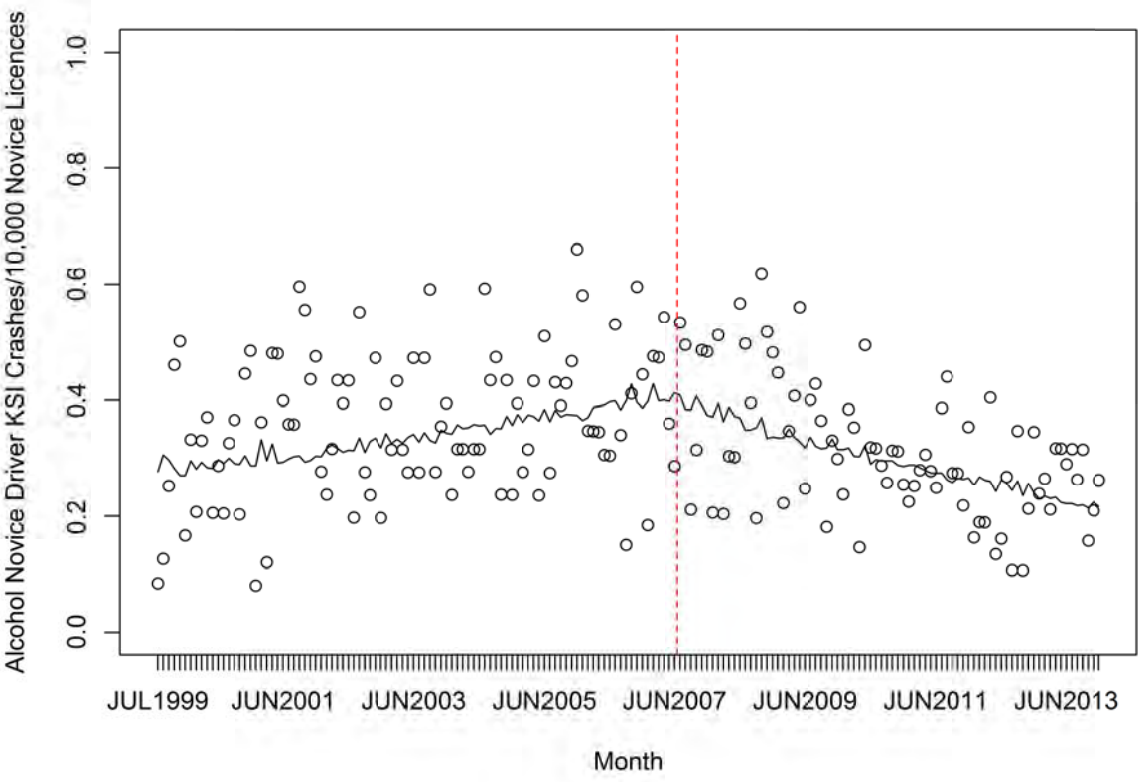

Figure 19: KSI crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 16: Summary statistics of KSI crashes involving novice drivers with a positive BAC per 10,000 per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0041	0.0014	0.0068	0.003
GLS shift	-0.0275	-0.2507	0.1957	0.8096
Change in post GLS trend	-0.012	-0.0166	-0.0074	<.0001

3.7 All Crash Casualties

3.7.1 Casualties of crashes involving novice drivers

The changes in Queensland crash casualties involving novice drivers over time are depicted in Figure 20 and summary statistics in Table 17. Trends analysis shows that while the introduction of the new GLS did not result in an immediate significant shift in rates of casualties of crashes involving novice drivers, the post-GLS trend significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease in casualties of crashes involving novice drivers per 10,000 novice licences, at a rate of 1.2% per month or 13.9% per year.

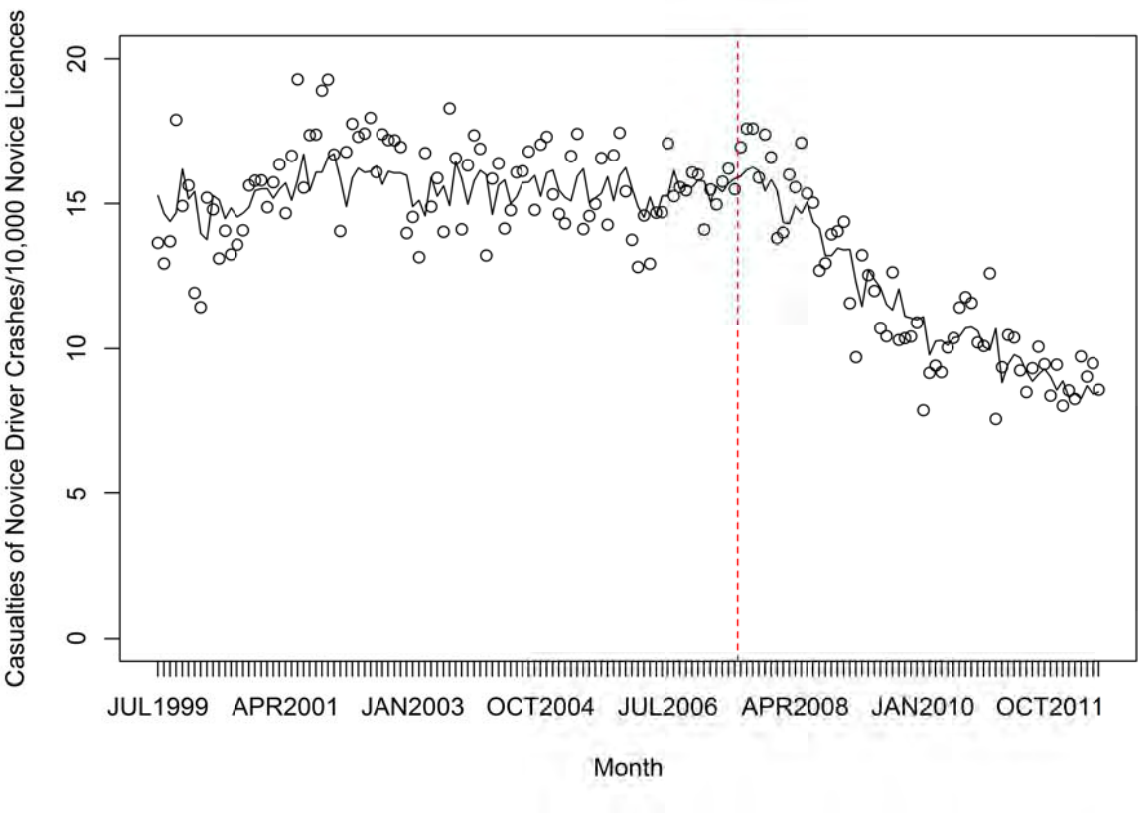

Figure 20: Casualties of crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 17: Summary statistics of casualties of crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0035	-0.0005	0.0011	0.5252
GLS shift	0.1335	-0.0473	0.0953	0.5093
Change in post GLS trend	-0.0191	-0.0137	-0.0101	<.0001

3.7.2 Casualties of crashes involving novice drivers relative to other driver crashes

The changes in Queensland crash casualties involving novice drivers relative to those of crashes with other drivers over time are depicted in Figure 21 and summary statistics in Table 18. Trends analysis of casualties crashes involving novice drivers as a proportion of all crashes also shows that while the introduction of GLS did not result in an immediate significant shift in rates of crashes involving novice drivers, the post-GLS trend significantly changed compared to the pre-GLS period. The post GLS trend shows a gradual decrease of 0.2% per month or 2.9% per year. This was much slower compared to that of casualties of crashes involving novice drivers per 10,000 novice licences.

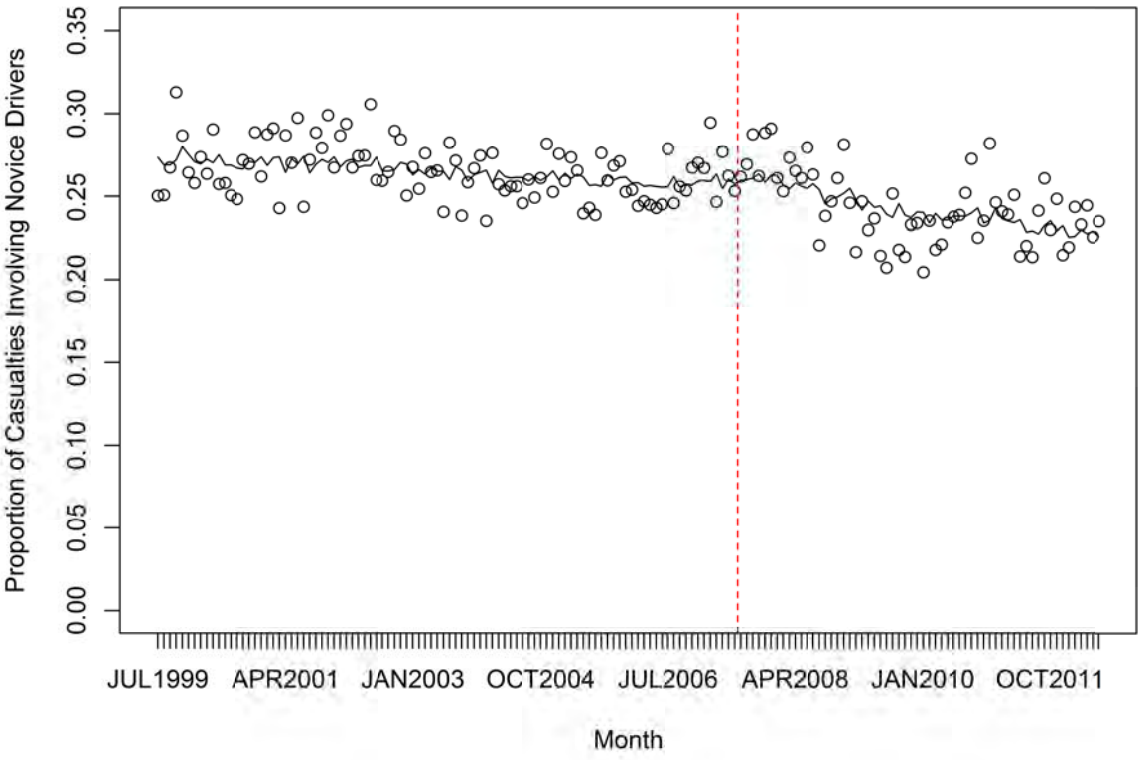

Figure 21: Casualties of crashes involving novice drivers as a proportion of casualties of all crashes. Queensland, Jul 1999-Jun 2012

Table 18: Summary statistics of casualties of crashes involving novice drivers as a proportion of all crashes, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	-0.0007	-0.0012	-0.0002	0.0061
GLS shift	0.01720	-0.0267	0.0611	0.4443
Change in post GLS trend	-0.0017	-0.0029	-0.0006	0.0025

3.7.3 Casualties of KSI crashes involving novice drivers

The changes in Queensland KSI crash casualties involving novice drivers over time are depicted in Figure 22 and summary statistics in Table 19. The post-GLS trend of KSI casualties of crashes involving novice drivers per 10,000 novice licences significantly changed compared to the pre-GLS period. There was a gradual decrease in the rate of KSI casualties of crashes involving novice drivers per 10,000 novice licences post-GLS of 0.4% per month or 5.2% per year. The rate of this decrease was slower than that of casualties of all crashes.

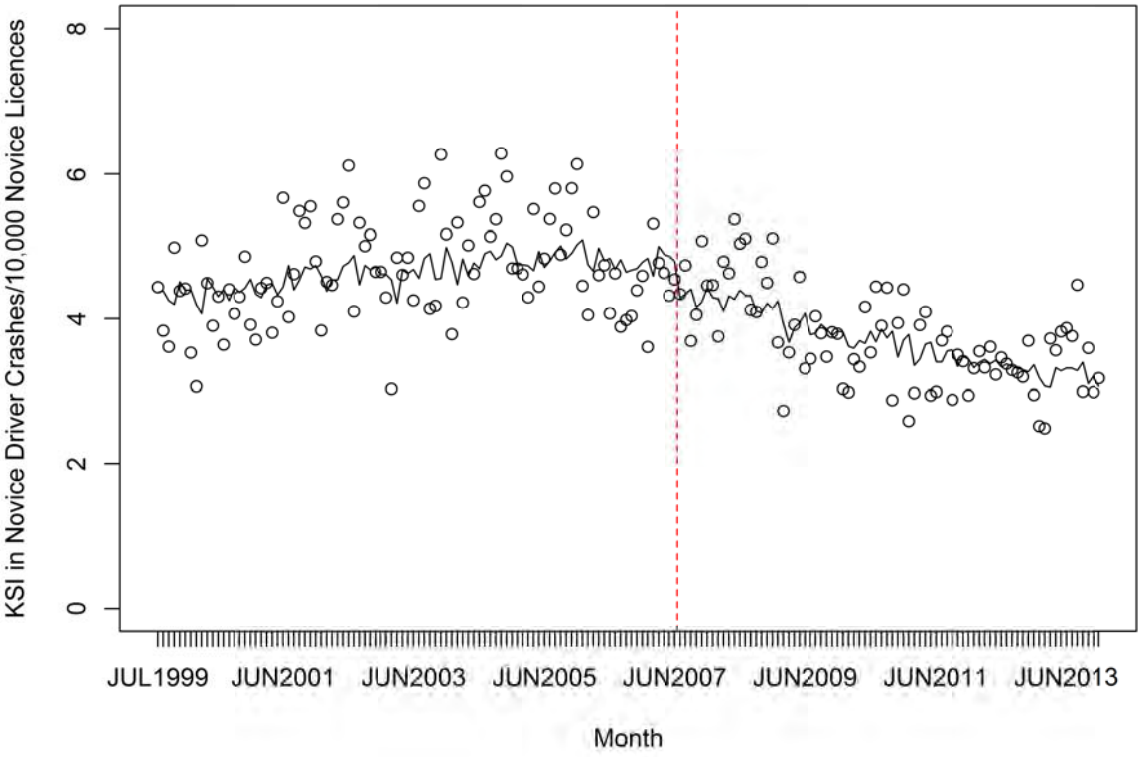

Figure 22: Casualties of KSI crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 19: Summary statistics of KSI casualties of crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999- Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0013	0.0002	0.0024	0.0170
GLS shift	-0.1241	-0.2131	-0.0351	0.0070
Change in post GLS trend	-0.0057	-0.0075	-0.0039	<.0001

3.7.4 Casualties of KSI crashes involving novice drivers relative to other driver KSI crashes

The changes in Queensland KSI crash casualties involving novice drivers relative to those of KSI crashes of other drivers over time are depicted in Figure 23 and summary statistics in Table 20. The trend in KSI casualties of crashes involving novice drivers as a proportion of KSI casualties of all crashes during the post-GLS period did not vary significantly compared to that of the pre-GLS period.

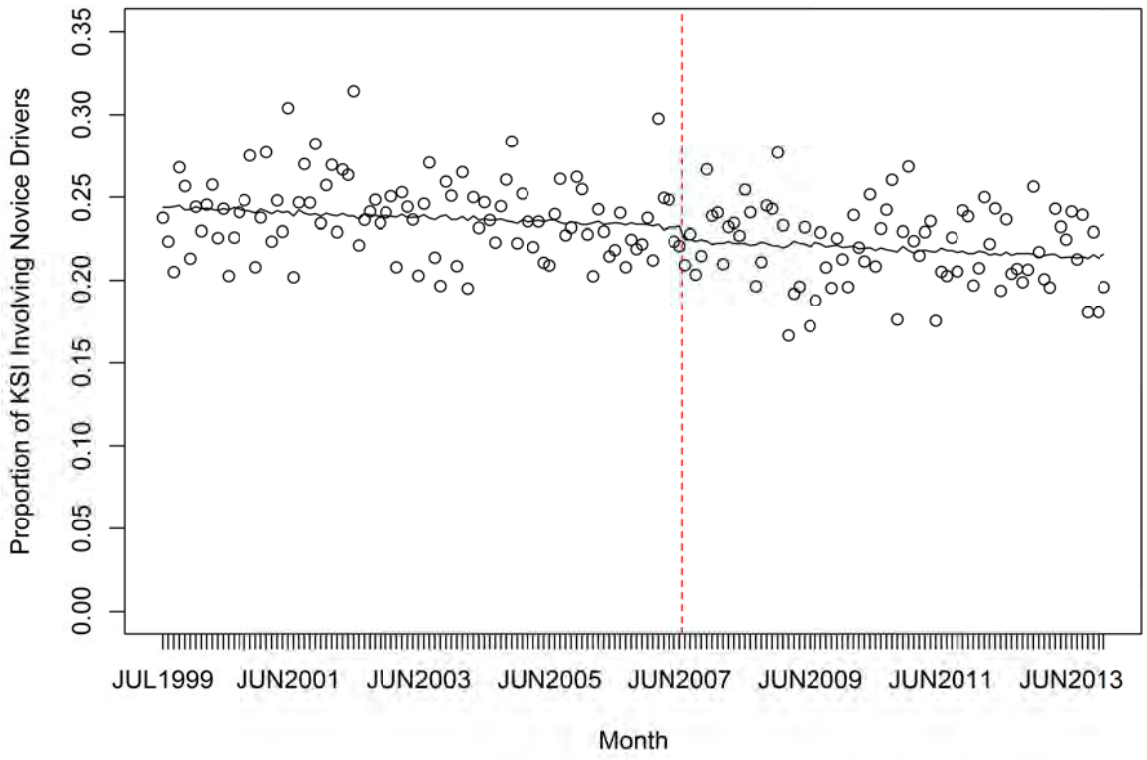

Figure 23: Casualties of KSI crashes involving novice drivers as a proportion of casualties of all KSI crashes. Queensland, Jul 1999- Dec 2013

Table 20: Summary statistics of KSI casualties of crashes involving novice drivers as a proportion of all crashes, Queensland, Jul 1999- Dec 2013

	Estimate	95% CI		P
Pre GLS trend	-0.0005	-0.0012	0.0002	0.1891
GLS shift	-0.0359	-0.0974	0.0256	0.2547
Change in post GLS trend	-0.0001	-0.0014	0.0012	0.868

3.8 Single-Vehicle Crash Casualties

3.8.1 Casualties of single-vehicle crashes involving novice drivers

The changes in Queensland single-vehicle crash casualties involving novice drivers over time are depicted in Figure 24 and summary statistics in Table 21. The post-GLS trend in the rate of casualties of single-vehicle crashes involving novice drivers per 10,000 novice licences significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease of 1.0% per month or 12.1% per year.

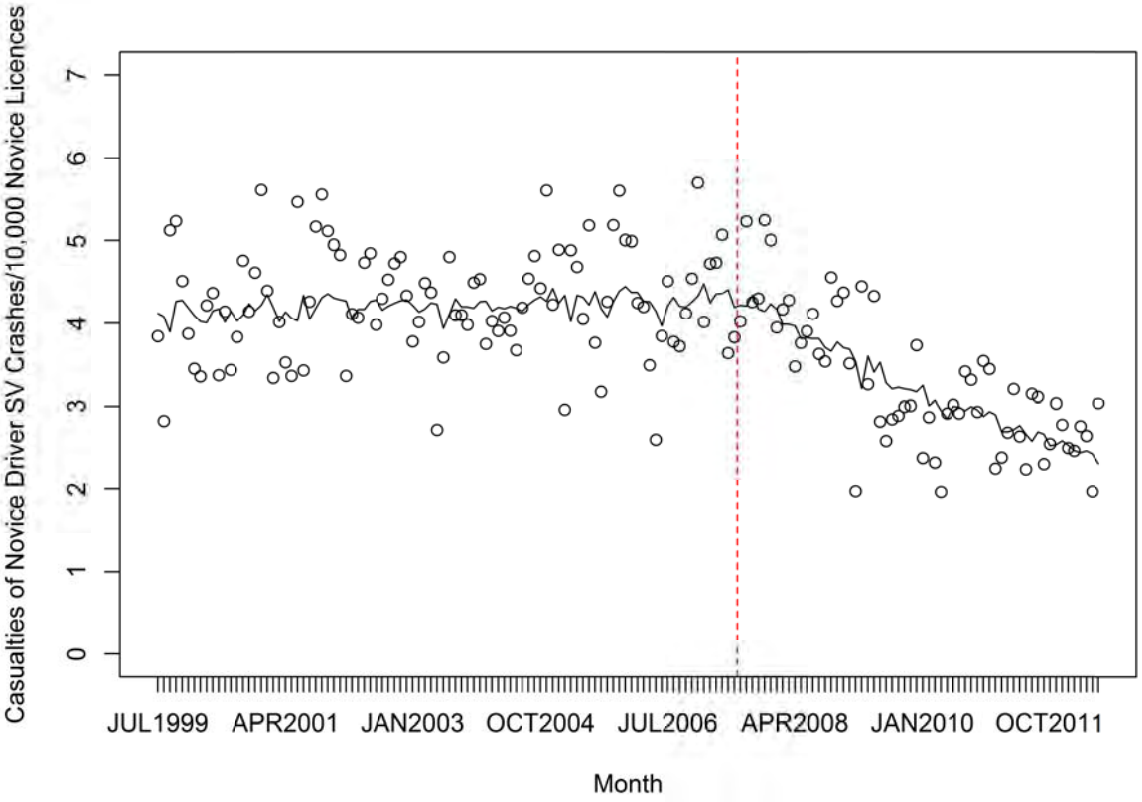

Figure 24: Casualties of single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 21: Summary statistics of casualties of single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0005	-0.0008	0.0017	0.4718
GLS shift	0.0039	-0.1054	0.1133	0.9438
Change in post GLS trend	-0.0106	-0.0134	-0.0078	<.0001

3.8.2 Casualties of KSI single-vehicle crashes involving novice drivers

The changes in Queensland KSI single-vehicle crash casualties involving novice drivers over time are depicted in Figure 25 and summary statistics in Table 22. It seems that the introduction of the new GLS resulted in an immediate significant shift in rates of casualties of KSI single-vehicle crashes involving novice drivers and the post-GLS trend significantly changed compared to that of the pre-GLS period. There was a gradual decrease in the post-GLS rates of 0.3% per month or 3.8% per year.

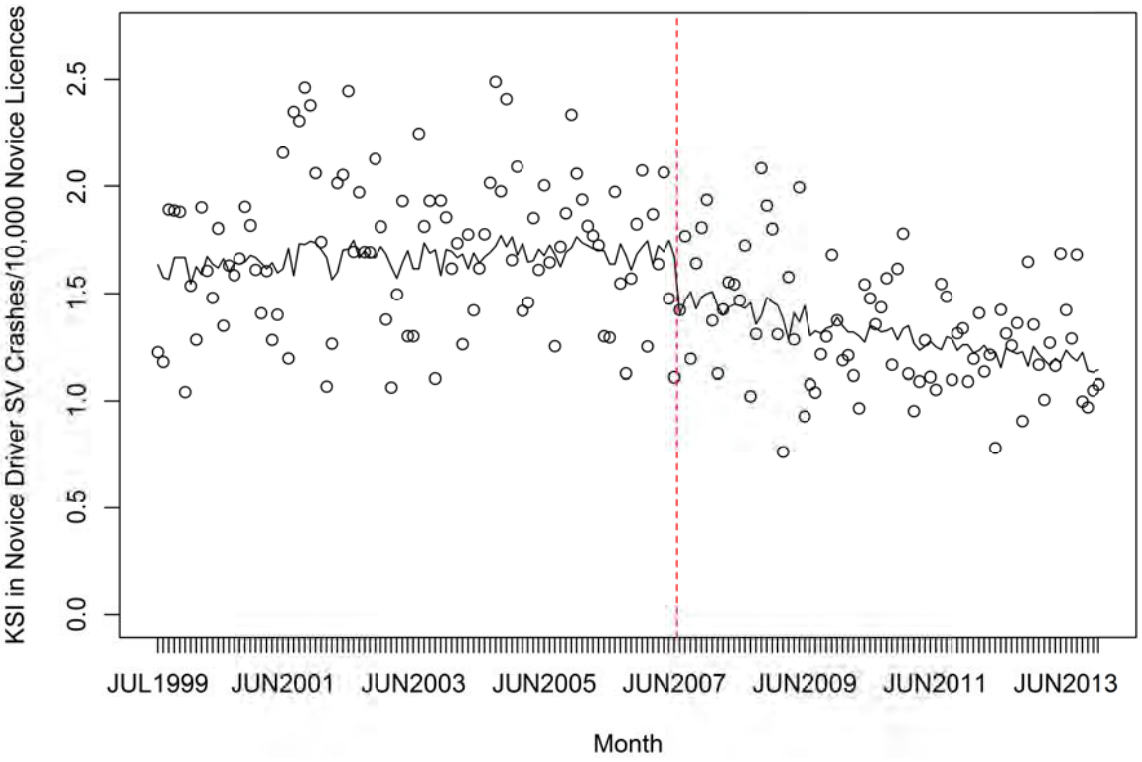

Figure 25: Casualties of KSI single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 22: Summary statistics of casualties of KSI single-vehicle crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0005	-0.0011	0.0020	0.5537
GLS shift	-0.1454	-0.2720	-0.0188	0.0255
Change in post GLS trend	-0.0036	-0.0062	-0.0010	0.0067

3.9 Night Crash Casualties

3.9.1 Casualties of night crashes involving novice drivers

The changes in Queensland night crash casualties involving novice drivers over time are depicted in Figure 26 and summary statistics in Table 23. No immediate significant shift in rates of casualties of night crashes involving novice drivers was observed but the post-GLS trend significantly changed compared to the pre-GLS period. The post-GLS trend shows a gradual decrease of 1.4% per month or 17.1% per year.

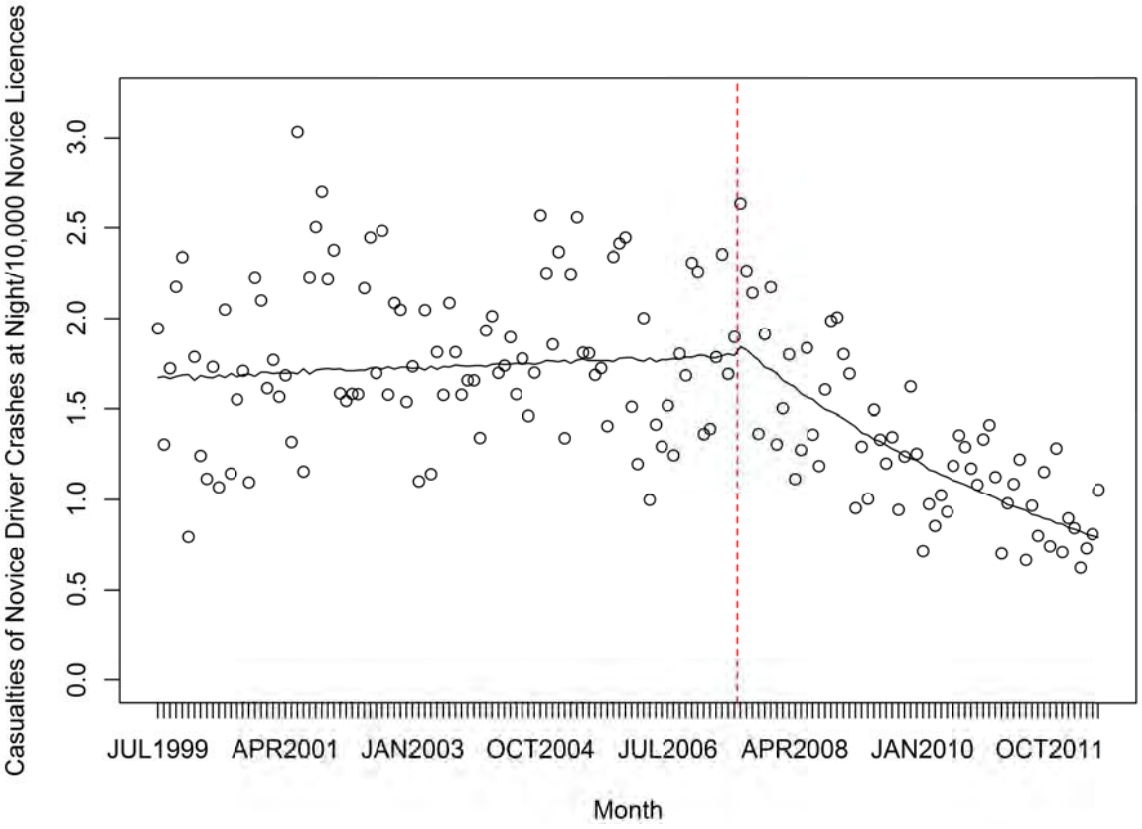

Figure 26: Casualties of night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 23: Summary statistics of casualties of night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0008	-0.0010	0.0025	0.4035
GLS shift	0.0312	-0.1262	0.1886	0.6980
Change in post GLS trend	-0.0151	-0.0191	-0.0111	<.0001

3.9.2 Casualties of KSI night crashes involving novice drivers

The changes in Queensland KSI night crash casualties involving novice drivers over time are depicted in Figure 27 and summary statistics in Table 24. The observed immediate shift in rates of casualties of KSI night crashes following the introduction of the new GLS was not significant. However, the post-GLS trend significantly changed compared to the pre-GLS. There was a gradual decrease of 0.7% per month or 8.5% per year during the post-GLS period.

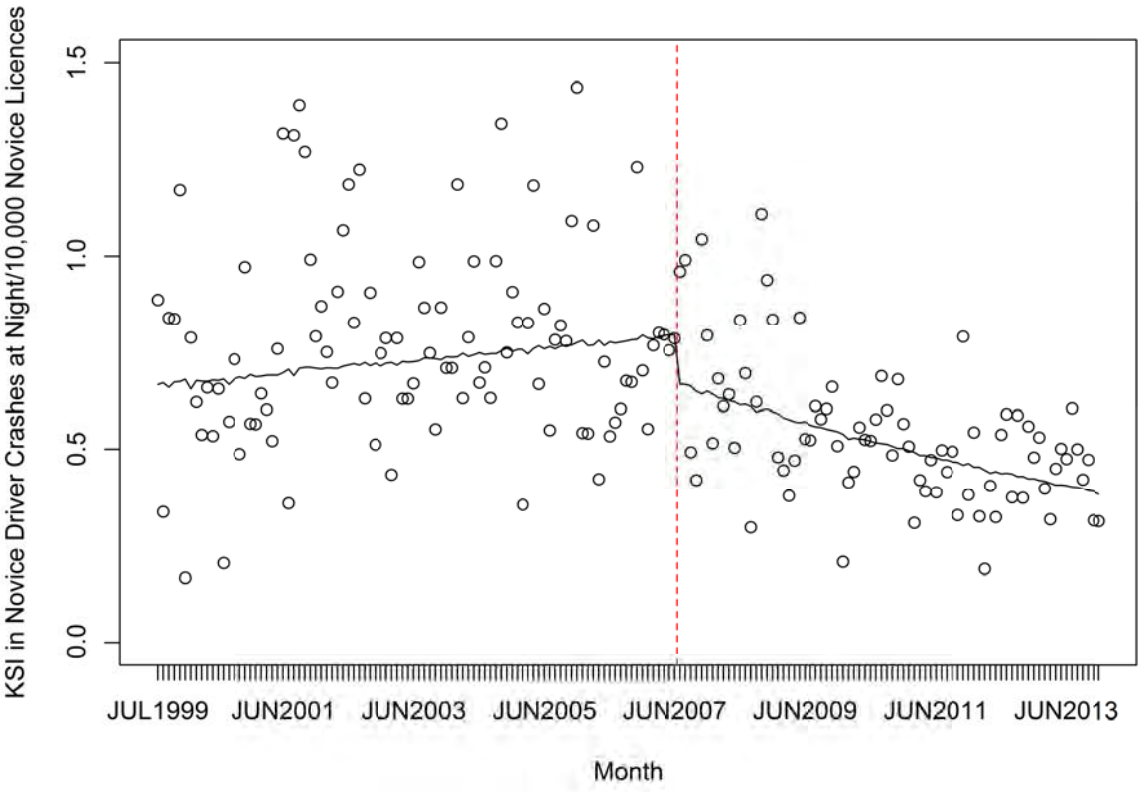

Figure 27: Casualties of KSI night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 24: Summary statistics of casualties of KSI night crashes involving novice drivers per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0019	-0.0005	0.0043	0.1290
GLS shift	-0.1757	-0.3766	0.0252	0.0884
Change in post GLS trend	-0.0090	-0.0131	-0.0049	<.0001

3.10 Passenger Crash Casualties

3.10.1 Casualties of passenger crashes involving novice drivers

The changes in Queensland night crash casualties involving novice drivers over time are depicted in Figure 28 and summary statistics in Table 25. Post-GLS trend in rates of casualties of crashes involving novice drivers carrying at least one passenger per 10,000 novice licences significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 1.2% per month or 14.2% per year.

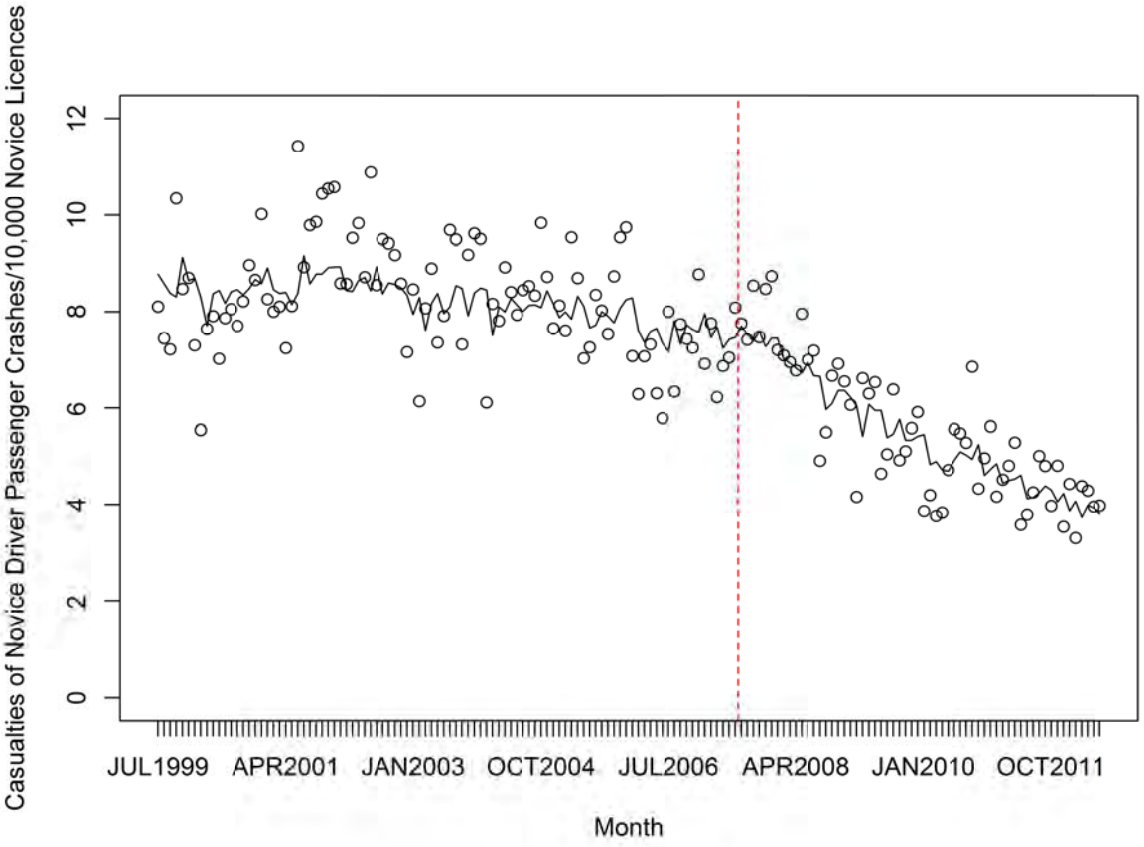

Figure 28: Casualties of crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 25: Summary statistics of casualties of crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	-0.0015	-0.0026	-0.0005	0.0053
GLS shift	0.0038	-0.0895	0.0971	0.9372
Change in post GLS trend	-0.0104	-0.0128	-0.0080	<.0001

3.10.2 Casualties of KSI passenger crashes involving novice drivers

The changes in Queensland KSI passenger crash casualties involving novice drivers over time are depicted in Figure 29 and summary statistics in Table 26. The post-GLS trend in rates of casualties of KSI crashes carrying at least one passenger following the introduction of the new GLS significantly changed compared to the pre-GLS period. There was a gradual decrease of 0.4% per month or 5.4% per year in the rates during the post-GLS period.

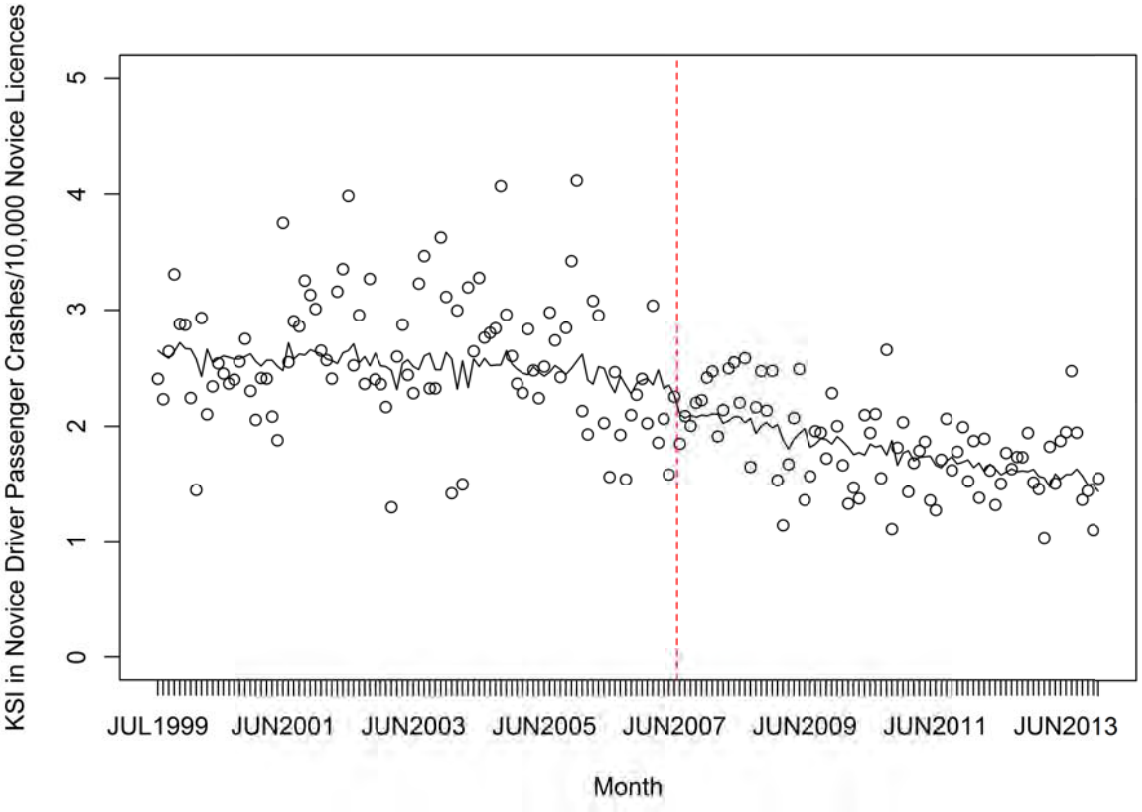

Figure 29: Casualties of KSI crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 26: Summary statistics of casualties of KSI crashes involving novice drivers carrying at least one passenger per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	-0.0011	-0.0026	-0.0005	0.1823
GLS shift	-0.1208	-0.0895	0.0971	0.0678
Change in post GLS trend	-0.0034	-0.0128	-0.0080	0.0121

3.11 Alcohol Crash Casualties

3.11.1 Casualties of alcohol crashes involving novice drivers

The changes in Queensland alcohol crash casualties involving novice drivers over time are depicted in Figure 30 and summary statistics in Table 27. Post-GLS trend in casualties of crashes involving novice drivers with a positive BAC per 10,000 novice licences significantly changed compared to the pre-GLS period and the post-GLS trend shows a gradual decrease at a rate of 1.7% per month or 20.4% per year.

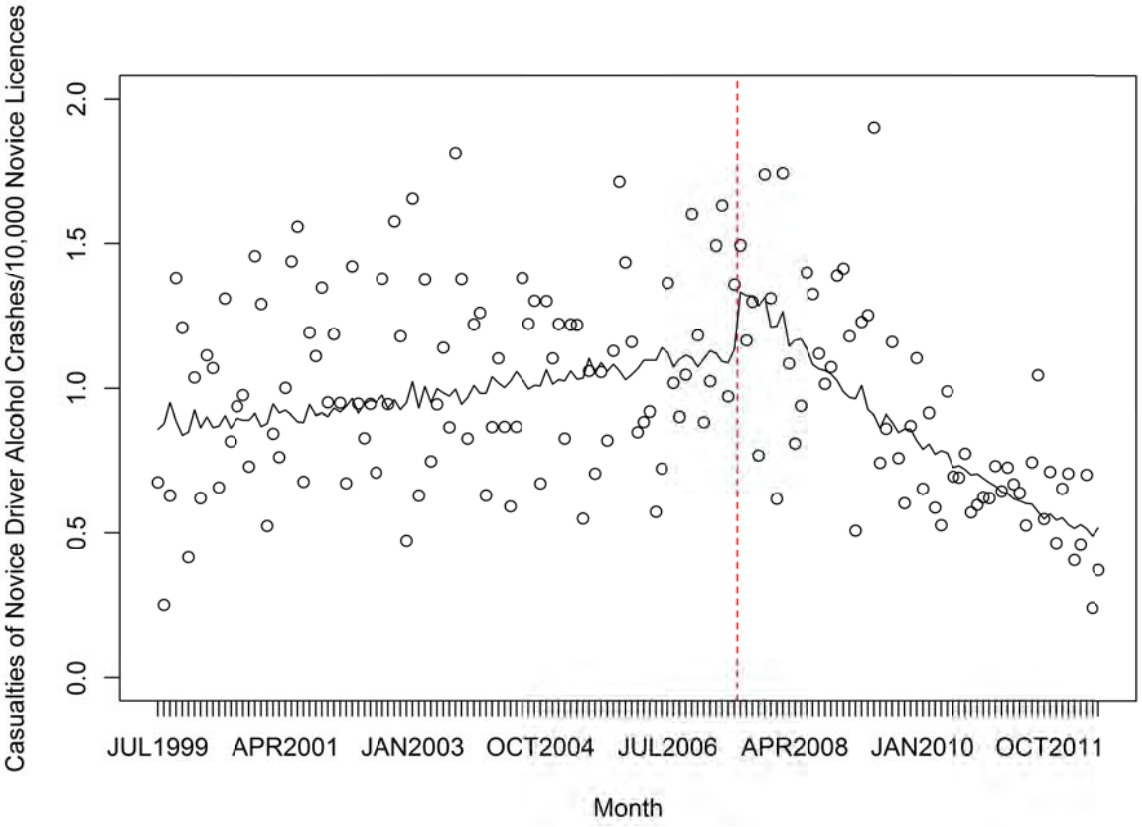

Figure 30: Casualties of crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

Table 27: Summary statistics of casualties of crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Jun 2012

	Estimate	95% CI		P
Pre GLS trend	0.0028	0.0005	0.0051	0.0168
GLS shift	0.1924	-0.0134	0.3982	0.0688
Change in post GLS trend	-0.02	-0.0252	-0.0148	<.0001

3.11.2 Casualties of KSI alcohol crashes involving novice drivers

The changes in Queensland KSI alcohol crash casualties involving novice drivers over time are depicted in Figure 31 and summary statistics in Table 28. The post-GLS trend in rates of casualties of KSI crashes involving novice drivers with a positive BAC per 100,000 following the introduction of the new GLS significantly changed compared to the pre-GLS period. There was a gradual decrease of 0.8% per month or 9.7% per year in the rates during the post-GLS period.

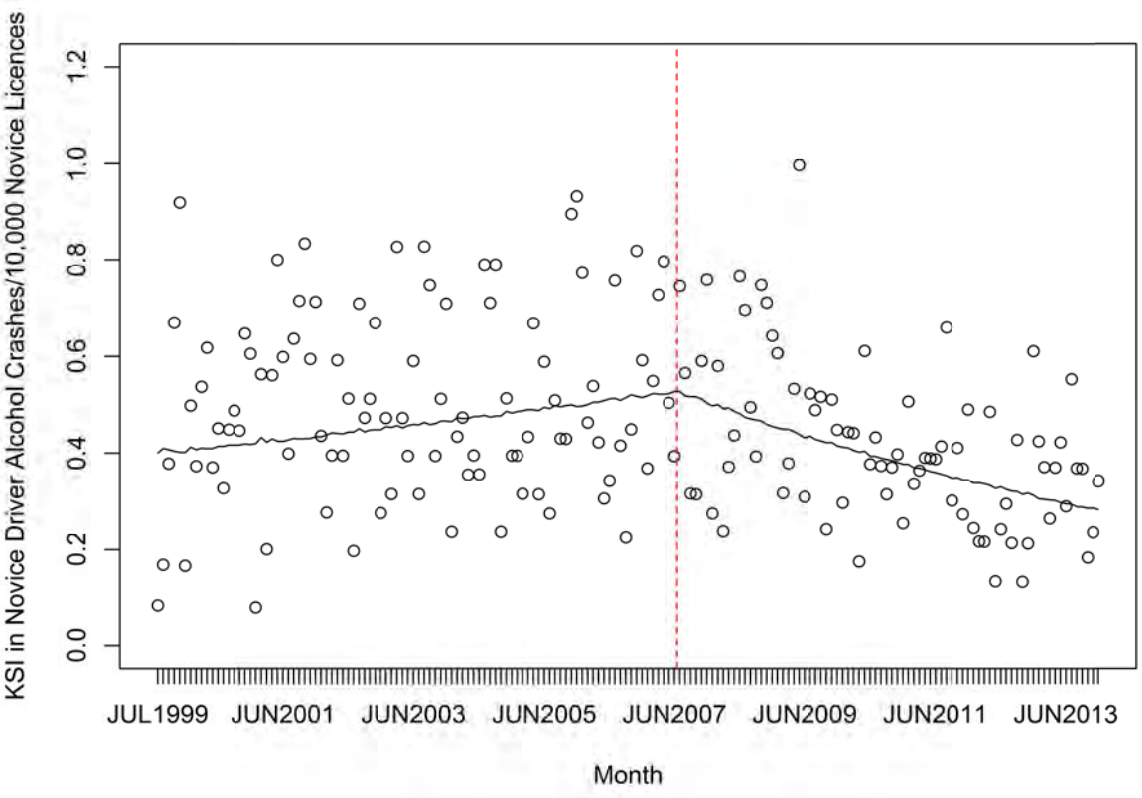

Figure 31: Casualties of KSI crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

Table 28: Summary statistics of casualties of KSI crashes involving novice drivers with a positive BAC per 10,000 novice licences, Queensland, Jul 1999-Dec 2013

	Estimate	95% CI		P
Pre GLS trend	0.0029	-0.0001	0.0060	0.0623
GLS shift	-0.0002	-0.2520	0.2517	0.9989
Change in post GLS trend	-0.011	-0.0161	-0.0059	<.0001

4. Results: Comparison of New-GLS to Old-GLS Novice Driver Crashes

4.1 All Crashes

Figure 32 depicts the trends in crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Tables 29 and 30. The pre-P licence crash trend (learner period) was 2.0% lower per month for the New-GLS than the Old-GLS drivers, which approached significance (p<.06). There was a significant decline of 14.2% in the peak of crashes in the first month of the P licence for New-GLS drivers compared to Old-GLS drivers. The trend in crashes over time from the time of the P licence also significantly declined to a greater extent for the New-GLS drivers compared to that of the Old-GLS drivers, with a difference of 0.4% per month or 4.9% per year.

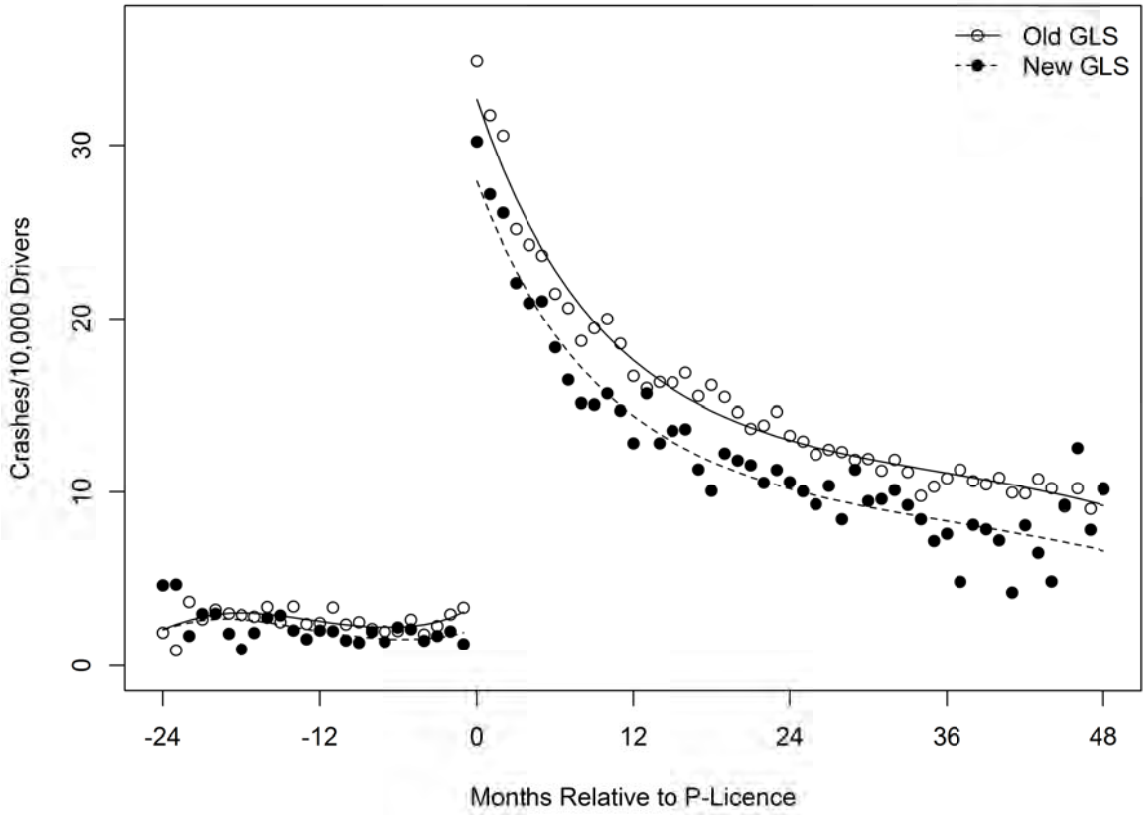

Figure 32: Crashes of Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

Table 29: Summary statistics of crashes involving Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	95% CI		P
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.980	0.960	1.001	0.055
P-licence period				
peak-old	3.476	3.340	3.616	
peak-new	2.981	2.814	3.159	
new vs old	0.858	0.812	0.906	<.0001
new vs old -- slope	0.996	0.992	1.000	0.034

4.2 KSI Crashes

Figure 33 depicts the trends in KSI crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Table 30. There were no significant differences between the two groups in pre-P licence KSI crashes, peak KSI crashes or the decline in KSI crashes from the time of P licence.

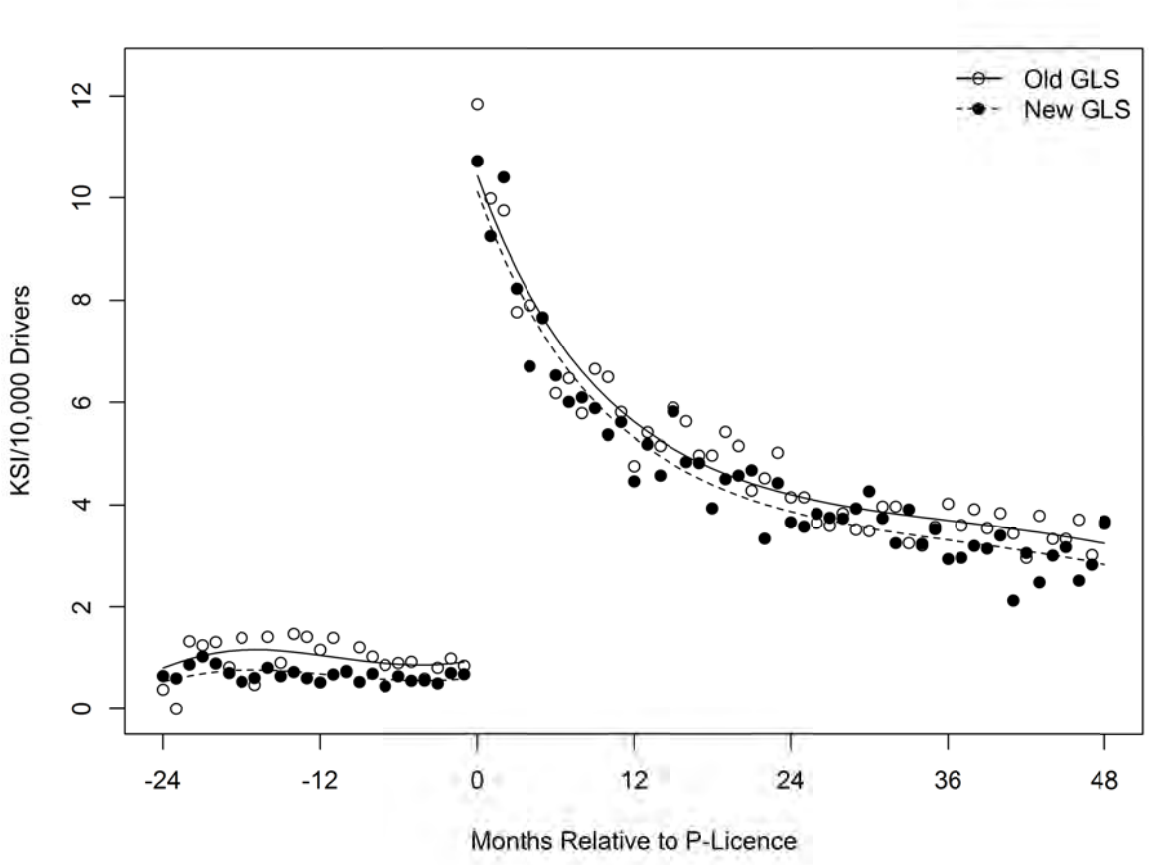

Figure 33: KSI crashes of Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

Table 30: Summary statistics of KSI crashes involving Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	95% CI		P
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.999	0.976	1.022	0.897
P-licence period				
peak-old	1.043	0.987	1.102	
peak-new	1.012	0.953	1.074	
new vs old	0.970	0.914	1.029	0.312
new vs old -- slope	0.998	0.995	1.001	0.144

4.3 Single-vehicle Crashes

Figure 34 depicts the trends in single-vehicle crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Table 31. There was no significant difference between the single-vehicle crashes of the two groups in the pre-P licence period. There was a significant decline of 12.2% in the peak of single-vehicle crashes involving New-GLS drivers compared to Old-GLS drivers. The trend in single-vehicle crashes from the time of the P licence did not differ significantly between the two groups.

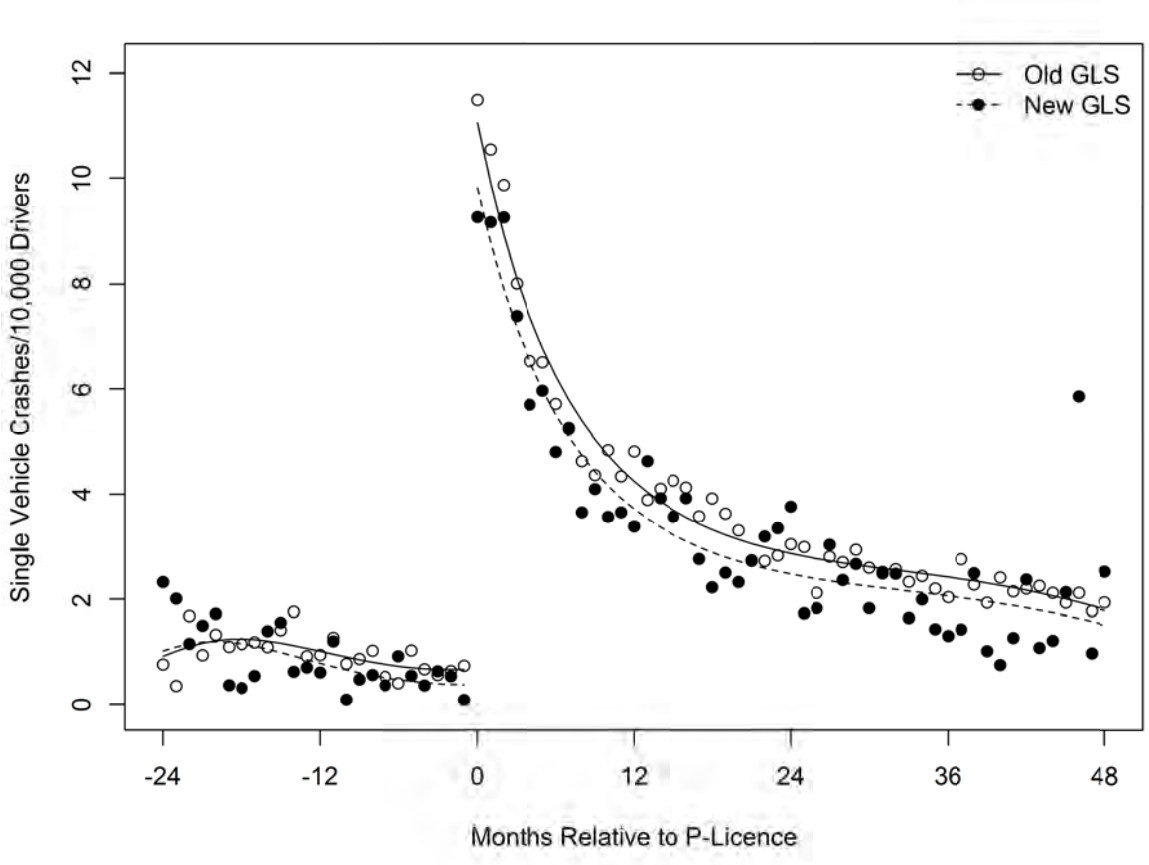

Figure 34: Single-vehicle crashes of Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

Table 31: Summary statistics of single-vehicle crashes involving Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	**95% CI**		**P**
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.971	0.937	1.007	0.108
P-licence period				
peak-old	1.185	1.104	1.272	
peak-new	1.041	0.938	1.155	
new vs old	0.878	0.795	0.970	0.011
new vs old -- slope	1.000	0.993	1.007	0.968

4.4 Night Crashes

Figure 35 depicts the trends in night crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Table 31. The pre-P licence crash trend (learner period) was 6.3% lower per month for the New-GLS than the Old-GLS drivers, which was a statistically significant difference. There was a significant decline of 28.7% in the peak of night crashes involving New GLS drivers compared to Old GLS drivers. The trend in night crashes from the time of the P licence did not differ significantly between the two groups.

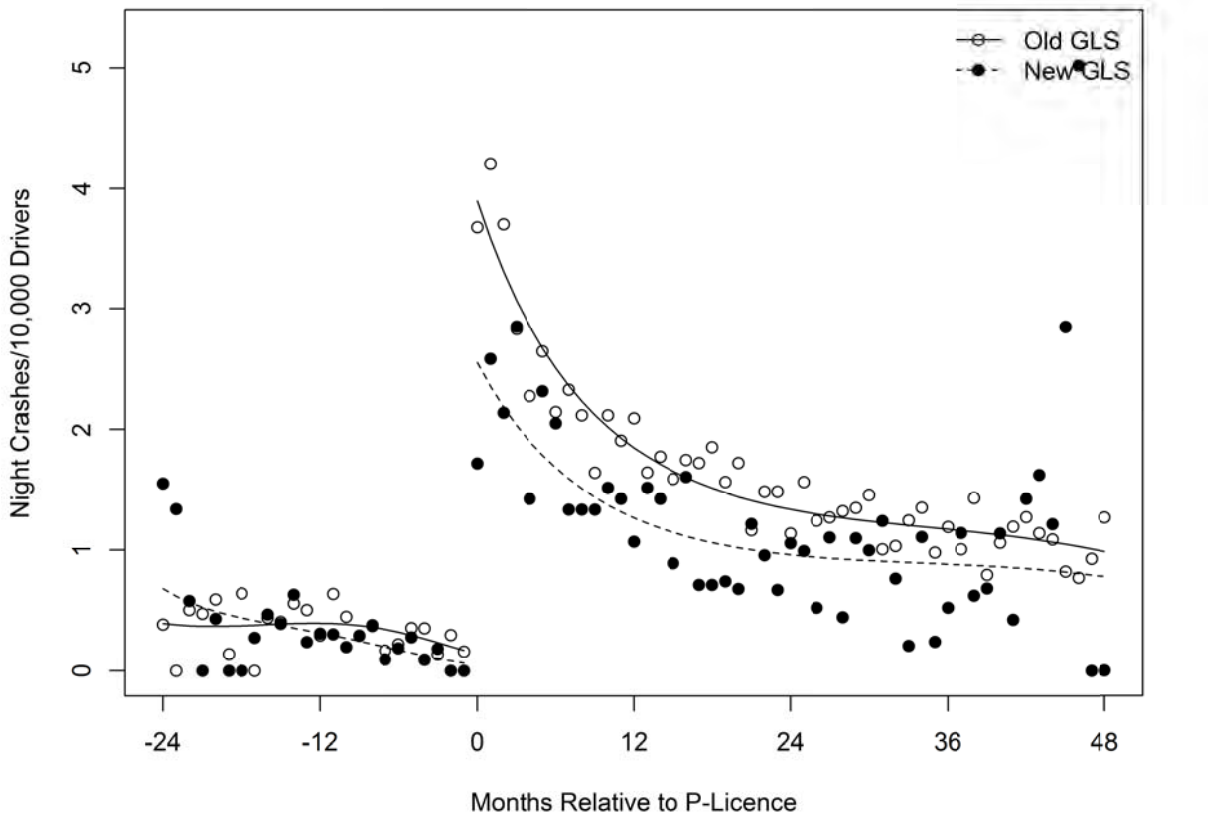

Figure 35: Night crashes of Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

Table 32: Summary statistics of night crashes involving Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	95% CI		P
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.937	0.881	0.996	0.038
P-licence period				
peak-old	0.403	0.357	0.453	
peak-new	0.287	0.239	0.346	
new vs old	0.714	0.598	0.851	0.0002
new vs old -- slope	0.995	0.983	1.008	0.430

4.5 Passenger Crashes

Figure 36 depicts the trends in passenger crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Table 33. There was no significant difference between the passenger crashes of the two groups in the pre-P licence period. There was a significant decline of 22.9% in the peak of passenger crashes involving New-GLS drivers compared to Old-GLS drivers. The trend in passenger crashes from the time of the P licence also significantly declined to a greater extent for the New-GLS drivers compared to that of the Old-GLS drivers, with a difference of 0.8% per month or 9.4% per year.

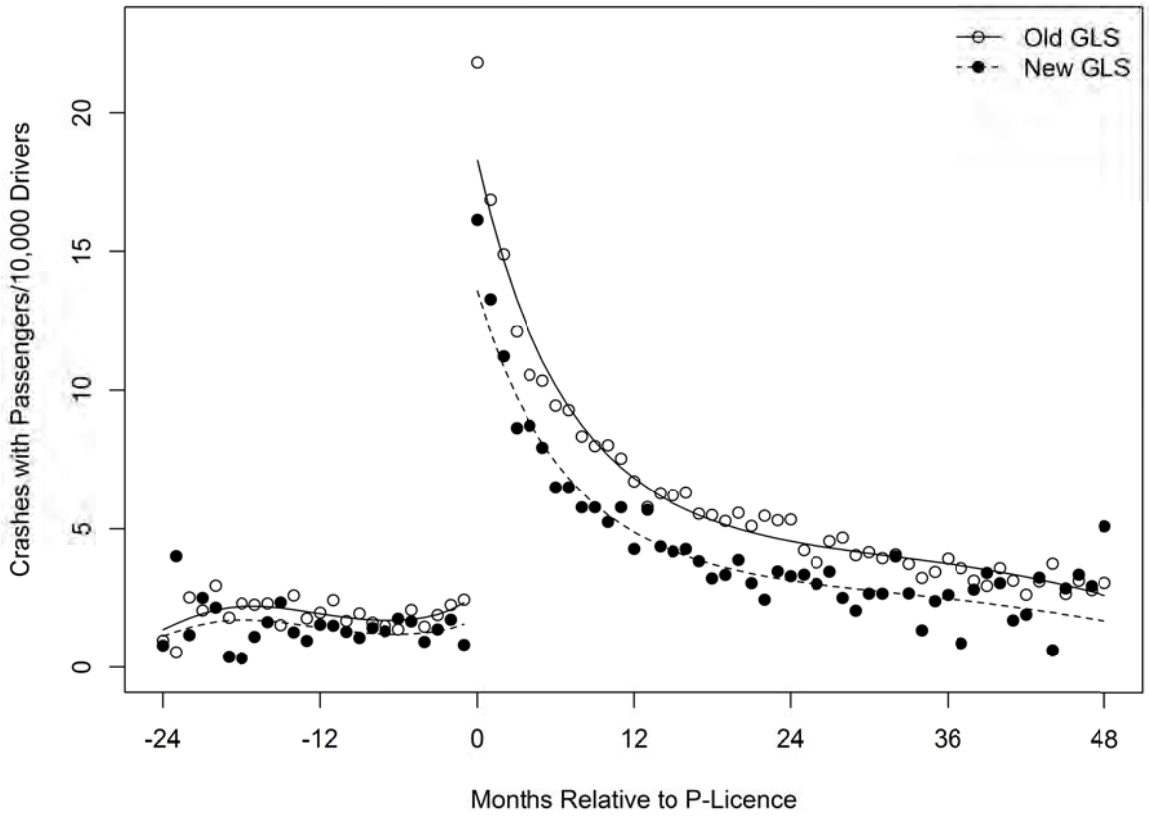

Figure 36: Passenger crashes of Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

Table 33: Summary statistics of passenger crashes involving Old-GLS and New-GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	95% CI		P
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.991	0.967	1.016	0.480
P-licence period				
peak-old	1.974	1.866	2.087	
peak-new	1.522	1.396	1.660	
new vs old	0.771	0.709	0.839	<.0001
new vs old -- slope	0.992	0.986	0.999	0.015

4.6 Alcohol Crashes

Figure 37 depicts the trends in alcohol crashes of Old-GLS and New-GLS novice drivers relative to when they received their P licence, with summary statistics in Table 34. There was no significant difference between the alcohol crashes of the two groups in the pre-P licence period. The decline of 21.5% in the peak of alcohol crashes involving New GLS drivers compared to Old GLS drivers was not statistically significant, nor was the decline in alcohol crashes over time from the time of P licence.

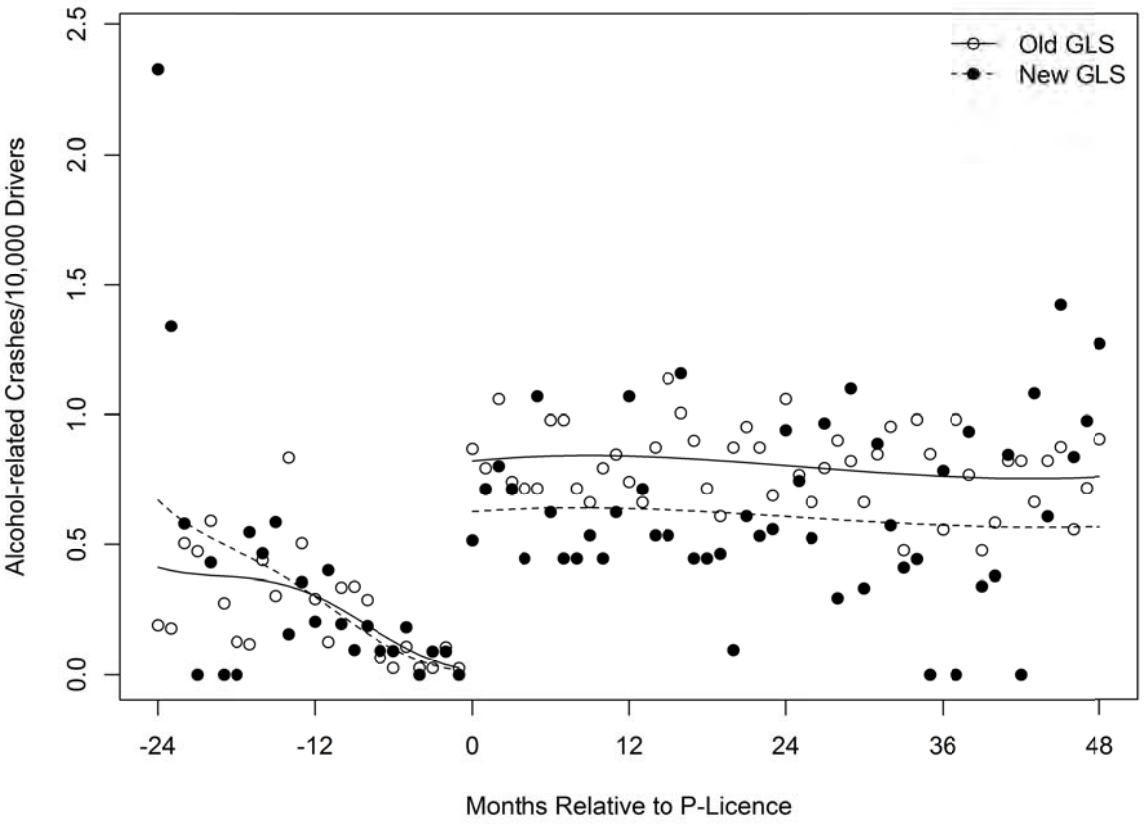

Figure 37: Alcohol crashes of Old-GLS and New GLS novice drivers per 10,000 novice licence holders by months on licence

Table 34: Summary statistics of alcohol crashes involving Old-GLS and New GLS novice drivers per 10,000 novice licence holders by months on licence

	Mean Estimate	95% CI		P
Pre-P licence (learner period)				
pre-p: new vs old -- slope	0.959	0.891	1.033	0.267
P-licence period				
peak-old	0.088	0.070	0.111	
peak-new	0.069	0.050	0.096	
new vs old	0.785	0.581	1.060	0.114
new vs old -- slope	0.998	0.979	1.016	0.796

5. Results: Trends in Novice Driver Traffic Offences over Time

To explore any potential issues with compliance with GLS requirements and restrictions, we explored the trends in several GLS-specific and non-GLS-specific police-recorded offences over the study period. The figures in this chapter depict changes in offence rates per 100,000 licences from July 1999 to June 2015 for novice drivers; that is, those on learner and/or provisional licences as applicable to the offence. In addition, comparable offence rates for 25-29 year-old open licence drivers are included when applicable.

Figure 38 depicts offences over time for failure to display the applicable L or P plates. As noted in Figure 2, there was no requirement to display P plates prior to introduction of the new GLS. Therefore, it is unsurprising that the rate of offences in this category first increased steadily when the new GLS was introduced. However, since late in 2013 these offences started to reduce and no longer represent an increasing concern. With the 2014 rate at around 200 offences per 100,000 novice drivers, this represents a moderately frequent offence relative to other offences explored in this chapter.

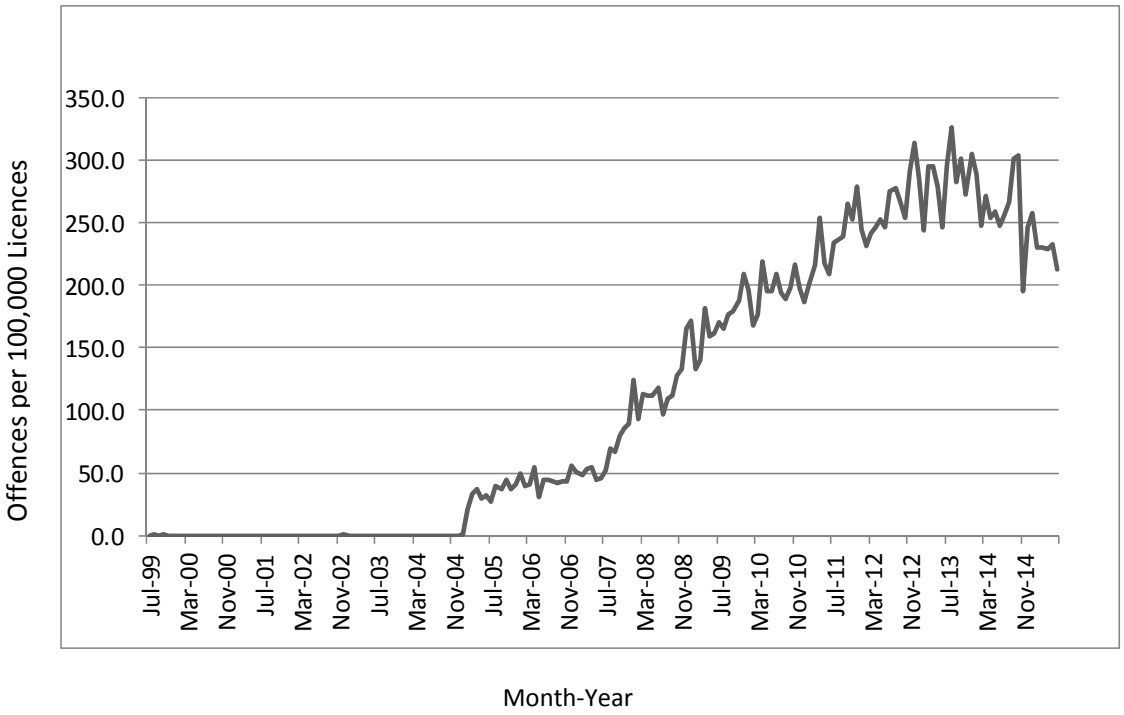

Figure 38: Rates of novice driver failure to display correct L/P plate offences Jul 1999 to Jun 2015

Figure 39 depicts mobile phone use offences over time for novices and for 25-29-year-old open licence drivers. Prior to the new GLS, mobile phone offences comprised hand-held use only, whereas the new GLS introduced additional offences for hands-free use, including passenger use of loudspeaker functions (detailed in Figure 2). Prior to the new GLS offence rates were increasing for both groups of drivers. For novices, however, this trend appeared to reverse from the year following the new GLS and to stabilise in recent years around the rate of 40 offences per 100,000 licensed novices; considerably lower than for licence plate offences. For the open licence holders, the upward trend continued for longer and to a higher rate through to about 2010 before dropping and somewhat stabilising in recent years, although remaining at over twice the rate of that of novice drivers.

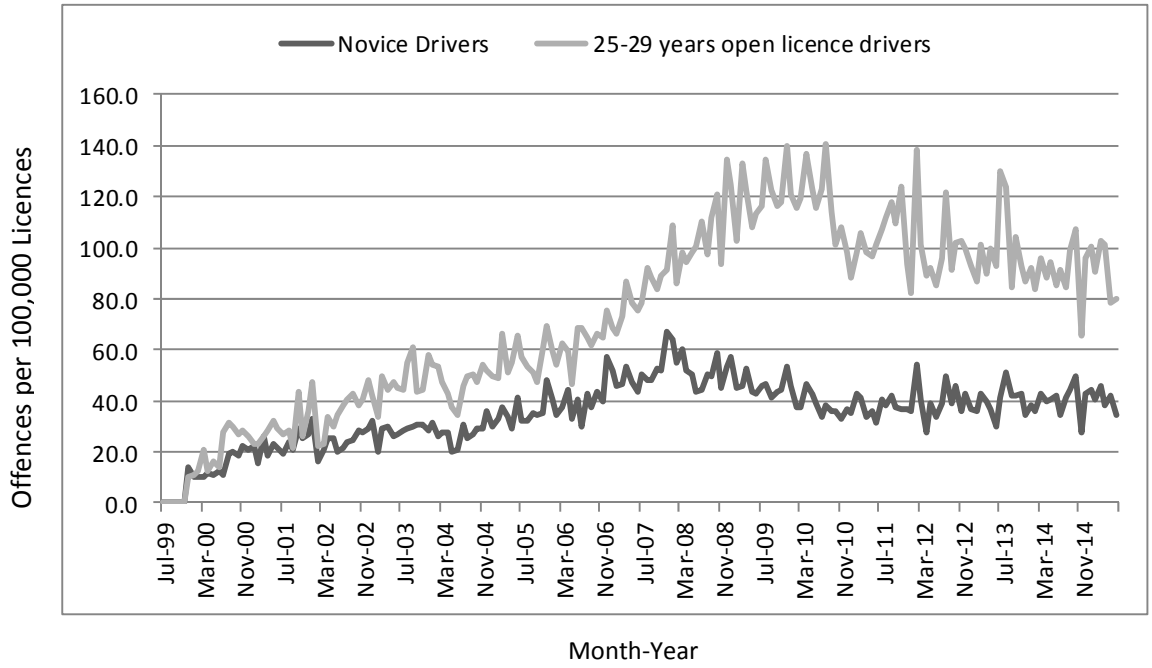

Figure 39: Rates of mobile phone offences for novice drivers and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

Figures 40 shows the level of offences relating to the new GLS restriction on carrying more than one passenger aged younger than 21 years at night. These seem to be fluctuating around the rate of 8 per 100,000 licences, lower from late 2008 and higher after late 2012, but could be increasing over time. Nonetheless, this offence rate is very low relative to the other offences explored in this chapter, albeit this offence only applies to a subset of novices, the P1 licence holders.

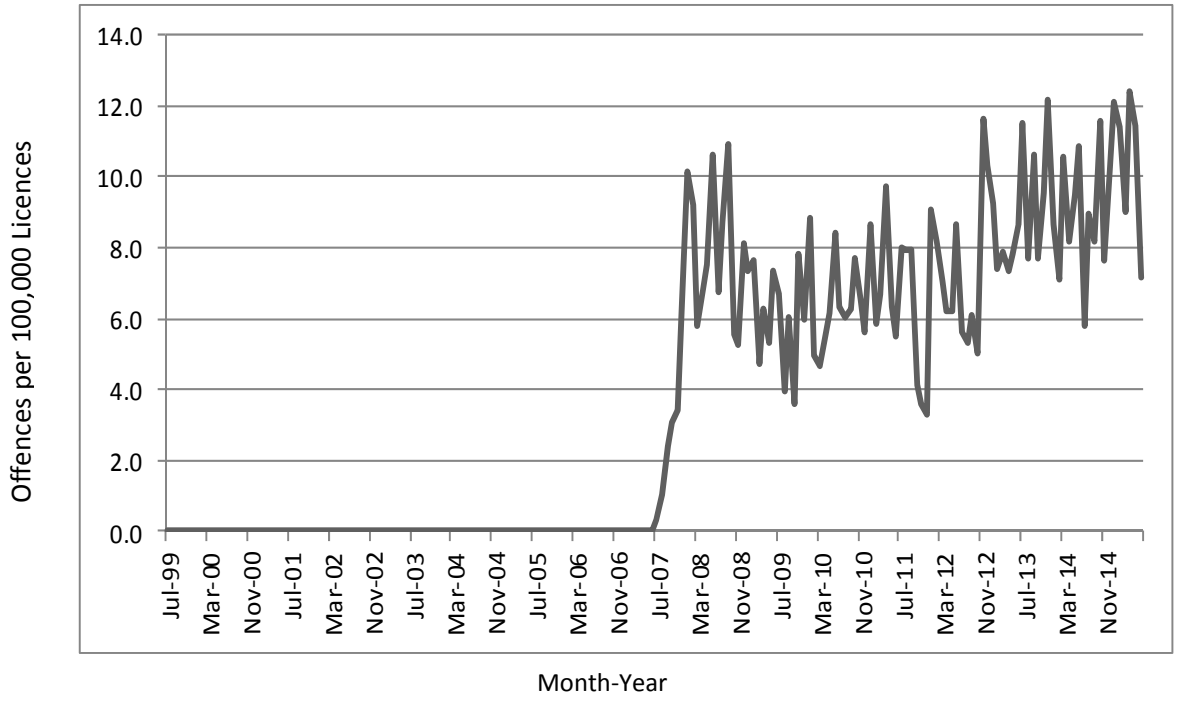

Figure 40: Rates of passenger carriage offences for novice drivers Jul 1999 to Jun 2015

Figure 41 depicts alcohol offences over time for novices and for 25-29-year-old open licence drivers. The previous GLS already included a zero alcohol restriction for novices, which continued in the new GLS; although initially only for those aged under 25. From July 2010, the restriction applied to all novices. Despite no initial change to alcohol restrictions in July 2007, novice alcohol offences seemed to decline around this time, perhaps showing the potential of GLS to work as a "system" and have synergistic impacts (i.e. potentially due to improved identification of novice status by the need to display P plates). The decrease slowed from around 2010, and then declined more sharply again in 2014 to an even lower level than in 1999, around 50 offences per 100,000 licences; a low offence rate although slightly higher than for mobile phone offences. In contrast, alcohol offences for 25-26-year-old open licence drivers (at the higher 0.05% BAC threshold), showed a very small, slow increase over the years from 1999 to 2012 at a much lower level of offending than novices (around the rate of 20 offences per 100,000 licences). This rate then doubled from 2012 to 2014, approaching the 2014 novice rate of around 40 offences per 100,000 licences.

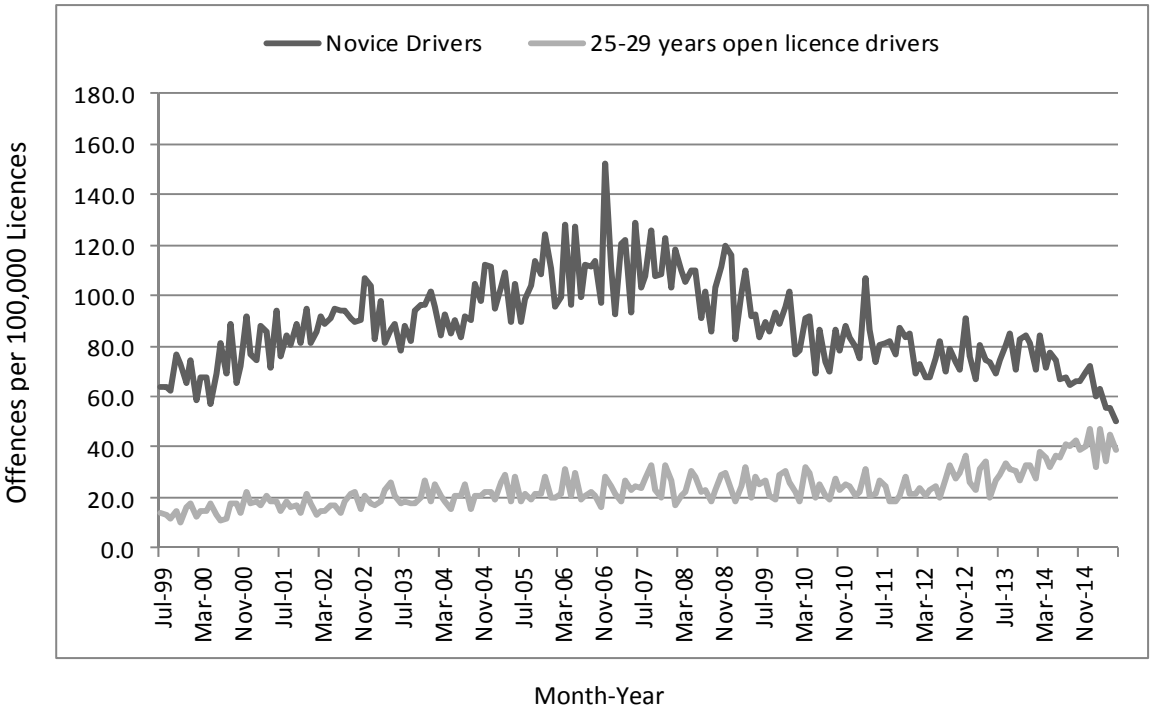

Figure 41: Rates of alcohol offences for novice drivers and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

We next explored never licensed driving, disqualified driving, and unlicensed driving offences, including comparison offence rates for 25-29-year-old open licence holders, as shown in Figures 42, 43 and 44. Figure 42 first depicts the rates of never licensed driving offences for age groups 16-24 years and 25-29 years. The rates of these offences were extremely low, relative to other offences. The rates for 25-29 year olds show a flat profile at less than one offence per 100,000 licences throughout. For 16-24 year olds, these offences seemed to be increasing prior to the new GLS and then stabilised around the time of its introduction, followed by a drop in 2008, remaining at or below the one per 100,000 licences rate thereafter.

Figure 43 shows driving while disqualified offences over the study period. For the novice group, these offences were steadily increasing prior to the new GLS, then appeared to stabilise around the time of its introduction. This was followed by decreases from late 2008 to 2010, increases in 2011 to 2013 (up to a similar level as in 2007), before then decreasing again returning to the lower rate recorded in late 2010; under 30 offences per 100,000 licences and therefore lower than for phone

use and alcohol offences. For 25-29-year-old open licence holders, disqualified driving offences appeared to be slowly increasing over time from 1999 to early 2012, with a greater increase later in 2012 fluctuating around a rate of 10 offences per 100,000 licences thereafter. Therefore, they showed a much lower rate of these offences than novices, also without fluctuation around the time of introduction of the new GLS.

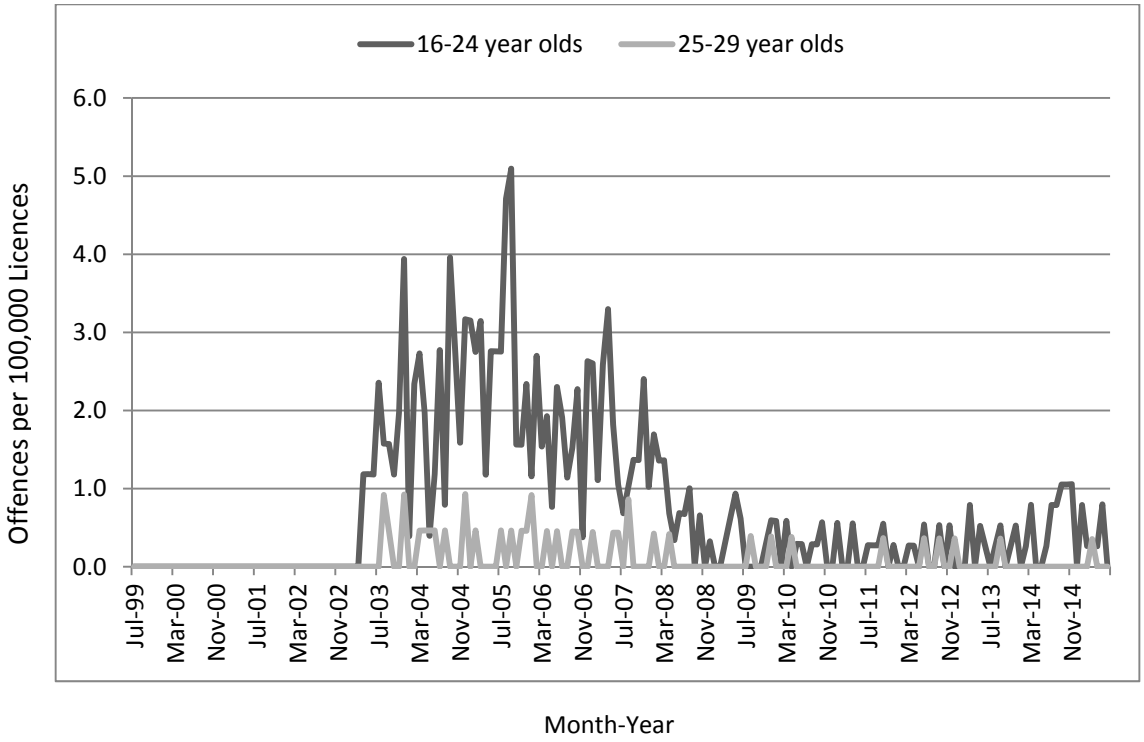

Figure 42: Rates of never licensed driving offences for drivers aged 16-24 years ("novice drivers") and 25-29 years ("25-29 years open licence drivers") Jul 1999 to Jun 2015

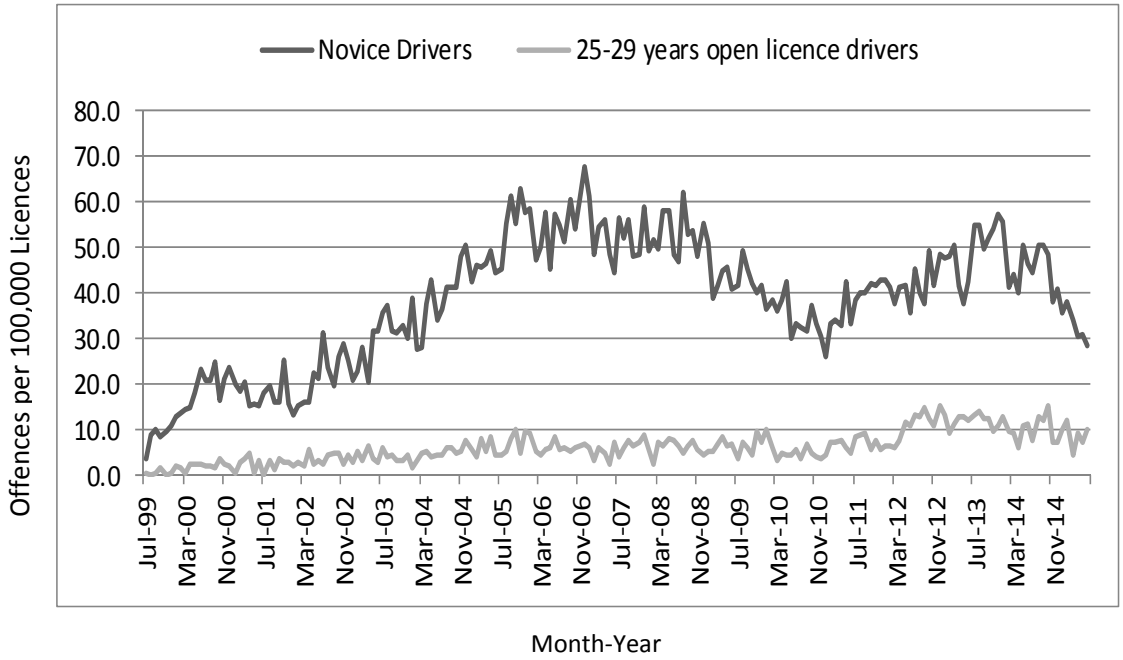

Figure 43: Rates of driving while-disqualified offences for novice drivers and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

Figure 44 depicts the rates of unlicensed driving offence for the novices and 25-29 year-old open licence holders. For the novice group, unlicensed driving offences seemed to be increasing prior to the new GLS, to stabilise around the time of introduction of the new GLS, and then to drop through to 2010, before returning to an even slightly higher level in 2013-2014; around 150 offences per 100,000 licences and therefore higher than for phone use and alcohol offences. For 25-29-year-old open licence holders, there is a similar increasing trend from 1999, also more rapid from 2010-2011, but at a lower offence rate than for novices and without the fluctuation around the time of introduction of the new GLS.

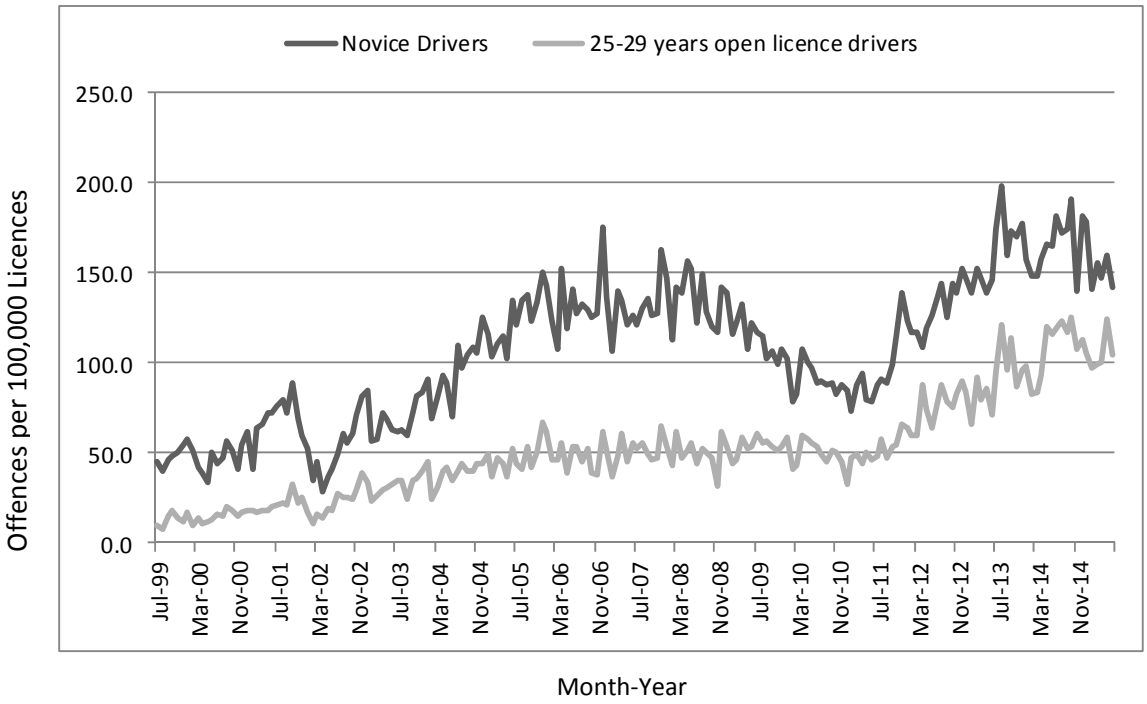

Figure 44: Rates of unlicensed driving offences for novice driver and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

Further to exploring the potential to reject the new GLS restrictions, Figure 45 shows offences for the night driving restriction that applies to new GLS provisional drivers when returning to driving following a disqualification. This offence category has fluctuated since its introduction in 2007; seeming somewhat stable in 2008-2009, decreasing in 2010 but then increasing through to 2013, showing a decrease in 2014 to around 11 offences per 100,000 licences. Therefore, while the rates for this offence have previously reached a more moderate level, the most recent rate is relatively low, similar to the passenger restriction offences.

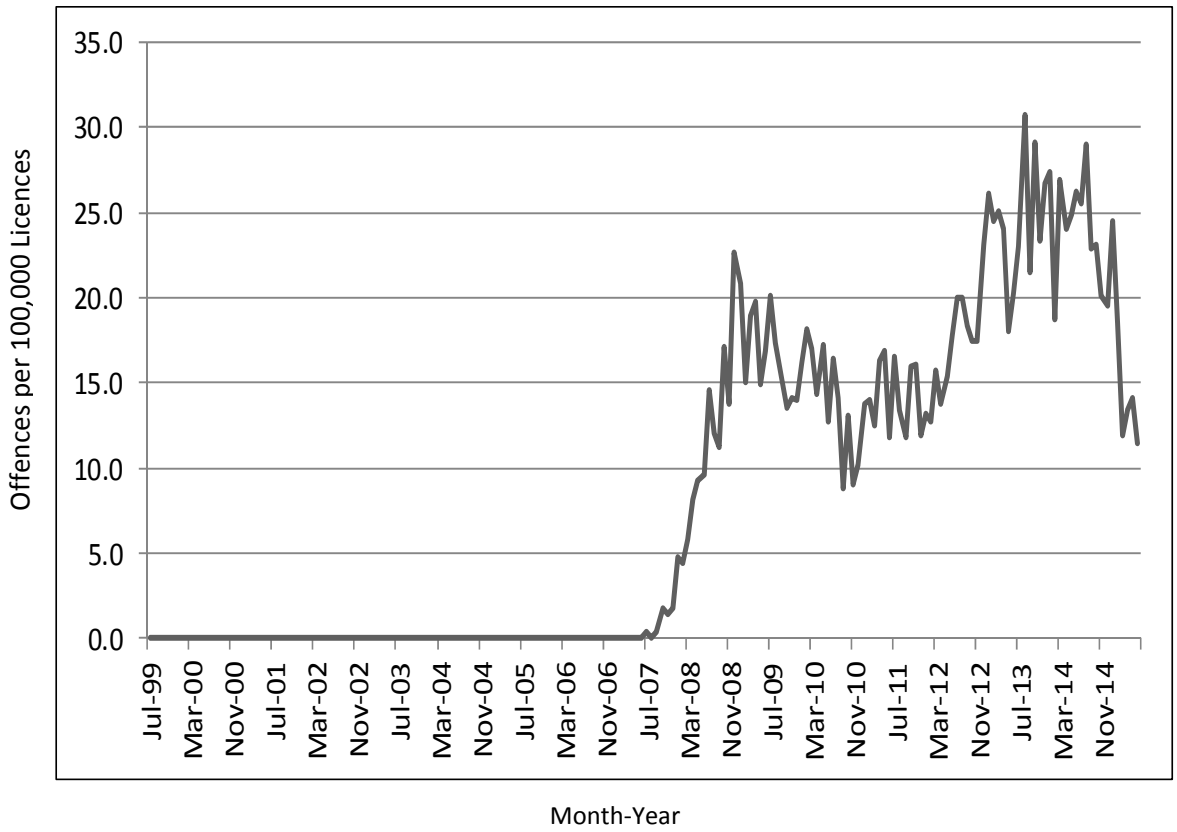

Figure 45: Rates of night driving offences for novice drivers Jul 1999 to Jun 2015

Next, we explored patterns over time in speeding offences (Figure 46) and the total of all offences (Figure 47). These therefore include offences not necessarily directly targeted by GLS, but indirectly by the lower demerit point threshold. While this applied in both the old and new GLS, Figure 46 suggests there was a decrease in speeding offences for novices following the new GLS through to 2010, then an increase thereafter, whereas for 25-29-year-old open licence holders rates increased sharply at the time of the new GLS such that from 2008 to 2014 they were at least double the rate of novice drivers. Nonetheless, at around 1,250 offences per 100,000 licences, this was a much higher offence category for novice drivers relative to all other offences.

Discussing these findings with Queensland Police, we learned that from 2010 they received approval to increase their level of covert speed enforcement relative to overt speed enforcement by 30%. This seems to have led to the sharp increase in speeding offences from this time, and could also contribute to changes found for other offences from 2010.

Figure 47 shows that overall, novices and 25-29-year-old open licence drivers had a very similar overall offence rate through to 2007 and in fact the open licence group rates increased and remained higher than novices thereafter. Novice offence rates showed a drop from 2008 to 2010, increasing thereafter, likely also accounted for by the abovementioned changes in policing practices.

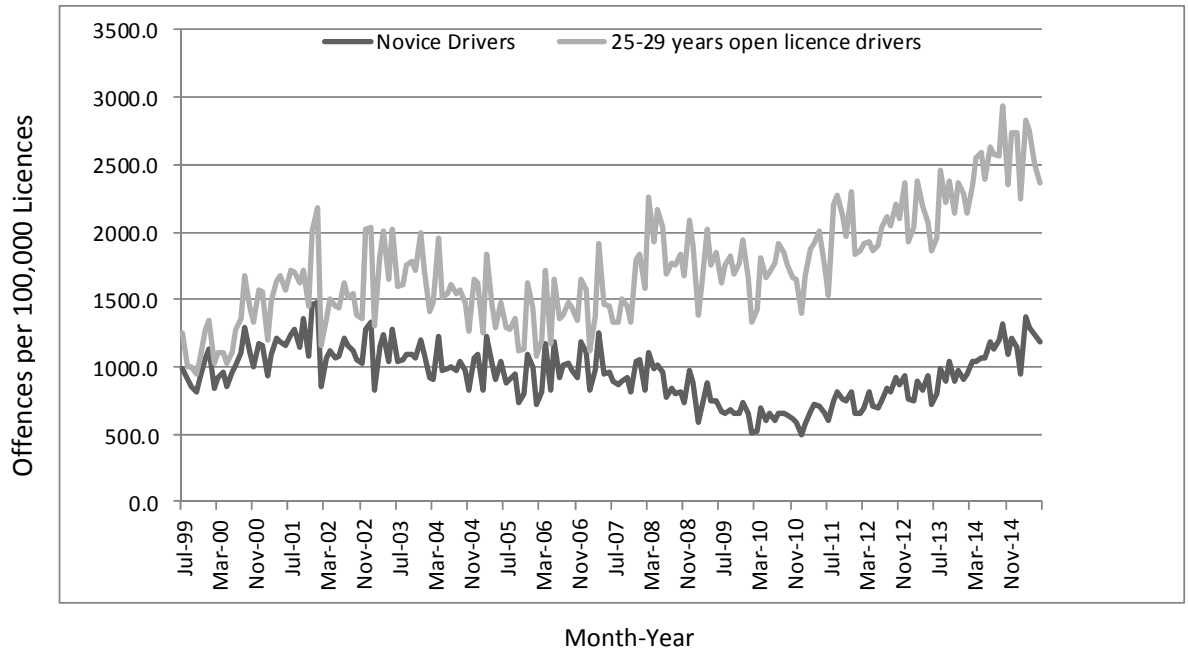

Figure 46: Rates of speeding offences for novice drivers and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

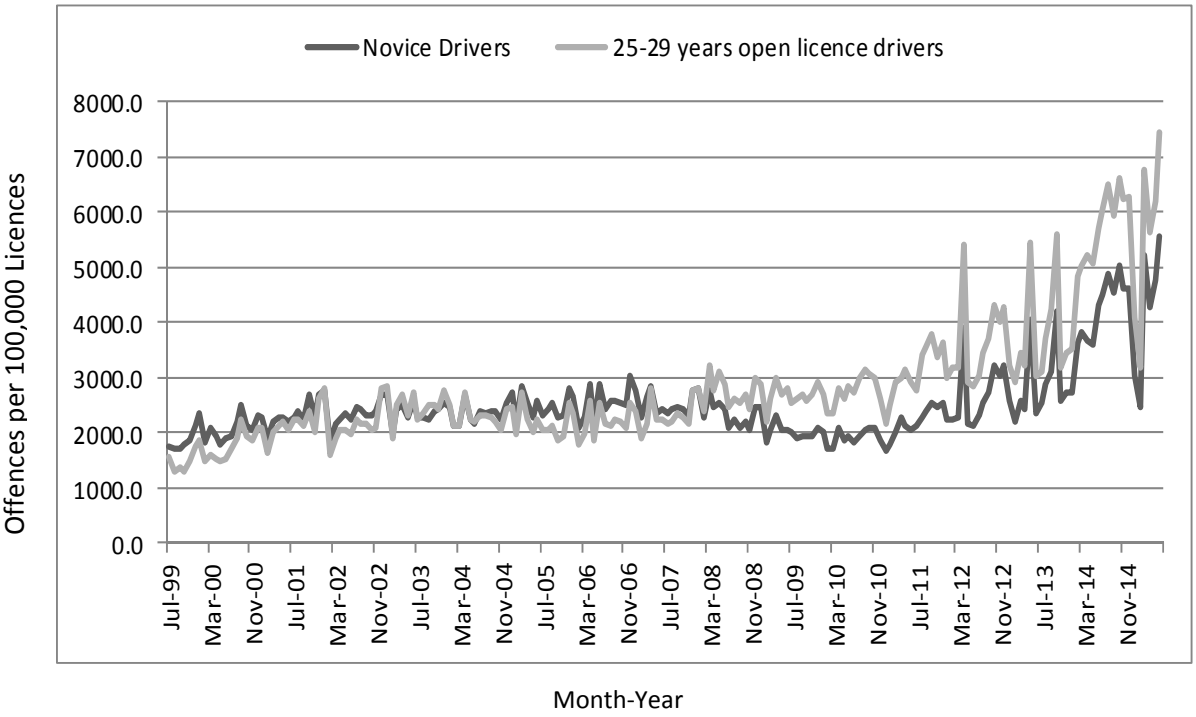

Figure 47: Rates of all (any) driving offences for novice drivers and 25-29-year-old open licence drivers Jul 1999 to Jun 2015

6. Results: Additional Age-Based Analyses

Two additional sets of analyses were undertaken to address age-related queries: first, a check on whether the New GLS limit on certain requirements to those under age 25 was adequate or whether additional conditions should also apply for novices aged 25 and older; and second, a check on whether young novices were delaying licensure such that New GLS drivers would be older than the Old GLS cohort. These are addressed in sections 6.1 and 6.2 respectively.

6.1 Comparison of New-GLS Provisional Driver Crash Rates by Age Group (Under 25 years, 25 years and Older)

Crash rates for New GLS provisional drivers by age group under 25 years and age 25 or older are summarised in Table 35, including for all crashes, single-vehicle crashes, passenger crashes and night crashes. In all comparisons, the rates of New GLS drivers aged 25 and over were statistically significantly lower than those of the New GLS drivers aged under 25: 38.8% lower for all crashes, 46.8% for single-vehicle crashes, 31.7% for passenger crashes and 26.8% for night crashes.

Table 35: P licence crash rates for New GLS drivers per 1,000 novice licence holders by age group (<25 years, 25+ years)

Crashes	Age at P licence	Rates per 1,000 licence	95% CI	
All crashes	Under 25	21.13	20.65	21.60
	25 and over	12.93	11.91	13.95
Single-vehicle	Under 25	6.35	6.09	6.62
	25 and over	3.38	2.86	3.91
Passenger	Under 25	7.79	7.50	8.08
	25 and over	5.32	4.66	5.97
Night crashes	Under 25	2.09	1.94	2.25
	25 and over	1.53	1.18	1.88

6.2 Age of New-GLS and Old-GLS Provisional Drivers

Reputed claims of young people delaying licensure to older ages have been reported in several countries in recent years, and including in QLD. We explored whether the average age of provisionally-licensed novices in the New-GLS group was older than that of the Old-GLS group, including by mean age, median and upper and lower quartile. The results are summarised in Table 36. No significant difference was found.

Table 36: Age comparison between New GLS P licence drivers and Old GLS P licence drivers

	Mean	95% CI		Median	Lower Quartile	Higher Quartile
New GLS	20.07	20.05	20.08	17.86	17.21	19.74
Old GLS	20.04	20.03	20.05	17.95	17.29	20.46

7. Discussion

The targeted outcome of Queensland's new GLS was to achieve a reduction in the number of people killed or seriously injured through involvement in a young driver crash. For the purposes of the current project, serious injury was to be determined by hospitalised casualty as reported in the police crash data held by TMR. The broad objectives of the current project were to evaluate whether the new GLS was achieving this outcome, and to determine what specific GLS initiatives were contributing to this outcome. Broadly, the new GLS was found to be achieving the intended outcome, although most clearly when examining for all crashes and all injury levels. There were mixed indicators for the specific GLS initiatives, discussed further below.

Significant declines in crashes of all severities relative to the overall licensed driver population in Queensland suggested that, while the crash trend declined for all drivers over the study period, the new GLS contributed to a greater decline among novice drivers following the introduction of the new GLS. Novice driver crashes declined at a rate of 13.1% per year, a 3.0% greater decline relative to the QLD driver population. For provisional licensed drivers, the decline was 9.3% per year; greater than for 25-29-year-old open licensed drivers (2.6%).

While the crash trends included a significant 5.4% decline in KSI crashes among novice drivers following the introduction of the new GLS, the decline as a proportion of all such crashes in Queensland was not statistically significant. However, when including a more narrow age comparison group, it was found that the significant 3.6% decline in KSI crashes for provisional-licensed drivers was greater than that for 25-29-year-old open licensed drivers (2.4%).

Explored as a proxy for at-fault crashes, all single-vehicle crashes and KSI single-vehicle crashes were also found to decline significantly for novice drivers following the introduction of the new GLS, at a rate of 11.5% and 4.5% per year respectively. Specific to features of the new GLS, significant declines were found for novice driver night crashes (15.9% per year) and night KSI crashes (9.1%), passenger crashes (13.5%) and KSI passenger crashes (5.3%) and also alcohol (18.6%) and KSI alcohol crashes (9.4%).

The same pattern of findings for trends in novice driver crashes was found when examining the trends by casualties arising from the novice driver crashes. Novice driver crash casualties declined at a rate of 13.9% per year, a 2.9% greater decline relative to the QLD driver population. A significant 5.2% decline in KSI crash casualties was found among novice drivers, although the decline as a proportion of all such casualties in Queensland was not statistically significant. Single-vehicle and KSI single-vehicle crash casualties declined significantly for novice drivers following the introduction of the new GLS, at a rate of 12.1% and 3.8% per year respectively. Specific to features of the new GLS, significant declines were found for novice driver night crash casualties (17.1% per year) and night KSI crash casualties (8.5%), passenger crash casualties (14.2%) and KSI passenger crash casualties (5.4%) and also alcohol (20.4%) and KSI alcohol crash casualties (9.7%).

To more narrowly address whether changes in the QLD GLS were contributing to the overall objectives, trends in crashes of only those novice drivers completing all standard learner and provisional components of the new GLS were compared to those of novice drivers who had completed all standard learner and provisional components of the old GLS. These findings were more mixed. The crash trends for New-GLS learner drivers were slightly lower than for the Old-GLS learner drivers for all crashes, likely due to the significantly lower rate of night crashes. This was despite the introduction of the 100 logbook hours requirement, which might be expected to increase driving exposure and therefore crashes. However, the requirement also included a minimum of 10 hours of night driving and it is unknown whether this might have changed the relative amount of night driving achieved. It is also possible that the new phone restrictions for

learner drivers and their passengers contributed to reductions. In any case, the protective role of supervisory drivers in keeping crash rates low for learner drivers appeared to be sustained, appositive finding, consistent with previous research investigating this issue in Sweden [10].

Also positive was the finding that peak crashes in the first month on a provisional licence – the extreme height of risk for all novices drivers and therefore a particular target of GLS initiatives – was much lower following the new GLS: 14.2%. This also was found for single-vehicle crashes (12.2%) and more substantially for night crashes (28.7%) and passenger crashes (22.9%), but not for KSI crashes or alcohol crashes; albeit alcohol restrictions were already in place in the previous GLS.

Mixed results were also found when examining the crash trends from this time of first provisional licensure over the several years of data available. The declining trend in all crashes was statistically significantly greater for the New-GLS drivers than for the Old-GLS drivers at 4.9% and also for passenger crashes at 9.4%. However, other crash comparisons (KSI, single-vehicle, night and alcohol crashes) were not statistically significantly different.

Overall therefore, when examining trends for all novice drivers over time, in keeping with previous GLS evaluation approaches [6], significant declines were found for crashes, fatalities and serious injuries. The "purer" evaluation of the new versus old GLS based only on those completing all aspects of either the previous or the new GLS, but not then accounting for other potential contributing factors over time, also found declines associated with the new GLS, but predominantly during the learner stage and for the very high-risk peak in crashes in the first month of provisional licensure and when comparing all crashes from that month over time. Passenger crashes also achieved a statistically significant difference over time from the P licence, suggesting the new GLS night passenger restriction in particular was contributing to the declines. This was also reflected in a substantial drop in night crashes overall in the peak first month of P licence.

Notably all other comparison figures also indicated that the trends were tracking at a greater decline for the New-GLS group relative to the Old-GLS group, just not to a statistically significant extent. Given that only a limited number of years of data were available to track trends for the New-GLS group compared to additional years of data for the Old-GLS group, should these trends for New-GLS drivers continue to decline more rapidly, it is likely that significant findings will be confirmed as additional data becomes available in future years.

Regarding police-recorded offences, those regarding display of L and P plates increased steadily after the new GLS was introduced, only declining from late 2013. Otherwise overall, rates of GLS-specific offences were generally low and decreases were found following the introduction of the new GLS offences, with any increases typically followed by decreases in recent years. The exception was passenger carriage offences, which showed potential to be increasing but at a very low offence rate level (12 per 100,000 licences). More moderate rates were found for mobile phone offences (40/100,00) at about half the rate of 25-29-year-old open licence holders, and for alcohol offences (50/1000,000), although these were higher than for 25-29-year-old open licence holders.

Further we explored whether the increased GLS requirements and conditions potentially resulted in more unlicensed driving, including specifically as never licensed or disqualified drivers. In fact, never licensed offences decreased. Disqualified driving offences initially decreased, before fluctuating upwards from 2010 and reducing again in 2014. We also explored offences not specific to GLS in terms of speeding offences and the total of all offences. Similar increases were found from 2010, which were associated with an increase in Queensland Police covert speed enforcement.

Given the various crash rates for novice drivers aged 25 years or older were consistently significantly lower than for novice drivers aged under 25, this also suggested that this age distinction for restrictions was appropriate. For all crashes, the under 25 novice rate was a considerable 38.8%

lower than for those 25 years and older. This difference was even greater at 46.8% lower for single-vehicle crashes, 31.7% lower for passenger crashes and 26.8% lower for night crashes. Given these findings, there is no clear imperative to recommend extending the additional conditions and restrictions for novices aged under 25 to novices aged 25 and older.

However, compared to novices, the offence data show considerably higher offence rates for 25-29-year-old open licence holders for mobile phone use (i.e. hand-held use) and particularly speeding offences. Further examination of the offence data and discussion of the results with Queensland Police is warranted. If these rates include a high proportion of repeat offences, it might be worth considering applying a reduced demerit point threshold for this age group (for example, 8 points, mid-way between the novice 4 points and open licence 12 points) or some other incentive to increase compliance. There is limited research to identify what might be the most effective initiative, although several evaluations introduced or strengthened demerit point systems suggest they can be effective [11-14], including for phone use and speeding specifically [11, 13], particularly if supported by sustained police enforcement and media coverage [15, 16].

No age difference was found for new provisional drivers in the New GLS and Old GLS groups, with a median age a little younger than 18 years or average 20 years for both groups. This dispels reputed public opinion that young people are delaying licensure. While delays to age 25 years would avoid some of the more labour intense (logbook) and restrictive (night passenger, phone and vehicle power) components, novice drivers aged 25 and older are still provisional for one year so are not excluded from the age comparisons. This does not account for the otherwise reputed opinion that some young people are not gaining licensure at all or perhaps are driving less. Including rates per licensed drivers in the analyses, we were able to control for different numbers of drivers over time; however, no measure or proxy of driving hours or mileage was available and therefore the latter was not able to be accounted for in the current study.

Moreover, a key limitation in interpreting all of the present findings relates to the timing of the introduction of the new GLS at the same time as the global economic downturn. Internal investigations by Transport and Main Roads suggest Queensland was not immune to this impact (personal communication). There has been some limited international research on the link between economic downturns and reduced road crashes, including modelling particularly with data on young males, which suggests that youth might be particularly affected due to assumed greater difficulty in gaining employment [17]. This concern was partly addressed by limiting some of the comparative analyses to provisional drivers (of any age) versus 25-29 year-old open licensed drivers only, with risk reductions for New-GLS provisional drivers evident in all comparisons. Future research could seek to model potential links with relevant economic datasets (such as employment data and sales of alcohol, fuel, old and new vehicles, for example) and examine whether any differences are evident by specific age and gender groups.

An additional limitation in this study that was not able to be accounted for directly is the potential impact of a short-term divergence in the reporting of injury severities during the evaluation period. In 2006, a new incident recording system was implemented by Queensland Police. During the transition period the injury severity for some casualties was not recorded by police in the usual way and therefore sourced through other means such as medical records. Serious injury crashes showed a drop in 2006 to 2007 despite increasing in the years prior, which might have been associated with this administrative change. As including the 2006-2007 serious injury data was a more conservative approach, we chose to retain these data.

It is also noteworthy that there was no comparable Australian jurisdiction with the same “old GLS” model to act as a control over the study period and the restricted age and licence groups included as comparison groups in some of the analyses could only approximate controls. For example, 25-29-

year-old open licence holders were selected as a close age group to GLS novice cohort but would likely vary in driving practices to the youngest novices and also it might be expected that the GLS has some carryover crash-reduction benefits when first graduating onto the open licence, so there is potential for confounding.

Interpretation of offence data results was also limited by a lack of corresponding information on changes in police enforcement practices over the study period; i.e. increases or decreases in enforcement levels generally and relative to the specific offences. Discussions of preliminary findings with Queensland Police identified that an increase in covert speed detection in 2010 was a potential contributor to increases in related offences. Further discussions might contribute additional insights.

Overall, the consistent finding of reductions in crashes and injuries identified (irrespective of the size of the associations), including larger reductions for New-GLS novices than the comparison groups, increases confidence that the changes to QLD's GLS contributed to reductions in road trauma over and above any other contributing factors.

7.1 Conclusions

In conclusion, we found that the new GLS was associated with declines in overall crashes and overall fatalities and serious injuries involving novice drivers. Learner driver crashes at night were significantly lower for New-GLS drivers compared to Old-GLS drivers, irrespective of any increase in exposure associated with the 100 logbook hours requirement. The combined impact of the learner and P1 licence stage initiatives were also associated with a large drop in peak crashes during the first month of the P1 licence, including among novice-driver-only (single-vehicle) crashes and night crashes, in addition to passenger crashes. With this transitional month a specific target of GLS initiatives, this finding is particularly important in attributing the GLS changes as a key contributing factor to the reductions identified. During the provisional phase, the night passenger restriction in particular was consistently associated with significant declines in all analyses of crash and injury rates involving novices carrying passengers (i.e. passenger crashes, KSI passenger crashes, passenger casualties and KSI passenger casualties relative to all other QLD licence holders; passenger crashes for the New-GLS versus Old-GLS group; and for declines from the time of the P licence).

Returning to the specific research questions included as the project aims and objectives (section 1.4), the following can be concluded:

- Are the GLS changes increasing experience during the learner stage, that is, younger minimum age, longer holding period and 100 logbook hours practice driving requirement, associated with reduced crash and injury risk when first transitioning from the learner to the provisional (P1) stage and during the P1 licence stage overall? Yes it is likely these initiatives contributed to the overall declines and particularly the reduction in peak crashes in the first month of the P1 licence phase, although the findings over time on the P1 licence were more mixed. However, the contribution of the learner initiatives versus the P1 licence initiatives to these findings cannot be separated.
- Are the GLS changes restricting exposure to risky driving conditions during the P1 stage in terms of using a mobile phone or passenger loudspeaker phone use and limiting young passenger carriage at night associated with reduced crash and injury outcomes during the P1 stage?
    - Is this evident in crashes involving passengers? Yes.
    - Is this evident in crashes at night? Yes.
    - What is the related pattern of phone use offences? Mobile phone offences increased briefly following introduction of the new GLS, then decreased and seem to

have stabilised. The contribution of the mobile phone restrictions to the crash outcomes is not possible to separate.
    - What is the related pattern of passenger carriage offences? These offences seem to be fluctuating, potentially increasing, but at a low level only. Only additional years of data will confirm and therefore these should be monitored.
    - What other patterns of provisional driver offences occurred, including P1-plate display, indicating likely levels of compliance? No clear issue with compliance with any specific GLS initiative was identified (with some caution regarding the night passenger restriction).
- Are these GLS changes restricting exposure to risky driving conditions during the P1 stage associated with reduced crash and injury risk during the P2 stage?
    - Is this evident by sustained lower crash and injury risk for drivers under the new GLS compared to those under the previous GLS at 13-36 months following provisional licensure? Yes this was found for crashes overall, as well as for passenger crashes specifically.
- Are all of these GLS changes restricting risky driving exposure during the provisional stage associated with reduced crash and injury risk once transitioning to the open licence stage?
    - Is this evident by sustained lower crash and injury risk for drivers under the new GLS compared to those under the previous GLS from 37 months following provisional licensure? Yes there is evidence of this for all crashes and passenger crashes specifically.
- Is the change for the zero alcohol requirement for learners and provisional drivers to apply to all drivers (i.e. not just those aged <25 years) associated with a reduction in reduced alcohol-related crash and injury outcomes during the learner and provisional periods and transition to early open licence period? Alcohol results were mixed with very clear findings for the overall trends, even earlier than the July 2010 expansion of the restrictions. However, no differences were found when comparing only drivers under the new GLS to the previous GLS.
    - What is the related pattern of alcohol-related offences during the learner and provisional periods and transition to early open licence period? The alcohol offence rates reduced to around 2010 and appeared to stabilise at this time before decreasing again in 2014. It is possible this relates to police operations so no specific conclusions can be drawn.
- Is the condition of “if under age 25” acceptable where applicable or should there be additional conditions for novices aged 25 and older? This was found to be acceptable and no extension of the conditions for those aged under 25 to those older are recommended.

7.2 Implications and Recommendations

Given no dire compliance issues or disbenefits for novices aged 25 and older were detected, and no evidence of delayed licensure under the new GLS was found, no changes to extend all of the new GLS requirements and restrictions to all aged drivers are recommended. Notwithstanding this, further investigation into the high rate of mobile phone use and particularly speeding offences by 25-29-year-old open licence holders should be considered. Further research could also model potential confounding influences for specific age and gender groups due to the economic downturn coinciding with the introduction of the GLS changes.

It is recommended the current system continues, with future evaluation likely to determine even stronger findings of benefits with additional years of data, although it is also acknowledged that the impact of GLS initiatives can plateau over time. Comparison of the new GLS to the recent review of

research on GLS component effectiveness [6] identifies that it already includes many of the components with the strongest evidence of effectiveness in international evaluations. Future directions to consider further strengthening QLD's GLS particularly include strengthening the night passenger restriction. This could be extended to a passenger restriction at all times of day and a restriction on all night driving for P1 drivers in the absence of a supervisory driver: both associated with approximately 20% reduced fatal crashes of young provisional drivers and 40-50% of all night crashes [6]. Even stronger would be to restrict carriage of any peer passengers in the first months of P licence driving (up to 25% reductions [6]).

Ultimately, raising the minimum provisional driving age to 18 years would provide an even stronger model, with age 18 applying in Victoria, as well as most international countries (across Africa, Asia, Europe and South America). Recent modelling research in South Australia has found, for example, that such a change in that state would contribute to a 20% reduction in fatalities and serious injuries for 16-24 year-olds and a 5-6% reduction in the overall road toll [18].

These specific crash types and cohort analyses should continue to be monitored in QLD and strengthened restrictions introduced should they be identified as clear issues for QLD, particularly if GLS impacts appear to plateau.

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