Graduated driver licensing in the Isle of Man

DEPARTMENT OF INFRASTRUCTURE

Contents

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Overview

Young and novice drivers are consistently overrepresented in road crash and injury data in jurisdictions worldwide (DfT, 2019; OECD, 2006; WHO, 2013). Collision analysis reported here shows that 16-24 year olds in the Isle of Man are similarly overrepresented in collisions on the island. The Isle of Man Road Safety Strategy includes challenging casualty reduction targets and reducing young driver collisions will help achieve these.

A review of evidence for the most effective interventions to improve the safety of young and novice drivers in the Isle of Man recommended the implementation of graduated driver licensing (GDL) (Kinnear, Sharpe & Hitchings, 2019). This document considers how GDL could be implemented in the Isle of Man. It provides an overview of the theoretical basis for GDL, the evidence for its effectiveness and what is considered best practice GDL design (i.e. what components might be included). Consideration of how collisions in the Isle of Man could be impacted by the implementation of GDL demonstrates that GDL can complement the existing licensing framework and would be expected to reduce collisions involving young and novice drivers on the island.

Young driver collisions in the Isle of Man

In December 2019, just over 4,500 young drivers aged 16-24 years old had a full car licence. This equates to 8% of the driving licence population in the Isle of Man. Meanwhile, between 2012 and 2017, it is estimated[1] that 18% of collisions (1,025 of 5,704) on the island involved a young driver aged 16-24 years (Figure 1).

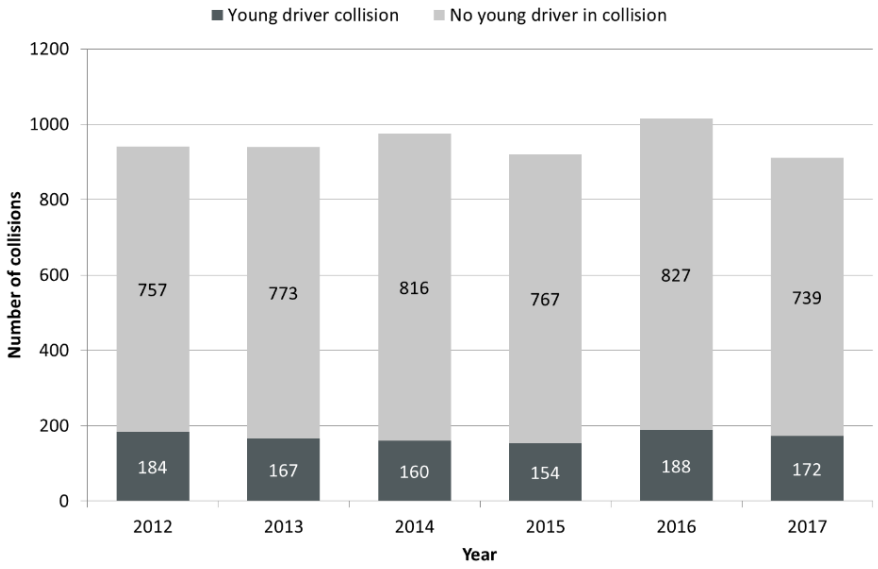


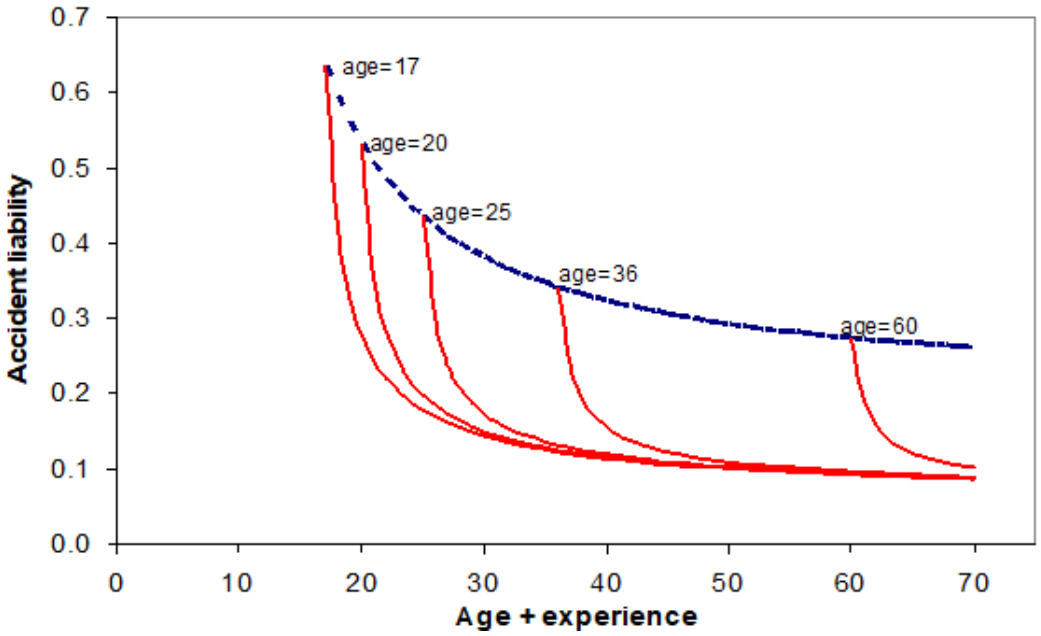
Figure 1: Number of collisions involving a young driver by year (2012-2017)

[1] Note that information on the age of the drivers was obtained from several age-related variables with different amounts of missing information in each. These entries were combined to obtain the maximum amount of information about the age of drivers in the collisions. Drivers with no age recorded in any of these variables were excluded from the analysis.

From a comparison of the collision statistics and the driving licence statistics, it can be concluded that young drivers are over-represented in the collision statistics, and are thus a key area for the Isle of Man Road Safety Strategy to target with interventions to reduce collision risk.

Why are young and novice drivers at greater risk of being involved in road collisions?

The overarching contributory factors to young and novice driver crash risk are youth and inexperience. This can be seen in Figure 2 below which shows the independent effects of increasing age (blue dotted line) and the more dramatic effect of becoming fully licensed and gaining experience at various ages (solid red lines). Figure 2 demonstrates that youth (e.g. between 17 and 25 years) is an important risk factor. Youth is associated with both social and developmental influences, not necessarily unique to driving. For example, it has been established that areas of the brain that inhibit impulsivity and risk-taking do not fully mature until the mid-20s (Giedd, 2004; Gogtay et al., 2004; Romine & Reynolds, 2005).



Source: Maycock, Lockwood & Lester (1991)

Figure 2: The independent effect of age and licenced driving experience on crash risk

The red lines denote that all new drivers, regardless of age, are at increased collision risk (Maycock, Lockwood & Lester, 1991; McCartt, Mayhew, Braitman, Ferguson & Simpson, 2009; Wells, Tong, Sexton, Grayson & Jones, 2008a,b). The lines suggest a learning curve like that associated with the acquisition of other complex skills and represent skills acquired through driving experience and not through driver training. Estimates suggest that most

learning occurs during the first 1,000-3,000 miles of independent driving (Kinnear, Kelly, Stradling & Thomson, 2013; Mayhew, Simpson, & Pak, 2003; McCartt, Shabanova, & Leaf, 2003).

What is Graduated Driver Licensing (GDL)?

GDL is a licensing system designed to complement the natural learning process. This is achieved by encouraging driving experience in safer contexts, gradually exposing new drivers to more complex and dangerous situations over time. Developmentally this allows a driver to be better prepared for when they are exposed to driving in situations known from crash analysis to be associated with increased risk. GDL therefore protects new drivers from high risk driving situations while developing skills in safer contexts. This often results in a delay in full licensure which also improves safety due to the increased age and maturity at which a driver can drive unrestricted.

A GDL system typically includes two key phases – a learner phase and a probationary phase. During the learner phase the aim is to encourage drivers to gain as much supervised practice as possible as this is known to reduce post-test crash risk. Some jurisdictions therefore stipulate a minimum learner period or minimum amount of practice. A logbook is often used to supplement this requirement and can be used to encourage varied practice, although is not essential. Through modelling of crash risk, Sagberg (2002) estimated that new drivers require 5,000-7,000 kilometres of learner experience to achieve the optimal balance of risk and experience resulting in the greatest safety benefit. This has been estimated to equate to between 80-140 hours of practice (Senserrick & Williams, 2015).

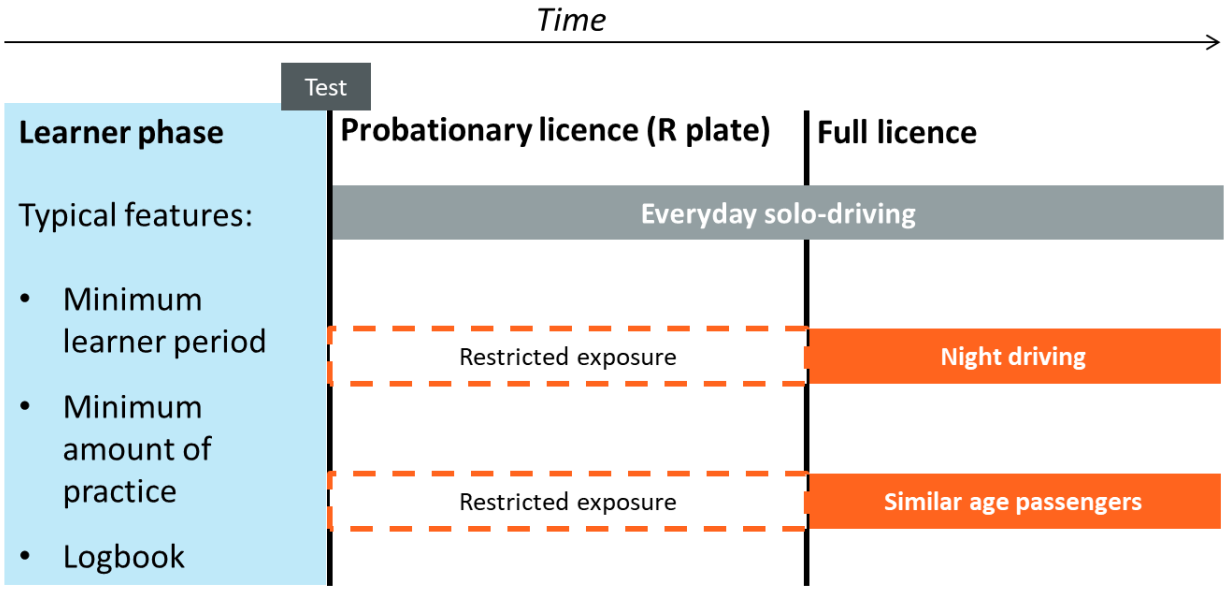


Figure 3: Overview of typical GDL structure

Young and novice driver crash risk is known to increase when driving at night and when carrying similar aged passengers (the risk increases exponentially with each similar age passenger in the car). As shown in Figure 3, it is therefore typical for newly licensed drivers to be restricted from driving at certain times of night and from carrying similar age passengers (this is only relevant for new drivers under 25 years). The probationary phase can last from 6-24 months before drivers graduate to a full unrestricted licence. Many jurisdictions require drivers to carry an identifier on the vehicle they are driving (like the R plate) during this time.

How effective is GDL?

The evidence for the effectiveness of GDL in reducing crashes for newly-licensed young drivers is overwhelming. A detailed review of the evidence can be seen in Kinnear et al. (2019). Numerous single and multi-jurisdiction analyses and meta-analyses have all reported crash and fatality reductions for young drivers (e.g. Baker, Chen & Li, 2008; McCartt, Teoh, Fields, Braitman & Hellinga, 2010; Russell et al., 2011). Although the precise mechanism for this effect is not always clear (e.g. reduced exposure or increased safe practice), it has been consistently found that implementing a GDL system reduces fatal and injury crashes.

Table 1 shows a summary of results based on individual GDL evaluations reviewed by Russell et al. (2011). This demonstrates the consistency of these evaluations finding that GDL reduces fatal and injury collisions. Effectiveness is generally found to be highest with younger age groups, which is particularly relevant for the Isle of Man with a licensing age of 16 years. Another review of 27 evaluations across the US and Canada found crash reductions for young drivers to range between 20-40% (Shope, 2007).

Table 1: Levels of GDL effectiveness on licensed driver collision rate by collision type (Russell et al., 2011)

Collision type	Sample	Denominator	% change (adjusted median first year post-GDL)	% change (adjusted median beyond the first year post-GDL)	Direction of change
All collisions	16 year old drivers	Licensed drivers	36	34	Reduction
All collisions	All teenage drivers	Licensed drivers	15	15.5	Reduction
Fatal collisions	16 year old drivers	Licensed drivers	59	33	Reduction
Fatal collisions	All teenage drivers	Licensed drivers	12.5	18	Reduction
Injury collisions	16 year old drivers	Licensed drivers	16	33	Reduction
Injury collisions	All teenage drivers	Licensed drivers	17	13	Reduction
Night-time collisions	16 year old drivers	Licensed drivers	20	42	Reduction
Night-time collisions	All teenage drivers	Licensed drivers	32	14	Reduction

It is noteworthy that stronger GDL systems (that is, those with stricter learner and probationary restrictions) have been associated with greater reductions in fatal crashes involving young drivers when compared with weaker GDL systems (McCartt et al., 2010; Lyon, Pan & Li, 2012). This means that the casualty savings realised from the implementation of a GDL system will depend on things like the start and end time of the night-time restriction and the number of same age passengers allowed in the probation period.

What parts of a GDL system should the Isle of Man consider?

Of the 73 GDL systems in place across the US, Canada, Australia and New Zealand, no two systems are identical (Senserrick & Williams, 2015). While GDL provides a framework, local requirements and social and political pressure will shape the final components and the details within them. Nevertheless, there are components that are commonly implemented or considered and the support and evidence for each is summarised in Table 2.

Table 2:Commonly considered components of a GDL system

Phase	Component	Support and evidence
Learner	Minimum learner age	There is strong evidence that age of licensure impacts crash risk with younger ages being associated with higher crash risk.
	Minimum learner period	Supervised practice is extremely safe and there is good evidence to support that gaining more of it, and in a variety of on-road situations, is beneficial for post-test safety. However, the evidence for the precise amount of learning is mixed, with some advocating for a 6 or 12 month minimum period and minimum practice of anywhere from 50-120 hours. Minimum practice requirements are not common in the US but are more stringently applied in Australia.
	Minimum number of hours supervised practice	
Probationary	Night-time driving restriction	It is widely evidenced that young and novice drivers are over-represented in collisions at night. This restriction is one of the most effective as it limits exposure to this risk for newly licensed drivers. It is considered a critical component of most GDL systems along with passenger restrictions.
	Driving with peer-age passengers restriction	It is well established that crash risk for new young increases with each young passenger drivers (e.g. 17-24) being carried. This component therefore restricts exposure to a known high risk context in the probationary phase. Carrying older age passengers actually reduces risk, hence the restriction usually only applies to the carrying of young passengers. New drivers over 25 years old are less at risk than younger new drivers and are not usually included in the passenger restriction.
	Zero BAC (blood alcohol concentration) limit	The impact of alcohol on novice driver collision risk is greater than for experienced drivers (Peck, Gebers, Voas & Romano, 2008), hence a lower limit for new drivers has been implemented in some jurisdictions. Begg & Stephenson (2003) were unable to establish definitive results from New Zealand's lower alcohol limit of 0.3g/l for new drivers. However, a summary of subsequent literature found a range of effectiveness with a 9-24% reduction in alcohol-related fatal crashes for 15-19 year olds (4-17% for all severities) (Senserrick & Williams, 2015).
	Mobile phone use restriction	The effect of driver distraction on collision risk is well established. However, few jurisdictions have applied mobile phone restrictions as part of a GDL system. Often

		mobile phone use is covered by legislation applying to all drivers. There is little evidence of effectiveness for this component, largely due to a lack of evaluation studies.
	Speed restriction	This is not a common component of GDL systems but is included here as it is already in place in the Isle of Man for new drivers. In the absence of speed limits on unrestricted roads, the collision analysis reported in section "Impact of probationary phase: night-time restriction" suggests this should be retained.
	Identifiers	Identifiers as part of a GDL system are used in Canada, New Zealand and Australia. While there is no clear evidence for the use of identifiers, it is logical that they improve compliance and enforcement by increasing the visibility of new drivers to the authorities and increase the perceived threat of detection.

With so many different GDL systems in place around the world work has been conducted to try and identify the most effective components and the most effective conditions. In reality, the most effective solution is the one that (in addition to being evidence-based) suits the needs of the jurisdiction in which it is being applied and is supported by authorities and the public.

Based on our review of the literature and others who have sought to develop a best practice GDL system (e.g. Mayhew, Williams & Robertson, 2016; IIHS, 2015; Vaa, Høye & Almqvist, 2015), Table 3 provides an overview of what are considered to be the most important components with the most desirable conditions.

Table 3: Overview of best practice GDL components with desirable conditions

Phase	Component	Conditions
Learner Min. 12 months	Minimum hours practice (supported by logbook)	100-120 hours
Probationary >12 months	Night-time component	21:00 to 06:00
	Peer passenger component	One or no young passenger
	Lower alcohol limit	Zero limit
	Penalty points	Lower threshold

Would GDL be effective in the Isle of Man?

Overall impact of a GDL system

By applying the levels of collision reduction from GDL that could be expected based on international reviews (see Section "How effective is GDL?") it is possible to consider what the impact (i.e. the effectiveness) of a full GDL system might be in the Isle of Man. This type of appraisal is based on a number of assumptions regarding the types of components implemented and the strength of those components; it should only be considered as indicative of what might be expected if evidenced best practice principles are followed. Additional assumptions relate to the proportion of young drivers included in the analysis that would be impacted by GDL at any one time. This is unknown as the length of time a licence is held is not possible to determine from the existing data.

Table 4 shows the estimate of the number of collisions that may be prevented by the introduction of GDL in the Isle of Man. The green shading represents the most likely range of effectiveness (20-40% reduction) based on international evaluations from jurisdictions where the licensing age is also 16 years old. Results are presented with a breakdown in the reduction in collisions by type. In general, the proportion of young driver collisions in the Isle of Man is fairly constant in terms of severity each year, with approximately 67% damage only, 26% slight injury, 5% killed or seriously injured. It is worth noting that in recorded injury collisions, there may be more than one casualty.

Table 4: Estimated collision reduction based on a range of potential effectiveness if GDL applied to drivers aged 16-24 years old[2]. Green represents most likely range.

	10%	**20%**	**30%**	**40%**
Annual reduction in collisions	**17**	**34**	**51**	**68**
Damage only collisions	11	23	34	46
Casualty collisions (all severities)	6	11	17	23
KSI collisions	1	2	3	4

Impact of learner phase

The learner phase of a GDL system might introduce a minimum number of hours practice or a minimum learner period to encourage more practice. There were no data available to assess the impact of setting a minimum number of hours practice.

Due to a change in recording systems, no historic information was available on the length of time that drivers held a provisional driving licence before passing their test in the Isle of Man. However, it was possible to estimate the number of current provisional licence holders that would be affected by the introduction of a minimum learner driver period.

[2] Numbers have been rounded to whole figures for presentation.

The proportion of drivers who hold a full car driving licence for less than 12 months decreases with age, suggesting a minimum learner period would affect younger drivers more than older drivers. Adjusting for this, as of December 2019, a 12-month minimum learner period would apply to approximately 820 young drivers (i.e. those aged 16-24 who have a provisional licence currently which has been held for less than 12 months). A six-month minimum learner period would apply to 470 young drivers (i.e. those aged 16-24 who have a provisional licence currently which has been held for less than 6 months).

Impact of probationary phase: night-time restriction

Isle of Man collision data were used to estimate the number of collisions that could be prevented if a GDL night-time component was introduced. As it is not possible to identify when the collision happened relative to the date of test pass, the only criteria applied to this analysis is that the collision must include a young driver aged 16-24 years (this will capture collisions involving young novice drivers and young drivers with more experience). It is therefore a maximum.

Depending on the hour, young drivers were involved in 21%-52% of collisions between 21:00 and 06:00. This suggests that young drivers are overrepresented in night-time collisions and would support the inclusion of a night-time restriction as part of a GDL system (see Figure 4).

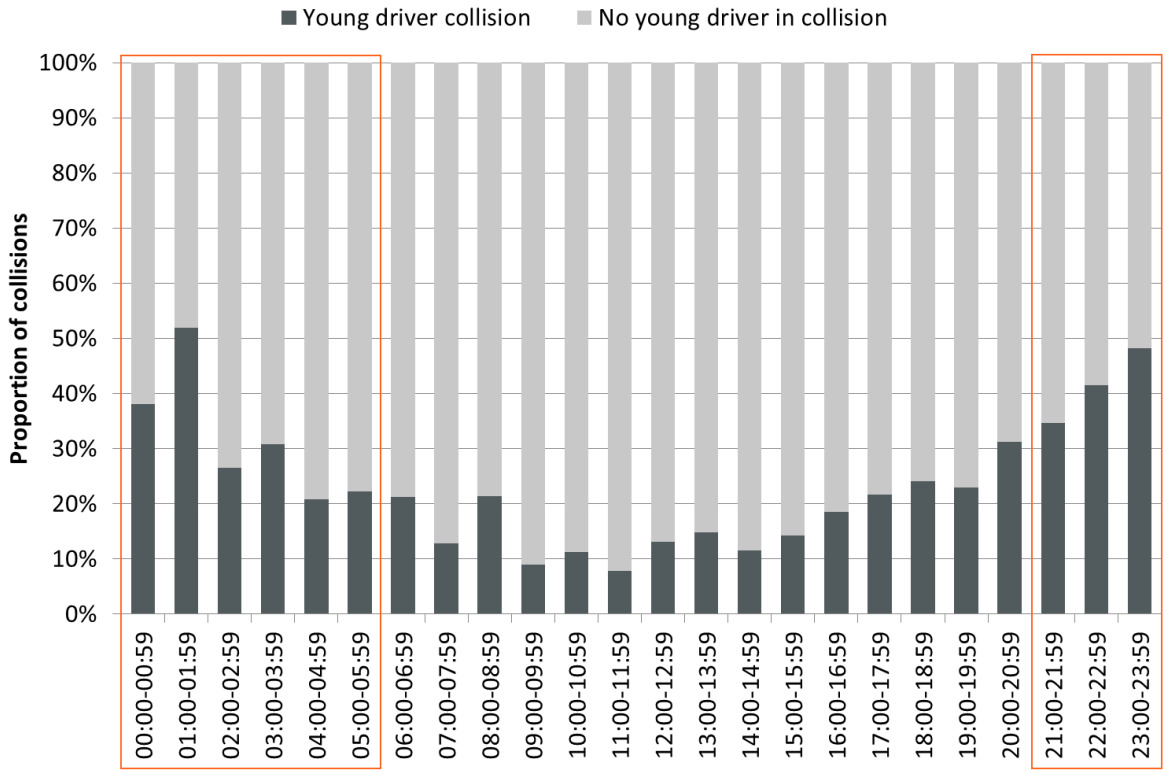


Figure 4: Proportion of collisions involving a young driver by time of day (2012-2017 data)

If restrictions on night-time driving were introduced for young drivers then the maximum number of young driver collisions prevented by this night-time component would be:

For a 'weak' application (i.e. no permission to drive between 12am-5am), up to 73 collisions could be have been prevented between 2012 and 2017 ≈ 12 collisions a year.

For a 'strong' application (i.e. no permissions to drive between 9pm-6am), up to 228 collisions could have been prevented between 2012 and 2017 ≈ 38 collisions a year.

These data can be seen represented by time of day in Figure 5 which therefore shows the difference between weak and strong implementation of the component.

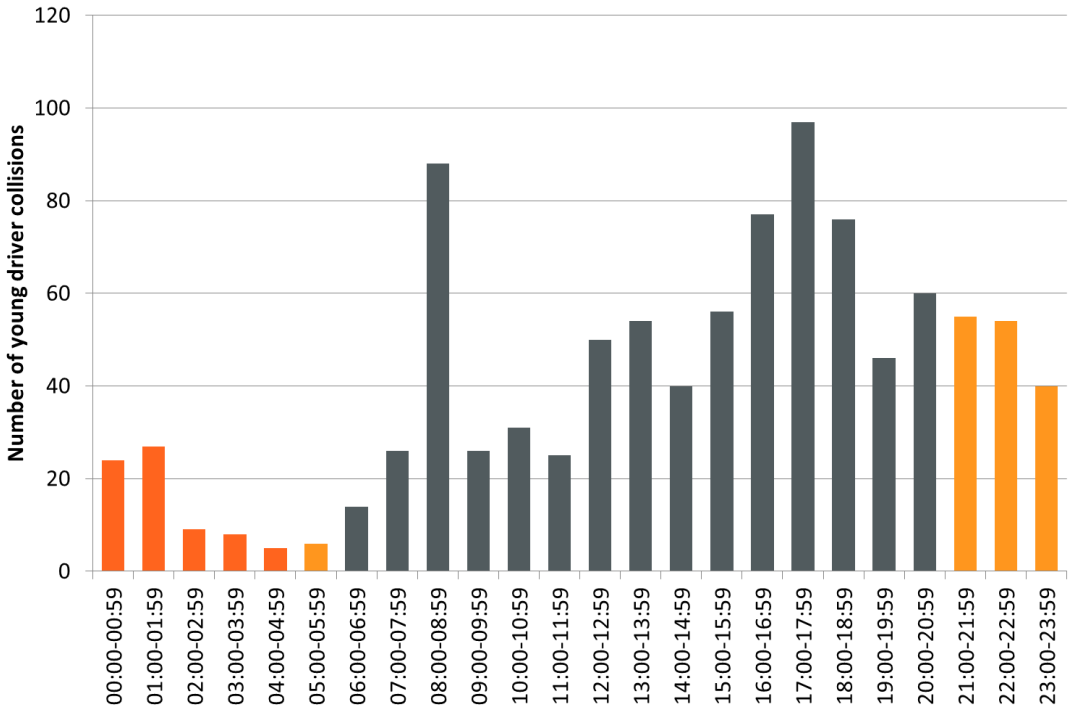


Figure 5: Young driver collisions impacted by a night-time GDL component (darker orange = weak, lighter + darker orange = strong)

Impact of probationary phase: peer passenger restrictions

Using the Isle of Man collision data and TRL's knowledge from previous similar analyses the number of collisions which could be prevented if a GDL passenger component was introduced for young drivers was estimated. As with the night-time component, these figures are the maximum number of collisions which could be prevented since it was not possible to calculate time since licensure for those involved in collisions.

No information was available in the Isle of Man collision data on whether the young drivers were carrying passengers or not at the time of the collision, hence assumptions had to be made based on our expertise and previous analyses. Figures were calculated assuming that the proportion of young drivers carrying similar aged passengers in the Isle of man is the same as other areas of the UK.

The maximum impact of a restriction on carrying peer age passengers is estimated to be:

- For a 'weak' application (i.e. no 14-20 year old passengers), up to 50 collisions a year.
- For a 'strong' application (i.e. no 14-24 year old passengers), up to 66 collisions a year.

Impact of probationary phase: lower (zero) alcohol limit

Between 2012 and 2017, of the (122) collisions with 'drink/drugs' recorded as the cause, 25% (30) of these involved a young driver. Since only 18% of all collisions during this period involved a young driver, this suggests that drink/drugs may be overrepresented in young driver collisions.

Breath test information was also provided in the collision data: 2.6% (27[3] out of 1,025) of collisions involving a young driver had a positive breath test compared with 1.3% (59 out of 4,679) of collisions with no young driver.

These data suggest that alcohol is likely to be more prevalent in young driver collisions than in collisions that do not involve a young driver; however, the number of collisions that a lower/zero alcohol limit could potentially affect is expected to be small due to the low numbers of these collisions overall.

Impact of probationary phase: speed restrictions

Analysis of the collision data shows that between 2012 and 2017, of the 484 collisions with 'speeding' recorded as the cause, 47% (226) of these involved a young driver. This suggests that speeding may be overrepresented in young driver collisions.

Speed restrictions are not a common component of GDL as most jurisdictions rely on existing speed limits. However, the Isle of Man is unique in having a network of unrestricted roads. To control for this, newly qualified drivers must display a red R sign and are limited to a maximum speed of 50mph for a period of 12 months from licensure. The analysis suggests this should remain and could form the basis of a GDL framework.

Consideration of commonly cited barriers

While GDL is evidenced as an effective intervention that prevents injury collisions and saves lives, concerns are often raised regarding implementation or its impact on day-to-day life. A GDL system will require adaptation by new drivers, parents and carers, the learning to drive industry and authorities. This final section concludes by updating the commonly cited concerns reported in Kinnear et al. (2019) and considers the evidence for them. These can be seen listed in Table 5.

[3] Of these, 85% (23 out of 27) were positive breath tests for the young driver.

Table 5: Consideration of commonly raised concerns about GDL

Concern	**Evidence and comment**
The introduction of GDL will increase unlicensed driving.	• No increase in unlicensed driver collisions was found in New Zealand following the introduction of GDL (Frith & Perkins, 1992), although Males (2007) reported an increase in unlicensed driver collisions for 16, 17 and 19 year olds following the introduction of GDL in California. • There are few other reports of this as an unintended consequence. It is likely that the casualty savings afforded by GDL would more than offset any increased in unlicensed driving. Education and media support for GDL has been suggested to encourage compliance and perceived legitimacy (Mayhew et al., 2014).
New drivers will not comply with GDL restrictions and GDL will be difficult to enforce.	• Parents are often referred to as the primary enforcers with GDL seen to empower them. • Enforcing GDL laws is no more difficult than any other road safety legislation and relies on measures to support compliance (such as information, education and media). • Enforcement is easier and compliance is increased when new drivers are required to carry an identifier (e.g. an R plate) (Curry, Elliot, Pfeiffer, Kim & Durbin, 2015). • Even where GDL is not strongly enforced, it still demonstrates effectiveness. Naturalistic studies with new young drivers in the US, where GDL enforcement is described as "modest" (Williams, 2017; p36), suggest that compliance is high. Curry, Pfeiffer and Elliot (2017) found 97% of 17-20 year olds were compliant with New Jersey's night-time restriction and 92% were compliant with the one-passenger restriction despite low levels of enforcement. A similar finding is reported from North Carolina (Foss & Goodwin, 2014).
GDL will unfairly impact on the mobility and employability of young people.	• Restrictions such as minimum learner periods, passenger restrictions and night-time restrictions will of course impact on the mobility of young drivers. Whether this is unfair depends on how the trade-off between the reduction in mobility and the potential casualty savings is perceived. • Williams, Nelson and Leaf (2002) found that young drivers use various means to adapt their travel behaviour to get around night-time and passenger restrictions, without much problem. The vast majority of journeys affected are social (Begg, Langley, Reeder & Chalmers, 1995; Ferguson, Williams, Leaf, Preusser & Farmer, 2001) and can be dropped or adapted.

Cont.	• In New Zealand, only a small proportion of mostly social journeys were predicted to be affected by a recent increase in the driving age (from 15 to 16 years old) (Begg & Langley, 2009). • No evidence has been found to indicate whether GDL impacts on the employability of young people. It is worthy of consideration that many jurisdictions have implemented GDL since 1987 and no evaluations have reported that the employability of young people has being adversely affected. • Surveys of young drivers and parents (such as Begg et al., 1995; Ferguson et al., 2001; Williams et al., 2002) suggest that restrictions are likely to have a minor impact on employment at most. • In some jurisdictions, exemptions are given for work- or education-related driving. However, exemptions have been associated with diluting the effectiveness of the restriction when compared with GDL systems with no exemptions (Vanlaar et al., 2009).
GDL will penalise all new drivers and is unfair on responsible drivers.	• All new drivers are at increased collision risk due to their inexperience. • Responsible new drivers (including those with no previous convictions and 'model teens') are still involved in fatal collisions (Williams, 1999; Williams, 2006).
GDL will disproportionately impact those living in rural areas.	• It is logical that those living in rural areas will be affected more than those in urban areas due to the availability of public transport (or lack thereof). However, a comparison of the impact of GDL in rural and urban areas of North Carolina found that there were no differences between the perceptions of GDL between urban and rural parents and teen drivers; that is, rural dwellers did not report being disproportionately affected by GDL restrictions (UNC, 2001). • GDL has been shown to be more effective in rural areas than urban areas due to the greater risk posed by rural roads (UNC, 2001). Young rural drivers are 44% more likely to be involved in an injury collision compared with young urban drivers and are therefore more likely to benefit from GDL in public health terms (Fosdick, 2013).
GDL just delays collisions or offsets them to other groups of drivers.	• Even in a GDL system, crash risk increases when drivers obtain their full independent licence (after the probationary phase). However, by this stage they are older and more experienced hence their overall crash risk is reduced compared with gaining a full licence following test pass. • Zhu, Zhao, Long and Curry (2016) examined whether GDL had an unintended consequence of increasing non-driver fatalities among adolescents. This could occur due to young drivers having to walk,

Cont.	cycle, be a passenger or use public transport during an extended learner phase or during restricted periods in the probationary phase. Analysis of fatality data from across 50 US states and the District of Columbia between 1995-2012 did not find evidence of a shift in risk as a result of GDL. Among adolescents aged 16 years, GDL was not associated with any increase in passenger, pedestrian or cyclist fatalities.
Passenger restrictions increase the number of young drivers on the road increasing their exposure.	• There is no evidence to suggest that the benefits of passenger restrictions are offset by increasing young driver exposure. If operating in a strong GDL system, where the exposure of young drivers is increased, the exposure will occur in safer conditions (e.g. not at night) and will not be with same age passengers. • Chaudhary, Williams and Nissen (2007) studied the effects of GDL implementation in three US states and found no evidence that passenger restrictions for new drivers had offset crash risk. • Chen, Braver, Baker and Li (2000) noted that such is the crash risk of driving with peer age passengers that even if all passengers 16 to 19 years old in the USA were to instead drive solo, 290 lives would be saved annually.
Telematics can do everything that GDL does.	• There is no evidence to support this assertion. • It is possible that telematics can support GDL legislation, but it is unlikely that it can substitute for it. For example, legislation applies to and affects all drivers entering the licensing system. Telematics, at present, is a vehicle-specific technology making it difficult to apply GDL rules when there are multiple drivers, or a new driver uses multiple vehicles.
It is driver behaviour that is the problem and drivers need better training and education.	• There is no evidence that education and training can substitute for driver experience on-road or reduce novice driver collisions. • Where driver education or training substitutes for time in GDL systems to allow earlier licensure, evidence suggests this increases collision involvement (Boase & Tasca, 1998; Mayhew et al., 2003b; Wiggins, 2004; Lewis-Evans, 2010).

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