

GRADUATED DRIVER LICENSING:
EFFECTIVENESS OF SYSTEMS &
INDIVIDUAL COMPONENTS

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Abstract:

Graduated licensing systems (GLS) have been increasingly adopted by licensing jurisdictions around the world. Under a GLS, driving privileges are gradually phased in to allow early driving experience to be gained in lower-risk situations. Restrictions are gradually lifted to allow driving experience under more-challenging conditions before full licensure. The present report details the GLS models in operation in Australia, with a focus on components of the learner and intermediate licence phases. The effectiveness of overseas GLS models in terms of reduced crash risk is also reviewed. The primary aim of the report, however, is to detail the wide range of individual GLS components of the learner and intermediate licence phases and to discuss the literature on their contribution to GLS effectiveness. Other considerations that need to be addressed when introducing GLS components in a new or existing model are also discussed. It is concluded that there is overwhelming support for GLS models, including those with restrictions not currently in place in Australia, namely, night-time driving and peer passenger restrictions. There is considerable support for a review of current Australian licensing systems and the development, implementation and evaluation of additional GLS initiatives in order to maximise the ability of the systems to address the over-involvement of young Australians in crash statistics.

Key Words:

graduated licensing systems, young drivers

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Preface

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EXECUTIVE SUMMARY

Newly-licensed drivers are one of the groups most vulnerable to crash involvement, particularly in their first year of driving. This pattern is common worldwide. Licensing jurisdictions have become increasingly aware that traditional methods to address this issue, such as standard driver education and training programs, have not worked. An alternative, is to introduce a range of requirements and restrictions on drivers in sequential stages as they learn to drive, that is, mandate a graduated licensing system (GLS).

The crash risk of novice drivers is inflated by the effects of both youth and inexperience. The aim of GLS is to reduce this risk by limiting driving to safer, lower-risk conditions and progressively lifting restrictions as experience is gained. Basic forms of GLS were introduced as early as the 1960s and 1970s. However, the more sophisticated systems that currently exist were largely implemented during the 1990s.

The primary aim of the current project was to review the effectiveness of overseas GLS models and the effectiveness of individual GLS components in reducing the crash risk of young drivers. A further objective was to provide a detailed description of current Australian GLS models and their specific requirements and restrictions for both the learner and intermediate licence phases.

Review of Australian GLS models and their components

Four GLS structures were identified among Australian states and territories. Victoria (VIC), South Australia (SA), Northern Territory (NT), Queensland (QLD) and Tasmania (TAS) follow a standard three-stage structure, namely, a learner phase, followed by an intermediate licence phase, and finally the full licence phase. The GLS in New South Wales (NSW) differs in that it includes two intermediate licence phases. The Australian Capital Territory (ACT) GLS also includes two intermediate licence phases, however, the second one is optional. In contrast, Western Australia (WA) includes two learner phases in its GLS model.

Overall, each Australian licensing system differs in the varying requirements and restrictions that apply during each phase. In addition, the ACT and SA have two optional pathways to obtain intermediate licensure, while the NT has two optional pathways in both the learner and intermediate licence phases. In each case, the options are education and training-based programs.

Summaries of the GLS components of the Australian learner phases and the intermediate licence phases are provided in Tables A and B.

Effectiveness of GLS models and individual GLS components

Most overseas GLS models follow the standard three-stage structure common in Australia. Evaluations of the effectiveness of overseas GLS models in reducing crash risk have generally shown substantial benefits, although the range of reductions in certain crash and injury types shows much variation. In addition to methodological issues, one of the main reasons for this variation is a lack of consistency in the many GLS requirement and restriction options incorporated in each system. In addition, jurisdictions can differ on a number of levels before a GLS is implemented, which can also affect the nature or extent of change following a new GLS.

Table A. Summary of GLS components of Australian learner permits

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Minimum age	16 years	16 years	L1: 16 years L2: No	15 years 9 months	16 years	16 years	16.5 years	16 years
Mandatory education prior to applying	No	No	L1&L2: No	Yes	No	No or yes if CBTA option	No	No
Road law knowledge test	Yes	Yes	L1: Yes L2: No	Yes	Yes	Yes or no if CBTA option	Yes	Yes
Eyesight test	Yes	Yes	L1: Yes L2: No	Yes	No	Yes	Yes	Yes
Practical test	No	No	L1: No L2: Yes	No	No	No	No	No
Minimum length of learner period	6 months; 3 if 25+ years old	6 months	L1+L2: No	6 months	No	6 months or no if CBTA option	6 months	6 months
Maximum length of permit; Ability to renew	10 years; renewable	3 years; must resit test	L1+L2: 1 year; renewable	2 years; must resit test	3, 6 or 9 months; renewable	1 year; must resit test	1 year; renewable	3 years; must resit test
Mandatory education and instruction	No	No	L1&L2: No	No	No or yes if CBTA option	No or yes if CBTA option	No	No
Mandatory minimum driving hours	No	50 hours	L1: No L2: 25 hours	No	No or yes if CBTA option	No or yes if CBTA option	No	50 hours
Supervisory driver minimum requirements	Full licence for 2 years; .05 BAC limit	Full licence; .05 BAC limit	L1&L2: Full licence for 4 years	Full licence	Full licence; .05 BAC limit	Full licence	1 year intermediate licence	Full licence; no suspension for 2 years
Display L-plates	Yes	Yes	L1&L2: Yes	Yes	Yes	Yes	No	Yes
BAC limit (g/100ml)	Zero	.02	L1&L2: .02	.02	Zero	Zero	Zero	Zero
Maximum speed restriction	No	80 km/h	L1&L2: 100 km/h	No	80 km/h	80 km/h except in CBTA session	No	80 km/h
Towing restriction	Yes	Yes	L1&L2: Yes	750 kg GVM	No	No	No	Yes
Freeway restrictions	No	No	L1: Yes L2: No	No	No	No	No	No

Table B. Summary of GLS components of Australian intermediate licences

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Minimum age	18 years	<i>P1</i> : 17 years <i>P2</i> : 18 years	17 years	17 years; 17.5 years <i>P2</i> option	16.5 years	16.5 years or 16 years if CBTA	17 years	17 years
Practical test	Yes	<i>P1</i> : Yes <i>P2</i> : No	No	Yes or CBTA	Yes or CBTA	Yes or no if CBTA option	Yes	Yes
Hazard perception test	Yes	<i>P1</i> : No <i>P2</i> : Yes	Yes	No	No	No	No	No
Knowledge test	No	<i>P1&P2</i> : No	No	No	No	No	No	Yes
Length of intermediate licence period	3 years	<i>P1</i> : 1 year <i>P2</i> : 2 years minimum	2 years	3 years	1 year minimum	1 year	3 years if aged <23 years; 2 years if 23-24 years; 1 year if >24 years	3 years if aged <22 years; if 22-24 years hold until 25 years; 1 year if >24 years
Display <i>P</i> -plates	Yes	<i>P1&P2</i> : Yes	Yes	Yes; No for <i>P2</i> option	Yes	Yes	No	Yes
Transmission restriction	Yes	<i>P1</i> : Yes <i>P2</i> : No	No	No	No	Yes	No	No
BAC limit (g/100ml)	Zero	<i>P1&P2</i> : .02	.02	.02	Zero	Zero	Zero	Zero
Maximum speed restrictions	No	<i>P1</i> : 90 km/h <i>P2</i> : 100 km/h	110 km/h	No	100 km/h	100 km/h	No	80 km/h
Towing restriction	No	<i>P1</i> : max 250 kg <i>P2</i> : No	1.5 x tail weight of vehicle	750 kg GVM	No	No	No	No
Vehicle power restriction	Yes	<i>P1&P2</i> : No	No	No	No	No	No	No
Night-time restrictions	No	<i>P1&P2</i> : No	No	No	No	No	No	No
Passenger restrictions	If licence disqualified in first year, one passenger only	<i>P1&P2</i> : No	No	No	No	No	No	No

Table B. (cont.) Summary of GLS components of Australian intermediate licences

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Post-intermediate licence education	No	<i>P1&P2</i> : No	No	No; Voluntary for <i>P2</i> option	No	No	No	No
Effect of suspensions on length of intermediate licence period	No	<i>P1&P2</i> : No	No	No	No	No	No	If first year must start again. After first year, extended by length of suspension
Lower demerit point threshold: Length of licence suspension (or 12 months good driving record option)	5 points in 12 months: 3 months	<i>P1</i> : 4 points: 3 months <i>P2</i> : 7 points: 3 months	No	4 points: 3 months; 8 points: 3 months for <i>P2</i> option	4 points: 6 months	No	4 points in 12 months: 3 months	4 points in 12 months: 3 months
Exit test	No	<i>P1</i> : No <i>P2</i> : Yes	No	No	No	No	No	No
Minimum age for full licence	21 years	20 years	19 years	20 years	19 years	17.5 years or 17 years if CBTA option	20 years	20 years

Given the success of the GLS, it is valuable to determine which components are most likely to maximise safety benefits. Therefore, a review of a wide range of GLS components of the learner and intermediate phases was undertaken, with attention to research that indicated their likely effectiveness. However, it must be emphasised that the effectiveness of any individual component is dependent on other components that comprise the GLS model. In addition, the effectiveness of introducing a new component into an existing GLS model will largely depend on the combination of components already inherent in that model.

The following GLS initiatives were found to show clear associations with crash reductions:

- Increasing the minimum learner period (which subsequently increases on-road supervised driving experience).
- Night-time driving restrictions for intermediate-licensed drivers.
- Passenger restrictions for intermediate-licensed drivers.
- Mandating a zero BAC limit for both learner and intermediate-licensed drivers.
- Mandating seat-belt use at all times for both learner and intermediate-licensed drivers.

There was theoretical support for achieving this increase in the minimum learner period by the following means, but the relative merits of these initiatives have not yet been fully evaluated:

- Mandating a minimum learner period.
- Lowering the minimum learner age while maintaining the intermediate licensing age.
- Raising the minimum intermediate licensing age to extend the learner period.

There was theoretical support for the following GLS initiatives and some research suggesting benefits, but the initiatives have not yet been fully evaluated:

- Extending the intermediate licence period by increasing the minimum period or raising the minimum age for full licensure.
- Requiring a good driving record for progress to full licensure (e.g. extending the intermediate period following licence suspension).
- Lowering the demerit point threshold for intermediate-licensed drivers.

Results regarding effectiveness are currently limited, inconclusive or unknown for the following GLS components:

- Including attitudinal/motivational issues in graduated education, instruction and training programs (within GLS models only).
- Mandating minimum supervised driving hours for learner drivers.
- Allowing a lengthy learner permit tenure and no fees to renew permits to discourage early licensure.
- Mandating supervisory driver requirements, including minimum age and driving experience, BAC limit and absence of recent licence disqualification.
- Recommending that learner drivers are only accompanied by a supervisory driver in the initial stages of learning, before allowing driving with multiple passengers.
- Restricting intermediate-licensed drivers from driving high-powered vehicles.
- Increasing penalties for driving offences for intermediate-licensed drivers.
- Removing age-based exemptions from GLS restrictions at all stages.
- Mandating display of licence status plates by both learner and intermediate-licensed drivers (e.g. *L*-plates and *P*-plates).
- Mandating maximum speed restrictions for both learner and intermediate-licensed drivers (potentially counterproductive).
- Mandating towing restrictions for both learner and intermediate-licensed drivers.

- Inclusion of graduated/multi-staged testing requirements, including knowledge tests, on-road practical tests and assessments, hazard perception tests, exit tests and retesting requirements.

Two GLS initiatives were found to be counterproductive, that is, research has shown increased crash risk associated with the following:

- Education initiatives that encourage early licensure.
- Extensive professional instruction in the absence of sufficient private supervised driving experience.

In addition to these existing GLS components, several initiatives that are not currently included within GLS models, were identified in the literature that offered potential new directions:

- Mobile phone restrictions.
- Age and size of vehicle recommendations.
- Education and training methods from fleet initiatives, including peer group discussion and EcoDriving programs.
- Initiatives for recidivists, including education-based programs, alcohol and seat-belt interlocks and vehicle immobilisation or impoundment programs.

Other GLS considerations

The review identified a number of additional issues that require consideration before implementing changes in existing GLS models.

Impact on mobility

Some GLS requirements and restrictions may result in independence and mobility trade-offs for the driver, their families and friends and the wider community, when alternative transport arrangements are required. To gain road safety benefits, GLS restrictions must be balanced with individual and society mobility wants and needs such that the road safety benefits offset mobility loss. Potential, albeit short-term, effects on the mobility of young drivers, including differing needs of rural and disadvantaged groups, should be considered in relation to GLS initiatives. Notably, a recent US survey suggests that the majority of young drivers under a GLS are able to undertake the activities they wish to and have not been unduly affected by either night-time driving or peer passenger restrictions.

Social acceptability and community support

GLS restrictions have previously been perceived to be socially unacceptable and likely to lack community support. However, the overseas experience suggests this is not the majority opinion and that attitudes and acceptance of GLS models improve after they have been in place for some time (about one year). In North America, it is reported that GLS models are now considered both beneficial and sensible, with many groups recognising that it is important for restrictions to be somewhat strict, such that motivation and incentive to obtain a full licence may otherwise be undermined. Moreover, surveys of both young drivers and parents affected by a GLS show a high level of support for GLS restrictions. There is some indication that night-time driving restrictions have higher approval than passenger restrictions, although a lack of awareness of associated risks (by both young drivers and their parents) appears to account, in part, for this finding. It is argued that GLS models that include a high level of parental involvement maximise many of the GLS benefits.

Compliance and enforcement

While non-compliance to various GLS requirements and restrictions is widely reported by many young drivers and their parents, generally most report violating conditions only rarely. Moreover,

substantial reductions in crash risk have still been reported. Mandating GLS regulations reinforces their importance and can empower both young drivers and their parents to assert their safer driving preferences, which may otherwise be difficult without mandatory requirements. It is suggested that the effectiveness of GLS legislation is compromised when there is little visible Police enforcement of GLS conditions supported by appropriate penalties. However, in the US, official enforcement is perceived as secondary only and somewhat minor compared to parental enforcement and self-imposed enforcement.

The comparative value of this finding for Australia and Europe, however, is unclear, given the often older minimum ages that apply for unsupervised driving compared to the US (e.g. 18 years for Victoria, Norway and Sweden compared to around 16 years or younger in the US). Nonetheless, it is appropriate that driving should be viewed separately from other rights for young people due to their disproportionately high risk of being involved in an injury crash during their early stages of unsupervised driving.

Applicability to all new drivers

A particular objection to the introduction of GLS restrictions has been that they apply to all young drivers seeking a licence, including responsible drivers. However, research indicates that many crashes involving young drivers result from inexperience, rather than deliberate risk taking on behalf of the young drivers. Most novice drivers involved in fatal crashes do not have prior traffic violations or records and are not readily distinguishable from other drivers. That is, up until the time of the crash they are not necessarily identifiable as problem or irresponsible drivers.

Terminology

Careful use of GLS terminology is recommended so as not to promote negative views of GLS initiatives. It should be emphasised that the GLS process aims to provide lower-risk conditions in which to learn to drive.

Conclusions

The present review clearly shows that implementing graduated driving requirements and restrictions on young drivers contributes to reductions in their crash and injury risk. Factors, such as contrasting methodologies, delayed and declining licensing rates and lack of distance travelled data make it difficult to quantify the extent of the contribution. Moreover, individual GLS components of a certain phase of the system do not function in isolation from other components within that phase or components in other phases. Deciding on the nature and extent of restrictions and requirements for a particular GLS model requires careful consideration of a wide range of options and, potentially, further assessment of their effectiveness based on the existing licensing system and the community affected by it.

The two GLS initiatives considered to be most effective in North American jurisdictions are the night-time driving and peer passenger restrictions. Neither of these components is included in any current Australian GLS. Many of the concerns these initiatives have raised in Australia either do not apply (e.g. exemptions are included for family, work and education purposes) or have been found to be largely unfounded (e.g. significant reductions in crash risk have been reported despite some problems with compliance and enforcement difficulties). The key to maximising support for, acceptance of and compliance with GLS models will largely depend on extensive and quality education to raise awareness and understanding of the issues that the GLS aims to address.

While Australian GLS models have undoubtedly contributed to crash reductions, young drivers are still over-represented in our crash statistics, especially at night and with peers. The literature indicates that these statistics can be directly addressed by specific GLS initiatives. Therefore, it is time to review current models and to develop, implement and evaluate additional GLS initiatives in

order to maximise their road safety benefits and better address the over-involvement of young Australians in current crash statistics.

1. INTRODUCTION

1.1 Nature of the young driver problem

Foss and Goodwin (2003) have recently declared that “the most dangerous thing most teenagers will ever do is drive, or ride as a passenger with a teen driver” (p.79). Indeed in motorised countries worldwide, vehicle-related crashes are the leading cause of death of young people. In Victoria, Australia, for example, 27% of fatally-injured drivers in 2000 were aged 18-25 years, even though this age group comprised only 14% of all licensed drivers (VicRoads, 2002a). Moreover, the main causes of young driver crashes relate to their own driving errors and inexperience (NHTSA, 1998).

There are several reasons why young drivers have higher crash risks (Gregersen & Bjurulf 1996; VicRoads, 2002c; Waller, 2003):

- They are inexperienced.
- Their cognitive and perceptual skills and other competencies needed for driving are not sufficiently developed.
- They do not recognise or accurately assess risk.
- They are less adept at anticipating, perceiving, identifying and, therefore, reacting to hazards.
- They are over-confident and over-estimate their own driving ability.
- They drive under more dangerous conditions (more night-time driving, social driving and passenger distractions).
- They take more intentional or unintentional risks (high speeds, close following distances, aggressive driving).

Newly-licensed drivers are most vulnerable to road crash involvement in their first year of unsupervised driving, particularly during the first 6-8 months (Mayhew, Simpson & Pak, in press; TOI, 1998; VicRoads, 2002c). As their driving experience increases, their crash involvement decreases. This pattern is common worldwide (Williams, 1999). In Victoria, Australia, Diamantopoulou, Skalova, Dyte and Cameron (1996b) found that drivers with less than one year of driving experience were significantly more likely to be involved in a casualty crash than experienced drivers. This is consistent with research in the United States (US) and Canada (Mayhew et al, in press; Williams, 1995). These findings imply that first year drivers should be a primary target of road safety initiatives, such as those implemented through graduated licensing systems.

Licensing jurisdictions are increasingly becoming aware that traditional methods to address the young and novice driver problem, such as education and training, have not worked (e.g. Williams, 1995). In 1995, Mayhew and Simpson suggested that licensing practices should shift emphasis from formal education-based training to strategies that increase supervised on-road driving experience, given experience has been found to reduce novice driver crash involvement (Christie, 2001; Ferguson, Leaf, Williams & Preusser, 1996; Gregersen, Berg, Engstrom, Nolen, Nyberg, & Rimmo, 2000). Around this time, several new systems began to emerge that incorporated a range of requirements and restrictions that were generally more stringent for the first year of unsupervised driving, due to the increased crash risk for these drivers.

1.2 Nature of graduated licensing systems

Graduated licensing systems (GLS) aim to reduce the crash risk of novice drivers by imposing restrictions on their driving to moderate the effects of youth and inexperience. Driving restrictions are gradually phased out as experience is gained. This allows novices to commence driving in

lower-risk situations with gradual lifting of restrictions until a full licence is obtained. This creates a safer environment to allow the acquisition of skills while providing time for the benefits associated with maturity and experience to develop. In this way, a GLS is similar to an apprenticeship system (Simpson, 2003).

GLS incorporate initiatives with several aims (NHTSA, 1998):

- To expand and lengthen the learning process.
- To reduce exposure to risk.
- To improve driver proficiency.
- To provide greater motivation for safe driving.

Researchers such as Simpson (2003) and Preusser and Leaf (2003) distinguish the GLS from other licensing systems by inclusion of a compulsory learner phase (allowing only supervised driving) and an intermediate licence phase¹ (allowing restricted driving) prior to full licensure². GLS have been increasingly adopted by licensing jurisdictions around the world. Common to nearly all jurisdictions is this three-phase process. The main differences between the various GLS models are related to the lengths of time required at each stage and the types of restrictions implemented during the stages prior to full licensure.

1.3 Standard GLS components

GLS components are generally identified as belonging to one of two broad categories:

- Pre-licence measures (those which primarily encourage more supervised driving experience).
- Post-licensing measures (those which place restrictions on driving to allow experience to be gained under lower-risk circumstances).

Based on the work of Williams and Mayhew (1999), the Insurance Institute for Highway Safety (IIHS, 1999, 2001b) proposed a three-stage GLS model for the North American context, identifying several of these GLS components. The model is presented in Figure 1.1. As shown, a minimum learner period of six months and both night-time driving and passenger restrictions for intermediate-licensed drivers were recommended. While a minimum intermediate licence period was not specified, it was recommended that night-time driving and passenger restrictions should not be lifted until age 18 years, regardless of whether full licence status is available prior to this age.

A fundamental purpose of GLS is to provide new drivers with the opportunity to gain driving experience under conditions that minimise their exposure to risk (Simpson, 2003). The essential defining features are the multi-phase system and gradually eased restrictions from higher-risk driving activities within a multi-stage licensing system. While Williams (2000) indicates that the major GLS contributions to crash reductions are delaying the age of full licensure and restrictions on late night driving and driving with peer passengers, a large variety of additional conditions or restrictions may be included. These likely contribute to the great variability of findings of GLS effectiveness. This variability is not trivial, with Preusser (1996) highlighting that the crash risk for 15-17 year-olds in the US varies by more than 100% across states. Therefore, it is important to

¹ As a number of terms are used in different jurisdictions to refer to the interim licensing phase (e.g. 'probationary', 'provisional' or 'intermediate licence'), for the sake of consistency, the term 'intermediate licence' is used throughout this document to refer to any interim phase(s) situated between learner and full licence phases. It is also identified as the first phase of unsupervised driving.

² The term 'unrestricted licence' is also used in the literature to refer to a full licence. Only the term 'full licence' is used in the present report, both for consistency and as some restrictions still apply to full licences in many jurisdictions (e.g. BAC limits).

distinguish GLS models that appear to be most effective, and those components that maximise this effectiveness.

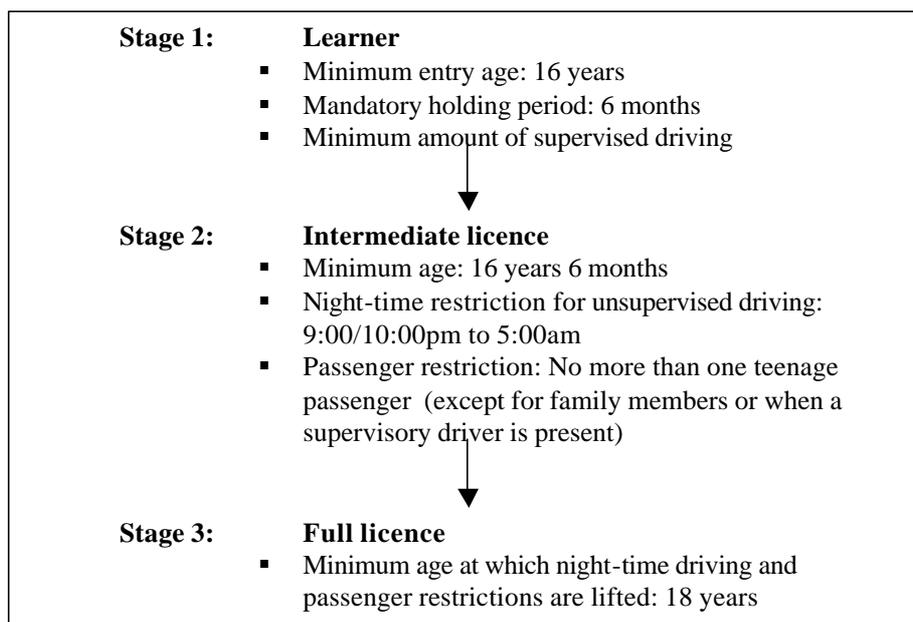


Figure 1.1 The US/IIHS GLS Model

1.4 Aim and structure of present report

By North American standards, Australian licensing jurisdictions have only a limited application of GLS. While licensing is staged, night-time driving and passenger restrictions are not included. However, some Australian GLS models include components that are not present in US models, or that are only applied to a limited extent.

The primary aim of the current project was to review the effectiveness of overseas GLS models and the effectiveness of individual GLS components in reducing the crash risk of young drivers, with a focus on the learner and intermediate licence phases. A further objective was to provide a detailed description of current Australian GLS models and their specific requirements and restrictions.

Of note, the project did not aim to provide specific recommendations for changes to existing Australian GLS models. Rather, the current report presents a review of what is known regarding GLS effectiveness and what has been recommended in the literature to date.

The focus of the review is on graduated car licensing systems (i.e. GLS initiatives for motorcycle and heavy vehicle licences are excluded). Gender differences are not specifically reviewed, although some differential findings are included when necessary to address theoretical underpinnings.

The report provides a brief history of GLS (Chapter 2). It is followed by detailed description of Australian GLS models, including a summary table to compare individual components of the learner and intermediate licence phases (Chapter 3). These details were current as of September 2002; although changes to the Victorian GLS introduced in December 2002 are also included. Chapter 4 provides a review of overseas GLS models that have been subject to evaluations of their effectiveness in reducing young driver crash risk. It is followed by details of a comprehensive range of GLS options for learner and intermediate licence phases, including a discussion of any

literature that indicates the individual effectiveness of a component within a GLS model, and any related issues and concerns (Chapter 5). Chapter 6 highlights some additional considerations that need to be addressed when introducing new GLS initiatives. Some final comments are provided in the concluding chapter (Chapter 9). Appendix 1 provides a list of all abbreviations included in the report.

2. BRIEF HISTORY OF THE GLS

Graduated licensing was first proposed in the early 1970s by Waller in response to the over-representation of young drivers in crashes in North Carolina (Waller, 2003). The US National Highway Traffic Safety Administration (NHTSA) developed a GLS model in the mid-1970s offering US states financial incentives to adopt it (Williams, 2000). While many US jurisdictions adopted some components, Maryland was the first to enact formal GLS laws, in 1978 (McKnight & Peck, 2002). However, New Zealand is recognised as the first licensing jurisdiction in the world to adopt the full GLS scheme (including night-time driving and passenger restrictions), in August 1987 (Langley, Wagenaar & Begg, 1996). This was followed by jurisdictions in Canada in 1994 and the US in 1996 (McKnight & Peck, 2002) as a means to address to the marked over-representation of young drivers involved in casualty and fatal crashes in North America (Williams, 1999). Table 2.1 presents a summary of the known year of implementation of some form of GLS in North American jurisdictions. As shown, while basic GLS models were in operation as early as pre-1975, new systems have been implemented as recently as the past year.

Table 2.1 Introduction dates of GLS models in North American jurisdictions

Effective Date	Jurisdiction	Effective Date	Jurisdiction
Pre 1975	New York	1998	Massachusetts
1979	Maryland	1998	New Hampshire
1989	Oregon	1998	Ohio
1994	Nova Scotia	1998	South Carolina
1994	Ontario	1999	Delaware
1996	Florida	1999	Indiana
1996	Kentucky	1999	Iowa
1996	New Brunswick	1999	Kansas
1996	Virginia	1999	Minnesota
1997	Connecticut	1999	Nebraska
1997	Georgia	1999	Newfoundland
1997	Michigan	1999	Pennsylvania
1997	North Carolina	1999	Rhode Island
1997	Quebec	1999	South Dakota
1998	British Columbia	2000	New Mexico
1998	California	2000	Okalahoma
1998	Illinois	2000	Yukon
1998	Louisiana	2001	Missouri
1998	Maine	2001	New Jersey

Note: Adapted from Meehan & McGinnis (1999), Williams & Mayhew (1999)

Many countries in Europe have also now introduced some form of GLS, including:

- Austria.
- Denmark.
- Finland.
- France.
- Great Britain.
- Germany.
- Luxembourg.
- Northern Ireland.

- Norway.
- Portugal.
- Spain.
- Sweden.
- Switzerland.

In Australia in 1983, the Federal Office of Road Safety proposed a five-stage GLS process, which included passenger and night-time driving restrictions for unsupervised drivers (Drummond, 1994). This was not adopted by any of the states or territories. In 1989, the Federal Department of Transport, in an attempt to improve road safety, proposed a 10-point package including zero BAC restrictions, minimum permit and licensing ages, and a minimum permit holding period. From that time, Australian jurisdictions began to adopt some of these components, however, to date none conform to the full GLS concept (Haworth, 1994).

Overall, GLS have had a significant impact on crash reductions. Nonetheless, evaluation research shows much variation in the effectiveness of various GLS operating in different jurisdictions. This can, in part, be attributed to great variations in the GLS components included in each, the different ages that apply to various stages, and the different methodologies employed. The range of systems in place are explored in the following chapter for jurisdictions that have undergone GLS evaluations. (For further details on the history of the GLS and development of the learner and intermediate licence phases, see: Mayhew, 2003; Preusser & Leaf, 2003; Simpson, 2003; Waller, 2003.)

3. GLS MODELS IN AUSTRALIAN JURISDICTIONS

The following sections describe the GLS models in operation in Australia. In general, all systems were found to include a learner phase followed by an intermediate licence phase. However, the systems differ due to the number of phases and varying conditions that apply during each phase.

There are four basic models in operation:

1. Victoria (VIC), South Australia (SA), Northern Territory (NT), Queensland (QLD) & Tasmania (TAS):
 - Learner phase.
 - Intermediate licence phase.
 - Full licence.
2. New South Wales (NSW):
 - Learner phase.
 - First intermediate licence phase.
 - Second intermediate licence phase.
 - Full licence.
3. Western Australia (WA):
 - First learner phase.
 - Second learner phase.
 - Intermediate licence phase.
 - Full licence.
4. Australian Capital Territory (ACT):
 - Learner phase.
 - Intermediate licence phase.
 - Optional second intermediate licence phase.
 - Full licence.

The following sections provide an overview of each model and the requirements and restrictions applicable at the various stages in each jurisdiction. In the final section, details of requirements and restrictions for the learner and intermediate licence periods are summarised in tables for ease of comparison.

3.1 Victoria

Victoria's current GLS was introduced in 1990 (VicRoads, 2002d). It involves a three-phase GLS model as depicted in Figure 4.1. The three-phase structure is similar to most other Australian and overseas GLS models. A number of new initiatives for intermediate-licensed drivers were introduced in December 2002, although these have not yet come into effect.

3.1.1 Learner permit

In Victoria, a learner permit is obtained by passing a road law knowledge test and eyesight test. The permit's duration is 10 years. It is renewable in the first five years after expiry by paying a fee. If it expires for five or more years, a test must be undertaken to re-acquire it. It must be held for a minimum period of six months if the holder is under 25 years of age or for three months for those over 25 years. Applicants must be a minimum age of 16 years and can only drive under the supervision of a driver who has been fully licensed for at least two years. The supervisory driver

must remain under a .05 BAC limit. For the learner, a zero BAC limit applies and *L*-plates must be displayed on the front and rear of their vehicle. Learner drivers cannot tow a trailer, caravan or other vehicle.

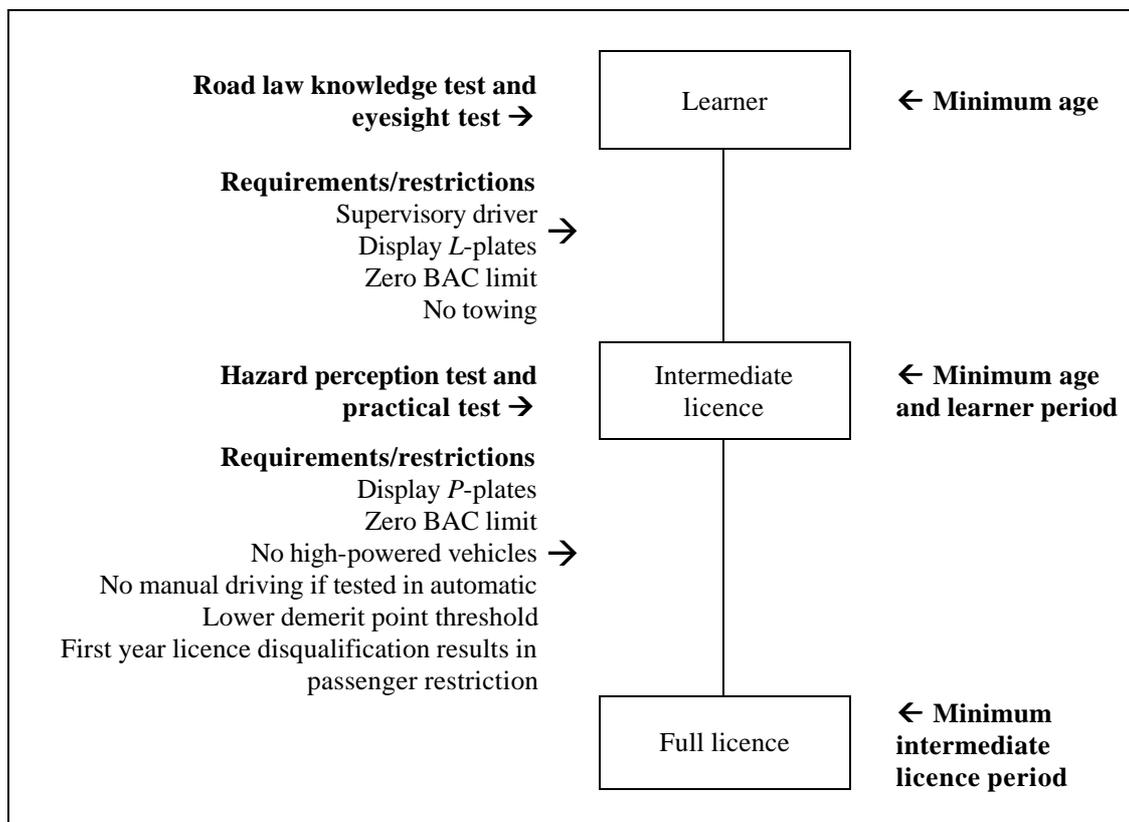


Figure 3.1 Victoria's three-stage GLS model

3.1.2 Intermediate licence

The intermediate licence is called a probationary licence. It is obtained by passing an on-road practical test and a hazard perception test. Its duration is three years. Applicants must be a minimum age of 18 years. Intermediate-licensed drivers are subject to a zero BAC limit and must display *P*-plates on the front and rear of their vehicle. In addition, unlike any other Australian jurisdiction, intermediate-licensed drivers must not drive a high-powered vehicle³. If tested in a vehicle with an automatic transmission, they are restricted to driving a vehicle with automatic transmission until full licensure. There are no restrictions on towing. Intermediate-licensed drivers are also subject to a lower demerit point threshold than fully-licensed drivers⁴. If five demerit points are accumulated in a 12-month period, drivers must opt for a three-month licence suspension

³ A high-powered vehicle is a motor vehicle (not a motorcycle or motor trike) that has a power to mass ratio exceeding 125 kilowatts per tonne or has an engine capacity exceeding 3.5 litres per tonne of the unladen mass of the motor vehicle (VicRoads, 2002d). The high-powered vehicle restriction and requirement to display *P*-plates do not apply to members of the Police force in the course of duty when driving a Police vehicle or to a member of the Country Fire Authority when driving a vehicle in the course of fire-fighting operations (VicRoads, 2002d).

⁴ Fully-licensed drivers have a demerit point threshold of 12 points Australia-wide.

or a 12-month good driving record⁵. For the good driving option, if any demerit points are incurred, the licence is suspended for six months (i.e. double the length of time of the previous option)⁶. If an offence results in a licence suspension or cancellation during the first year of licensure, a passenger restriction applies when returning to driving. The passenger restriction allows the intermediate-licensed driver to carry only one passenger for a 12-month period.

3.1.3 Full licence

Drivers achieve full licence status after three years as an intermediate-licensed driver. Therefore, the minimum age for Victorians to acquire a full licence is 21 years.

3.2 New South Wales

New South Wales has a four-stage licensing system including two mandatory intermediate licence stages (RTA, 2002). It is the only Australian jurisdiction to follow this GLS model. The system was introduced in July 2000, which extended the previous intermediate licence phase of one year to two years minimum. Additional tests were incorporated, namely, a hazard perception test undertaken during the intermediate licence period and an exit test to proceed to a full licence. The four-stage model is represented in Figure 3.2.

3.2.1 Learner permit

The minimum age for acquiring a learner permit is 16 years and it must be held for a minimum of six months before applying for an intermediate licence. It expires after three years, after which the applicant must re-sit the knowledge test in order to regain the permit. Applicants must pass both a knowledge test and eyesight test. Learners can only drive when accompanied by a fully-licensed driver who is under the .05 BAC limit and must complete a logbook (provided) to record a minimum of 50 hours driving. The logbook encourages driving under a range of specified conditions, such as driving at night and in the wet. The logbook must be signed by instructors or supervisors, with penalties applying for misleading or false information. *L*-plates must be displayed on the front and rear of the vehicle. Learner drivers must remain under a .02 BAC limit, must not exceed 80 km/h⁷, and are restricting from towing.

3.2.2 First intermediate licence

Intermediate licences are called provisional licences. To progress to the first stage of intermediate licensure (*PI*) learner drivers must pass an on-road practical test. The *PI* licence is available from age 17 years and must be held for a minimum of 12 months before applying for the second stage of intermediate licensure. *PI* drivers must display red *P*-plates on the front and rear of their vehicle, must not exceed 90 km/h, and a .02 BAC limit applies. They can only tow a maximum of 250 kg and, if tested in an automatic vehicle, cannot drive a manual vehicle. A lower demerit point threshold also applies, such that, when four or more demerit points accumulate, the licence is suspended for three months.

⁵ Previously, the threshold was not reduced but stricter penalties resulting in licence suspensions applied. These penalties included an extension of the intermediate licence period by the duration of the suspension plus six months. (At the time of writing legislation had been passed lowering the demerit point threshold but it has not yet come into effect.)

⁶ The good driving option is a feature of the demerit point system and applies to all drivers Australian-wide.

⁷ NSW Learner drivers are also not permitted to drive in Centennial Park.

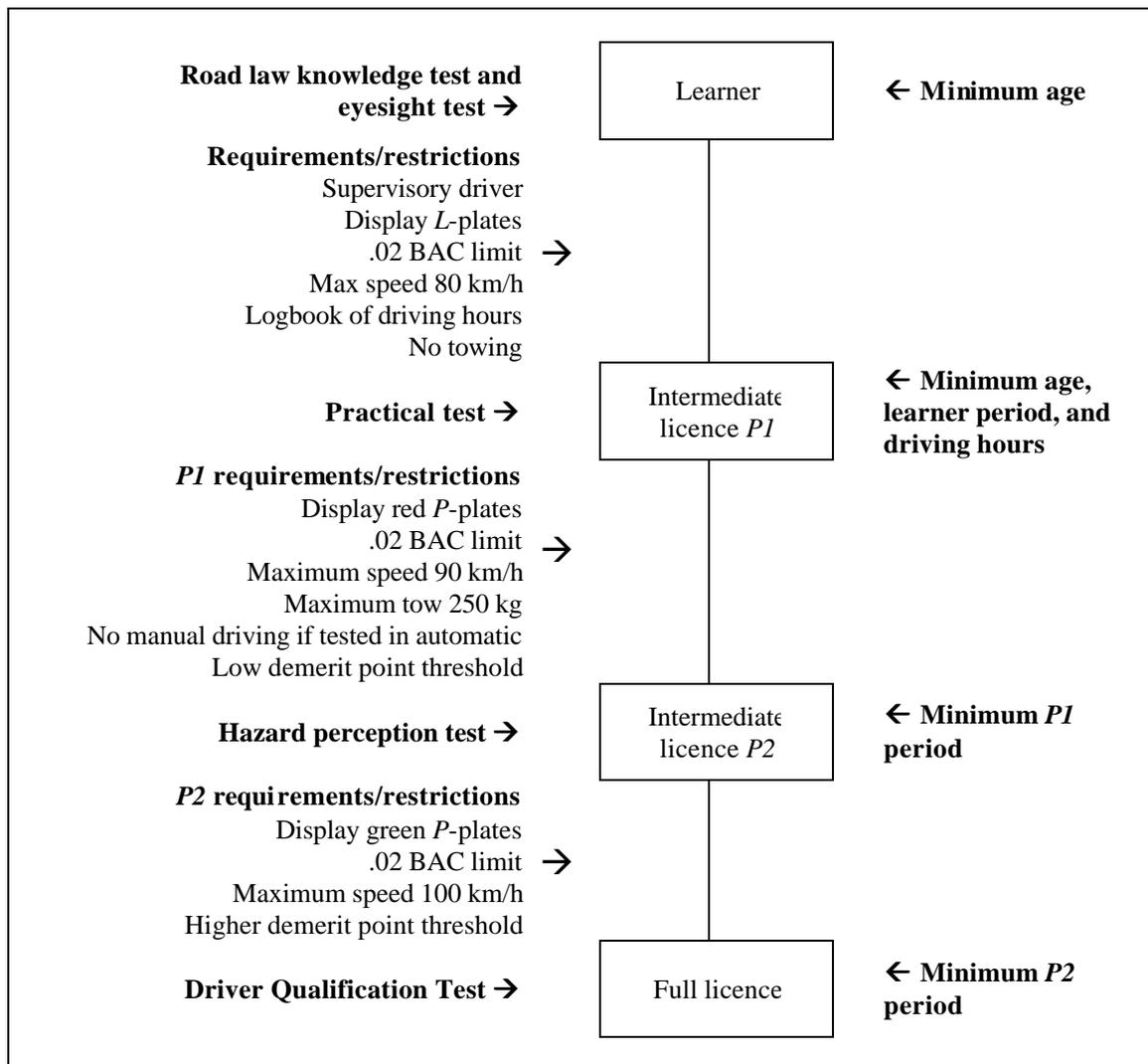


Figure 3.2 New South Wales' four-stage GLS model

3.2.3 Second intermediate licence

The second intermediate licence (*P2*) is first available one year post-*P1* licensure; therefore, at a minimum age of 18 years. It must be held for a minimum of two years before applying for a full licence. The *P2* licence is only issued once the driver has passed a hazard perception test. *P2* drivers are required to display green *P*-plates on the front and rear of their vehicle. A .02 BAC limit still applies; however, the speed limit restriction is raised to 100 km/h. Towing and transmission restrictions are lifted. During *P2*, the demerit point threshold rises to seven demerit points for a three-month licence suspension (i.e. still below the full licence threshold but higher than the *P1* threshold).

3.2.4 Full licence

A full licence is first available two years post-*P2* licensure. The minimum age to acquire a full licence is 20 years. To qualify, drivers must pass an exit test known as the Driver Qualification Test (DQT). The DQT is a comprehensive test that is described as a combination of an advanced hazard perception test, a further test of the road rules and knowledge of safe driving practice.

3.3 Western Australia

Components of a GLS were recently introduced in Western Australia in February 2001 (DPIWA, 2001). The WA GLS model is a four-phase process involving two stages as a learner, as shown in Figure 3.3. The practical test is positioned within the extended supervised driving period rather than as an endpoint to the learner period. In this way, it reduces the potential for learners to undertake test-focused instruction only. In addition, the practical test itself is designed to be difficult to pass without extensive driving experience (Drummond, 2001).

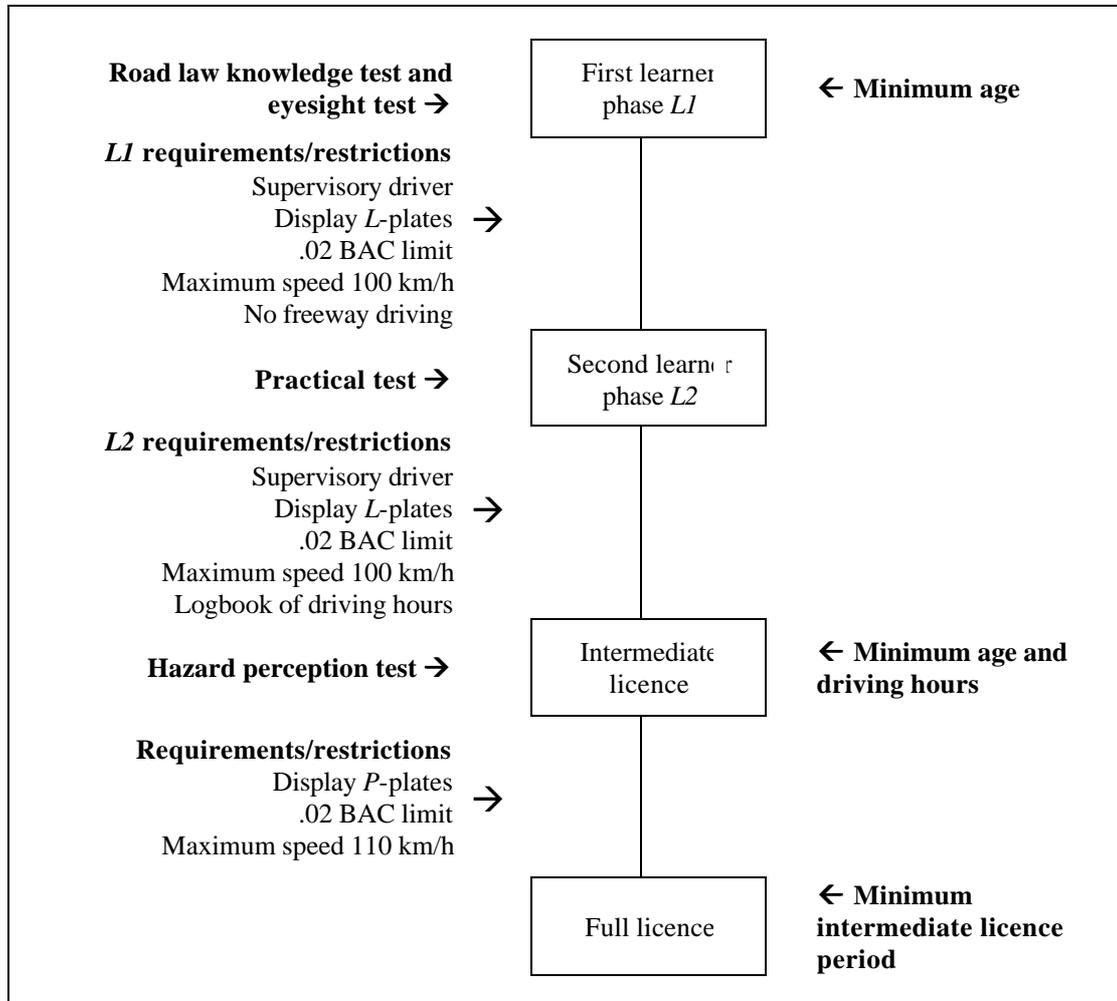


Figure 3.3 Western Australia's four-stage GLS model

3.3.1 First learner permit

The minimum age for applying for a learner permit is 16 years. Applicants must pass a theory and eyesight test. During this first stage as a learner driver (*L1*), an instructor or a driver who has been fully licensed for at least four years must accompany the learner. *L*-plates must be displayed at the front and rear of the vehicle, drivers must remain under a .02 BAC limit, must not exceed 100 km/h, and are restricted from driving on freeways. There is no minimum *L1* period before applying to progress to the second learner stage (*L2*). A single permit is issued for the combined learner period (*L1* and *L2*), which is valid for 12 months but can be renewed free of charge.

3.3.2 Second learner permit

Applicants for the second stage learner permit (*L2*) must pass an on-road practical test. Similar to *L1*, the learner must be accompanied by an instructor or a driver who has been fully licensed for at least four years, must display *L*-plates, not exceed 100 km/h, and remain under a .02 BAC limit; however, the freeway driving restriction is lifted. During this stage, 25 hours of supervised driving must be completed and recorded in a logbook (provided), which encourages driving experience in several specified road environments, such as driving at night and on freeways. The logbook must be signed by instructors or supervisors, with penalties applying for misleading or false information. There is no minimum *L2* period. Therefore, as there is also no minimum *L1* period, there is no specified minimum period as a learner driver.

3.3.3 Intermediate licence

The intermediate licence is called a provisional licence. To progress to an intermediate licence, applicants must pass a hazard perception test and submit a completed logbook. The minimum age is 17 years. The intermediate licence extends for two years. Drivers must display *P*-plates on the front and rear of their vehicle, remain under a .02 BAC limit, and are restricted to a maximum speed of 110 km/h.

3.3.4 Full licence

Drivers achieve full licence status after two years as an intermediate-licensed driver. Therefore, the minimum age to acquire a full licence is 19 years.

3.4 Australian Capital Territory

Over the period of 1999 to 2001, the Australian Capital Territory introduced an optional three or four-phase process that includes non-mandatory options for intermediate licensure, allowing drivers a choice of GLS process (Urban Services, 2002). As depicted in Figure 3.4, drivers have two options to progress from the learner to intermediate licence phase and a further option sometime into the intermediate licence period to change licence requirements/restrictions.

3.4.1 Learner permit

The minimum age for application for a learner permit in the ACT is 15 years 9 months. All applicants must undergo a driver education course and must pass a theory and eyesight test. The permit is valid for two years, after which applicants must resit the tests. It must be held for a minimum of six months before applying for an intermediate licence. Learner drivers must be accompanied by a fully-licensed driver and display *L*-plates at the front and rear of their vehicle. They are subject to a .02 BAC limit and are restricted to towing a maximum of 750 kg GVM.

3.4.2 Intermediate licence

Intermediate licences are called provisional licences. The minimum intermediate licence age is 17 years. There are two means to obtaining the first, mandatory intermediate licence (*P1*) in the ACT. Applicants must either pass a one-hour, on-road practical test or undertake Competency Based Training and Assessment (CBTA). For the latter, drivers must undertake training and demonstrate 22 competencies pertaining to on-road driving skills with an accredited driving instructor. This involves some logbook requirements. Intermediate licences are issued for three years. Intermediate-licensed drivers must display *P*-plates on the front and rear of their vehicle. A .02 BAC limit applies and they are restricted to towing a maximum of 750 kg GVM. A lower demerit point threshold also applies, such that licence suspension for three months will occur if four or more demerit points are accumulated.

After holding the intermediate licence for six months, drivers can voluntarily complete an education course, *Road Ready*, to progress to an optional second intermediate licence phase (*P2*). This allows them to remove their *P*-plates and the demerit point threshold is increased to eight

points before suspension (i.e. higher than the first intermediate phase but still below the 12 point threshold for fully-licensed drivers).

3.4.3 Full licence

A full licence is issued after the three year minimum intermediate-licensed period. The minimum age at which a full licence becomes available is 20 years.

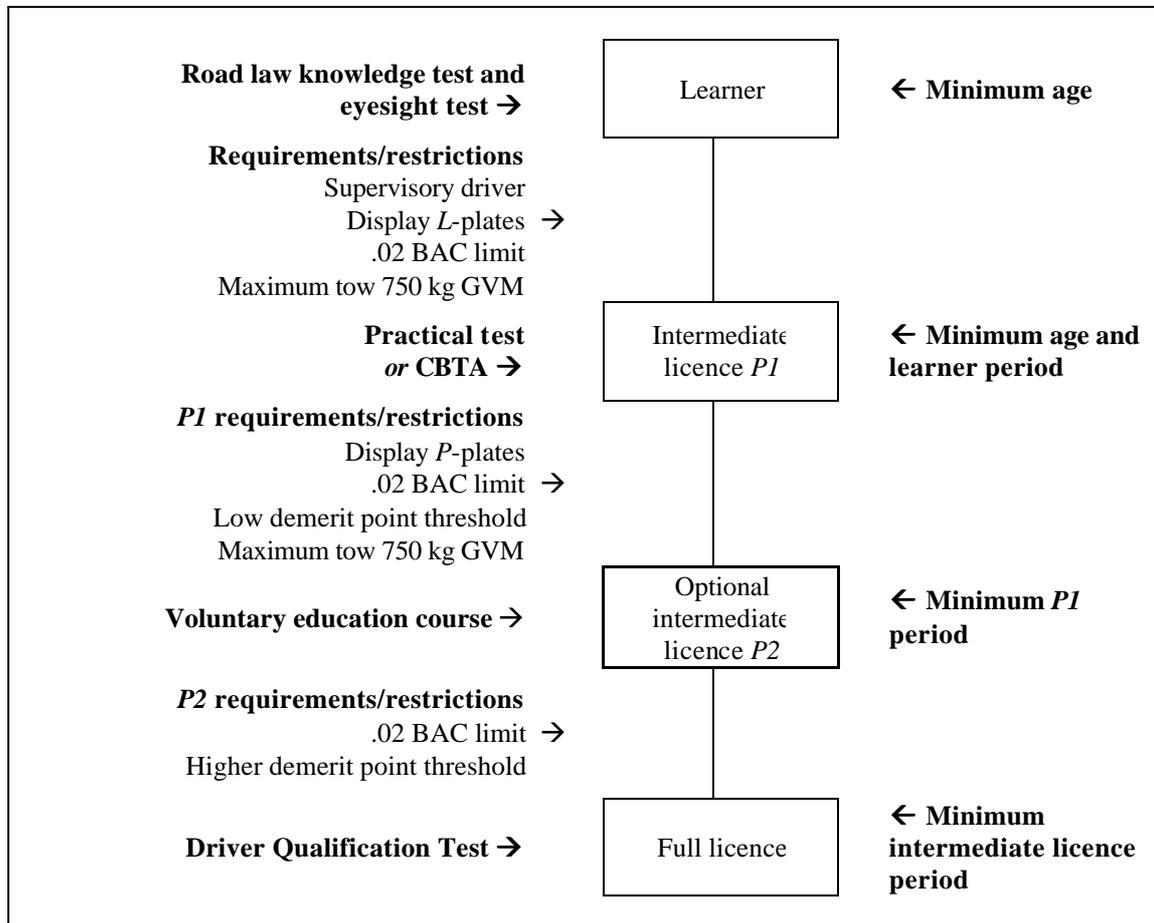


Figure 3.4 Australian Capital Territory's optional three or four-stage GLS model

3.5 South Australia

A new GLS was formally introduced in South Australia in 1989 (Transport SA, 2002a). It is essentially a three-phase model and, therefore, similar to Victoria's GLS structure, although, like the ACT model, there are two options to gain an intermediate licence. While the model is current at the time of writing, the South Australian Government has announced that it is currently planning on introducing a number of new licensing requirements as a part of a new safety package (Government of South Australia, 2002).

3.5.1 Learner permit

The minimum age to obtain a learner permit in South Australia is 16 years. It is obtained by passing a road law knowledge test. A three, six or nine-month permit can be obtained and is

renewable on paying a fee. There is currently no minimum holding period⁸. A fully-licensed supervisory driver who is restricted to a BAC limit of .05 must accompany the learner. *L*-plates must be displayed on the front and rear of the vehicle. Learners are restricted to a zero BAC limit and a maximum speed of 80 km/h.

3.5.2 Intermediate licence

Intermediate licences are called provisional licences. The minimum age to obtain an intermediate licence is 16 years 6 months. Similar to the ACT, there are two means to obtaining an intermediate licence. Applicants must either pass a one-hour, on-road practical test or complete CBTA. For the CBTA option, drivers must undertake training by an accredited driving instructor. This comprises 23 training modules of on-road driving skills, usually requiring a minimum of 10-12 sessions. Some logbook requirements are also included. Once the practical test or CBTA has been completed, the intermediate licence is issued. This must be held for a minimum of 12 months before applying for a full licence. Drivers must display *P*-plates on the front and rear of their vehicle. A zero BAC limit and a 100 km/h speed restriction apply. A lower demerit point threshold of four points applies, which attracts a licence suspension of six months.

3.5.3 Full licence

A full licence can only be obtained once the driver has turned 19 years of age and has held an intermediate licence for a minimum of 12 months.

3.6 Northern Territory

Changes were progressively made to the Northern Territory's licensing system during the late 1980s to 1994. The Northern Territory essentially has a three-phase GLS model, however, there are two options to progress through the learner and intermediate licence phases: traditional licensing processes (theory and practical testing) or government-subsidised education and training (DIPENT, 2002). Drivers are encouraged to complete the latter, known as the Driver Training and Licensing (DTAL) program. At the intermediate licence level, the DTAL option allows the driver to obtain a full licence faster than the traditional approach. The effectiveness of the different approaches has not been reported but a review is currently being planned (Chandler, 2002).

3.6.1 Learner permit

The minimum age for obtaining a learner permit in the NT is 16 years. By the traditional pathway, applicants must pass a theory and eyesight test. By the DTAL pathway, applicants must complete 6 hours of theoretical CBTA in addition to the eyesight test. The permit is valid for one year, after which applicants must re-qualify for a new permit. It must either be held for a minimum of six months or no minimum applies if drivers choose the DTAL CBTA path to intermediate licensing. All learner drivers must be accompanied by a fully-licensed supervisory driver and must display *L*-plates on the front and rear of their vehicle. A zero BAC limit applies. Learners are restricted to a maximum speed of 80 km/h unless they are undertaking a DTAL practical session.

3.6.2 Intermediate licence

Intermediate licences are called provisional licences. The intermediate licence can be obtained after passing an on-road practical test at a minimum age of 16 years 6 months by the traditional path or as early as 16 years if choosing the DTAL CBTA option. The latter requires an additional four hours of off-road sessions and successful completion of the CBTA program, for which 12 lessons are subsidised by the Government. The licence lasts for one year. Intermediate-licensed drivers must display *P*-plates on the front and rear of their vehicle, and a zero BAC limit and

⁸ A minimum holding period for learner permits is one of the many proposed changes currently under consideration.

maximum speed restriction of 100 km/h apply. If tested in an automatic vehicle, they cannot drive a manual vehicle until on a full licence.

3.6.3 Full licence

A full licence is obtained after 12 months of intermediate licensure, therefore, from a minimum age of 17 years for DTAL CBTA graduates or 17 years 6 months via the traditional pathway.

3.7 Queensland

Queensland's current GLS came into effect in 1999 (Transport QLD, 2002). It is a three-phase model, similar to Victoria's GLS structure, although with differing individual requirements and restrictions.

3.7.1 Learner permit

The learner permit in Queensland can be obtained from 16 years 6 months after passing a theory and eyesight test (Transport QLD, 2002). The permit is valid for one year and is renewable simply by paying a fee. The minimum holding period is six months. A fully-licensed supervisory driver or a driver who has held an intermediate licence for at least one year must accompany learner drivers. Learners are subject to a zero BAC.

3.7.2 Intermediate licence

Intermediate licences are called provisional licences. The intermediate licence is obtained by passing an on-road practical test at the minimum age of 17 years. Drivers under 23 years of age must hold the intermediate licence for three years. For drivers over 23 years but not yet 24 years the minimum holding period is two years, and for 24 year-old or older drivers, it is one year. Intermediate-licensed drivers must comply with a zero BAC limit. If an intermediate licence holder accrues four points in a 12 month period they are given the option of taking a three-month suspension, or a 12-month good driving record.

3.7.3 Full licence

A full licence can be gained after observing the minimum intermediate licence periods. The minimum age is 20 years.

3.8 Tasmania

In March 2002, Tasmania began implementing changes to their licensing system by introducing mandatory minimum hours (DTIERT, 2002). Currently, the GLS model has a standard three-stage structure, although planning is underway to implement a new system that comprises two phases within each of the learner and intermediate licence phases (i.e. *L1*, *L2*, *P1*, & *P2*) (Langford, 2002).

3.8.1 Learner permit

To obtain a learner permit, theory and eyesight tests can be conducted at 15 years 11 months of age. However, the permit cannot be issued until a minimum of 16 years of age (DTIERT, 2002). It is valid for three years, after which applicants must resit the tests. The permit must be held for at least six months before applying for an intermediate licence. A fully-licensed supervisory driver who has not had their licence suspended during the previous two years must accompany the learner driver. Learners must complete a logbook demonstrating the accumulation of 50 hours of supervised driving⁹. They must display *L*-plates on the front and rear of their vehicle and comply with a zero BAC limit. Learner drivers are not permitted to exceed 80 km/h or tow another vehicle, trailer or caravan.

⁹ Logbooks under the new system will also specify a range of driving conditions.

3.8.2 Intermediate licence

Intermediate licences are called provisional licences. To obtain an intermediate licence, drivers must pass a theory and on-road practical test in addition to providing a completed logbook. The tests can be conducted at 16 years 11 months of age; however, the licence cannot be issued until a minimum of 17 years of age. Drivers under the age of 22 years must hold the intermediate licence for three years. Drivers between 22-23 years must hold the licence until they reach 25 years of age. If aged 24 years or older, the minimum holding period is one year. A maximum speed restriction of 80 km/h and the zero BAC limit remain during the intermediate licence phase. Drivers must display *P*-plates at the front and rear of their vehicle. If they accumulate four demerit points in 12 months, the licence is suspended for three months. If this occurs in their first year of the intermediate licence, they must resit the knowledge and practical tests. If occurring after the first year the intermediate licence is extended for the period of the suspension.

3.8.3 Full licence

Once the minimum holding period has been observed a full licence is issued. The minimum age at which a full licence can be issued is 20 years.

3.9 Summary of learner and intermediate licence phase components

To aid comparison, the components of the learner permit and intermediate licence phases of the GLS model in each Australian state and territory are summarised in Tables 3.1 and 3.2 respectively.

Table 3.1 Summary of GLS components of Australian learner permits

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Minimum age	16 years	16 years	L1: 16 years L2: No	15 years 9 months	16 years	16 years	16.5 years	16 years
Mandatory education prior to applying	No	No	L1&L2: No	Yes	No	No or yes if CBTA option	No	No
Road law knowledge test	Yes	Yes	L1: Yes L2: No	Yes	Yes	Yes or no if CBTA option	Yes	Yes
Eyesight test	Yes	Yes	L1: Yes L2: No	Yes	No	Yes	Yes	Yes
Practical test	No	No	L1: No L2: Yes	No	No	No	No	No
Minimum length of learner period	6 months; 3 if 25+ years old	6 months	L1+L2: No	6 months	No	6 months or no if CBTA option	6 months	6 months
Maximum length of permit; Ability to renew	10 years; renewable	3 years; must resit test	L1+L2: 1 year; renewable	2 years; must resit test	3, 6 or 9 months; renewable	1 year; must resit test	1 year; renewable	3 years; must resit test
Mandatory education and instruction	No	No	L1&L2: No	No	No or yes if CBTA option	No or yes if CBTA option	No	No
Mandatory minimum driving hours	No	50 hours	L1: No L2: 25 hours	No	No or yes if CBTA option	No or yes if CBTA option	No	50 hours
Supervisory driver minimum requirements	Full licence for 2 years; .05 BAC limit	Full licence; .05 BAC limit	L1&L2: Full licence for 4 years	Full licence	Full licence; .05 BAC limit	Full licence	1 year intermediate licence	Full licence; no suspension for 2 years
Display L-plates	Yes	Yes	L1&L2: Yes	Yes	Yes	Yes	No	Yes
BAC limit (g/100ml)	Zero	.02	L1&L2: .02	.02	Zero	Zero	Zero	Zero
Maximum speed restriction	No	80 km/h	L1&L2: 100 km/h	No	80 km/h	80 km/h except in CBTA session	No	80 km/h
Towing restriction	Yes	Yes	L1&L2: Yes	750 kg GVM	No	No	No	Yes
Freeway restrictions	No	No	L1: Yes L2: No	No	No	No	No	No

Table 3.2 Summary of GLS components of Australian intermediate licences

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Minimum age	18 years	<i>P1</i> : 17 years <i>P2</i> : 18 years	17 years	17 years; 17.5 years <i>P2</i> option	16.5 years	16.5 years or 16 years if CBTA	17 years	17 years
Practical test	Yes	<i>P1</i> : Yes <i>P2</i> : No	No	Yes or CBTA	Yes or CBTA	Yes or no if CBTA option	Yes	Yes
Hazard perception test	Yes	<i>P1</i> : No <i>P2</i> : Yes	Yes	No	No	No	No	No
Knowledge test	No	<i>P1&P2</i> : No	No	No	No	No	No	Yes
Length of intermediate licence period	3 years	<i>P1</i> : 1 year <i>P2</i> : 2 years minimum	2 years	3 years	1 year minimum	1 year	3 years if aged <23 years; 2 years if 23-24 years; 1 year if >24 years	3 years if aged <22 years; if 22-24 years hold until 25 years; 1 year if >24 years
Display <i>P</i> -plates	Yes	<i>P1&P2</i> : Yes	Yes	Yes; No for <i>P2</i> option	Yes	Yes	No	Yes
Transmission restriction	Yes	<i>P1</i> : Yes <i>P2</i> : No	No	No	No	Yes	No	No
BAC limit (g/100ml)	Zero	<i>P1&P2</i> : .02	.02	.02	Zero	Zero	Zero	Zero
Maximum speed restrictions	No	<i>P1</i> : 90 km/h <i>P2</i> : 100 km/h	110 km/h	No	100 km/h	100 km/h	No	80 km/h
Towing restriction	No	<i>P1</i> : max 250 kg <i>P2</i> : No	1.5 x tail weight of vehicle	750 kg GVM	No	No	No	No
Vehicle power restriction	Yes	<i>P1&P2</i> : No	No	No	No	No	No	No
Night-time restrictions	No	<i>P1&P2</i> : No	No	No	No	No	No	No
Passenger restrictions	If licence disqualified in first year, one passenger only	<i>P1&P2</i> : No	No	No	No	No	No	No

Table 3.2 (cont.) Summary of GLS components of Australian intermediate licences

Component	VIC	NSW	WA	ACT	SA	NT	QLD	TAS
Post-intermediate licence education	No	<i>P1&P2</i> : No	No	No; Voluntary for <i>P2</i> option	No	No	No	No
Effect of suspensions on length of intermediate licence period	No	<i>P1&P2</i> : No	No	No	No	No	No	If first year must start again. After first year, extended by length of suspension
Lower demerit point threshold: Length of licence suspension (or 12 months good driving record option)	5 points in 12 months: 3 months	<i>P1</i> : 4 points: 3 months <i>P2</i> : 7 points: 3 months	No	4 points: 3 months; 8 points: 3 months for <i>P2</i> option	4 points: 6 months	No	4 points in 12 months: 3 months	4 points in 12 months: 3 months
Exit test	No	<i>P1</i> : No <i>P2</i> : Yes	No	No	No	No	No	No
Minimum age for full licence	21 years	20 years	19 years	20 years	19 years	17.5 years or 17 years if CBTA option	20 years	20 years

4. GLS EFFECTIVENESS IN OVERSEAS JURISDICTIONS

This chapter describes the various GLS models implemented in overseas jurisdictions and evaluations of their effectiveness as a road safety countermeasure. Licensing models are distinguished as GLS if they include compulsory learner and intermediate licence phases prior to full licensure. The focus is on GLS models that have been evaluated. Details of other models can be found elsewhere (e.g. Baughan & Simpson, 2002). The evaluations have been most successful in reducing crashes and fatalities, in one case over 50% (see Table 4.1 for a summary). Before reviewing these models, however, there are several issues to be raised in relation to the strength of the findings, in particular, regarding methodologies applied in the evaluations.

4.1 Difficulties in determining GLS effectiveness

Variations in evaluation results among jurisdictions may be due to a wide range of factors other than the GLS models in place (Shope & Molnar, 2003; Simpson, 2003). Methodologies vary from study to study and few are able to include patterns of driving exposure or distance-travelled measures. Results can be complicated by declines in population and licensing rates and other contributing factors that are difficult to quantify. In addition, a lengthy period following GLS implementation is necessary for reliable data. AGLS must be in place long enough for people licensed under the previous system to move out of the new one (be issued a full licence). This often includes people who rush to be licensed in the previous system, which may also artificially raise the licensing rate just prior to the GLS introduction and thus influence results for that period.

In addition, jurisdictions can differ on a number of levels before a GLS is implemented, which can also affect the nature or extent of change following a new GLS. These include general crash trends, licensing rates, distances travelled, and attitudes towards road safety - for the community at large, for the driving population and more particularly for young drivers. They can also differ in terms of the licensing systems (graduated or otherwise) in place prior to the introduction of the new GLS.

One particular example regards seat-belt use. In many US jurisdictions seat-belt use is not mandated, therefore, introducing a GLS that includes this requirement for novices would undoubtedly affect fatality rates even with low compliance, regardless of other GLS features (e.g. see Evans, 1996). Such an evaluation may have little comparative value for jurisdictions that already mandate seat-belt use for all drivers.

Furthermore, jurisdictions can differ in the types and nature of other restrictions on young people in general; that is, not just drivers. For example, in many US states in which licensing is possible at 16 years of age there are night curfews for young people that apply to various age ranges (e.g. for 13-17 year olds) and the legal drinking age is often 21 years. Therefore, it could be expected that night-time driving restrictions and BAC limits will have a differential effect on the crash involvement of intermediate-licensed drivers in these jurisdictions compared to, for example, Victorian drivers who are at least 18 years of age, can legally drink and have not been subject to state-wide night curfews.

Therefore, as concluded by Simpson (2003), we do not know how much of the variability in GLS effectiveness is attributable to differences in evaluation methodology, to the sites where studies have been conducted, or to the fundamental differences in the GLS programs themselves. Readers should be mindful of these issues when considering the research findings.

4.2 New Zealand

In 1987, New Zealand became the first country to introduce a full GLS, that is, a GLS that included night-time driving and passenger restrictions (Begg, Stephenson, Alsop, & Langley, 2001; Langley et al, 1996). Since May 1999, it applies to all new drivers (previously it only applied to drivers under 25 years of age). The learner permit can be obtained from age 15 years on passing written and oral knowledge tests and an eyesight test. Learners must be accompanied by a supervisory driver who has held a full licence for two years. Originally, the supervisor had to be at least 20 years of age, but this requirement was removed with the 1999 changes. Learners must display *L*-plates on their vehicle. They have a .03 BAC limit and a night-time driving restriction (10:00pm-5:00am). They are also subject to stricter penalties for traffic violations, including extensions of up to six months. The minimum learner period is six months. Prior to the 1999 changes, this could be reduced to three months if an approved driving course was completed.

The intermediate licence is obtained on passing an on-road practical test and lasts 18 months, although this can be reduced to 12 months if an approved driving course is completed. This option was introduced with the 1999 changes. A night-time driving restriction (between 10.00pm-5.00am) and passenger restrictions (no passengers under the age of 20 years unless they are dependents, a spouse or qualify as a supervisory driver) apply, unless accompanied by a supervisory driver¹⁰. A .03 BAC limit also applies at all times. A Chief Traffic Officer can extend the intermediate licence period by up to six months for traffic violations and can also provide exemptions for restrictions in cases of undue hardship (Baughan & Simpson, 2002). An on-road exit test focussing on higher-order skills must be passed to progress to a full licence (Baughan & Simpson, 2002). The minimum age for full licensure is therefore, 16 years 6 months if the driving course option is chosen, or 17 years for the traditional path.

An evaluation of the effectiveness of the New Zealand GLS was conducted prior to the 1999 changes by Langley et al (1996). Using hospital data for the period 1979-1992, serious injury crashes were compared for GLS drivers aged 15-19 years and 20-24 years to a control group of drivers aged 25 years and over who were licensed under the pre-GLS system. It was found that after the introduction of the GLS serious injury crashes reduced by around 23% for 15-19 year olds, 12% for 20-24 year olds and 16% for drivers aged 25 year olds and older. Assuming that the oldest driver group were not affected by the GLS conditions, it was concluded that at a net benefit of least a 7% reduction in serious injury crashes of 15-19 year olds (23%-16%) were attributable to the GLS.

Further positive effects were reported by Begg et al (2001) who compared 1980-1995 Police-reported crash data linked to hospital records to compare the crash involvement of pre and post-GLS drivers. Intermediate-licensed drivers under the new GLS had significantly fewer crashes at night, crashes that involved passengers of all ages and alcohol-related crashes compared to the equivalent pre-GLS group. Overall however, there was not a statistically significant difference in the proportion of crashes involving young casualties. For fully-licensed drivers, the GLS group also had significantly fewer crashes at night than their pre-GLS counterparts, however, there were no other differences.

A recent discussion by Begg and Stephenson (2003) emphasises that, since the introduction of the New Zealand GLS in 1987 (to 1998), both the number and rate¹¹ of serious injuries and fatalities of 15-24 year-old vehicle occupants have nearly halved. Notwithstanding other contributing factors,

¹⁰ Notably, the removal of the minimum age requirement for supervisory drivers results in an age overlap between supervisory drivers for learners and restricted passengers for intermediate-licensed drivers. That is, supervisory drivers can be a minimum age of 18 years 6 months, yet passenger restrictions apply to passengers under 20 years of age. Therefore, while the passenger restriction appears to limit carriage of peers, this may not apply if peers meet supervisory driver requirements.

¹¹ per 100,00 population

they state there is little doubt that the GLS has been the most important factor influencing this outcome.

4.3 North America

Differing licensing policies, laws and traffic environments between jurisdictions can present various problems for road and traffic authorities in neighbouring jurisdictions. (Notably, Australia is progressively standardising its laws and licensing procedures across jurisdictions; NRTC, 2000). However, a benefit of these circumstances is that they provide opportunities to compare and assess the effectiveness of differing licensing strategies between similar jurisdictions. This opportunity has driven much research in the US.

For example, Meehan and McGinnis (1999) found that in 1997 the proportion of teenage drivers involved in fatal crashes in US states without a GLS was 20% higher than that for states with a GLS. Furthermore, they noted that the success of GLS was more evident for male than female drivers. This was an important finding given the inflated over-representation of young male drivers in crash statistics.

More recently, Foss (2000) reported that all American jurisdictions that have enacted some form of GLS have been able to demonstrate crash rate declines for beginner drivers. The size of this effect has ranged from 7% to 32% across jurisdictions. Foss notes, however, that while learner and full licence GLS stages are similarly enacted throughout many jurisdictions in the US, intermediate licence components vary considerably and these differences contribute to the differing levels of effectiveness. The following sections detail a selection of these US GLS models, specifically, those that have undergone evaluation.

4.3.1 California

California introduced a GLS in 1998 that applies to all drivers under 18 years of age (ACSC, 2001; Bloch, Shin & Labin, 2000; Baughan & Simpson, 2002). The minimum entry age is 15 years on passing a knowledge and eyesight test. Learners must be accompanied by a fully-licensed supervisory driver who is at least 25 years of age. A minimum of 50 hours driving experience must be verified by a supervisory driver, including 10 hours at night. A .01 BAC limit applies. Learners must also complete a driver education course and at least six hours of professional driver instruction. The minimum learner period is six months.

Intermediate licences are obtained on passing an on-road practical test. Differing restrictions apply to the first six months and second six months, similar to a two-stage intermediate licence phase as in place in NSW. During the first stage, a night-time driving restriction (between 12:00am-5:00am) and a passenger restriction (no passengers under 20 years of age) apply unless a supervisory driver is present. During the second stage, these restrictions change so that the passenger restriction only applies during the night-time hours (12:00am-5:00am). For the entire intermediate licence phase a .01 BAC limit and more stricter penalties (including a one-month suspension and a restriction to supervised driving only) apply. A full licence is available from a minimum age of 18 years.

A preliminary evaluation of the effectiveness of the GLS was reported in press releases by the Automobile Club of Southern California (Bloch et al, 2000; see also Shope & Molnar, 2003). Crash rates in 1998-1999 were compared for 16 year-old drivers (the first cohort in the intermediate licence phase of the GLS) and 18 year-old drivers (who were not affected by the new GLS). The number of at-fault fatal and injury crashes of 16 year-old drivers was found to decline by 20% compared to 6% for 18-year old drivers. A further evaluation was conducted with 1998-2000 data using a similar method, except crashes involving peer passengers were also examined and data for 19 year-olds were used as the control (ACSC, 2001; see also Shope & Molnar, 2003). At-fault and injury crashes of 16 year-old drivers were found to have reduced by 24% and at-fault

property damage crashes by 17%. No equivalent declines were found for 19 year-old driver crashes.

4.3.2 Florida

Florida introduced a new GLS in 1996 that applies to all new drivers under 18 years of age (Baughan & Simpson, 2002; McCartt, Leaf, Farmer, Ferguson & Williams, 2001). It includes a minimum entry age of 15 years on passing a knowledge and eyesight test. Learners must be accompanied by a fully-licensed supervisory driver aged at least 21 years and must acquire a minimum of 50 hours supervised driving experience, including 10 hours at night. A .02 BAC limit applies (introduced in 1997). The learner phase has differing night-time restrictions for the first three months and remaining nine months, similar to a two-stage learner phase as in place in WA. During the first stage a night-time driving is restricted between 7:00pm-6:00am. Thereafter, the restriction commences at the later time of 10:00pm. The minimum learner period is 12 months (previously six months).

Intermediate licences are obtained on passing an on-road practical test and carry variable night-time driving restrictions dependent on age: between 11:00pm-6:00am for 16 year olds, and 1:00am-5:00am for 17 year olds. A .02 BAC limit and more serious penalties for restrictions apply, including an automatic restriction from driving except for business purposes if six demerit points are accumulated within 12 months. A full licence is available from a minimum age of 18 years.

Ulmer, Preusser, Williams, Ferguson and Farmer (2000) evaluated the effectiveness of Florida's GLS (prior to the changes in 2000) by comparing crash rates before and after its introduction. Crash rates were also compared with the neighbouring state of Alabama, which had not introduced a GLS. The overall findings indicated that the introduction of the GLS in Florida resulted in a 9% reduction in crashes amongst 15-17 year olds. The greatest effect was for 15 year olds, followed by 16 year olds, and then 17 year olds. Effects of the GLS were also found to be greater for night-time driving periods than for daytime driving periods. This was attributed to the dramatic reduction in exposure that the night-time driving restrictions effected.

McCartt et al (2001) reported on other significant changes following the introduction of Florida's GLS (also prior to the changes in 2000). Young drivers licensed under the GLS system were found to have obtained learner permits at a younger age, to have held these permits for longer periods of time, and to have logged more practice miles prior to licensure. Self-reported drink-driving involvement also significantly decreased. In addition, crash rate reductions were found to be greater in urban areas than in rural areas, although reasons behind this result were yet to be determined.

4.3.3 Kentucky

Kentucky introduced a GLS in 1996 for all new drivers under 18 years of age (Baughan & Simpson, 2002). Commencement of the learner phase is from 16 years and requires applicants to pass both a knowledge test and eyesight test. A supervisory driver aged 21 years or older must accompany the learner. A night-time driving restriction (between 12:00am-6:00am) exists for drivers under the age of 18 years. Learners must not drive under the influence of drugs, including a .02 BAC limit for alcohol consumption. The minimum learner period is approximately six months (180 days).

Intermediate licences are available on passing an on-road practical test. The night-time driving restriction (for drivers under 18 years of age) and .02 BAC restriction (for drivers under 21 years of age) remain in place during this phase. A lower demerit point threshold also applies. Within one year of obtaining the intermediate licence, drivers are required to complete a four-hour graduated licensing education course. A full licence is available from 18 years of age (with the .02 BAC limit still in place until 21 years of age).

A preliminary evaluation of the effectiveness of the Kentucky GLS compared crash data three years prior and two years following the introduction of the GLS (Kentucky Transportation Centre, 1999, cited in Baughan & Simpson, 2002). For 16 year olds, the per-driver crash rate reduced by 33.5%, crashes during the restricted night-time hours reduced by 33.5%, fatal crashes by 27.6%, and injury crashes by 34.5%. Teenage alcohol-related crashes also decreased by 30.5%.

4.3.4 Maryland

Maryland introduced a GLS in 1979 (for all new drivers under 18 years of age) and is recognised as the first US state to do so (albeit it a limited GLS model as it does not include passenger restrictions) (Baughan & Simpson, 2002; McKnight & Peck, 2002). Some changes were made in 1999, however the effectiveness of these changes has not yet been reported. From age 15 years 9 months applicants can obtain a learner permit on passing a knowledge and eyesight test. The first of two handbooks to assist parents is issued focusing on instruction of basic driving skills. All learners must be accompanied by a fully-licensed supervisory driver who is at least 21 years of age. A .02 BAC limit applies. The minimum learner period was 14 days prior to 1999 and is now four months. Since 1999, the learner must also undertake driver education and demonstrate at least 40 hours of driving experience.

An intermediate licence is obtained on passing an on-road practical test. A night-time driving restriction (between 12:00am-5:00am) and a .02 BAC limit apply. The second handbook is issued to parents at this time, which focuses on instruction of more complex driving skills. In order to progress to a full licence, intermediate licence holders must be a minimum of 18 years of age and demonstrate 12 months of conviction-free driving, up from six months prior to 1999.

McKnight, Hyle and Albricht (1983, cited in Baughan & Simpson, 2002) analysed crash data for the years 1975-1982. Two GLS requirements were evaluated, namely, the night-time driving restriction and the six-month violation-free requirement. They found that daytime crashes for 16 and 17 year-old drivers were initially reduced by 5%. Moreover, this reduction was not attributed to a change in exposure, although, long-term effects beyond the intermediate licence phase were not found. No crash reduction was found during the night-time restricted hours for those 16 and 17 year olds to whom the restriction applied. There was, however, a 10% reduction in convictions for traffic offences of 16 year-old drivers and a non-significant reduction of 5% for 17 year-old drivers.

4.3.5 Michigan

Michigan introduced a GLS in 1997 for new drivers under 18 years of age (Baughan & Simpson, 2002; Shope, Molnar, Elliot & Waller, 2001). It allows commencement of the learner phase from the age of 14 years 9 months after passing an eyesight and health test. Learners must be accompanied by a supervisory driver who is a parent/guardian only or a fully-licensed driver over 21 years of age that they have appointed. Learners must participate in a two-phase driver education program, comprising a total of 24 hours of theory sessions and six hours of practical sessions. They must accumulate 50 hours of supervised practice, including 10 hours at night. The minimum learner period is six months.

An intermediate licence can be applied for from age 16 years. Applicants must meet a requirement to be violation and crash-free in the previous 90 days and pass an on-road practical test. A night-time driving restriction (between 12:00am-5:00am) applies. A full licence can be applied for after six months at a minimum age of 17 years. Applicants must be free of serious traffic violations and at-fault crashes for 12 consecutive months.

Shope et al (2001) examined crash data for 16 year-old drivers one year prior and two years following the introduction of the Michigan GLS. They found a significant decline in the crash rate¹², which, adjusted for population changes, represented an overall crash risk reduction of 25%

¹² per 1,000 population

following implementation of the GLS. Significant risk reductions were also reported for fatal and non-fatal injury crashes (24%); crashes during the day (24%), evening (21%) and at night (53%); and for single-vehicle (29%) and multi-vehicle (23%) crashes. Although alcohol-related crash rates remained low, they did not show significant differences. Shope et al concluded that substantial crash reductions were likely attributable to the GLS, particularly the night-time driving restriction.

4.3.6 North Carolina

North Carolina's GLS was implemented in December 1997 (Foss, Feaganes, & Rodgman, 2001). It applies to all drivers under the age of 18 years. The minimum entry age is 15 years on completion of an approved driver education course. A high school diploma or equivalent (including a Driving Eligibility Certificate issued by public schools) is also a pre-requisite. A .02 BAC limit applies. The learner phase has differing restrictions for the first six months and second six months, similar to a two-stage learner phase as in place in WA. During the first six months a night-time driving restriction (9:00pm-5:00am) applies. This restriction is lifted during the second learner stage. Seat-belts must be worn by drivers and passengers throughout the entire learner phase. The minimum learner period is 12 months.

An intermediate licence can be obtained provided the preceding six months as a learner is free of traffic violations. A .02 BAC restriction and night-time driving restriction (between 9:00pm-5:00am) apply and all occupants must wear seat-belts. The minimum holding period is six months. Intermediate-licensed drivers must have a consecutive six months violation-free period to progress to full licensure.

Foss et al (2001) evaluated initial effects of the introduction of North Carolina's GLS on the crash patterns of 16 year olds. Police-reported crash data and other data sources compared crash patterns during the one-year period prior to the introduction of the new GLS (1996-1997) to a one-year post-GLS period (1999), including data for 25-54 year olds as a control. Analyses were adjusted to account for population growth, general crash trends, enforcement variation, other safety initiatives, and number of licensed 16 year-old drivers. Foss et al found that fatality crash rates¹³ declined by 57%, and minor or no injury crashes by 23%. Crash rates during the night-time restricted period reduced by 43% and daytime crashes by 20%. In addition, it was noted that single-vehicle crashes reduced by a greater extent than multiple-vehicle crashes. Overall, therefore, substantial crash reductions were reported.

4.3.7 Nova Scotia

Nova Scotia introduced a GLS in 1994 (Vance, 1996). Like New Zealand, it applies to all drivers regardless of age. It requires a minimum entry age of 16 years and the passing of a knowledge and eyesight test. The learner phase requires a fully-licensed supervisory driver but does not allow any other passengers. A zero BAC limit applies and stricter penalties for traffic violations, including six-month suspensions. The minimum learner period is six months, but can be reduced to three months if an approved driver training or education program is completed.

An intermediate licence can be obtained at age 16 years 6 months (or 16 years 3 months for program options) on passing an on-road practical test and lasts for two years. A night-time driving restriction (between 12:00am-5:00am) and a zero BAC limit apply. Stricter penalties apply for traffic violations, including suspensions that result in having to recommence the two-year period. A six-hour approved driver training or education program must be completed to graduate to a full licence.

Evaluation of the GLS found a 24% decline in 16-year-old driver crashes, a decline of 19% in all novice driver crashes regardless of driver age, and a 37% reduction in crashes over the first three

¹³ per 10,000 population

years of the introduction of the licensing system (IIHS, 1999; Mayhew, Simpson, & des Groseilliers, 1999). Recent re-evaluations of the impact of the GLS (IIHS, 2002b) indicated a 51% crash reduction among learner drivers (16-18 years of age), a 9% crash reduction during novice's (16-19 year olds) first year of driving and an 11% reduction during their second year of driving. The 51% reduction was attributed to the requirement for learners to drive while supervised and to fewer novices being fully licensed than under the previous licensing system. The benefits seen during the novice phase were attributed to the night driving restriction, which was reported to have reduced crashes by half during the restricted hours.

4.3.8 Ontario

Ontario introduced a GLS in 1994 (Baughan & Simpson, 2002; Boase & Tasca, 1998). Like New Zealand and Nova Scotia, it applies to all drivers irrespective of age. The GLS process commences with a learner permit, which can be obtained from age 16 years on passing a knowledge and eyesight test. Learners must be accompanied by a supervisory driver who has at least four years experience and is under a .05 BAC limit. Learners must meet a zero BAC limit and are subject to a night-time driving restriction (between 12:00am-6:00am). Intervention initiatives (warnings and interviews) follow traffic violations, including suspensions of up to 90 days. Learners can only drive on freeways if accompanied by a qualified driving instructor. The learner phase lasts for 12 months or can be reduced by up to eight months following an approved education course.

An intermediate licence is obtained on passing an on-road practical test and lasts for 12 months. The zero BAC limit and intervention initiatives continue to apply. An additional on-road practical test (twice the length of the intermediate licence test) must be passed to progress to full licence (Baughan & Simpson, 2002).

Boase and Tasca (1998) evaluated crash risk one year prior and one year following the introduction of Ontario's GLS (1993-1995). Fatality crashes were found to decrease by 6%, injury crashes by 24% and property damage crashes by 33%. Moreover, a 31% reduction in total crash rates¹⁴ for all young drivers (learners and intermediate-licensed) and a 27% reduction in alcohol-related crashes were found, as well as a 62% reduction in crashes during night-time restricted hours and a 61% reduction in freeway crashes by learner drivers.

4.4 Europe

Similar to North American jurisdictions, licensing models in Europe vary from country to country. Only a few can be considered to represent GLS models. The following sections detail European GLS models that include a compulsory learner phase and intermediate licence phase and that have undergone evaluation.

4.4.1 Finland

Finland introduced a limited GLS in 1990 (Keskinen, Hatakka, Katila, Laapotti & Peräaho, 1999). While it comprises three phases, only education and training initiatives are required to progress through the phases. The first phase, equivalent to the learner phase, commences from 17 years 6 months. Learners must be accompanied by a fully-licensed supervisory driver who is either a qualified instructor or a parent/guardian. They must complete 20 25-minute theory sessions with qualified instructors and a minimum of 30 25-minute practical sessions, either with the instructors or with parents/guardians. No additional licence restrictions apply.

A second phase, equivalent to an intermediate licence phase, commences on completion of the learner phase education and training requirements. No additional licence restrictions apply. Between six months to two years into the intermediate licence phase, drivers must complete additional education and training. This includes a one-hour, on-road practical session, three hours

¹⁴ per 10,000 licensed novice drivers

off-road at an approved training centre, and four theory sessions. A driving style computer test and self-evaluative questionnaire must also be completed. These are not exit tests that can prevent progression to full licensure if failed, rather they provide feedback to the driver. The aim of the program is on defensive, anticipatory and ecological driving, with a focus on attitudinal/motivational aspects of driving. A full licence is issued after completion of the education and training program.

Keskinen et al (1999) evaluated the effectiveness of Finland's GLS based on longitudinal survey data and claims data from all Finnish insurance companies for drivers qualified prior and following the GLS introduction. While there was little evidence of an effect during the first year, differences were reported in the long term. For the four-year period following introduction of the GLS, a 25% decrease in crashes on slippery roads for 18-20 year-old males and a 50% decrease for males aged over 20 years was found. An 18% decrease was found for 18-20 year-old females. There was no significant change for females aged over 20 years. Similar percentage decreases were reported for crashes in the dark. The extent to which the reductions could be contributed to the GLS was complicated by the finding that there was a downward trend in crashes in Finland in general during the analysis period. However, crash reductions in the 2-4 years following the program were more marked than for the general crash trend.

4.4.2 Northern Ireland

Northern Ireland introduced its GLS as early as 1967, with the most recent changes being implemented in 1998 (Hewitt, 1994; Hewitt & Ferguson, 1992). The learner phase commences from 17 years of age on completion of knowledge and eyesight tests. Learners must be accompanied by a qualified supervisory driver and must comply to a 45mph speed restriction. They must also display *L*-plates on their vehicle. There is no minimum learner period.

The intermediate licence can be obtained (from age 17 years) on passing an on-road practical test. *R*-plates (indicating a restricted licence) must be displayed on the vehicle and the 45mph speed restriction remains. Stricter penalties apply for traffic violations, including an extension of the intermediate licence period of up to 12 months. The intermediate licence is held for 2 years (increased from 12 months in 1998), after which time a full licence is obtained.

An evaluation into the effectiveness of the GLS, with a focus on the intermediate stage, was reported by Hewitt and colleagues (Hewitt, 1994; Hewitt & Ferguson, 1992). The research was conducted when the intermediate licence period extended for 12 months and examined the five-year period post-intermediate licensing. Compared to a control group, no differences were found in the overall crash rates¹⁵ of intermediate-licensed drivers in the first year of driving. However, of these crashes, those involving intermediate-licensed drivers were more likely to result in no injuries compared to controls and crashes in consecutive years (2-5 years). Overall, while some positive findings were reported, given that the study did not include comparisons of pre and post-GLS crash rates, the results are inconclusive regarding the effectiveness of introducing the GLS.

4.4.3 Norway

Norway's current GLS was implemented in 1994, which, similar to Finland, focused on training initiatives (Baughan & Simpson, 2002). The learner phase commences from 16 years of age (lowered from 17 years of age previously). Learners must be accompanied by a supervisory driver who has held a licence for five years and is at least 25 years of age. *L*-plates must be displayed on the vehicle. Learners must undertake mandatory training comprising 9.5 hours of theory and practical sessions, including two hours in darkness and on slippery roads.

An intermediate licence can be obtained from 18 years of age on passing an on-road practical test and lasts for two years. Serious traffic violations can result in licence cancellation and the need to

¹⁵ per annual mileage

re-take the practical test and recommence the two-year period. Intermediate-licensed drivers must undertake mandatory training comprising five practical sessions in addition to 1.5 hours of training in darkness and three hours of skid-pan training.

An evaluation of the GLS was conducted by Sagberg (2000). It was found that 54.5% of learners utilised the lower learner age minimum to commence learning before 17 years of age. However, there was only a small increase in supervised driving experience (by number of sessions and distance travelled). No reduction in crash risk per kilometre was found.

4.4.4 Sweden

Sweden's limited GLS was introduced in the early 1970s, with the most recent changes implemented in 1993 (Gregersen, 1997, 2003). At this time, the minimum age for applying for a learner permit was reduced from 17 years 6 months to 16 years while keeping the minimum licensing age at 18 years. Learners must be accompanied by a supervisory driver who is aged 24 years or older and has been licensed for five years. All learners must undergo a half-day skid-pan training course. No additional licence restrictions apply.

Applicants can apply for intermediate licensure at a minimum of 18 years of age on passing an on-road practical test. The licence is essentially a full licence with no additional restrictions, however, any serious traffic violation during the first two years leads to a cancellation of the licence (Gregersen, 2003). The minimum age at a full, unrestricted licence, therefore, is 20 years.

Gregersen (1997) evaluated the effects of the change in learner age, based on survey and Police-reported crash data. Gregersen found that 45-50% of the learner population utilised the lower minimum learner age to commence learning prior to 17 years 6 months of age. Furthermore, those drivers who started learning early were found to have acquired about 120 hours of driving experience on average compared to those who started after 17 years 6 months who averaged only about 40 hours, and compared to the pre-GLS average of just under 50 hours. Moreover, these early learners had about a 40% lower crash rate¹⁶ as intermediate-licensed drivers than the later learners. The study found that drivers making use of the lowered age limit had a tendency to come from a higher socio-economic group. After adjusting for this factor, the crash risk benefit was still estimated to be substantial: about a 35% reduction. A recent evaluation of crash trends in Sweden from 1988-1998 has confirmed these crash reduction benefits (Murray, in press).

4.5 Summary of reported crash reduction effects

Table 4.1 summarises the range of crash reduction effects reported in evaluations of the various GLS models, identifying the target/evaluation groups.

Notably, unlike New Zealand and most North American jurisdictions and similar to Australian jurisdictions, the European jurisdictions do not include night-time driving or passenger restrictions in their GLS models. The range of crash reduction effects reported suggests that differing GLS requirements and restrictions contribute to differences in GLS effectiveness. Nonetheless, the range of reductions reported suggests that there are potentially significant benefits to be gained from implementing some form of GLS.

¹⁶ per mile

Table 4.1 Reported crash reduction effects of overseas GLS models

Jurisdiction	Target/Evaluation group	Crash reduction findings (minimum)
California	16 year-old drivers	20%
Finland	18-20 year-old male drivers	25%
	18-20 year-old female drivers	18%
Florida	15-17 year-old drivers	9%
Kentucky	16 year-old drivers	34%
Maryland	16-17 year-old drivers	5%
Michigan	16 year-old drivers	25%
New Zealand	15-19 year-old drivers	7%
North Carolina	16 year-old drivers (fatalities)	57%
	16 year-old drivers (minor, no injury)	23%
Northern Ireland	17 year-old drivers	inconclusive
Norway	18-20 year olds	no change
Nova Scotia	16 year-old drivers	24%
Ontario	Learner and intermediate licensed drivers	31%
Sweden	18-20 year-old drivers	35%

5. EFFECTIVENESS OF INDIVIDUAL GLS COMPONENTS

5.1 Identifying individual component effectiveness

As identified in Chapter 4, there are many evaluations that report on the effectiveness of particular GLS models in reducing novice driver crashes. Hedlund, Shults and Compton (2003) clearly state that no additional research is needed to justify the need for GLS. Given the success of GLS, it is useful to determine which components are the strongest contributors to this success, that is, to consider individual GLS elements on their own merits.

Individual GLS requirements and restrictions do not function independently. Rather they work together as a system. NHTSA (1998) has asserted that effective graduated systems primarily work on four levels:

1. They increase the learning period to maximise driving experience and maturity of the driver before a full licence is issued.
2. They reduce crash risk exposure by requiring novices to accumulate important experience in lower-risk situations.
3. They improve driver proficiency by encouraging practice and by having multi-level testing, requiring well-developed basic skills before moving on to more advanced skills, and by delaying retesting after failures.
4. They increase the motivation for safe driving by rewarding good driving (progressively lifting restrictions) and imposing penalties for violations.

While it is advantageous to explore the individual contribution of particular GLS initiatives, it must be emphasised that the effectiveness of any individual component introduced into an existing GLS model will largely depend on the combination of components already inherent in the existing model.

The difference in minimum age requirements in particular may reduce the applicability of many overseas research findings on other GLS components to Australian GLS models. Most overseas jurisdictions allow unsupervised driving at much younger ages than most Australian jurisdictions. In North America intermediate licences are usually issued from 16 years or 16 years 6 months, whereas in Australia more often the equivalent minimum is 17-18 years (with the exception of South Australia and the Northern Territory). In New Zealand this minimum is even lower at only 15 years 6 months. Given that age alone is directly related to crash risk (e.g. Maycock, Lockwood & Lester, 1991; Williams & Ferguson, 2002), these differences reduce the ability to generalise research findings of GLS component effectiveness.

Further, while in New Zealand and Canada, for example, restrictions apply to all new drivers (of any age), most US jurisdictions relax restrictions for drivers aged 18 years or older (Simpson, 2003). Some Australia jurisdictions also relax their restrictions, but not until the early 20s. Again this reduces the ability to generalise research findings.

There are several other issues associated with extrapolating results of evaluations carried out on one GLS as relevant to other GLS models. There is a lack of research on individual elements of GLS and that it is difficult to isolate these effects as GLS comprise multiple components that differ from model to model (Foss & Goodwin, 2003). Not only is almost every GLS different, but so too can be the nature of conceivably similar restrictions. For example, while many jurisdictions now

include night-time restrictions, these vary greatly, commencing from as early as 9:00pm to as late as 1:00am with similarly differing end times.

Moreover, most of the methodological concerns addressed in relation to the GLS model evaluations also apply here. In addition, the road safety contribution of many of the components was difficult to determine as often several new components were introduced simultaneously in new or revised GLS and, therefore, any individual effects could not be isolated.

McKnight and Peck (2002) have cautioned that approximately half of the reduction in crashes immediately following changes to a licensing system can be attributed to the reduction in the number of learners obtaining their permit. The decline in licence holders following a change to a licence system should be taken into consideration when interpreting the safety benefits of implementing GLS.

Foss (see discussion in McKnight & Peck, 2002) has noted that, while “it may never be possible to disentangle the separate effects of individual elements... we can turn to both conceptual and theoretical principles for guidance, mixing in available research results where they are available” (p.37, McKnight & Peck 2002). The present review focuses on such literature that can add to our understanding of the role and likely effectiveness of specific GLS components.

Waller, Olk and Shope (2000) make a meaningful distinction between the learner and intermediate licence components. Young driver crash risk is attributed to both youth and inexperience (e.g. Drummond & Yeo, 1992; Maycock et al, 1991; Simpson, 1996). According to Waller et al, components of the learner phase particularly target the inexperience factor by allowing driving only in the lowest risk driving conditions and requiring extensive supervised practice. Intermediate phase components build on these initiatives in addition to targeting the intentional risk-taking behaviours more characteristic of youth, particularly by including more severe penalties for deliberate traffic violations (considered to act as motivators of safer driving; Ferguson, 2003).

The following sections examine an extensive range of GLS components, as listed in Table 5.1. First, learner phase components are examined, second, intermediate licence components, third, components that apply to both these phases and, finally, some potential initiatives not yet included within GLS models.

5.2 Components of the learner phase

5.2.1 Increasing supervised driving experience

Increasing the amount of supervised driving experience during the learner phase is a critical objective of the learner phase of any GLS model. Learner drivers, while under supervision, have the lowest level of crash risk (VicRoads, 2000a). UK research has estimated that crash risk in the first year of unsupervised driving is at least 20 times higher than in a supervised driving environment (Forsyth, Maycock, & Sexton, 1995). Current research in Sweden places this figure even higher, finding a 33 times greater risk of an injury crash after obtaining an intermediate licence compared to the learner phase (Gregersen, Nyberg & Berg, in press). Therefore, the supervised learner period is the safest time to gain driving experience. If sufficient experience is not gained during this period, this transfers learning to one of the least safest driving periods, namely, the first few months of unsupervised driving.

Table 5.1 Individual GLS components examined in present report

Licensing phase	Component
Learner phase	<ul style="list-style-type: none"> • Increasing supervised driving experience <ul style="list-style-type: none"> - Mandating a minimum learner period - Increasing the minimum learner period - Lowering the minimum learner age - Raising the minimum intermediate licensing age - Mandating minimum driving hours - Removing processes that encourage early licensure • Supervisory driver requirements <ul style="list-style-type: none"> - Age and driving experience - BAC limit - Absence of licence disqualification • Professional driving instruction • Multiple passengers restriction
Intermediate licence phase	<ul style="list-style-type: none"> • Extending the intermediate licence period <ul style="list-style-type: none"> - Increasing the minimum period of intermediate licensure - Raising the minimum age for full licensure • Night-time driving restrictions • Peer passenger restrictions • High-powered vehicle restriction • Good driving record requirement • Increased penalties for offences • Lower demerit point threshold • Extension of licensure following suspension
Both learner and intermediate licence phases	<ul style="list-style-type: none"> • Age-based exemptions from restrictions • Display of licence status plates • Zero BAC limit • Maximum speed restrictions • Mandatory seat-belt use • Towing restrictions • Testing requirements <ul style="list-style-type: none"> - Knowledge tests - On-road practical tests - Hazard perception tests - Exit tests or requirements - Retesting • Education, instruction and training • Enforcing compliance with restrictions
Potential GLS initiatives for both phases	<ul style="list-style-type: none"> • Mobile phone restriction • Age and size of vehicle recommendations • Education and training methods from fleet initiatives • Initiatives for recidivists

The process of gaining more driving experience during the learner period is achieved largely by increasing the length of the learner permit period. Strategies to encourage greater experience include:

- Mandating a minimum learner period.
- Increasing the minimum learner period.
- Lowering the minimum learning age.

- Raising the minimum intermediate licensing age.
- Mandating minimum driving hours.
- Removing processes that encourage early licensure.

Mandating a minimum learner period

Simply mandating a minimum learner period, even if only for six months, is likely to increase learner driving experience. In 1997, driving experience was compared for learners in NSW, who have a minimum permit-holding period of six months (for those aged under 25 years), and learners in South Australia (under both traditional and CBTA systems), who have no mandatory holding period. The results showed that the mean duration of supervised practice for learners undergoing their licence tests was 42 hours in NSW and only 28 hours in South Australia (Austroads 1999). The mandatory minimum learner period is likely to have influenced this finding.

Increasing the minimum learner period

McKnight and Peck (2002) report that increasing the length of the learner period and the amount of supervised practice can reduce crash risk. From their review, they identified 11 countries that were found to have a per capita reduction in crashes following the extension of their learner phase. Reductions ranged from 5-32%. McKnight and Peck, concluded that the reduced crash risk associated with increasing the length of the learner period was due to both the improved skills developed during the increased supervised practice period and the subsequent delay in licensure.

Lowering the minimum learner age

In 1993, Sweden lowered the age at which a learner permit could be obtained from 17 years 6 months to 16 years while keeping the licensing age at 18 years. Following this initiative, the only change to their licensing system at that time, Sweden experienced an overall 17% reduction in crash risk for all novice drivers (per 10 million kilometres) argued to be due to about 50% of novices utilising the extended training period (Gregersen et al, 2000). Crash rates per 1000 drivers for those under the new compared system were reduced by 20.8% in comparison to crash rates for drivers under the old (pre-1993) system. Gregersen (1997, 2001) also reported that 16-17 year old learners who obtained an average of about 120 hours of supervised driving experience had a 35% lower crash risk once licensed than learners who averaged about 40 hours of supervised driving experience.

In contrast, Norway reduced its learner age from 17 years to 16 years while retaining its 18 year-old licensing age in 1994. Unlike Sweden, however, there was no recorded change in learner driving practice or crash risk for novice drivers (Sagberg, 2000). Baughan and Simpson (2002) caution that the contrast between these two similar countries needs a clear understanding before road safety predictions based on lowering the learner age can be determined. Maycock and Forsyth (1997) also indicate that, in the UK, males who gained more experience (drove a greater number of miles) during the learner period had fewer crashes once licensed to drive unsupervised. However, for females the amount of experience they had as a learner had no influence on their crash rate once licensed.

Victoria reduced the age a learner permit was issued from 17 years to 16 years in 1990, in order to encourage greater learner experience. This was proven effective in terms of earlier uptake of a learner permit (VicRoads, 2002b). VicRoads (2002b) indicates that about 38% of all (car) learner permit applicants are aged 16 years and about 15% of all applicants apply for the permit within one month of turning 16 years of age. This trend is presented in Figure 5.1.

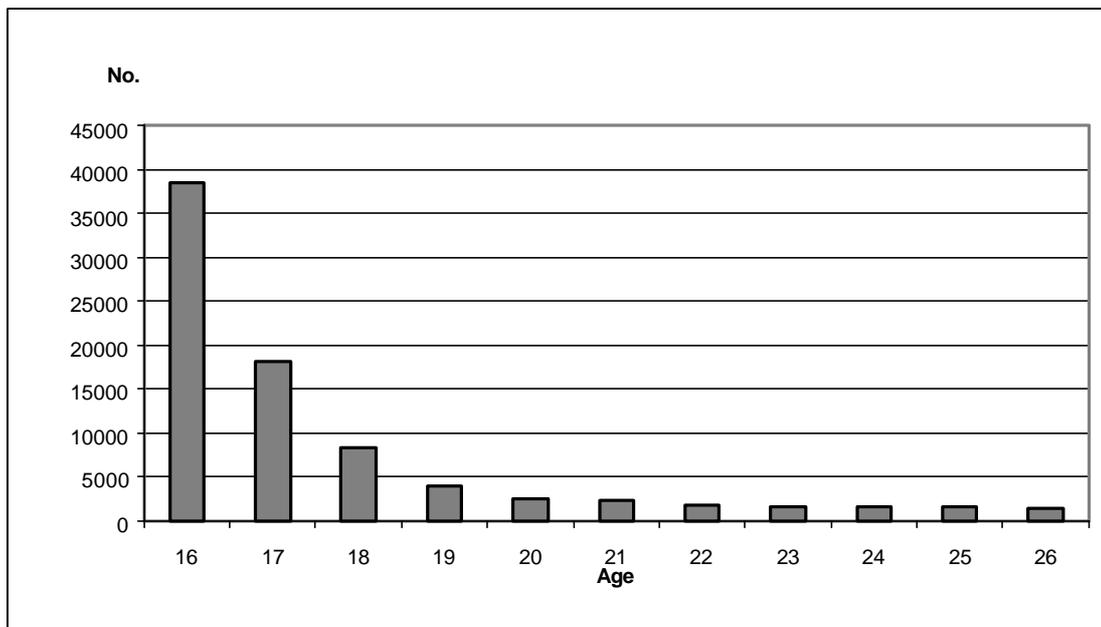


Figure 5.1 Number of (car) learner permit applicants aged 16-26, during period of July 1999 to 30 June 2000

Catchpole and Stephenson (2001) also found that, while not able to compare learner experience pre and post this initiative, and not ruling out causal relationships between other variables, the ability to obtain a permit at 16 years in Victoria was associated with increased supervised driving experience in the period following implementation of a significant level of promotion and support for increased supervised learner experience. Based on 1999 survey data, applicants who obtained their learner permit at age 16 years were found to acquired an average of 108 hours experience in comparison with those who obtained their permit at age 17 years who obtained around 49 hours. A follow-up study by Catchpole and Coutts (2002) found that the amount of supervised driving experience had increased for both groups, with those acquiring their permit at age 16 years still reporting a much higher level of experience (122 hours) than those who delayed obtained their permit to age 17 years (63 hours).

Raising the minimum intermediate licensing age

The increased crash risks associated with a low licensing age are related to a number of factors, including:

- immaturity (less well developed perceptual systems and behaviour);
- an increase in the total number of novice drivers on the road; and
- a reduction of the amount of time available to gain experience in the learner phase.

Setting an intermediate licensing age to address these issues represents a compromise between many factors, including society's expectations of a level of maturity at which young people can be considered responsible enough to drive unsupervised, the safety of young drivers and other road users, young driver mobility wants and needs, along with the independence, freedom, status and peer recognition that a driver licence brings (Arnett, 2002; Williams, 1995).

Early estimation of the crash benefits associated with higher intermediate licensing ages in the US suggested fatal crashes could be reduced by as much as 65-70% without increasing rates at older ages (Williams, Karpf, & Zador, 1983). In Australia, Drummond (1986, 1994) concluded that

raising the intermediate licensing age resulted in a net road safety saving due to the elimination of crashes associated with earlier licensing (see also Williams, 1995). That is, for example, if the licensing age is raised from 17 years to 18 years, this removes all 17 year-old drivers from the intermediate-licensed driver crash record.

In 1989, South Australia raised the minimum age to obtain an intermediate licence, from 16 years to 16 years 6 months in addition to raising the minimum age to obtain a full licence from 17 years to 19 years. An evaluation by O'Connor and Giles (2000) found a reduction in the fatality and serious injury rates¹⁷ of 16-19 year olds following this initiative based on 1983-1992 data. Notably, however, as a zero BAC limit was introduced during this period (in 1985), this was likely to have contributed to the findings in addition to any benefits of increased age.

Mandating minimum driving hours

Mandating a minimum number of driving hours for learner drivers aims to ensure that all learners establish a standard level of experience before attempting a practical test for licensure. It also eliminates the potential for learner drivers to take a practical test after a minimal number of lessons and, as a result, have to gain their driving experience once licensed. Logbooks represent a means for learners to keep track of their driving hours and experience. In addition, they function to send a message to the community that obtaining sufficient driving hours rather than just passing a practical test is important.

As noted by Waller (2003), instruction for any complex psychomotor skill begins with relatively simple exercises, with task demands gradually increasing. Too often in relation to driving however, only rudimentary preparation is achieved during the learner phase. Whilst simple driving skills (learning the road rules, changing gears) may take only a short period of time to develop, highly complex driving skills (including the judgement of hazards) are estimated to take potentially decades (Evans, 1991). Inexperienced drivers have been shown to have an impoverished mental model of what is likely to happen in driving situations (Triggs & Smith, 1994). Gaining driving experience allows a more accurate mental model to develop.

At a conceptual level, a minimum number of hours should represent a time period that will allow novices to learn basic essential skills and subsequently decrease their mental load when carrying out those skills. By decreasing mental workload drivers are increasing automatic processes¹⁸, which essentially allows them to devote more of their conscious attention to higher-order skills, with less-complex skills requiring less mental effort.

Waller (1993) suggested that beginning drivers should be required to submit documentation about the extent of their driving experience and that licensing jurisdictions should require that minimum amounts of driving experience be demonstrated in order to apply for a licence (rather than simply specifying a minimum learner period). Waller also recommended that no great effort should be extended to enforce verification of documented driving experience to ensure adherence to the rules. Instead the process should be used to encourage an increase in driving experience.

Meehan and McGinnis (1999) specified that a mandatory number of supervised driving hours of around 50 hours, including 10 hours at night, was necessary before allowing unsupervised driving. They also suggested it is important to involve parents in the process, which can be facilitated by logbooks requirements.

¹⁷ per 100,000 population

¹⁸ While the concept that driving (as a whole) is automated has been questioned (see Groeger, 2000), the term is used here to describe tasks that can be carried out with little conscious effort - due to experience that has been gained. It is not suggested that all aspects of driving become automated.

One Canadian and 32 US jurisdictions have mandatory driving hour requirements. Mandatory driving hours range from 10 to 50, with 50 being most common. Eighteen of these jurisdictions require 10 of these hours to be at night. Most jurisdictions do not require mandatory hours for applicants over the age of 18 years (IIHS 2001d; IIHS 2002a).

US jurisdictions with minimal hour requirements typically use driver experience logs. These comprise a one or two page sheet on which learners record their hours and parents/guardians confirm driving experience acquisition. A survey of parents of young drivers in Michigan found that parental supervision of logbook entries was associated with a greater amount of supervised driving experience than the GLS requirement (Waller et al, 2000). While 50 hours was mandated, on average, 75 hours were reported.

In Australia, NSW and Tasmania have introduced a mandatory minimum requirement of 50 hours supervised driving experience. Western Australia requires 25 hours. All require that the driving hours be recorded in a logbook before the learner is eligible to apply for a licence (RTA, 2002; DPIWA, 2001; DTIERT, 2002). WA and NSW logbooks allow detailed entry of the driving undertaken to encourage experience in a range of driving conditions. This requirement aims to increase the awareness of learners that practice in many environments is necessary. Furthermore, it is considered likely to encourage learners to gain more experience than the mandated minimum hours as it will usually require driving on routes that are not a part of their usual driving destination.

Concerns have been raised that cheating on logbooks may occur. Australian jurisdictions with these systems in place impose penalties for false or misleading statements in their logbooks. Under Section 97 of the WA Road Traffic Act, penalties that apply include fine of up to \$1,600 for false or misleading logbook statements. Tasmania imposes penalties of up to \$4,000 (DTIERT 2002) and NSW impose penalties of up to \$2,000 (Section 22 of the Driver Licensing Act). These penalties apply to the person making the false statement so may include the permit holder, driving instructor or parent.

Another concern regarding logbook systems is that setting a minimum number of hours of driving experience may give the impression that this is the target to be achieved (and not greater driving hours). Research in Sweden has found that gaining about 120 hours of supervised driving experience compared to about 40 hours resulted in 35% lower crash risk (Gregersen, 1997). One option to address this is to implement extensive education campaigns for both learners and supervisory drivers. An additional option is found in Victoria. While no minimum hours are mandated, voluntary logbooks are promoted to facilitate driving experience for up to 120 hours. The logbooks are included in a Victorian road safety and road law handbook (*Road to Solo Driving*) provided by VicRoads, which pre-learners need to study in order to pass their learner test (VicRoads, 2000b). To build on this, Victoria's Transport Accident Commission (TAC) sends an information pack to learners three months after they have gained their permit, which aims to remind both learners and their parents about the importance of gaining a minimum of 120 hours driving practice (Cockfield, 2003). This is timed to reach learners when their initial enthusiasm for gaining practice may be starting to dissipate. In addition, the TAC provides a scratch card system that encourages learners to keep track of their hours by scratching off a box on a 'postcard' every time they accumulate an hour of driving experience (up to 120 hours). This is sent to learners in mid-December as a reminder to use the summer holiday period to gain as much practice, in as many different conditions, as possible.

While VicRoads conducted extensive research and consultation with the target groups including in depth interviews, focus groups and quantitative research to develop a logbook that young people supported and found easy to use, their actual record keeping rates are low (Cavallo, 2003). Observations from focus groups indicated that reasons for this include that young people (particularly males) do not like to be monitored, they can't be bothered filling out records for every

trip, or they don't think there is a need to keep track of their exact hours. Notably, however, they viewed the system as a useful one, but one for learners other than themselves. That is, a certain amount of optimism bias appears to contribute to the low usage rate (rather than the quality of the log book, for example).

Catchpole and Stephenson (2001) also conducted research regarding the voluntary use of logbooks. They found that about 30% of learners had not acquired a logbook and, of the 70% who had, only about 21% reported using them. While the voluntary logbook system is, therefore, not well-used at present, Victoria encourages learners to maximise their driving experience by allowing permits to be obtained up to two years prior to the intermediate licensing age and by setting a minimum permit-holding period of six months. Overall, despite the low usage rate of logbooks, 16 year olds in Victoria are now on average acquiring around 122 hours of supervised driving experience and 17 year olds 63 hours (Catchpole & Coutts, 2002).

A final concern regards potential increased costs for learners and their families associated with gaining additional experience. Mandating minimum driving hours may discriminate against low-income families, those without access to a vehicle and/or to a supervisory driver (e.g. for learners without parents or parents that are unlicensed; Waller, 2003). In some circumstances, more lessons may be required with professional driving instructors. This potential should be researched and addressed in jurisdictions mandating such systems, against the likely potential benefits. Notably, Waller (2003) has argued that the cost of saving young lives is likely to more than compensate for any increased costs associated with licensing requirements.

Removing processes that encourage early licensure

Having a learner permit with a limited tenure (e.g. three, six or nine months in SA), at the end of which the learner driver is required either to apply for another learner permit or to apply for an intermediate licence, may encourage learner drivers to apply for their licence, regardless of whether they are sufficiently prepared for driving unsupervised. If the learner permit is issued for a long period of time (e.g. 10 years in Victoria) it enhances the value of the permit and encourages learner drivers to continue in the learner phase.

While there may be potential disadvantages of lifetime licences, these are unlikely during the learner phase. For example, one concern is that lifetime licences (that can be held without further assessment) allow drivers to return to driving after long gaps, at which time they may have forgotten the road laws (or the laws may have changed) or their driving abilities/experience may be compromised. During the learner phase, this scenario is unlikely to create problems as an experienced driver, who can provide advice about road laws and driving capabilities, must always accompany the learner driver. Notably, road law tests alone (i.e. the types of tests undertaken to gain a learner permit) have not been found to correlate with driver performance (Torpey, 1988).

Other paths that can lead to early licensure include education initiatives conducted through schools. Studies indicate that driver education initiatives in schools at age levels where students are eligible for licensing lead to earlier licensure (Christie, 2001; Woolley 2000). Educational initiatives are also in place in several jurisdictions that reduce the minimum holding period of learner permits. Mayhew, Simpson, Ferguson and Williams (1998) found that in Nova Scotia 69% of learners participated in an education course. While the majority did so to reduce insurance costs, 33% claimed their aim was to reduce the minimum learner period, thereby allowing faster progression to unsupervised driving. Mayhew and colleagues (Mayhew et al, 1998; Mayhew & Simpson, 1996) have also expressed concern that education incentives may compromise safety as they assume that education provides road safety benefits at least equivalent to that obtained from real-world driving experience. This assumption is not supported. Rather, earlier licensure has the potential to increase road safety risks.

The 'classic' study in this area was a large controlled trial of two driver training programs in the De Kalb County in the US (Stock, Weaver, Ray, Brink, & Sadof, 1983). The initial review, while finding no overall differences, reported a reduction in crashes and traffic violations for trained groups in the first six months compared to a control group. However, a later reanalysis (Lund, Williams & Zador, 1986) found that the benefits reported during the first six months were more than fully offset by the earlier licensure of one of the training groups. For these drivers, crashes and traffic violations actually increased (Christie, 2001).

A more recent analysis of the effect of an education initiative resulting in early licensure in Ontario also reported increases in crash rates; by 45% for 16-19 year olds and 7% for 20-24 year olds (Boase & Tasca, 1998). Overall, research supports the view of Mayhew et al (1998), who recommend against a reduced learner period due to education initiatives in lieu of on-road instruction and driving experience.

Notably, in 1999, New Zealand removed the option of reducing the minimum learner period by completing an education campaign (Begg et al, 2001). In Australia, the DTAL CBTA program in the NT is the only one that currently allows early intermediate licensure at age 16 years compared to 16.5 years if CBTA is not undertaken. The effectiveness of the DTAL CBTA program versus the traditional program has not been reported but a review is currently being planned (Chandler, 2002).

There is, however, some indication that the CBTA optional program in South Australia is encouraging earlier licensure (Austroads 1999). From a 1997 survey, it was found that South Australian learners who opted for the practical test averaged 33 hours practice. In contrast, those who opted for CBTA averaged only 26 hours and were more reliant on professional instructors. Some research suggests that some such instructors were promoting very short periods for completion of the CBTA (Cavallo, 2003; making the decision when to pass the test; eg rather than parents). Compared to practical test applicants, CBTA applicants were also found to be younger and to have held their permit for a shorter period. However, they has also experienced a wider variety of tasks and conditions during professional lessons. Approximately two thirds of applicants qualified for their licence via CBTA.

5.2.2 Supervisory driver requirements

Within the GLS structure it is important for learner drivers to gain driving experience under supervision. Supervisors may include professional driving instructors or the parents, relatives, carers or friends of the learner driver. Parents and others acting as supervisory drivers do not provide a formal training role, but provide support and facilitate the accumulation of on-road supervised experience (VicRoads, 2002d).

Age and driving experience

Most jurisdictions have an age or experience-based requirement for supervisory drivers. This is aimed at ensuring only experienced (usually in terms of a full licence holder) and non-peer drivers take on this role. The basis for this is that both young age and inexperience are critical crash risk factors (e.g. Drummond & Yeo, 1992; Maycock et al, 1991; Simpson, 1996). Minimising these factors in the accompanying driver should ensure that they have developed the critical higher-order cognitive skills necessary to make safer driving decisions for the learner.

Within a particular GLS model, the requirement of a full licence for supervisory drivers usually restricts similar-aged peers from supervising young learners. However, if the supervisory driver received their licence in a jurisdiction with a different licensing process, this can potentially offset the aim to avoid peer supervision. For example, Victorian supervisory drivers must be fully licensed and have held a car licence (intermediate or full) for at least two years. For drivers first licensed in Victoria, this deems them eligible to supervise at a minimum age of 21 years (after three years on an intermediate license). In contrast, a driver first licensed in the Northern Territory

could be eligible to supervise Victorian learners at a minimum age of 18 years (after one year on an intermediate licence and one year on a full licence). Such a driver would therefore be three years younger than the Victorian equivalent, which is also three years younger than the minimum age at which a Victorian driver can drive unsupervised. In addition, it is probably that non-Victorian drivers will have had less driving experience on Victorian roads under Victorian regulations, which can differ considerably to their own licensing jurisdiction.

A consistent approach would require that all accompanying drivers have the same minimal age and driving experience requirements regardless of licensing jurisdiction. To address this, minimum ages requirements can be mandated (e.g. 25 years of age in Norway) or additional requirements could be mandated for drivers from different jurisdictions to ensure equivalent age and/or experience.

Mandating regulations for all supervisory drivers reinforces the importance of this role. Some jurisdictions, such as Michigan in the US, are based strongly on the involvement of parents (BSD Consultants, 2000). Under the Michigan system, parents must provide written permission before learners can enter the first level of licensing. Parents are also in charge of supervising logbook entries, and are notified of any violations of the graduated licence law until the driver turns 18 years of age. Such measures have been associated with learners gaining a greater amount of supervised driving experience than mandated levels (Waller et al, 2000).

BAC limit

Mayhew and Simpson (1999) have suggested that it is worthwhile to encourage zero BAC limits for supervisory drivers, given the importance of the role in the learning experience of novices; particularly as they may be required to take over the driving. Legislating a BAC limit can also reinforce to the learner that even small amounts of alcohol are considered to have an unfavourable effect on driving.

Table 3.1, which summarises the requirements of Australian learner permits, shows that only three of the eight jurisdictions legislate BAC limits for supervisory drivers (all .05; the legal limit for full licence holders in these jurisdictions)¹⁹. Not including such a requirement allows the supervisory driver to have a BAC in excess of levels considered to be maximum for safe and legal driving.

Absence of licence disqualification

Among Australian jurisdictions, only Tasmania includes an additional requirement for supervisory drivers. While they must be fully licensed, they must also not have had their licence suspended in the previous two years. This requirement reinforces the message that supervisory drivers need to be responsible drivers themselves in order to guide novices. This option could also be considered for other GLS models.

5.2.3 Professional driving instruction

Professional driving instructors:

- provide appropriate and correct car control skills in a safe environment (e.g. dual-controlled vehicles);
- provide on-road driving experience;
- impart road safety awareness; and
- prepare the driver for the practical test.

¹⁹ This does not include professional driving instructors who are subject to a zero BAC limit.

Therefore, they offer an important service in assisting learners to develop basic driving skills. Research has shown, however, that this service may not differ from that provided by family and friends.

Early research in the United Kingdom (UK) found that learners who had gained some private driving experience in addition to a moderate number of professional lessons were more likely to pass their driving test than those who had undertaken a substantial number of professional lessons (Forsyth, 1992). While these findings might be interpreted as suggesting that there is a threshold beyond which professional instruction becomes counterproductive, they might also indicate that instructors correctly spend more time with drivers whose skills are less developed or who are slower to learn (Hall & West, 1996). Notably, however, the latter explanation would indicate that the additional professional instruction was not effective. These findings have also been replicated in the UK more recently in a study that controlled for several other factors, such as academic grades, intelligence and personality variables, therefore supporting the former explanation (Groeger, 2000; Groeger & Brady, in press). Moreover, Groeger's research showed that the type of experience gained under private instruction was more varied in terms of length, time of day, road types and driving speeds than that with professional instructors. In particular, substantially more practice was gained in darkness. This further supports Forsyth's (1992) findings that the optimal combination of instruction is a moderate number of professional lessons in addition to the valuable driving experience gained under private instruction.

Recent research by Gregersen et al (in press) found that the total number of crashes and their severity during the learner phase are lower when learners practice with professional instructors than with relatives or friends. They suggest that this may in part be due to insufficient awareness by private supervisors of the limitations of learners with respect to mental workload and visual scanning, in addition to the professionalism of instructors and their use of dual-controlled vehicles. However, based on Groeger's research, it is likely that this finding can also be attributed to the greater levels and variety of driving exposure experienced while under the private supervision. Gregersen et al also recommended against any measures that would reduce the amount of practice with relatives and friends, suggesting that a focus on education for this group would be beneficial.

Christie (2001) reviewed the research literature on the effectiveness of professional driving instructors and found that the post-licensing crash rates of learners trained by professional driving instructors tended to be similar to that of learners trained by family or friends. Groeger (2001) reported that, in some cases, learners trained by professional driving instructors actually fared worse. Groeger suggested this may be due to learners who are poorer drivers eventually gravitating towards professional driving instructors, by which time the amount or nature of tuition they then receive is insufficient to allow improvement to a satisfactory level.

Gregersen (1994) suggested that the quality and extent of learner driver experience can be maximised by encouraging cooperation between professional driving instructors, who can provide car-control skills training and ongoing diagnosis and evaluation of safe driving techniques, and parents, who can provide a wide variety of driving experiences and allow practising of skills taught by instructors. Provided the tasks are well defined and parents do not shift responsibility to the professional driving instructor (and visa versa), this was deemed likely to be the most appropriate option.

Of note, a number of GLS jurisdictions, for example, France, require some mandatory training by professional driving instructors during the learner period. However, in several European countries, including Denmark, Germany and The Netherlands (Gregersen et al, in press), driving instruction is only allowed by accredited professionals (i.e. no private supervision is allowed).

5.2.4 Multiple passengers restriction

The University of North Carolina Highway Safety Research Centre (HSRC, 1996) has recommended that only the supervisory driver accompany learner drivers early in the learner period. This is considered advantageous for the learner in order to reduce distractions and minimise cognitive workload. If passenger restrictions were to be mandated throughout the learner period, however, this would limit the conditions under which learners gain experience under supervision and would therefore be counterproductive (Staysafe 37, 1997). Nonetheless, at least one of the GLS models reviewed does not allow passengers other than the supervisory driver, until the intermediate licence period (Nova Scotia). An alternative model is found in North Carolina in which there is a two-stage learner phase. A passenger restriction applies in the first six-month stage and is lifted in the second stage.

For single learner phase GLS models, it is likely to be advantageous to encourage supervisory drivers to be aware that additional passengers add to the workload of the learning driver and that the optimum learning environment would be for the learner to be accompanied by the supervisory driver only in the early stages of learning.

5.3 Components of the intermediate licence phase

5.3.1 Extending the intermediate licence period

Extending the intermediate licence period provides more opportunity for novices to gain unsupervised driving experience under lower risk conditions than at full licensure. The longer the period of time between permit issue and full licensure, the more experience and maturity can be gained aiding the development of essential driving skills. A lengthy period of time is required to accumulate and assimilate these skills for safer driving (Groeger, 2001).

Two strategies to extend the intermediate licence period were identified in the literature:

- Increasing the minimum period of intermediate licensure.
- Raising the minimum age for full licensure.

Increasing the minimum intermediate licence period

While many jurisdictions require one year only as the intermediate licence period, several jurisdictions have extended this period to 2-3 years, including most Australian jurisdictions. For example, Victoria increased its intermediate period to three years in 1990²⁰, as did NSW in 2000 (RTA, 2000).

In the context of his research on the effectiveness of extending the zero BAC limit for Victorian intermediate-licensed drivers, Christie (1996) found that a 2-3 year intermediate licence period was more effective than a one year period in terms of reducing alcohol-related crashes. A one year period was found to be insufficient both to deter intermediate drivers from drinking prior to driving and to encourage the establishment of durable behaviour patterns that separate drinking from driving.

Raising the minimum age for full licensure

As noted earlier, crash reduction benefits were reported in South Australia after the minimum full licensure age was raised from 17 to 19 years, in conjunction with raising the intermediate licensing age from 16 to 16 years 6 months.

²⁰ Victoria first introduced a three year intermediate period in 1964. This was decreased to two years in 1987 before returning to three years in 1990.

In contrast to the benefits identified by raising the minimum licensing age, reducing this age has been associated with increased crash risk. When the intermediate licensing age in Canada was reduced from 18 years to 16 years there was an associated 24% increase in fatalities among new drivers (Gaudry, 1987, cited in Gregersen & Bjurulf, 1996).

For jurisdictions that already have a high licensing age (e.g. Victoria has one of the highest minimums at 21 years), Ulmer, Preusser, Ferguson and Williams (1999) have suggested an alternative to mandating a higher licensing age is to impose strategies that encourage people to delay applying for a licence, including making it more difficult or costly to apply for a licence. Ulmer et al found that a concern that such initiatives may have a greater impact on poorer/disadvantaged groups was not substantiated. In Sweden, the introduction of a new 25% tax on driving lessons was introduced in 1997. That year, the proportion of intermediate licence holders among 18 year-olds (the age eligible for licensing) decreased to 26% from 29% in the previous year (Murray, in press).

5.3.2 Night-time driving restrictions

Night-time driving restrictions are considered to be one of the most beneficial elements of graduated licensing in the US (e.g. Shope & Molnar, 2003). They aim to reduce young driver crash risk by allowing intermediate-licensed drivers to gain experience only in lower-risk situations; that is, during the day or only at night when supervised or driving in non-recreational circumstances. They also raise community awareness of the risks associated with night-time driving.

Increased crash risk at night is common worldwide. Recent UK research indicates crashes at night are 2.6 times more likely than crashes in daylight (Maycock, 2002). Moreover, this risk has been shown to be magnified for young drivers (Williams, 1996). In Norway, crash risk for drivers aged 18-20 years has been found to be 110% greater at night than during the day (TOI, 1998), while in the US, the fatal crash risk of novices driving at night has been estimated to be about three times greater than that during the day (Williams, 2000). Recent analyses by Williams (2003) indicate that, for US 16 year olds, the fatal crash risk at night is higher than the daytime risk for drivers of all ages, even though exposure is lower during night-time hours. Crash data for all Australian jurisdictions, indicate that the highest fatality risk for drivers aged less than 26 years occurs during night-time hours with the 12:00am-6:00am period on weekends accounting for more than double the number of fatalities than during all other hours (ATSB, 2002).

These trends are believed to be due to several factors (Clarke, Ward & Truman, 2002; Crettenden, Yeo & Drummond, 1994; Ferguson, 2003; IIHS, 2001a; Williams, 2003; Williams & Ferguson, 2002):

- At night there is impoverished visual information.
- Night-time driving is associated with driving during hours where effects of fatigue and sleep deprivation are greatest.
- Many newly-licensed drivers have had less experience driving at night than during the day.
- Young drivers spend proportionally more of their driving time at night compared to other driver groups.
- Young drivers' night-time driving tends to include more recreational driving and driving with peers when compared to older age groups.
- During recreational driving, even drivers who generally try to follow the roads rules can be more easily distracted or encouraged to take risks.
- Driver aggressivity and recklessness (including inappropriate or illegal speeding) has been found to peak during darkness particularly for male drivers.

Recent analyses by Williams (2003) also show that, in the US, 78% of fatalities of 16-17 year-old drivers with BACs of .10 or higher occur between 9:00pm-6:00am.

While unknown to Australian jurisdictions, many overseas GLS jurisdictions have some form of restriction on late night driving in the intermediate licence stage. Of the 50 states of the US there are 36 that have some form of night-time driving restriction as part of their GLS (Lin & Fearn, 2003); although several jurisdictions also have night-time restrictions separate to GLS initiatives (IIHS, 2001d, 2002a; see Appendix 2). Night-time driving restrictions also exist in New Zealand and Canada. Restricted times and conditions vary among overseas jurisdictions but commonly apply from around 12:00am (midnight) to 5:00am, preventing driving unless accompanied by an adult supervisor. (See Appendix 2 for the range of restricted night-time periods that apply in North American jurisdictions.) The intent is not to restrict novices from driving at night per se, but to curb the higher-risk recreational (social) driving that occurs during this time period (Williams, 2000). For this reason, all US night-time driving laws allow exceptions for travel for work purposes and other activities considered essential. Notably, however, some jurisdiction allow more relaxed restrictions during weekends (see Appendix 2), when young drivers are more likely to undergo recreational driving associated with greater crash risk (Cave, 1985).

Several studies support the implementation of night-time driving restrictions for young drivers as part of GLS models (Ferguson et al, 1996; Levy, 1988; Williams & Preusser, 1997). These studies favour the restrictions as they form an essential component of GLS models in US jurisdictions that have achieved the most successful results in terms of crash reductions. NHTSA (2000) estimated that night-time driving restrictions (with no peer passengers but permitting adult passengers who can provide supervision) have been associated with crash reductions of up to 60% during the restricted hours.

Prior to their introduction, several studies explored the potential benefits of night-time driving restrictions for the US by using night curfews as a proxy measure (see Lin & Fearn, 2003). For example, Preusser, Zador and Williams (1993) explored the potential benefits of night-time driving restrictions for the US by comparing crash rates²¹ during 1984-1990 in large US cities with and without night curfews (as a proxy measure). Night curfews (established by local ordinances) are common in the US for young people in public places who are not accompanied by a parent. Preusser et al reported a 47% lower crash fatality rate for 13-15 year olds in cities with night curfews compared to those without curfews during the 12:00am-5:00am period, and a 19% lower crash fatality rate for 16-17 year olds during the same period. The study did not identify whether the 13-17 year olds were drivers or passengers, and cities varied according to the age ranges that the restrictions applied and the start and finish times of the restrictions (ranging from 9:00pm to 6:00am). Nonetheless, as the only crude measure available for the selected time period, the potential for night-time restrictions to reduce novice fatality crashes was supported.

Supporting these early findings, when night-time driving restrictions were implemented, associated crash benefits were found (see review by Lin & Fearn, 2003). Foss, Feaganes and Rodgman (2001) analysed Police-reported crash data and other data sources to examine the effect of introducing a GLS in North Carolina that included a night-time driving restriction (but not a peer passenger restriction at that time). Analyses were adjusted to account for population growth, general crash trends, enforcement variation, other safety initiatives, and number of licensed 16 year-old drivers. Fatality, serious injury and minor/no injury crash data were compared for the one-year period prior to the introduction of the new GLS and the one-year period following for 16 year olds and also 25-54 year olds. Foss et al found that (all) crashes during the night-time restricted period reduced by 43%. A reduction was also reported for daytime crashes in the order of 20%. Overall, the total effect of the introduction of GLS in North Carolina was a 57% reduction in fatal crashes and 23% reduction in crashes with no or minor injuries.

Based on Police-reported crash data and hospital records, Begg et al (2001) found that night-time driving restrictions in New Zealand were also associated with crash reductions during restricted

²¹ 100,000 persons per year per age and time of day.

hours. As the restrictions were introduced together with other GLS components (including passenger restrictions), individual effects of the night-time driving restrictions could not be quantified. Importantly however, the research also indicated that reduced night-time crash rates were not due to a proportional increase in daytime crashes (a concern raised by Carseldine, 1998). Rather they were due to less driving at night and/or safer (non-recreational) driving at night by novice drivers. In addition, a flow on effect was found as these drivers also had lower crash rates at night when issued a full licence.

A further concern that has been raised regarding night-time driving restrictions is that their introduction may shift the rate of crashes to fully-licensed drivers who consequentially transport the novice drivers as passengers (Carseldine, 1998). Williams (1995) found this concern to be unsupported in his research of crash-based data. While crashes appeared to rise just before the start of the night time restriction as drivers returned home, Williams found that over-riding positive effects prevailed during the restricted hours that more than compensated for this increase.

Based on their research findings, the majority of researchers of night-time driving restrictions have concluded that they should form part of any GLS model (Begg et al. 2001; Preusser & Stewart, 2001; Williams & Mayhew, 1999; Williams & Ferguson, 2002). Project GADGET (Siegrist, 1999), an ongoing project examining road safety initiatives in Europe, also recommends that restrictions should apply to all young drivers at night during their first year of unsupervised driving.

Of note, prominent researchers add to this recommendation, an argument for night-time restrictions to begin from at least 9:00pm or 10:00pm (Foss & Goodwin, 2003; Williams & Ferguson, 2002). They argue that research demonstrates that fatal crash risks for 16-17 year-old drivers are nearly three times higher during 10:00pm-12:00am than during the daytime or evening hours (6:00pm-10:00pm). Despite this, they report that two-thirds of night-time driving restrictions in US jurisdictions commence at midnight or later. Foss and Goodwin suggest these are limited restrictions only that fail to address the true extent of the problem. This suggests that, when considering introduction of a night-time driving restriction, careful analysis of young driver crash patterns by time of day are necessary to best target the problem.

Applicability to Australian GLS models

As noted earlier, the minimum age for intermediate licensure differs greatly among jurisdictions. Moreover, so too does the minimum holding period of an intermediate licence. In the US, the minimum period is often 6-12 months, while several Australian states have an equivalent minimum of three years. The older minimum ages and longer minimum holding periods in most Australian jurisdictions raise questions as to whether night-time driving restrictions would be acceptable for Australian intermediate licences (Drummond, 1994; Haworth, 1994).

Drummond (1994) suggested that an alternative use of night-time driving restrictions in Victoria would be to use them as an incentive to reduce traffic violations; that is, they could be included as a penalty when the novice driver violates certain road rules or in certain conditions, such as committing a traffic violation during night-time hours. In this way they would act as a threat and could encourage safer driving or, through education, even discourage unnecessary night-time driving. This option has the advantage that it would not limit all drivers to night-time restrictions by discouraging rather than prohibiting night-time driving. This approach is also supported by Bartl (2000, 2001) based on his research of novice-driver crashes in Europe. Bartl recommended that late night or weekend driving restrictions should only be promoted on a voluntary basis and that subsidiary modes of transport (e.g. community buses at nightclubs) should be organised.

However, Drummond (1994) also noted that such an approach may be difficult to implement as it could send an ambiguous message to newly-licensed drivers, thus limiting overall effectiveness. Williams, Ferguson, Leaf, and Preusser (1998) have suggested that voluntary and parental support

(rather than Police enforcement) of night-time driving restrictions has been very effective in the US.

Another possibility is that, rather than considering night-time driving restrictions as applicable for the entire intermediate licence period, they could be considered for shorter periods only, for example, six months. Lin and Fearn (2003) note that intermediate-licensed drivers in North Carolina are only subject to night-time restrictions for six months, yet substantial crash reductions have been reported²². Some jurisdictions already have more than one intermediate licence phase (or optional additional phases) in place, such as NSW and California. Night-time driving restrictions could be appropriate for initial phases of unsupervised driving in GLS models that gradually relax requirements within the intermediate licence phase until full licensure.

It is also important that any new night-time driving restrictions allows exemptions for work, education and other purposeful, non-recreational driving, in addition to supervised driving during the restricted periods. As with most changes to GLS models, adequate education will be needed, particularly regarding such exemptions, to alleviate community concerns that the restriction will prove to be a barrier to activities such as employment and schooling, or discriminate against remote or disadvantaged youth.

5.3.3 Peer passenger restrictions

Passenger restrictions aim to reduce the crash risk of both novice drivers and the peer passengers that they carry. The increased risk of a crash for novice drivers carrying passengers is well documented (Mitsopoulos & Regan, 2001; Williams, 2000, 2001). Moreover, fatality risk is increasingly elevated with every additional passenger (Chen, Baker, Braver & Li, 2000; Williams, 2000, 2003; Williams & Ferguson, 2002). The presence of three or more passengers increases the fatal crash risk by four times the risk when driving alone (Williams, 2003). Williams (2001) also reported that 63% of teenage passenger deaths occur when other teenagers are driving. In the US in 2000, passengers accounted for 40% of all crash fatalities of 16-19 year olds (Williams, 2003) and 57% of all crash fatalities of 13-19 year olds (Lin & Fearn, 2003).

Crettenden et al (1994) found that, within Australia, drivers under 21 years of age carried more passengers both during the day and at night on non-work related trips. In Victoria, Diamantopoulou et al (1996b) found young drivers had similarly high risks regardless of whether they were driving alone or with passengers, although the greatest risk was when at least two passengers were present. However, the age of the passenger was not included, making interpretation in relation to peer passenger effects difficult. Examination of 1996-1997 Victorian data revealed that 43% and 41% (for respective years) of all first-year drivers' casualty crashes occurred with passengers (Cavallo, 2003). More than half of all US crash fatalities of 16-17 year-old drivers occur when passengers younger than 20 years are present and there is no supervisory driver (Williams & Ferguson, 2002).

As discussed in relation to night-time driving restrictions, when a new GLS that included passenger restrictions (as well as night-time driving and other restrictions) was introduced in New Zealand a reduction in crashes was found (Begg et al, 2001). This included a significant reduction in novice-driver crashes involving passengers. In New Zealand, the passenger restrictions apply to passengers under the age of 20 years (except when passengers are a spouse, dependent or qualify as a supervisory driver) unless a supervisory driver is also present. Notably, of passengers that were injured in crashes, around 70% were aged 15-19 years.

Previously, concern has been raised that the introduction of passenger restrictions would result in an increase in novices driving separately (rather than travelling together), increasing their exposure

²² Note that this is not independent of other GLS initiatives, including a night-time driving restriction during the first six months of the learner phase.

and, therefore, their crash risk (Drummond, 1994; Staysafe, 1998). This is further compounded by the likelihood that the increased exposure would be more concentrated at night when young drivers are more likely to be driving recreationally. IIHS (1999) examined these concerns and concluded that, even with an increase in novices driving alone, there would still be a substantial reduction in fatalities. The study estimated that, even if compliance rates were as low as 20%, an estimated 9% reduction in deaths would occur. With 100% compliance, around 38% reduction of deaths was estimated.

Similar reduction estimates were reported by Chen, Braver, Baker and Li (2001) when examining this issue for 16-17 year-old drivers. They predicted that, if these drivers were required to drive alone and their passengers were forced to drive alone (or with drivers older than 18 years of age), the predicted reduction of road user deaths would be approximately:

- 7% with a compliance rate of 20%;
- 22% with a compliance rate of 50%;
- 23%-29% with a compliance rate of 70%; and
- 31%-42% with a compliance rate of 90%.

Based on these findings, Chen et al (2001) recommended that GLS models should prevent the carrying of passengers younger than 20 years of age.

Prior to these findings, Chen et al (2000) had compared crash risk by several passenger age groups. They had found that crashes of 16-17 year-old drivers were more likely to result in fatalities when passengers aged 13-19 years or 20-29 years were present in comparison to passengers aged 30 years or older. A more recent US study by Williams and Shabanova (2002) also found that when 20-29 year-old passengers were present, seat-belt use was the lowest and many of these crashes involved alcohol use. They recommended that young driver passenger restrictions should extend to passengers up to 29 years of age.

Chen et al (2000) have indicated that while night-time driving restrictions are an appropriate road safety countermeasure, they cannot substitute for passenger restrictions, due to their finding that more than half the fatal crashes of US novice drivers with passengers occurred during daylight hours. Chen et al's (2001) research provided support for the notion that passenger restrictions were likely to be more effective than night-time driving restrictions alone. While they found that the incidence of fatal driver crashes increased with the number of passengers both during the day and at night (and that this was more pronounced in the presence of male passengers), they also found that more than half of the fatal crashes occurred during the day. Therefore, the introduction of a peer passenger restriction could potentially effect a greater proportion of passenger-involved crashes, reducing both novice driver and passenger deaths.

It is noteworthy, however, that research such as that of Foss et al (2003) (as reported in the previous section), has reported carry-over effects of night-time driving restrictions to daytime hours, such that substantial reductions in crashes have occurred. They reported an overall effect of a 57% reduction in fatalities, which compares favourably to Chen et al's estimates.

New Zealand and 22 US jurisdictions (IIHS, 2002a) include passenger restrictions in their GLS models. Currently in Australia, Victoria is the only jurisdiction to include any type of passenger restriction. It applies only if an intermediate-licensed driver commits an offence that results in a licence suspension or cancellation within the first 12 months of licensing [Regulation 219, Road Safety (Drivers) Regulations 1999]. On reissue of the licence, the passenger restriction permits the driver to carry only one passenger for a period of 12 months. The present review suggests that more extended passenger restrictions warrant assessment for Australian GLS models, particularly in conjunction with night-time driving restrictions (Chen et al, 2001; NHTSA, 2000).

Foss and Goodwin (2003) suggest that, given problems with compliance (discussed in Section 6.3), restricting all passengers of intermediate-licensed drivers “may overstep the bounds of what is generally considered reasonable” (p.82). They suggest that the effectiveness of a one-passenger-only restriction should be investigated in future research to identify whether potentially greater compliance with such a restriction would offset the lower risk reduction it affords.

A further issue to consider regarding peer passenger restrictions is the concern that they are contrary to designated-driver campaigns (Drummond, 1994; Staysafe 37, 1997, 1998). This drink-driving countermeasure encourages drivers who consume alcohol to assign a designated driver to transport intoxicated drivers home as passengers. However, while the designated-driver strategy could be considered to be easily employed and also attract high levels of community acceptance, some research suggests the strategy is not used effectively by many young drivers (e.g. Barr & MacKinnon, 1998; Timmerman, Geller, Glindemann & Fournier, in press). Barr and MacKinnon (1998) examined the frequency of designated driver use among US college students and reported that 94% of those surveyed indicated that their designated drivers had consumed alcohol. In addition, 14% reported selecting their designated driver based on the person who was most sober at the time of driving. Therefore, for this high-risk group, it was found that designated drivers frequently consume alcohol. Timmermann et al (in press) have recently found that alcohol consumption by designated drivers is particularly problematic for male designated drivers.

Another alternative option to peer passenger restrictions has been proposed by Mitsopoulos and Regan (2001). They suggest that education programs could be developed to manipulate the nature of driver-passenger inter-relationships in order to reduce risky behaviour and subsequent crashes. Passengers could help improve road safety outcomes by assisting with hazard detection, reducing the driver’s mental workload by answering mobile phones, navigating and so on, and by discouraging risky behaviours (e.g. speeding and tailgating).

5.3.4 High-powered vehicle restriction

Victoria is the only known licensing jurisdiction to impose a high-powered vehicle restriction for intermediate-licensed car drivers. The current restriction is 125 kilowatts per tonne with a capacity to mass ratio of 3.5 litres per tonne of the unladen mass of the motor vehicle. Victoria introduced the restrictions after finding that first-year drivers were at a greater risk of having a casualty crash in a vehicle of more than 150 brake horse power than a similar driver in a vehicle of less than 150 brake horse power (based on Drummond & Healy, 1986; VicRoads 1990). It was intended that by restricting the power level of vehicles driven by new drivers, crash risk would be reduced.

Drummond (1994) has argued, however, that the restriction provides a likely crash reduction of less than 2% among a small number of young drivers who would regularly drive these vehicles, provided that their crash risk does not transfer with them. In addition, he found that drivers of high-powered vehicles in their second and third years were safer (had a lower crash risk) than drivers of lower-powered vehicles. Based on these factors, Drummond argued that the restriction had only marginal road safety benefits.

Recently, Clarke et al (2002) reported on some findings of young drivers of ‘performance’ cars, that is, those cars that were denoted of above average performance, including greater engine capacity. They found that, while young drivers of these vehicles tended to have above average skills on two safe driving factors, they also undertook more risks, such as deliberate speeding and reckless driving. This contributed to a rise in the crash involvement of performance vehicles during night-time hours, when recreational driving associated with higher risk-taking was greatest.

Hatakka, Keskinen, Gregersen, Glad and Hernetkoski (2002) also acknowledge the importance of motivational factors in driving high-powered vehicles. They point out that male drivers who are interested in driving fast tend to choose fast cars. Drivers who had a high level of motivation for

car choice (important factors being high acceleration, powerful engine, good looking, sporty) were found to have the highest number of traffic violations, when controlling for distance travelled.

There are also political and social factors to consider in relation to a high-powered vehicle restriction. Speed remains a major contributor to injury crashes in Victoria (VicRoads, 2002a). It is likely that there is a public perception, particularly reinforced by the media, that restricting novices from driving high-powered vehicles will help limit the incidence of crashes involving excessive speed.

5.3.5 Good driving record requirement

A GLS component included in some GLS models, including those in Victoria, New Zealand and several US states (see McKnight & Peck, 2003), is to require intermediate-licensed drivers to demonstrate that they can drive safely before being granted a full licence. Evidence of safe driving is a record that excludes traffic violations and sometimes (usually at-fault) crashes within a defined period (e.g. six in North Carolina, 12 months in Maryland and Michigan). It is argued that providing rewards to influence behaviour is more effective than threatening punishment of undesired actions (Foss & Goodwin, 2003).

Williams and Mayhew (1999) indicate that most American jurisdictions penalise drivers if they do not comply with GLS restrictions or are involved in traffic violations or at-fault crashes. These penalties are aimed to delay or prohibit graduation to a full licence for those drivers with a poor driving record. The penalties are assumed to provide a strong motivation for safe driving and increased compliance with GLS restrictions. HSRC (1996) has recommended that a learner driver should have 12 consecutive violation-free months, and intermediate-licensed drivers six months, before being eligible to proceed to the next phase.

Tannahill and Smith (1990) report that Ontario's GLS requires young drivers to have two years free of licence suspensions and that intermediate-licensed are allowed only half the number of demerit points required for suspension compared to fully-licensed drivers. They attribute these requirements as contributing to a 14% reduction in traffic offences for intermediate-licensed drivers and 11% reduction for male drivers under 20 years of age. McKnight and Peck (2003) also attribute a good driving record requirement in Maryland as responsible for significant reductions in crash and traffic violations.

Haworth (1994) pointed out that graduating through a licensing system based on time is not as effective as a motivator of safe driving as graduation based on driving record, for which motivation to drive safely can be encouraged by making the driving record the key factor in removing restrictions. Graduation based on time alone raises a concern that the novice driver may not drive or drive infrequently so fail to gain necessary experience before a full licence is issued. This may simply transfer crash rates to other groups (Haworth, 1994).

Notably, Waller (1993) suggested that, while a threat will not address the issue of inexperience, it might help deter deliberate high-risk behaviour, such as speeding, which is under the violator's control. Waller therefore suggested that additional penalties, such as licence suspension or extension of the GLS restricted period, should focus on volitional risk taking rather than errors due to inexperience.

From another perspective, the lifting of increased penalties in subsequent GLS stages can be viewed as a reward for good driving. The possibility of progress to more relaxed penalties can provide an incentive to drive safely as a reward rather than as a threat, particularly if sanctions keep young drivers from progressing to the next licensing stage with their peers (McKnight & Peck 2002; NHTSA, 1998).

There is a notable concern that loopholes can exist in relation to the good driver requirement when drivers have the option to have their case heard in court (Scott, 2002). In many jurisdictions, a driver cannot be regarded as guilty of a driving offence until proven so in court. Therefore, if the time lapse until the case can be heard (including additional time if an appeal occurs) extends beyond the intermediate licence period, the driver can progress to a full licence. In this way, if deemed guilty and a licence suspension results, this will apply to the full licence such that intermediate licence sanctions will be bypassed. Consideration should be given as to whether drivers found to have a poor driving record should still be subject to intermediate-licence penalties following a suspension.

Another measure of good driving behaviour used predominantly in the US, is the absence of an at-fault crash (Williams & Mayhew, 1999). Introducing this as a condition of good driving behaviour presents a number of practical issues that need to be taken into consideration (Cairney, 1986; Christie, 2001; Robertson & Baker, 1975; Simpson, 1996):

- At-fault crashes may not necessarily be due to traffic violations or intentional high-risk driving behaviour, but rather may result from inexperience.
- It is unreasonable to penalise a novice driver for an at-fault crash that even an experienced driver could not avoid (e.g. mechanical failure).
- Crashes are relatively rare events. Many are not reported to the Police or licensing authority. Therefore, higher-risk drivers will not regularly be detected by this method.
- At-fault crash status requires blame to be attributed to the crash, potentially by a court rather than an administrative decision.

These issues need to be addressed if crash records are considered in addition to traffic violations when determining the requirements of a good driving record.

5.3.6 Increased penalties for offences

The aim of increased penalties for traffic violations is to provide an incentive for young people not to disregard the conditions of their licence and, therefore, improve compliance with restrictions (Begg et al, 2001). An important factor in motivating high compliance with GLS restrictions is a perception that a high risk of detection exists and penalties for offences are high enough to discourage aberrant behaviour (Cameron & Sanderson, 1982).

Baughan and Simpson (2002) suggest that drivers who commit traffic offences such as speeding, and running red lights have a higher crash risk due to several factors, including:

- Increased potential to come into conflict with other road users.
- Reduced time to react to hazards.
- Increased mental workload.
- Reduced predictability of their behaviour for other drivers.
- Increased likelihood that the consequences of their errors will be more severe.

From this perspective, increased penalties for such offences aim to deter the most high-risk behaviours.

New Zealand increased the penalties for traffic violations in 1999 to address problems with low compliance. However, as this change was introduced with a range of other initiatives, an evaluation of its effectiveness has not yet been determined (Begg et al, 2001).

A unique penalty applies in North Carolina for novices who violate the GLS seat-belt requirement (Ferguson, 2003). If intermediate-licensed drivers are found in violation of this requirement, they are delayed from graduating to a full licence and a higher fine can be imposed (four times the

amount for fully-licensed drivers). Ferguson (2003) notes, however, that there is no available information on the extent to which this is enforced.

5.3.7 Lower demerit point threshold

Effectiveness of demerit point systems

Within demerit point systems, points are accumulated if a driver is found guilty of committing a traffic offence. The number of points increases with the severity and road safety consequences of the offence (e.g. in Australia, speeding offences attract between 1-6 points depending on how many kilometres over the speed limit the driver is travelling). When the cumulative demerit point count on a driver's record reach a specified level, an intervention is effected. This may be the issue of a warning notice, a licence suspension or cancellation, or a good driving behaviour option. The underlying assumption is that recidivist drivers who commit multiple offences and, therefore, accumulate high numbers of demerit points have an increased likelihood of being involved in a crash. The demerit point system, therefore, aims to target intervention initiatives at assumed high-risk drivers (Zaidel 2001).

Zaidel (2001) has pointed out that while the correlation between traffic violations and crash records is small, a small group of drivers commit many violations and are responsible for many crashes while only accounting for a small fraction of the recorded total of offences and crashes. In contrast, a large number of drivers do not receive any traffic infringements yet account for a sizeable proportion of crashes.

A study of Victorian drivers (irrespective of licence type) confirmed that demerit points can be used to predict driver crash involvement (Diamantopoulou, Cameron, Dyte & Harrison, 1997). Including total number of demerit points as a measure in a model that included driver age, sex, location and endorsement of licence, casualty and serious injury crash involvement and total traffic convictions significantly increased the ability of the model to predict crash involvement two years later.

Forsyth et al (1995) found that intermediate-licensed drivers who attracted the attention of Police as traffic offenders or potential offenders were more likely to be involved in crashes than those who did not. Traffic offenders had a 66% higher crash liability than those without recorded offences and Police-warned novices had a 39% higher crash liability than those who had not been warned. This latter finding also supports the use of warning letters for some offences.

Warning or driver improvement letters are seen as a low-cost intervention targeting potential high risk drivers via a threat of more severe intervention, such as licence suspension. They are also important to impart knowledge to drivers of the demerit point system, encouraging them to drive more responsibly (Victorian Parliamentary Road Safety Committee, 1994). A study of the use of these letters in Oregon was conducted by Jones (1994). While the crash reduction effects identified were small, letters were concluded to be a very cost-effective option. The content of the letters was also found to be important. Standard letters of a high threat content that provided details of the offence that prompted the warning were found to be more effective than 'soft sell' letters.

Demerit point initiatives have generally been found to have a positive road safety benefit. Zaidel (2002) examined 11 studies that investigated the effects of demerit point systems, warning letters and licence revocation. The evaluation found that all three measures led to significant crash reductions. Their combined effect was found to contribute to an overall reduction in total crashes of about 12% and a reduction of fatal and injury crashes of about 17%.

For novices, research has associated a lower demerit point threshold with crash reductions for newly-licensed young drivers in California. McKnight and Peck (2003) report on a 1988 study by Hagge and Marsh that specifically evaluated this initiative, which was put in place prior to the introduction of California's current GLS model. A reduction in both crashes and traffic violations

was reported for 16 year olds in comparison to a control group of 19 year olds, not affected by the restriction. Fewer 16 year olds reached the demerit point threshold and, for those who did, a reduction in recidivism after suspension was found.

Notably, in Australia there is a nationally agreed scale of exchangeable points and offences (NRTC, 2000). That is, similar offences attract similar points nationwide, and points received in any Australian jurisdiction are attached to the driver's licence regardless of the jurisdiction in which the licence is issued. Such a system is likely to be beneficial for other countries with multiple jurisdictions to aid enforcement of penalty initiatives within the individual jurisdictions.

Effectiveness of lower demerit point threshold

Providing a similar incentive to increasing penalties is lowering of the demerit point threshold for intermediate-licensed drivers (in comparison to fully-licensed drivers). By reducing the number of demerit points required to trigger a suspension or good driving behaviour option, the initiative aims to act as a deterrent from committing traffic offences and encourages young drivers to take greater care when driving.

Lowered demerit point thresholds usually range from 4-6 points (down from 12 points in Australian jurisdictions). Notably, in Britain, rather than causing a licence suspension, if a novice driver accumulates six penalty points within the first two years of gaining an intermediate licence, their status reverts to a learner driver (Baughan & Simpson, 2002).

While several GLS jurisdictions, in Australia and Canada as well as New Zealand have lowered their demerit point thresholds for novices, the effectiveness of these initiatives have not yet been determined (Bouchard, Dussault, Simard, Gendreau, & Lemire, 2000). It is noted that the Victorian Parliamentary Road Safety Committee (1994) recommended that intermediate-licensed drivers should not be differentially affected due to concerns of equity and that removing them from the road system during their formative training may interrupt the crucial process of gaining necessary driving experience. Victorian initiatives in place prior to December 2002, including extending the licence period following a suspension, aimed to address this latter concern.

In one of the few published findings in this area, Tannahill and Smith (1990) report on an association between lower demerit point thresholds and crash reductions. As noted earlier, they report that Ontario intermediate-licensed drivers are allowed only half the number of demerit points required for suspension compared to fully-licensed drivers and that they must have a two-year suspension-free period prior to full licensure. Tannahill and Smith attribute these requirements as contributing to a 14% reduction in traffic offences for intermediate-licensed drivers and 11% reduction for male drivers under 20 years of age.

5.3.8 Extension of licensure following suspension

An important goal of GLS is to maximise the amount of experience novice drivers receive before progressing to a full licence. Therefore, it would be contrary to this goal to introduce penalties, such as licence suspensions, that reduce the amount of driving experience obtained on an intermediate licence. This does not mean that suspensions should not be imposed. Rather, the length of time a novice driver must hold their intermediate restricted licence, once it is returned after a suspension, should be extended by the duration of the suspension (Waller, 1993).

This initiative aims to ensure that all novice drivers spend the same amount of time gaining experience on the lower-risk, restricted licence before proceeding to a full licence. From another perspective, if this initiative was not in place, licence suspensions would reduce the time higher-risk drivers, those for whom the GLS restrictions are most befitting, are subject to driving in restricted (safer) circumstances. Victoria includes this initiative as part of its GLS, however legislation introduced in December 2002 will remove this component in favour of a reduced demerit point threshold.

5.4 Components of both learner and intermediate licence phases

5.4.1 Age-based exemptions from restrictions

In some jurisdictions, such as New Zealand and all Canadian provinces, GLS requirements and restrictions apply to all new drivers irrespective of age, whereas most GLS models in the US only apply to those under 18 years of age (Simpson, 2003). Driver age alone is related to novice driver crash risk, such that risk decreases as age increases (e.g. Maycock et al, 1991; Williams & Ferguson, 2002). However, the higher crash risk found for newly-licensed drivers is generally more attributable to inexperience than age (e.g. Maycock et al, 1991; e.g. Mayhew et al, 1999).

Maycock et al (1991) demonstrated this relationship, based on UK research. Drivers who delayed first licensure from 17 years of age (the minimum age for licensure) to 18 years experienced a 6% lower crash risk. However, regardless of what age drivers are first licensed, the first year of experience results in about a 30% reduction in crash risk.

Mayhew et al's (1999) found a similar pattern in Nova Scotia following the introduction of GLS. Among 16 year-old drivers, a 24% decrease in crashes was found for the first year of the GLS, and a 37% reduction over the first three years. However, while recognising that 16 year-olds comprised the majority of novice drivers, the overall finding was that the crash rate²³ reduced by 19% for all novice drivers.

Staysafe 37 (1997) recommended that GLS restrictions apply to all novice drivers due to the difficulties in separating the combined effect of age and inexperience. Maryland also included this requirement in its GLS to overcome criticism that age-based methods may appear to be discriminatory. Not permitting GLS requirements to be exempted on the basis of age reinforces the message that all new drivers need a long enough period to gain essential driving experience.

5.4.2 Display of licence status plates

Most Australian and some overseas jurisdictions require novices to display plates that indicate their status as either a learner or intermediate driver. In Australia, learner drivers display *L*-plates and intermediate-licensed drivers display *P*-plates (representing 'probationary' or 'provisional' driver). In British Columbia, novice drivers display *N*-plates (ICBC 2002), while in Northern Ireland they require *R*-plates (Baughan & Simpson, 2002).

Staysafe 37 (1997) suggests these status plates are valuable for several reasons:

- They allow other road users to be aware that the driver is a novice so that greater caution can be exercised.
- They allow better enforcement.
- They may help limit the risks that novices are willing to take whilst displaying their licence status.

Some jurisdictions also include the removal of licence status plates as an incentive for novices to undertake additional driver education and/or training (e.g. in the ACT). Staysafe 37 suggests the requirement to display *P*-plates could also be used as an incentive for safer driving by removing this requirement for intermediate-licensed drivers who have had a violation-free record for 12 months.

During 1994-1995, Norway introduced a requirement for learner drivers to display status plates when under private driver instruction. An evaluation of Norway's licensing initiatives found a reduced crash risk for learner drivers and suggested that the requirement to display status plates may have contributed to this reduction (TOI, 1998).

²³ per 10,000 licensed novices

5.4.3 Zero BAC limit

Driving affected by alcohol is a risk factor for all drivers. It presents an even greater risk for novice drivers who are already in a high-risk category due to their age and inexperience, and who are likely to have not yet developed an understanding of the influence of alcohol on their physical and cognitive abilities required for driving. Williams (2003) reports that, while fewer young drivers (under 20 years of age) drink-drive than older driver groups (under 50 years of age), and young drink-drivers consume less alcohol, they have a higher risk of crash involvement in all BAC ranges. An integral component of most GLS jurisdictions is a prohibition against drinking and driving, reflected by a zero or low BAC limit for both learner and intermediate-licensed drivers.

A zero BAC limit has been recommended in North America (Williams & Mayhew, 1999), in the European Union (Bartl, 2000) and Australia (Haworth, 1994). While in some jurisdictions BAC restrictions commence at .02 (e.g. NSW, WA and the ACT) or .03 (e.g. New Zealand), the reduced BAC level still aims to discourage novice drivers from drinking before driving (Chamberlain & Solomon, in press). For example, Florida declares its .02 BAC limit as a 'zero tolerance' of alcohol (Baughan & Simpson, 2002).

Zwerling and Jones (1999) reviewed the literature on the effectiveness of BAC restrictions. They assessed six studies that analysed fatalities and injuries of drivers from four Australian states (Victoria, Tasmania, WA and QLD) and three US states (Maine, Massachusetts and Maryland) with varying BAC limits. Participants were drivers involved in either serious or fatal crashes, ranging in ages from 15-21 years. All states had either .02, .04, .05, .06 or zero BAC restrictions. They found that jurisdictions with a zero BAC restriction, on average, had a 22% reduction for night-time single vehicle fatalities, after the implementation of the restriction. Jurisdictions with a .02 BAC limit had an average 17% reduction and jurisdictions with a BAC limit between .04 to .06 had an average reduction of 7% after the implementation of the restriction. While these results suggest that the lower the BAC restriction the higher reduction of injuries and fatalities in young drivers, this did not control for other GLS components that were not standard across all models.

In 1995 in Ontario, the BAC restriction for novice drivers was reduced from .08 to zero. This offered a more controlled opportunity to investigate the effectiveness of alcohol tolerances. Boase and Tasca (1998) evaluated the effect of the change by comparing the alcohol-related crash involvement of young drivers in 1993 (.08 BAC limit) with those in 1995 (zero BAC). Overall, they found a 27% reduction in the incidence of alcohol-related crashes. Among 16-19 year olds a crash reduction of 19% was found. These findings demonstrate the effectiveness of a lower BAC in reducing novice alcohol-related crashes.

Chamberlain and Solomon (2001; in press) argue that zero BAC restrictions send a clear message not to drink and drive, whereas, higher BAC limits give the impression that some drinking before driving is acceptable. In their study of 1983-1992 data, they found that US states that had introduced a zero BAC as part of their GLS experienced between 22-40% reductions in single-vehicle night-time youth fatalities, while states with BAC limits between .04-.06 experienced only a 7% reduction. They attributed these differences to the BAC restrictions and the different messages that they send to novice drivers.

Chamberlain and Solomon also examined more recent data from the National Highway Traffic Safety Administration. They found that a US jurisdictions that reduced its BAC limit from .02 to zero (Maine) and one that extended its zero BAC laws to apply to drivers up to age 21 years rather than only to age 18 years (Oregon) had respectively 36% and 40% reductions in night-time single-vehicle crashes among affected drivers. From this they concluded that a zero BAC restriction for all drivers up to age 21 years provided a road safety benefit.

Notably, Preusser and Stewart (2001) indicated that education and awareness dramatically increase the effectiveness of drink-driving laws and that detecting and punishing violators is not as important as deterring young people from drinking in the first place. In this regard, they argue that deterrence is best when people perceive that the risk of detection is high and that punishment will be swift and severe.

In Victoria, 1990s data indicate that 21-25 year olds, who represent the early post-intermediate-licence age group, comprise 28% of all drivers killed in alcohol-related crashes but represent only 9.4% of the driving population (VicRoads, 2002a). In addition, a recent survey of planning behaviour and strategy use to avoid drink-driving by this age group showed that attempts to combine alcohol and driving without exceeding a .05 BAC limit were less successful than those to avoid the combination altogether. This suggested the transition from a zero to .05 BAC limit on full licensure was problematic for many of the respondents (Senserrick, Hoareau & Diamantopoulou, 2002). This conclusion, together with that of Preusser and Stewart (2001), indicate that, at minimum, more education is needed, particularly for this exit stage to full licensure.

5.4.4 Maximum speed restrictions

Some Australian jurisdictions (NSW, WA, NT and Tasmania), a number of Canadian jurisdictions (see Mayhew & Simpson, 2001), and European jurisdictions (see Siegrist, 1999) require learner permit and/or intermediate licence holders to drive at lower speeds than posted limits (e.g. 80 km/h in a 100 km/h or 110 km/h speed zone). These restrictions are implemented based on several assumptions (Drummond & Torpey, 1984; Mayhew & Simpson, 1990), including that lower speeds:

- provide inexperienced drivers with additional time to react to cues and recover from mistakes;
- reduce the severity of a crash and subsequent injuries;
- allow drivers to gain experience in conditions with a greater safety margin; and
- may aid development of long-term behaviour that encourages driving at lower speeds.

Boase and Tasca (1998) found that a learner driver restriction from freeway driving in Ontario contributed to a 61% decrease in freeway crashes by learners. An analysis of European data has also found a strong association between speed limit violations and crashes for roads with speed limits of 70, 100 and 110 km/h, but not on roads with 80 or 90 km/h limits (Zaidel, 2001).

Until 1987, Victoria had a requirement that intermediate-licensed drivers could not exceed 80 km/h in their first year of being licensed. After removing this restriction, a comparison of driver crashes pre and post-1987 was conducted that found no evidence of an increase in serious crashes for intermediate-licensed drivers (VicRoads, 1988). Moreover, the analysis found that there was no increase in crash involvement for drivers who would have been restricted previously and, specifically, no increase in the proportion of fatal or serious crashes on roads with speed limits above 80 km/h. Three main factors were postulated as likely contributors to this finding:

1. Poor compliance with speed restrictions by intermediate-licensed drivers.
2. Limitations enforcing the restriction due to difficulties with detection by speed cameras and stationary speed detection methods.
3. The speed dispersion hypothesis, whereby a vehicle travelling at a much slower speed than the prevailing traffic stream elevates crash risk.

Another perspective on this issue has been highlighted by Doherty and Andrey (1997). Doherty and Andrey pointed out that there are additional safety features associated with driving on high speed roads (100 km/h speed limited) compared to metropolitan and feeder roads that make these roads safer for all drivers. They found that restricting young drivers from high-speed roads was associated with a 5% increase in their total crash involvement. They suggested this occurred due to

a transfer of travel by novices to lower-speed roads. In effect, the restriction diverted novices away from the safest roads to comparatively more dangerous roads.

It has also been noted that restricting learner drivers to lower speeds than posted prevents them from gaining experience at higher speeds and developing safer high-speed driving skills (such as freeway merging and driving on rural roads) under supervision and lower-risk conditions (Staysafe 37, 1997). In its submission to Staysafe 37 (1997), the Australian College of Road Safety suggested that a better way to minimise the concerns held towards speed restrictions for learners would be to require that driving commence on low speed roads and then progress to high speed roads once learners acquired sufficient practice. Notably, the European Union review of novice driver initiatives has advised against the introduction of differential speed limits for novices (Bartl, 2000, 2001).

NSW has the most graduated speed restrictions in their GLS compared to other Australian and most overseas jurisdictions. Learners are restricted to 80 km/h, first-stage intermediate-licensed drivers to 90 km/h, and second-stage intermediate-licensed drivers to 100 km/h. The model therefore excludes supervised practice at higher speeds. In comparison, while the Northern Territory has an 80 km/h speed limit for learners (increased to 100 km/h for intermediate-licensed drivers), it allows higher speeds when under instruction in their approved training and licensing program (DTAL).

5.4.5 Mandatory seat-belt use

It is widely accepted that consistent use of seat-belts in motor vehicles substantially reduces the incidence of fatalities and serious injuries due to crashes (e.g. Evans, 1996; Petridou, Skalkidou, Ioannou, & Trichopoulos, 1998; Robertson, 1996; Shibata & Fukuda, 1994). Victorian research has found that in 1997 approximately 20% of car occupants killed were not wearing seat-belts (VicRoads, 1998). It was estimated that the relative risk of being killed in a crash was four times greater for unbelted compared to belted occupants. A 1996 European Traffic Safety Council report (cited in Zaidel, 2002) suggested that if every car occupant in the EU in 1996 had used seat-belts (when front seat usage was only 75-80%), then approximately 10,000 of 25,000 recorded fatalities would have been saved.

Given these statistics, the need to increase seat-belt use is an understandable priority for many jurisdictions, reflected in the introduction of mandatory seat-belt legislation in jurisdictions worldwide (see Meehan & McGinnis, 1999). Based on data from 13 countries in Europe, research has also found that introducing a GLS seat-belt requirement (and related enforcement) is associated with increased usage (between 24% to 64% increase in the first year of introduction) (Steptoe, Wardle, Davidsdottir, Davou & Justo, 2002).

Australia, where seat-belt use is regulated for all drivers, has one of the highest wearing rates in the world (Cammisa, Williams, & Ferguson, 2000; Diamantopoulou, Dyte, & Cameron, 1996a). Moreover, Victorian research suggests that drivers who do not wear seat-belts do so only in some circumstances rather than at all times (Harrison, Senserrick, & Tingvall, 2000).

Victorian research has found that seat-belt use by drivers aged 18-21 years was as high as 99.7% (Diamantopoulou et al, 1996a). The wearing rate for 18-25 year-old passengers was also high, although somewhat reduced at 98.9% for front seat passengers and 94% for rear seat passengers. However, a more recent observational study in Victoria, suggested somewhat lower rates than these for metropolitan drivers. Drivers estimated to be aged between 18-21 years had a seat-belt wearing rate of 95.3%, but for their passengers only 89.1% were correctly restrained (Whelan, Diamantopoulou, & Senserrick, 2003). Therefore, there is still a need to increase seat-belt usage by novices.

Notably, Williams and Shabanova (2002), in a study of US drivers, found that seat-belt usage was lower for drivers of all ages at night and when alcohol was present. Moreover for young drivers, seat-belt use decreased with increasing number of passengers and was lowest when passengers aged 20-29 years were present. A number of US jurisdictions, such as North Carolina, now include a GLS requirement that all vehicle occupants (both novice drivers and their passengers of all ages) must wear seat-belts (Baughan & Simpson, 2002).

5.4.6 Towing restrictions

In 1992, Staysafe 22 reported that at least 1-2% of fatality crashes in NSW involved a vehicle towing a caravan or trailer. Concerns were raised regarding towing skills, particularly, the ability to overtake other vehicles safely. It was noted that, while some drivers may frequently tow trailers or other vehicles, it was likely that most other drivers do so only occasionally. Consequently, Staysafe 22 provided guidelines for correct use of towing equipment and complementary education and licensing regulations.

While several jurisdictions include a GLS towing restriction on learner drivers and/or intermediate-licensed drivers (e.g. Victoria, NSW, WA, ACT and Tasmania) the road safety effects of this restriction are generally unknown. Investigations on whether compulsory testing or licensing was necessary for towing were conducted by the House of Representatives Standing Committees in 1982 and 1986 (Staysafe 22, 1992). In 1982, there was insufficient evidence for such a requirement. In 1986, however, it was suggested that the feasibility of introducing a separate licensing test for drivers for towing caravans over a certain weight or length should be considered to ensure adequate knowledge and driving skills.

On the one hand, it can be argued that towing restrictions for learners and intermediate-licensed drivers allow them to maximise the development of general driving skills before adding to their cognitive/skill workload with the additional demands associated with undertaking a new and complex task such as towing. On the other hand, as argued for other GLS initiatives, it can be argued that undertaking this task while supervised by an experienced driver provides the opportunity to develop towing skills in lower-risk conditions. However, there is a clear distinction between towing and other restricted behaviours, such as driving at night, with peer passengers, on freeways or on high-speed roads. The latter are likely to be frequent, even daily aspects of driving and, therefore, well-practised. In contrast, towing is generally an infrequent activity and, therefore, even an experienced driver of several years may not have a well-developed understanding of the skills involved to provide adequate guidance for an inexperienced driver. If unrestricted during the intermediate licence phase, a novice without any previous experience during the learner period is able to undertake this task unsupervised.

In all, therefore, there is no conclusive support for or against towing restrictions in GLS models. Graduating restrictions from no towing to trailer weight restrictions and then removing restrictions provides opportunity for the added workload of the task to be gradually introduced with experience. However, there is no guarantee that towing will be undertaken or be well-practised in the early phases.

5.4.7 Testing requirements

Tests or assessments are an important component of all GLS models as they provide hurdles to graduate from one licensing phase to the next and encourage increased driving experience (Baughan, 2000; Siegrist, 1999). In addition to the traditional on-road practical tests, testing used within GLS models includes knowledge tests, hazard perception tests and exit tests.

Knowledge tests

Most licensing jurisdictions require applicants to pass a road law knowledge test in order to meet the initial GLS requirements to obtain a learner permit. This is seen as one of the important first

steps of GLS as it allows the learner driver to practice on the road within the framework of road law knowledge (Staysafe 37, 1997).

Knowledge test requirements ensure that learner drivers have a basic understanding of road laws and encourage pre-learners to read safety material before entering the road environment. They also have high face validity within the community (Staysafe 37, 1997). However, there is also community concern that many drivers appear to have little knowledge of the road rules or choose not to apply them (Staysafe 39, 1998). Gregersen and Bjurulf (1996) point out that it is important not to neglect any problems due to poor knowledge because these gaps may lead to potential driving risks.

There is not, however, an exact relationship between passing a road law knowledge test and actual driving performance (Torpey, 1988). Some research has found that applicants who pass the knowledge test on the first attempt had significantly lower crash rates²⁴ in each of their first three years of unsupervised driving than those who needed more than one attempt (Maag, Laberge-Nadeau, Dionne, Desjardins & Messier, 1999). This suggests that initial test performance could be used to screen higher-risk drivers to enable intervention to occur to reduce their crash risk (Hirsch & Magg, 2001).

On-road practical tests and assessments

On-road practical tests serve two primary functions (Baughan, 2000; Staysafe 37, 1997):

1. They are a mechanism to induce learners to accumulate driving instruction and experience.
2. They ensure that minimum skills are demonstrable and that unskilled drivers are screened for exclusion from the unsupervised driving population.

Most GLS jurisdictions require some form of on-road driving assessment (practical test or CBTA) to be passed in order to drive unsupervised. Current on-road practical tests are generally skill-based and do not assess driver characteristics (such as propensity to speed and attitudes/motivations to take risks) and, due to the restricted conditions in which they operate, do not provide a good measure of hazard detection skills (Maycock, 2002; Mayhew, 2003). Therefore, these practical tests are likely to be ineffective in reducing subsequent crash risk as behaviours assessed in the test do not directly determine subsequent driver behaviour.

Research has generally confirmed this assumption, finding little association between overall scores of on-road assessments and crash rates once licensed (Baughan, 2000; Maag, Laberge-Nadeau, Desjardins, Morin & Messier, 2001; Maycock, 2002). Other studies indicate counterproductive outcomes, particularly for male drivers (Hatakka et al, 2002). It was reported that the better that males drivers performed in an on-road practical test, the more often they were involved in crashes and traffic violation. It was suggested that these results were due to the emphasis of the tests on basic skills (which are essential for success in traffic) rather than driver attitude/motivation and driving style.

Maycock and Forsyth (1997), however, have found some associations between types of practical test errors and subsequent crash involvement. For instance, poor performance on low-speed manoeuvres and a higher number of attempts to pass the test were associated with an increase in subsequent crashes once licensed (particularly for females). In addition, the greater the number of minor errors that occurred during the test, especially errors of awareness and anticipation, the greater the crash involvement of the driver once licensed. Baughan (2000) has suggested that changes to the test (such as lengthening it) to screen out drivers who make a large number of minor errors would be beneficial.

²⁴ per 30-day period per 100 licenced drivers

Maag et al (1999, 2001) have also reported that, while no association was found between performance on an on-road practical test (only) and subsequent crashes, females who passed both the knowledge and practical test on the first attempt experienced lower crash rates²⁵ than females who needed more than one attempt.

Drummond (2001) raised a concern that practical tests can encourage young drivers to focus solely on passing the test as the aim of the learning period. This focus risks many young drivers compressing much of their driving experience into a short time period just prior to the test, rather than having a gradual, systematic development of skills related to safer driving behaviour. Baughan (2000) has suggested that any changes to the test that encourage more pre-test experience would be beneficial.

A test focus by learner drivers also has consequences for the driving instruction industry as learners often approach driving instructors to teach them how to pass the on-road practical test rather than to teach them how to drive safely (see Fitzgerald & Harrison, 1999). Instructors have a commercial responsibility to teach their students how to pass on-road assessments or risk losing their business. Baughan (2000) indicates that driver testing is a key way to influence both the competence of novice drivers, in terms of pre-driver instruction, and how they prepare for their test. To address this issue, British Columbia has legislation in place that prohibits driving schools to teach or allow a student to be taught the road test routes used by the Insurance Corporation of British Columbia without the Corporation's consent (ICBC, 2000). This has a dual aim, both to prevent instructors from only teaching novices how to drive these routes well and to reduce concerns of residents.

Maycock (2002) indicates that young drivers (particularly males) are faster, more aggressive, have a greater propensity to violate rules, and have quicker reactions (so leave smaller margins of error). This suggests that an on-road assessment would be beneficial if attitudes were also able to be tested. However, while these are important characteristics to identify risky drivers, they are difficult to test, particularly as applicants are motivated to perform well and are likely to avoid such behaviours during an assessment. Baughan (2000) has suggested that, due to this potential for applicants to feign favourable attitudes in order to pass a test, benefits may be restricted to providing an educational message to those of concern. Professional driving instructors are one such group that might target such education. West and Hall (1998) found that poor attitudes and high-risk drivers can be identified by driving instructors within the pre-licence instruction process.

Hazard perception tests

The ability to identify potential hazards in a traffic environment and to respond to those hazards appropriately, and promptly when necessary, is an important component of safe driving. It has long been recognised that inexperienced drivers have poor hazard and risk perception skills compared to experienced drivers (Brown & Groeger, 1988; Mourant & Rockwell, 1972). This has led to several jurisdictions including hazard perception tests (HPTs) as a component of their GLS testing (e.g. Victoria, NSW, WA, and British Columbia). Whereas the Australian HPTs are computerised, British Columbia's HPT requires drivers to identify potential hazards aloud to the examiner in a commentary style during the on-road practical test (ICBC, 2002). The UK also intends to introduce a HPT in November 2002 (Driver Standards Agency, 2002).

Victoria first implemented a HPT in 1996²⁶ for entry to intermediate licensure (in addition to the existing on-road practical test requirement). While originally intended as an exit test, given that hazard perception ability is related to driving experience, it was decided to include the test at this phase to encourage learners to maximise their on-road driving experience before applying for an intermediate licence (Scott, 2002). The HPT was a computerised test that required the applicant to

²⁵ per 30-day period per 100 licenced driver

²⁶ Victoria's first Hazard Perception Test was developed in 1989, piloted in 1994 and fully implemented throughout Victoria in 1996.

indicate when a nominated vehicle was safe to proceed (or not) in a series of short (seven second) video clips of traffic scenes.

An evaluation of the Victorian HPT by Congdon (1999) found that, novices with very low scores had higher crash involvement than novices with average and high scores, despite its very low psychometric reliability. Low psychometric reliability was considered to be due to the relatively short item duration and to some items eliciting responses that were inconsistent with the responses to other items. There was also a low pass requirement. A revised version was introduced in 2002, which included more items, longer response duration and a higher pass requirement (Scott, 2002).

Exit tests or requirements

Exit tests or requirements aim to reinforce to novice drivers that the GLS is a progressive learning process with various assessment hurdles before a full licence is issued and to establish that drivers have reached appropriate skill levels at each hurdle stage (Baughan, 2000). The rewards of meeting the hurdle tasks are relaxed learner or intermediate licence restrictions.

Staysafe 37 (1997) expressed concern that without an exit test to assess driving skills intermediate-licensed drivers could graduate to a full licence without having driven significant distances or driven under a sufficiently wide variety of circumstances during a period of lower-risk conditions. Therefore, an assessment of on-road driving skills prior to being issued a full licence was recommended and, moreover, that the assessments should be conducted through a competency-based assessment procedure rather than a formal test over a prescribed test route. Notably, this concern is likely to apply only to a certain proportion of novices given that one factor in novice over-representation in crashes is their greater exposure compared to other driving groups (e.g. Arup Transportation Planning, 1995; Evans, 1991).

Mayhew and Simpson (1996) suggest that more frequent and demanding tests be introduced under GLS. This would motivate novices to acquire and practice safe driving skills necessary to pass these tests. Failing the tests would demonstrate skill limitations. They suggested that these tests should be introduced earlier in the process and allow removal of some restrictions but not all before a full licence is issued. There is a rapid decrease in crash risk after the first few months of unsupervised driving (TOI, 1998; VicRoads, 2002a), which makes it imperative to ensure that adequate tests are introduced early in the process (within the first six months of gaining a licence) in order to target the novice driver when their crash risk is highest. In this way, they can be viewed as performance-based entry tests as they ensure that the novice has acquired the skills to progress/enter the next licence stage.

NSW currently adopts this approach by including tests at each level of licensing. Passing a knowledge test is a pre-requisite for the learner phase, passing an on-road practical test is required to progress to a first intermediate phase, a hazard perception test to progress to a second intermediate phase, and an exit test to graduate to full licensure. The exit test is described as a comprehensive test that combines an advanced hazard perception test with a knowledge-testing of road rules and safe driving practice (RTA, 2002). This GLS process was only recently introduced in 2000 and has not yet been evaluated.

A concern about the absence of an exit test from the intermediate licence phase to full licence is that it may give the impression that the novice is well experienced with driving, creating a false sense of safety when first driving unsupervised in higher-risk conditions. Recent Victorian research suggests this can be a difficult transition in adjusting to the relaxed restrictions, in particular, the change in BAC limit from zero to .05 (Senserrick et al, 2002). It may be beneficial to include a marking of this transition, if not with testing then with additional education.

Retesting

NHTSA (1998) has indicated that delayed retesting after failure is a strategy for improving driver proficiency as part of the multilevel testing process, based on the assumption that applicants will study further to address their inadequacies. Baughan (2000) noted that if the cost of a retest was increased or a longer delay was specified before retesting was allowed, applicants might delay sitting the test until they were more prepared.

Some jurisdictions require applicants who initially fail their tests to wait for a specified period of time before undergoing retesting. For example, Quebec enforces a 30-day period (Maag et al, 2001). As mentioned previously, applicants who fail their knowledge test on the first attempt, or both knowledge and practical test for females, are more crash-involved when first driving unsupervised than applicants who pass on the first attempt (Maag et al, 1999, 2001; Maycock & Forsyth, 1997). Delaying retesting for practical tests adds an extra 30 days to the learner period, thereby, increasing the opportunity for more supervised driving experience under lower-risk conditions. Therefore, a delay can act as an intervention for potentially high-risk drivers.

5.4.8 Education, instruction and training

As discussed in Section 5.2.1, education and training initiatives that lead to earlier unsupervised licensure, thereby increasing such exposure at an earlier age, have been shown to be counterproductive. Other education, instruction and training initiatives include those that are either mandatory or optional in GLS models to proceed to the following licence phase.

Learner phase

For learner drivers, initial education and instruction has been found to be important in developing basic car control skills and knowledge of road laws, building public support of such laws and increasing motorists' perceptions of their risk of apprehension (Christie, 2001; IIHS, 2001c). However, no association has been found with subsequent crash risk when licensed to drive unsupervised, either in the short term or long term (Christie, 2001). Essentially it is the accumulation of supervised driving experience under conditions of practice rather than training that provides the greatest crash protection.

A survey of South Australian learner driving experience under CBTA was reported by Austroads (1999). Intermediate-licensed drivers were surveyed at the time of licensing and responses compared of those who had opted for CBTA rather than undertake the on-road practical test option (Austroads, 1999). It was found that those who undertook CBTA were younger and had held their permit for a shorter period than those who opted for the practical test. They had also undertaken more professional instruction and less private supervised practice, experiencing a wider range of driving tasks and conditions under the professional instruction. This experience was also spread throughout the learner period whereas practical test applicants mostly had professional lessons in the period prior to the test. From the above discussions, the younger age at licensing, shorter learner period and lower supervised practice are likely to be disbenefits of the program, although a wider range of driving experience was also reported.

In 1986, Denmark's learner driver education and instruction program underwent a major change in the content and form (Carstensen, 2002). In Denmark, only authorised instructors can provide driver education and training, that is, no private instruction is allowed. This allows for comparatively more controlled circumstances in which to evaluate changes in their education and training programs. The minimum licensing age in Denmark is 18 years and the program can commence up to three months prior to this. In 1986, the emphasis of the program shifted from teaching of traffic rules to a more comprehensive coverage of topics, incorporating both theory and practical sessions, focusing on defensive driving, raising awareness of possible dangers in traffic, how to perceive these dangers, and how to react appropriately. Gradual practice of skills in increasingly demanding driving conditions was included in the programs and also driving on a

motorway and driving at night. These new subjects were also included in the theoretical and practical driving test.

Carstensen (2002) evaluated the effectiveness of these changes to the education, training, and testing program by comparing longitudinal survey data and Police-reported crash data for six years prior and six years following the program changes. Significant crash reductions were found, including multiple-vehicle and low-speed manoeuvring crashes, but not single-vehicle crashes. The reductions were more marked than those attributable to general crash trends, changes in the driving population and improved weather conditions, notwithstanding an increase in distance travelled estimates. Carstensen concluded that at least a 15% reduction in crashes was attributable to the program over a six-year period.

Intermediate phase

A recent meta-analytic review of post-licence education found 24 studies fitting the following selection criteria; randomised controlled trials which compare either post-licence education versus no education, or, one form of post-licence education versus a different form of education (Ker, Roberts, Collier, Renton, Bunn, 2003). There was no statistical difference to indicate that one form of education was more effective than another. There was also no difference between advanced education and remedial education. The authors argued that there was no evidence that driver education is effective in preventing road crashes.

For the intermediate licence phase, most education and training programs evaluated (and available) are those that operate outside GLS models. There has been little evidence of education and training effectiveness in reducing crash risk, in some cases increased crash involvement has been reported, presumably due to inflated confidence and risk taking (e.g. Christie, 2001; Mayhew & Simpson, 2002; Woolley, 2000). These programs have tended to be one-day or half-day training programs, which are unlikely to be associated with crash reductions for several reasons (Christie, 2002; Senserrick, 2002a; Woolley, 2000):

- Risky behaviours and crashes are not necessarily associated with lack of knowledge or inadequate vehicle-handling skills.
- Inexperience is potentially the greatest contributor to crash risk. Therefore, substantial on-road driving experience is a major protective factor that cannot be substituted by short-term training.
- Established behavioural patterns are difficult to modify, particularly when not practised or performed regularly (such as skills for use in emergency situations).
- Crashes are relatively rare events. Therefore, their use as an effectiveness measure is unlikely to distinguish differences in small samples or short study timeframes.
- Evaluations often do not account for distance travelled, other exposure measures or motivation levels of target groups and evaluation outcomes have not always matched the objectives of the training.
- In many jurisdiction, the official crash-reporting criterion involves injury requiring medical treatment. This grossly underestimates crashes of lower levels of severity, the very type of crashes where training may be expected to have its greatest impact.

Within GLS programs, the introduction of the Finnish GLS education and training program was found to be associated with crash reductions (Keskinen et al, 1999; as reported in Section 4.3.1). This differed from tradition training in that the focus was on attitudinal/motivational aspects of driving, rather than on advanced vehicle-handling skills (the focus of many standard, non-GLS training programs).

It is possible that the attitudinal/motivational focus of the education and training programs situated within the graduated licensing programs in both Finland and Denmark are associated with the crash reductions (Senserrick, 2002b). However, there may be other reasons for their effectiveness. These aspects of driving and driving skills are generally not addressed in most GLS education

and/or training initiatives, yet are argued to be among the most beneficial skills for safer driving (Boase & Tasca; 1998; Gregersen, 1996; Gregersen & Bjurulf, 1996; Hatakka et al, 2002; IIHS, 2001c; Woolley, 2000). In addition, the Finnish program is graduated throughout the licensing system, which is similar to Mayhew's (1997) recommendation to develop programs within the multi-stage structure of GLS models by having a basic driver education and instruction course in the learner phase and a safety-orientated training course in the intermediate licence stage.

While the Finnish and Danish programs appear promising, concern has been raised about the benefits of attitudinal/motivation training (known as insight training) following three recent Swedish studies that did not find benefits (Nolen & Nyberg, 2002; Nolen, Engstrom, Folkesson, Jonsson, Meyer, & Nygard 2002; Nyberg & Engstrom, 1999).

Nolen et al. (2002) aimed to further educate young drivers aged 18-24 and motivate them to use larger safety margins. The large-scale scientific crash-based evaluation compared 1,502 drivers that underwent one of four variants of the insight training program with a control group of 803 participants. Participants were randomly assigned to the insight training programs and control group, allowing the net effect of the program to be assessed and avoiding selection and volunteer bias. All participants undergoing insight training underwent a one-day course including practical and theoretical information. The results showed that the test group considered themselves to have understood the message of safety margins and indicated that they were influenced by the course two years after its completion. Positive long-term effects were also reported following the education in seat-belt use, distance-keeping and overtaking, and attitudes towards safety margins of young drivers. However, in terms of the program's effectiveness in reducing novice crashes, the results indicated no significant reduction in crashes for participants who undertook the insight training program and no differences across comparison groups. The comparative value of the results from this evaluation study of insight training and the Finnish study (which had no direct comparison or control group) is unclear.

Nolen and Nyberg, (2002), compared driving skills 1-2 months post-training of 18-20 year-old participants who had either received attitudinal/motivation training or skills-based training (including skid manoeuvring and recovery). A control group was also included. Performance was compared in a series of tasks:

1. An on-road driving session in an instrumented vehicle to measure speed and *g* forces.
2. Assessments of other drivers' behaviour in a series of actual driving sequences recorded on video by Police, demonstrating traffic violations and small safety margins.
3. Braking and evasive action exercises on the slippery surface of a driving track at a training facility.

No benefits of the insight training were found, relative to controls, while disbenefits were found of the skills training, including overall higher mean speeds and higher assessment of driving ability. There was some indication that insight-trained participants assessed traffic risk as lower in the video clips and expressed a higher probability that they would drive in a similar way to the videos. Nolen and Nyberg (2002) concluded that no positive road safety effects of training were demonstrated. However, while the study was thorough, it was based on a small sample of participants (15 skills-trained and 18 insight-trained participants) and the training examined was not situated within Sweden's licensing program.

Nyberg and Engstrom (1999) also conducted a survey of insight training participants, and found that, overall, a visit to the Insight centre had positive effects on attitudes towards seat belt use, however there was no difference in pupil's attitudes towards following distances, speed or road conditions.

In addition to attitudinal/motivational skills, the literature indicates that a number of different kinds of interacting (non-discrete) skills need to be developed for safe driving (Congdon & Cavallo 1999; Gregersen & Bjurulf 1996; Mayhew & Simpson 2002; Siegrist 1999; VicRoads 2002c):

- Basic vehicle-handling skills (e.g. steering, low-speed manoeuvring).
- Perceptual processing skills (e.g. scanning, use of peripheral vision).
- Cognitive processing skills (e.g. attention, concentration, judging distances and speeds, anticipating and predicting other driver behaviour)
- Risk/hazard assessment and reaction skills (e.g. perceiving, assessing and reacting to hazards, including estimation of own skills and anticipating other driver behaviours).
- Decision making skills (making safe and appropriate decisions based on information processed perceptually, and cognitively after risk assessment and rapidly making appropriate decisions).

Basic vehicle-handling skills are relatively quick and simple to learn and very few crashes are due to deficits in these skills. Learner instruction, on-road practical tests and knowledge tests are likely to adequately address these skills. However, it is unclear how much the remaining higher-order skills are addressed by either these or traditional education and training initiatives for intermediate-licensed drivers.

Emerging research shows that the extensive driving experience required to develop these higher-order cognitive skills can be supplemented with computer-based training methods. Two evaluations of young driver training in such skills have been conducted using driving simulators as a pseudo-observational method (Fisher, Laurie, Glaser, Connerney, Pollatsek, Duffy, & Brock, 2002; Regan, Triggs & Godley, 2000). In both studies, training was provided by interactive CD-ROM products. The driver ZED²⁷ (Zero Errors Driving) program uses video sequences designed to enhance learners' ability to recognise and deal with risks on the road, that is, the focus is on hazard perception skills. DriveSmart²⁸ addresses a broader range of skills, including hazard perception, attentional control, time sharing and calibration. Evaluations of the training products with young drivers showed positive results. Fisher et al (2002) demonstrated an increase in US young drivers' awareness of risks after completion of driver ZED at 1-2 weeks post-training, while Regan et al (2000) found, after DriveSmart training, Victorian novices performed significantly better than controls on many (although not all components) of the simulator tasks both immediately after testing and four weeks later. The researchers concluded that trained participants exhibited superior risk/hazard perception skills and attentional control skills than the controls.

Lonero (1999) believes there is future potential for driver education, instruction and training to provide a positive road safety benefit by developing motivation to support sharing of safer lifestyles, integration of road safety issues into school subjects in areas of social values, risk taking, peer pressure, and so on, in activity peer-based situations and development of media to enhance perceptual and decision making skills. Others have likewise recommended a similar holistic approach to road safety education and training (EU ADVANCED project, 2002; Woolley, 2000).

This contrasts with research findings regarding separate programs run through schools that are not integrated in such a manner. For example, a study in Scotland compared the benefits of two school-based programs at three and nine months post-training (Carcary, Power & Murray, 2001). While benefits were found for a post-licence, insight-education program at three months post-training, no differences were found at nine months compared to a pre-licence education program and a control group. Further research is needed to determine how driving education can be effectively integrated into classroom curricula and to determine methods that that best provide on-going effects of the benefits of such education.

²⁷ Interactive CD-ROM produced by the AAA Foundation for Traffic Safety.

²⁸ Interactive CD-ROM produced by Victoria's Transport Accident Commission.

Education is also important for parents of learner and intermediate-licensed drivers in order to maximise the effectiveness of GLS. It is important to educate parents about the importance of their role in supporting and maximising extensive driving experience and how they can facilitate compliance with (and enforce) GLS restrictions (Steenbergen, Kidd, Pollak, McCoy, Pigman & Agent, 2001). A major role for driver education, instruction and training is to create a more realistic view by parents/guardians of their children's driving abilities and motives. Graduated licensing allows a longer and more involved role for families in the driving process (Lonero, 1999).

5.5 Potential GLS components

5.5.1 Mobile phone restriction

Minimising in-vehicle distractions is an important objective of other GLS initiatives, such as passenger restrictions. As noted by Ferguson (2003), many other devices already exist in vehicles that can provide distractions to drivers, including radios, CD players and new technologies like navigation devices. From this perspective, mobile phones are another potential distraction device for drivers.

While it is difficult to obtain accurate data on mobile phone use and crash risk, as the presence or use of phones while driving is not generally recorded in crash data (NHTSA, 1997a; RoSPA, 2002), research suggests that mobile phone use, including hands-free use, is associated with greater crash risk for all drivers (e.g. Beirness, Simpson & Pak, 2002; Brühning, Haas, Mäder, Pfafferott & Pöppel-Decker, 1998; Laberge-Nadeau, Maag, Bellavance, Desjardins, Mesier & Saï di, in press; Ranney, Mazzae, Garrott & Goodman, 2000; Redelmeier & Tibshirani, 1997, 2001; SWOV, 2000; Violanti, 1998; Violanti & Marshall, 1996). Estimates indicate that the distractive effects of mobile phone use while driving increases crash risk by around 25% and that the risk of a driver fatality is between 4-9 times higher than when not using a phone.

Redelmeier and Tibshirani (1997, 2001) also suggest that risk estimates are conservative due to a serious under-reporting bias, as drivers are reluctant to provide information on their activities just prior to a crash that may implicate personal responsibility for the crash. They found that risks were similar for calls placed by the driver and calls received by the driver, during the day and night, during summer and winter, irrespective of age and experience.

RoSPA (2002) suggest that any mobile phone use when driving adversely affects driver performance by impairing the following driving skills:

- Maintenance of lane position.
- Maintenance of appropriate and predictable speed.
- Maintenance of appropriate following distances.
- Judgement and acceptance of safe gaps in traffic.
- General awareness of other traffic.
- Reaction times.
- Vehicle control following later detection of events in the environment.

One study that has examined mobile phone use by novice drivers, among other distraction, is that of Wikman, Nieminen and Summala (1998). Wikman et al investigated the duration of drivers' glances away from the road while driving when dialling a mobile phone, changing an audio cassette or tuning the radio. They found that novices' glance duration was more variable than that of experienced drivers, including more short and long glances at the distraction device. In addition, 29% of novices made glances that were lengthier than the maximum glance duration of experienced drivers. Moreover, these lengthy glances were associated with greater lateral displacement of the vehicle.

Ferguson (2003) reports that, while legislation to ban mobile phone use when driving is being widely considered in the US for all drivers, several states that introduced such legislation for teenage drivers did not enact that legislation. To date, one state, New Jersey has enacted legislation prohibiting learners and intermediate-licensed drivers to use a mobile phone while driving. As this was only effected in August 2002, it is too soon to evaluate the effectiveness of this initiative.

5.5.2 Age and size of vehicle recommendations

While most young driver initiatives focus on the driver and their crash risks, it is also important to examine vehicle protection factors such as vehicle age and vehicle size. A characteristic of young driver crashes is that older cars are often involved. Young drivers tend to drive smaller cars that provide less crash protection and to drive older cars that lack many of the safety features of modern vehicles, such as airbags (Arup Transportation Planning, 1995; Cammisa, Williams & Leaf, 1999; Williams, Preusser, Lund & Rasmussen, 1987). These factors reduce the protection offered to occupants, increasing their risk of serious injury (Di Pietro, 1998; Ferguson, 2003).

Cammisa et al (1999) found that car ownership by young drivers was related to their increased crash risk. They found that, once licensed, 60% of young people drove a vehicle that was different to the one in which they learned to drive and that 28% of these changes were from a larger to a smaller car. The main reasons young drivers chose to drive a particular vehicle was existing ownership (38%), the vehicle was cheap (22%), it was what the driver wanted (13%) or it was small and manoeuvrable (10%). Safety features were rarely mentioned as a reason for choice of vehicle (<2%). Cammisa et al concluded that requiring novices to drive only larger and/or newer vehicles would decrease their crash involvement.

In contrast, a study of family decisions of which vehicle a young, newly-licensed driver should drive found that much more emphasis was placed on transmission type (automatic), fuel economy and safety features (ABS and airbags) than large size (Rivara, Rivara & Bartol, 1998).

While this issue is difficult to address within a GLS, Ferguson (2003) has recommended that parents, who are an integral part of the GLS process, as well as young drivers be made aware of vehicle aspects other than obvious safety features such as airbags that moderate crash risk, including increased risk of small size, high power and unstable vehicles, such as four wheel drives.

5.5.3 Education and training methods from fleet initiatives

Further options for education and training programs that do not appear to be currently under consideration within GLS models are those offered by fleet initiatives. These include peer group discussions and environmentally-friendly driving initiatives.

Peer group discussions

A 'classic' study of fleet safety initiatives is known as the Swedish Telecom Study by Gregersen, Brehmer & Morén (1996). Gregersen et al (1996) compared the effectiveness of four training methods to a control group over a one-year period. These were:

- A peer group discussion program that comprised several small group discussions on how to best meet suggestions on company road safety measures.
- A driver-training program based on insight-training principles.
- A campaign program that circulated seasonal information on road safety issues on several occasions.
- A 'bonus' program that included financial incentives to reduce crash claims.

The study compared the crash involvement of the fleet driver groups two years prior and two years following program participation. While the driver-training group experienced a large reduction in crashes, crash reductions were greatest for the group discussion drivers. This highlights the role of the peer group when aiming to modify long-held attitudes and behaviours.

The importance of social factors in understanding driver behaviour, especially peer relationships, has been highlighted by road safety researchers (Canterbury, Gressard, Vieweg & Grossman, 1992; Evans, 1987; Horneman, 1993; Shope, Waller & Lang, 1996). Other studies have shown that peer intervention can be effective in modifying young drivers' behaviour (e.g. a high school alcohol safety program; McKnight & McPherson, 1986). Therefore, peer group discussions offer a method for potential use in young driver education and training programs that could be explored for future GLS models.

Environmentally-friendly driving

Environment-friendly driving, otherwise known as EcoDrive initiatives, primarily aim to reduce fuel consumption and emissions through changes in travel behaviour. While the EcoDrive concept also includes advice for car manufacturers, policy changes for roads and infrastructure changes, the focus is on smoother driving styles. Therefore, many of the EcoDriving techniques or changes to driving style are also associated with safer driving behaviours, including the maintenance of more controlled speeds that avoid unnecessary braking and acceleration.

In addition to reducing fuel consumption and emissions (Bongard, 1995; Johansson, 1999; Wilbers, 1999), EcoDrive training has been shown to reduce crash risk for fleet drivers (Johansson, 1999; Reinhardt, 1999; Smith & Cloke, 1999). Reinhardt (1999) analysed the results of a training scheme instituted in a corporate fleet. He found 35% fewer crashes, 22% higher mileage per crash and 28% less fleet driver-induced crashes. With the publicity surrounding the scheme, there was also an image improvement for the company and an increase in positive driver motivation. Another company training program also claimed a 35% improvement in crash rate (Smith and Cloke, 1999).

EcoDrive concepts are currently being used by driver trainers, taught in schools and instituted as part of fleet training programs (e.g. EPA Victoria, 2003; Jim Murcott Driving Centre, 2003). Young drivers are likely to be aware of environmental concerns relating to driving, however, to date, EcoDrive concepts are not widely incorporated in GLS education and training programs. A noteworthy exception is the Finnish program that has been associated with post-licensing crash reductions (Keskinen et al, 1999).

In Australia, the focus has been on fleet drivers, with several promotional materials being developed by environmental agencies and motoring organisations. For example, the Australian Greenhouse Office Fuel Consumption Guide 2000-2001 (AGO, 2000) includes "10 top tips for fuel efficient driving", which are consistent with the EcoDrive principles. The Environment Protection Authority and the Sustainable Energy Authority in Victoria are developing a driver education program that highlights the commonality of driver behaviour that improves safety, fuel use and environmental aspects of car use. The course is initially being developed for their staff but it is intended that it will be offered across the Victorian public sector.

EcoDriving offers a potential new direction to explore in relation to educating and training novices in safer driving behaviours by associating these behaviours with environmental benefits. Such benefits include reductions in fuel use, which also provides a financial incentive.

5.5.4 Initiatives for recidivists

Education-based programs

It has been argued that targeted driver improvement programs should apply to intermediate-licensed drivers who violate traffic regulations (Bartl, 2000; Crettenden & Drummond, 1994). Based on the findings of a review of all post-licensing initiatives in EU countries for the EU-Project DAN²⁹, Bartl (2000) reported that driver improvement courses have been found to be important in reducing recidivism rates. For example, in Austria, driver improvement courses for drink-drivers,

²⁹ Description and Analysis of post-licensing measures for Novice drivers

which are conducted by psychologists, were associated with a reduction in drink-driving recidivism by 50% compared to control groups who did not undertake the course. Based on the review, it was recommended that programs should be targeted to the offence and, to the extent possible, targeted at the individual (personal characteristics and attitudes). Moreover, they recommended that, when the offence can be viewed as “a symptom of a socially problematic character” (p.10), psychologists rather than other educators should conduct the programs.

McKnight and Tippetts (1997) report that many of the US driver improvement programs to target frequent offenders have also been found to reduce traffic violations. Programs that focus on road safety and crash prevention have been found to be less effective in reducing crashes than programs seeking to foster lawful driver behaviour. Notably, when drivers have had the choice either to have their licence suspended or to attend a program, it was found that those who chose not to attend the program tended to have the lower crash risk. This does not, however, reflect directly on the quality of the programs as it is likely that the suspensions reduced driving exposure and, therefore, the opportunity to re-offend. McKnight and Tippetts concluded that driver improvement courses should not be undertaken as a substitute for penalties, such as licence suspensions, that lead to lower crash risks, particularly those that reduce exposure.

Within Australia, some courts in NSW refer repeat offenders to education-based Traffic Offenders Programs (TOPS) after a finding of guilt yet prior to sentencing, which is delayed until such time that the program can be undertaken. An evaluation of the TOPS initiative indicated that participation reduced the probability of re-offending by an average of 25% (Saffron, Wallington & Chevalier 1999).

It is likely that education programs such as these could be modified to target intermediate-licensed recidivists.

Other initiatives

Other non-education based sanctions that may form options for deterring serious recidivist offender behaviour include vehicle sanctions involving the use of interlocks (alcohol interlocks for recidivist drink-driving and seat-belt interlocks for recidivist non-restraint use) and vehicle immobilisation, impoundment or permanent confiscation (NRMA, 2002).

Alcohol interlocks have been found to be a significantly effective way to reduce drink-driving recidivism while a device is fitted (Bierness, 2001; Voas, Blackman, Tippetts & Marques, 2002). However, it is reported that such devices are often removed and that, therefore, other incentives or initiatives need to be implemented with education-based programs for long-term benefits (Bierness, 2001; Voas et al, 2002). Emerging technologies regarding seat-belt interlocks intended for the new car market also offer the potential for such devices to be fitted into recidivists' vehicles (Regan, Oxley, Godley & Tingvall, 2001). NSW is currently considering introducing compulsory seat-belt interlocks for recidivist non-users, although the effectiveness of such an initiative is relatively uncertain (RTA 2000).

The NRMA (2002) reports that evaluations of vehicle immobilisation, impoundment or confiscation laws in the US and New Zealand have shown reductions of repeat offender behaviour of between 15% to 70% (depending on the sanctioning system in place and other broader factors). In addition, crash reduction benefits have been found. For example, in California, vehicles can be impounded on committing an offence that results in a licence disqualification or when driving on a disqualified licence. Crash reductions of 25% were reported for drivers in the former category and 38% for those in the latter category.

Simpson, Chinn, Stone, Elliott and Knowles (2002) reported on an alternative initiative in the UK. In the UK, intermediate-licensed drivers who accumulate six or more demerit points can be ordered

by the courts to re-sit their licence test. However, Simpson et al concluded that this initiative was not an effective deterrent.

A further alternative is found in California's GLS. A second traffic conviction or at-fault crash within the first 12 months of intermediate-licensure results in a 30-day driving restriction that allows only supervised driving by a fully-licensed driver of at least 25 years of age (Tannahill & Smith, 1990). This initiative has not been specifically evaluated.

Overall, several initiatives have been implemented to target recidivists of a range of traffic violations that offer the potential for specific young driver programs to be incorporated into GLS models.

5.6 Summary of individual component effectiveness

5.6.1 Components of the learner phase

Increasing supervised driving experience

The supervised learner period is clearly a much safer time to gain driving experience than when first on an intermediate licence. Several GLS initiatives to increase supervised driving experience were identified.

Mandating a minimum learner period

Some research has indicated that simply mandating a minimum learner period is likely to increase supervised driving experience, although this has not been formally evaluated.

Extending the learner period

Increasing the minimum learner period, lowering the minimum learner age and raising the minimum intermediate licensing age have all been associated with significant crash reductions. In addition, lowering the minimum learner age in Sweden for example, has also been associated with an increase in supervised driving experience for about half of the learner driver population.

Mandating minimum driving hours

There is no clear research on the effectiveness of mandating minimum driving hours, although parental involvement in this process has been associated with a greater amount of driving experience than the set minimum. While most jurisdictions with mandatory requirements require 50 hours of driving experience, research suggests that 120 hours is a more appropriate target and is likely to result in substantially lower crash risk.

Removing processes that encourage early licensure

Research has clearly shown that education initiatives that allow earlier licensing are associated with increased crash risk. It is also possible that short permit expiry periods and testing to reissue permits can encourage early licensing, although this has not been specifically addressed in research.

Supervisory driver requirements

While no published evaluation focusing specifically on the relationship between requirements for (private) supervisory drivers and learner experience or crash risk was identified, several requirements were recommended in the literature. These are minimum age and driving experience requirements, BAC limits (potentially a zero BAC limit rather than the limit for fully-licensed drivers to stress the importance of the role), and the absence of a licence disqualification during a specified time period (e.g. previous two years). Care should also be taken to ensure that requirements apply equally to all supervisory drivers, including those with driving qualifications from other jurisdictions.

Professional instruction

While professional driving instructors were found to offer an important service in teaching basic driving skills, research has shown that this service may not differ from that provided by family and

friends, and that the latter may be more beneficial in the variety of driving opportunities it presents. Recent research suggests, however, that learners are involved in fewer crashes while under professional instruction than while privately supervised. While education for parents/guardians about the limitations of learners' higher-order driving skills (e.g. hazard perception and time sharing) is likely to be beneficial, this finding regarding crash involvement may be largely due to the greater levels and variety of driving exposure experienced under private instruction. Some studies have also shown that learners who undertake a large number of lessons with professional instructors are more likely to fail the on-road practical test and to be involved in more crashes post-licensing. The literature suggests that the optimal combination of instruction is a moderate number of professional lessons in addition to extensive driving practice gained under private supervision.

Multiple passengers restriction

Given the increased workload to the driver of multiple passengers, one road safety research centre recommends that only the supervisory driver should accompany the learner in the early stages of learning to drive. However, as experience is gained, the supervised driving environment provides a safer context to learn to manage the distractions of passengers before graduating to the intermediate licence phase. Therefore, mandating a passenger restriction for the entire learner period, would intuitively appear to be counterproductive. At least one such jurisdiction has such a passenger restriction but the effects of this specific component have not been evaluated. The literature suggests that a recommendation to introduce passengers other than the supervisory driver only once some initial driving experience has been gained should be included in guidelines for supervisory drivers and other education initiatives.

5.6.2 Components of the intermediate licence phase

Extending the intermediate licence period

Extending the intermediate licence period, either by increasing the minimum intermediate licence period or raising the minimum age for full licensure, has been associated with significant crash reductions. Some research suggests that a period of 2-3 years is more beneficial than one year, with one year found to be insufficient for establishing safer habits to prevent drink-driving. It has also been suggested that other means can encourage delayed licensure, such as making it more difficult or costly to apply for a licence.

Night-time driving restrictions

Research in the US and New Zealand has reported significant reductions in novice driver crashes in jurisdictions that include night-time driving restrictions, particularly during restricted hours. It has also been shown that introducing the restrictions did not result in significant increases in crashes during daytime driving or for fully-licensed drivers transporting novices in restricted hours. While novice driver crashes may rise just prior to the start of the restriction period as they return home, any increase is more than compensated by a reduction during restricted hours. In jurisdictions where novices are at adult ages, it has been suggested that it may be more appropriate to introduce night-time driving restrictions as an incentive/penalty only for serious or night-time traffic offences or promote them on a voluntary basis. Alternatively, they could be introduced for a relatively short period when first on an intermediate licence phase, such as six months (shown to be effective in the US). Following overseas models, in addition to allowing supervised driving during the restricted periods, exemptions should be permitted for work, education and other purposeful, non-recreational driving. Associated education campaigns should emphasise aims, conditions and exemptions relating to any night-time driving initiative.

Peer passenger restrictions

Passenger restrictions, particularly restrictions of peer passengers, have been reported to be effective in reducing the crash risk of novice drivers (and their passengers), even when accounting for a subsequent increase in driving exposure by novices driving separately who would otherwise be travelling together. US research has indicated that the potential benefits are likely to be greater

than those effected by night-time driving restrictions, and most powerful when both of these initiatives are implemented simultaneously. Following overseas models, exemptions should be permitted for family members and when a supervisory driver is present. The potential impact on the use of designated drivers as a drink-driving countermeasure should also be considered. As for night-time driving restrictions, associated education campaigns should emphasise aims, conditions and exemptions relating to any night-time driving initiative. It has also been suggested that education programs can be developed to manipulate the nature of driver-passenger inter-relationships in order to reduce risky behaviour and subsequent crashes.

High-powered vehicle restriction

This GLS component was only found for one jurisdiction and has not been specifically evaluated. An early examination of high-powered vehicle restrictions suggested that only a very small crash reduction was likely for the small number of novices who would regularly drive these vehicles. However, recent research suggests that young drivers of 'performance' cars undertake more driving risks that contribute to their increased crash involvement during night-time hours. In addition, males who are interested in driving fast tend to choose fast cars and drivers who include high acceleration and powerful engine among their most important factors for car choice have been shown to have more traffic violations. It is likely that there is a public perception, reinforced by the media, that restricting novices from driving high-powered vehicles will help limit the incidence of crashes involving excessive speed.

Good driving record requirement

The literature suggests that requiring a good driving record in terms of a minimum violation-free period to graduate from an intermediate to full licence is an important motivational component of the GLS and potentially more so than the requirement to graduate through the system based on time alone. Moreover, such a requirement has been associated with significant reductions in traffic violations and crashes. Some jurisdictions include an absence of at-fault crashes as a good record requirement, however, the benefits of this are unclear given that novice driver crashes can result from inexperience, not just intentional risk taking, and can also represent crashes that not even experienced drivers could avoid. Consideration should also be given to the potential for intermediate-licensed drivers alleged to have committed traffic offences to progress to a full licence while their case awaits a court hearing. This allows drivers found guilty to bypass any additional penalty initiatives in the intermediate licence phase.

Increased penalties for offences

No direct evaluation has been conducted on the effectiveness of increased penalties for intermediate-licensed drivers as a GLS initiative. However, the literature suggests that drivers who commit serious offences, such as speeding and running red lights, have a higher crash risk.

Lowering of demerit point thresholds

Reaching or exceeding a mandated demerit point threshold can lead to the issuing of warning notices, licence disqualifications or good driving behaviour options. Research confirms that demerit points are predictive of crash involvement and that the intervention initiatives these effect are associated with crash reductions. An early evaluation of a lower demerit point threshold for intermediate-licensed drivers found reductions in crashes, in numbers of young drivers reaching the threshold, and in recidivism following suspensions. However, the GLS also included a two-year suspension-free good driving requirement. No clear evaluation of the effectiveness of the demerit point component alone has been reported.

Extension of licensure following licence suspension

Adding the period of suspension to the length of the intermediate licence period ensures that novice drivers remain in the intermediate licence phase for the same minimum duration as all other intermediate-licensed drivers before progressing to a full licence. Therefore, it increases the safety

benefits associated with GLS restrictions for the highest-risk drivers (those committing serious traffic offences). There is currently no available evaluation of the effectiveness of this initiative in reducing crashes.

5.6.3 Components of both learner and intermediate licence phases

Age-based exemptions from restrictions

Age alone has been shown to be related to crash risk, such that as age increases, crash risk decreases. Given the focus of GLS on young drivers, no specific evaluation was found regarding the effects of adding or removing age-based exemptions at older age thresholds (e.g. 18 years in the US, or 25 years in Australia). However, research does show that GLS initiatives contribute to crash reductions for all novices - not just the youngest ones.

Display of licence status plates

The requirement for learners and intermediate-licensed drivers to display licence status plates assists with enforcement of GLS requirements. One study has indicated that this requirement for learner drivers may have contributed to crash reductions. No other specific evaluations were found.

Zero BAC limit

Research has clearly indicated that a zero BAC limit is a more effective road safety countermeasure than higher BAC limits of .02 and over. This initiative has contributed to significant reductions in both alcohol-related crashes and night-time single-vehicle crashes for novices. There is some indication, however, that the transition from a zero to .05 BAC limit on full licensure can be problematic, suggesting better education regarding this transition is required.

Maximum speed restriction

The literature suggests that lowering or having differing speed limits for learner and intermediate-licensed drivers compared to fully-licensed drivers is unlikely to lead to a reduction in crashes. In fact, it may increase inexperienced driver crashes on lower-speed roads that do not have the same safety features. Restrictions for learners in particular prevent the development of high-speed driving skills under supervision and lower-risk conditions. Rather, the literature suggests that a more effective requirement would be for learners to commence driving on low-speed roads and gradually progress to higher-speed roads once sufficient practice has been acquired.

Mandatory seat-belt use

There is clear support for mandating seat-belt use for all vehicle occupants as a means to reducing substantially the incidence of crash fatalities and serious injuries. Introducing a GLS seat-belt requirement in jurisdictions without national regulations has been shown to increase seat-belt usage. While Australian drivers have one of the highest usage levels worldwide, there is potential for usage to be increased. Recent research indicates lower usage by novices when alcohol is present and when carrying passengers. These situations should be considered for targeted education and enforcement programs.

Towing restrictions

A small proportion of fatality crashes have been found to involve a vehicle towing a caravan or trailer. Overall, however, there is no conclusive support for or against towing restrictions in GLS models, although this initiative has face validity due to the additional cognitive/skill demands placed on the novice by this generally infrequent, complex task. Graduating restrictions from no towing to trailer weight restrictions to removing restrictions could provide opportunity for the added workload of the task to be gradually introduced with experience. However, there is no guarantee that towing will be undertaken or be well-practised in the early phases.

Testing requirements

Tests or assessments are an important component of all GLS models as they provide necessary hurdles and encourage increased driving experience.

Knowledge tests

Passing a knowledge test on road laws is considered an important first step of a GLS to allow learners to undertake driving experience within the context of this understanding. While there is not a clear relationship between knowledge tests and driving performance, some research suggests that passing the knowledge test on the first attempt is related to lower crash risk.

On-road practical tests and assessments

On-road practical tests encourage learners to gain experience, although this experience may focus more on passing the test than learning to drive safely. They also ensure that minimal skills can be demonstrated before progressing to a licence allowing unsupervised driving. However, the majority of the research literature suggests that, in their current form, practical tests have little association with later crash involvement. There is some evidence that errors on low-speed manoeuvres, requiring several attempts to pass the test, and making a large number of minor errors during the test can be linked to subsequent crash risk. Incorporating assessment of driver attitudes/motivations and making changes that will require increased pre-test experience is likely to be beneficial.

Hazard perception tests

Well-developed hazard perception skills are an important component of safe driving. Research has shown that inexperienced drivers have poorer hazard perception skills than experienced drivers. Evaluation of a currently implemented hazard perception test (VicRoads) suggests that it is not yet sensitive enough to predict likely crash involvement with high reliability, although it has subsequently been revised.

Exit tests or requirements

Exit tests or requirements reinforce the message that the GLS is a progressive learning process. The absence of any exit test from intermediate licence to full licence phases may give the impression that the novice is well experienced with driving, creating a false sense of safety when first driving unsupervised. The literature also suggests that testing is likely to have maximum road safety benefit if introduced early in the intermediate licence period, which is the highest crash risk period for novices. Current GLS models that include two-step intermediate licence phases with interim testing may allow the role of such tests to be evaluated in the future.

Retesting

Applying moderate costs and delaying the time to retesting after a test failure are strategies that can increase the motivation of inexperienced drivers to acquire greater driving skills and be well-prepared before resitting the test. For practical test failures, this delay increases the length of the supervised learner phase and, therefore, the opportunity for potentially higher-risk drivers to gain additional experience under lower-risk conditions. There is no specific evaluation, however, of this GLS initiative.

Education, instruction and training

While having an essential role in learning to drive a vehicle and becoming familiar with road laws, information-based education and basic vehicle-handling skills instruction are not directly associated with reduced crash risk and cannot substitute for skills gained through extensive supervised driving experience. Few programs for intermediate-licensed drivers exist within GLS models. Those that operate outside GLS models show either no benefits or disbenefits for young drivers, including increased confidence, risk taking and higher crash involvement. Within GLS models, education and training programs that focus on attitudinal/motivational aspects of driving and are graduated throughout the GLS phases have been associated with crash reductions. In addition, research suggests that higher-order cognitive skills essential for safer driving, such as hazard perception, attentional control, time sharing and calibration, can be trained by computer-

based programs to supplement the development of these skills gained through extensive driving experience.

5.6.4 Potential GLS components

Mobile phone restriction

Minimising in-vehicle distractions is an important objective of GLS initiatives, such as passenger restrictions. Research indicates that all mobile phone use when driving, including hands-free use, is associated with increased crash involvement and greater risk of driver fatalities for all drivers. One study of novices showed poorer performance than experienced drivers of an on-road driving task when dialling a mobile phone. Such research has prompted one US jurisdiction to introduce legislation to include a mobile phone restriction when driving during GLS learner and intermediate licence phases, although legislation is being considered to ban all mobile phone use when driving for all drivers in many US jurisdictions and other countries.

Age and size of vehicle recommendations

Novice drivers often drive older and smaller cars. Research suggests that requiring young drivers to drive newer vehicles or limit vehicle ownership would decrease their crash involvement. While this is likely to be true, enforcing such a requirement is not likely to be viable or acceptable in the community, particularly given the increased cost of larger and newer vehicles. An alternative strategy is to encourage young drivers and their families to focus on all vehicle safety factors when choosing a car.

Education and training methods from fleet initiatives

Small group discussions with peers has been shown to be an effective measure in reducing the crash risk of fleet drivers. Likewise EcoDriving skills have been associated with substantial crash reductions among fleet drivers. These methods offer potential new directions to educate and train young drivers in safer driving behaviours.

Initiatives for recidivists

Targeted education-based driver improvement programs have been found to be effective in reducing both recidivism rates and crash risk. Alcohol and seat-belt interlocks have also been shown to be effective in reducing recidivism, although it has been suggested that more long-term benefits would result if these initiatives were coupled with education-based programs, particularly to deter removal of the devices. Likewise, research has shown that vehicle immobilisation, impoundment or confiscation are effective in reducing recidivism, with one study of impoundment initiatives also finding associated crash reductions. Requiring licence retesting has not been found to act as a deterrent. One jurisdiction imposes a short-term restriction to supervised driving only, yet this has not been specifically evaluated.

6. OTHER GLS CONSIDERATIONS

Whilst the advantages of GLS models and individual components have been identified for more than two decades, many jurisdictions have implemented only limited applications. Notably however, components that are considered best practice in overseas jurisdictions may not necessarily be appropriate for Australian jurisdictions. Introducing new or updated licensing policies must take into account many factors relating specifically to the jurisdiction in question. These include potential impacts on mobility and independence, social acceptability and community support, compliance and enforcement issues, and suitability with respect to existing laws, particularly when those policies introduce more onerous requirements than those currently in place. These issues are now addressed.

6.1 Impact on mobility

Driving motor vehicles has become nearly an essential part of life in our society. Therefore, there is a social justice impact of GLS restrictions placed on novices that can impose, albeit short-term, independence and mobility constraints on the driver and the wider community. These can include the individual, families and others, when alternative transport arrangements are required. To gain road safety benefits, GLS restrictions must be balanced with individual and societal mobility wants and needs (Carseldine, 1998), recognising that GLS initiatives are one of the few options available to help reduce the road toll.

In practical terms, the restrictions most likely to reduce mobility are peer passenger and night-time driving restrictions. It is important to emphasise, however, that these are not blanket restrictions on all passengers and night-time driving. Rather, as is the case in overseas jurisdictions where these restrictions are currently enforced, they allow purposeful driving (e.g. for work, education) and driving with family members or under supervision of a fully-licensed driver. The key outcome is that only non-essential social/recreational driving, such as that with peers during high-risk driving hours, should be affected. Moreover, a recent US survey suggests that the majority of young drivers are able to undertake the activities they wish to and have not been unduly affected by either night-time driving or peer passenger restrictions (Williams, Nelson & Leaf, 2002).

Night-time restrictions have been opposed in Australia in the past on the basis that they would unfairly discriminate against rural communities where there is little public transport (e.g. Carseldine, 1998; Drummond, 1994). Similar concerns were raised in the US and Canada where it has been reported that up to 90% of parents and over 70% of novices support night-time driving restrictions (Ferguson, Williams, Leaf & Preusser, 1999; NHTSA, 1998; Williams et al, 1998). Begg, Langley, Reeder and Chalmers (1995) examined attitudes of young novices towards GLS restrictions in New Zealand and found that, while new drivers were affected by the restrictions more than expected, this did not lead to an increase in the numbers of young drivers who disagreed with the restrictions.

Studies investigating attitudes towards GLS restrictions have not separated rural from metropolitan drivers and as such may have potentially masked urban-rural differences. A report on equitable changes to the Western Australian licensing system (BSD Consultants, 2000) emphasised the need to consider specific individuals and minority groups (such as Aboriginal communities and drivers from remote areas) in the application of GLS restrictions. It was argued that the government had an obligation to ensure that any problems resulting from the new system affecting for minority and disadvantaged groups should be minimised and that, where possible, there should be flexibility to assist these groups in addressing the demands of a new system. Such an approach is essential to minimise inequality between, for example, rural and metropolitan drivers.

6.2 Social acceptability and community support

GLS restrictions are often perceived to be socially unacceptable and likely to lack community support (e.g. Waller et al, 2000). When Waller first proposed a GLS model that included night-time driving and passenger restrictions, these were rejected as being “draconian” and an “insidious attack on teenagers’ lifestyles” (Williams, 2001). Since then, these restrictions have been shown to be effective in reducing crashes and the social climate has changed. They are now considered both beneficial and sensible, with many groups recognising that it is important for restrictions to be somewhat strict, such that motivation and incentive to obtain a full licence is not undermined (Mayhew & Simpson, 1996; NHTSA, 1998; Williams, 2001b). Moreover, surveys of both young drivers’ and parents’ support for GLS restrictions have generally been more favourable than might be anticipated, with high levels of support found both before and after a GLS is introduced (e.g. Mayhew, 2000).

A year after New Zealand’s GLS was implemented (which includes both night-time driving and passenger restrictions), results of a survey by Whines (1988; cited in Baughan & Simpson, 2002) found there was no notable strong opposition to the system by young drivers. Those directly affected by the system were less supportive than others, with novices citing some inconvenience due to the restrictions, such as finding a supervisory driver if they wished to drive at night or with passengers. Less concern was expressed by 15-17 year olds and more by rural residents and females who were concerned about lack of public transport and personal safety. However, positive aspects were also identified. Young drivers reported less pressure from their peers to provide lifts, to drive at night when tired or after consuming alcohol. In addition, less self-reported traffic offences were reported after the GLS was introduced, as well as an increased perceived risk of detection. A later survey by Begg et al (1995) found that 70% of young drivers agreed with their GLS restrictions.

US and Canadian research offers additional support. Recently, Williams et al (2002) found that the majority (75%) of young drivers surveyed who were affected by GLS restrictions in California reported that they were able to do the activities they wanted and that they had not been unduly affected by either night-time driving or peer passenger restrictions. In addition, the majority (79%) of parents strongly endorsed the program. In relation to night-time driving restrictions, a telephone survey of parents of 17 year olds in the US found that three out of four parents surveyed supported the restrictions (Ferguson & Williams, 1996), while a survey of parents in Nova Scotia found that 86% supported the restrictions (IIHS, 1997).

Lin and Fearn (2003) report that overall, approval rates for night-time driving restrictions have been high at between 74-94%. Moreover, they suggest that the majority of American parents prefer the restriction to commence from 10:00pm or even earlier. In comparison, they suggest passenger restrictions have not received the same level of support, with approval rates ranging from 43-72%.

The low 43% approval rate cited by Lin and Fearn is likely to relate to research in North Carolina, which was conducted prior to introducing their GLS. A HSRC (1996) survey of parents showed that, while 74% favoured a night-time driving restriction, only 43% favoured passenger restrictions. Night-time driving restrictions were subsequently introduced late in 1997, but not passenger restrictions. However, it has been found that community support and acceptance of GLS restrictions tends to increase once those restrictions have been implemented (Begg et al, 1995; Lin & Fearn, 2003; Mayhew, 2000; McCartt, 2001). McCartt (2001) reports that, in Florida, there was a significant decline in the opposition of young drivers to each of the specific components of the GLS over time. As many as 90% of young drivers now support night-time driving restrictions, which are in place, while only 60% support passenger restrictions, which have not yet been implemented (NHTSA, 2000).

Research suggests that parents do not always understand novice driving risks well, being aware of their increased risk in general, but not in relation to specific situations such as driving at night with peer passengers (Simons-Morton & Hartos, 2003). Simons-Morton and Hartos (2003) suggest that parents are often ambivalent about novice driving, in that they are concerned about the risks but are also interested in reducing the time they spend transporting their teenage children. They suggest this may contribute to their weaker support for passenger restrictions, which apply all day, than for restrictions at night only. Notably, it has been reported that in Michigan, where the GLS requires a high level of parent involvement, parents describe how this experience has “brought home to them” (p.20, Waller, 2003) how much the young driver needs additional practice. Such involvement can help raise parents’ understanding of the objectives of GLS restrictions, which they may in turn feed back to their teenage children. Preusser and Leaf (2003) also highlight positive parental awareness and parental restriction findings in jurisdictions that did not have a GLS in place.

6.3 Compliance and enforcement

Related to the issue of acceptance of GLS restrictions, is the issue of compliance and whether GLS restrictions need to be actively enforced. Research suggests that, even when approval of a GLS model is high, many young drivers report violating GLS restrictions.

Surveys of young drivers have identified a range of compliance issues. For example:

- In North Carolina, 17% of young drivers reported that they had driven without the required supervisor (Foss, Goodwin, Feaganes & Rodgman, 2002)
- A survey in Nova Scotia found that 9% of learners surveyed drove unsupervised and 2% reported drinking and driving. Of the intermediate-licensed drivers surveyed, 3% reported drinking and driving, 39% reported violating the (limited) passenger restriction, and 40% reported violations of the night-time driving restriction (Mayhew et al, 1998).
- Approximately 40% of intermediate-licensed drivers in California reported violations of the night-time driving restriction (Williams et al, 2002).
- A restriction from driving on freeways for learner drivers in Ontario was associated with a 61% reduction in the freeway crashes of learner drivers, which nonetheless indicates problems with compliance, which otherwise would have resulted in a 100% reduction (Boase & Tasca, 1998).
- An Australian survey found that, in all states, 10% of learners and over one-third of intermediate-licensed drivers surveyed had not displayed their licence status plates all of the time (Haworth, 1994).
- Victorian crash statistics show that approximately 20% of fatal crashes involving 18-20 year olds are alcohol related, despite a zero BAC limit applying to these drivers (VicRoads, 2002a). Similar compliance problems have been reported with the zero BAC restriction in Ontario (Boase & Tasca, 1998).

Foss and Goodwin (2003) also report that non-compliance with passenger restrictions is more common than for night-time driving restrictions. They argue that while parents are able to monitor use of a vehicle at night and their supervision requirements, it is far more difficult to monitor the carriage of passengers (when supervisors are not present) and this may contribute to the greater non-compliance. Notably, this argument appears based on the assumption that most US novices are able to drive unsupervised from about age 16 years and, therefore, are likely to be living at home. This finding may have less relevance for some Australian and European jurisdictions where unsupervised driving is only permitted at older ages (e.g. 18 years in Victoria, Norway and Sweden). It is likely that in these jurisdictions many young drivers will have moved out of home and/or be less accessible to parents for monitoring. Moreover, one study in California reported that about half of the parents surveyed admitted to have knowingly allowed a son or daughter to violate the passenger restriction (Williams et al, 2002).

Naturally, the higher the level of compliance with GLS restrictions the greater the potential benefits. It can be argued that problems with compliance indicate there is a need for active enforcement of GLS requirements and restrictions. Zaidel (2002) points out that a regulation may be regarded as inefficient and ineffective if it is not complied with or cannot be enforced. Nonetheless, Mayhew et al (1998) highlight that, despite this non-compliance, substantial GLS benefits have been reported. Moreover, while the proportion of young drivers reporting non-compliance was relatively high in some instances, those that had violated the restrictions reported doing so only rarely. Notably, up to 72% of those violating some conditions (e.g. the night-time driving restriction) did so with their parents' permission, despite parents reporting that it was easy to enforce the restrictions.

It is generally agreed that both voluntary and parental enforcement of GLS restrictions have been effective in the US, with Police enforcement a less important factor (Mayhew, 2000; Williams, 1999; Williams et al, 1998). This is particularly demonstrated in the case of Michigan, where a high level of parental involvement is required. Under Michigan's GLS, parents must provide written permission before learners can enter the first level of licensing. Parents are also in charge of supervising logbook entries and are notified of any violations of GLS laws until the driver turns 18 years of age. A recent survey found that this parental involvement greatly enhanced GLS compliance (Waller et al, 2000). In particular, the amount of supervised driving experience undertaken by learners was at a level that exceeded the requirement. While 50 hours were mandated, on average, 75 hours were reported. Simons-Morton and Hartos (2003) also promote the use of parent-novice contracts for framing and promoting parental management practices and checkpoints for negotiation and monitoring.

Mandating such regulations and involving parents/guardians reinforces the importance of the supervisory role. Further, it empowers parents to enforce the restrictions they favour that may otherwise be difficult to do so without mandatory requirements (Foss & Goodwin, 2003). Begg et al (1995) reported a similar sense of empowerment for young drivers who might otherwise be less inclined to assert safer driving preferences under pressure from their peers.

Zaidel (2002) reports that much of the compliance with existing traffic rules and regulations is not only a result of voluntary compliance, but also due to successful socialisation rather than being dependent on active policing. However, it has been argued both that, if a law exists, it should be enforced to confirm for the community that the matter of the law is serious (Drummond, 1994) and that enforcement is a necessary component for any crash reduction strategy involving young drivers (Seigrist, 1999). Mayhew (2000) also acknowledged that if laws are to be effective they must be associated with appropriate penalties for violations of the restrictions, along with avenues for remediation (see also Begg et al, 1995).

A survey of judges, police and other enforcement agencies in Kentucky found that GLS restrictions were difficult to enforce and licence suspensions were not seen as a sufficient deterrent. However, it was suggested that this may have been due to poor education strategies that failed to make new drivers aware of the consequences of violations (Steenbergen et al, 2001). It has been argued that non-compliance often occurs because the target group does not understand the requirements and that, therefore, measures to encourage compliance should include clarity and brevity of regulations, as well as a public education campaign (Foss & Goodwin, 2003; ORR, 2001). Mayhew et al (1998) highlighted this issue for novice drivers, suggesting they poorly understood penalties associated with violating GLS restrictions and, therefore, there was a need for greater knowledge associated with a belief that the regulations are enforced before compliance with GLS restrictions would improve. Foss and Goodwin (2003) also highlight that laws that are not considered to be reasonable by the majority of parents and young drivers will result in non-compliance. Therefore, adequate education for both young drivers and their parents is essential to maximise compliance.

There are a number of other inadequacies associated with relying on enforcement for road safety countermeasures. These are discussed in Hirsch and Maag (2001) and include:

- The randomness of law enforcement.
- Evidence that legal sanctions reduce crash risk is weak.
- Legal compliance does not always decrease crash risk.
- The law sometimes fails to penalise drivers when they drive dangerously. (They found only 57% of crash-involved drivers who committed behavioural errors or unsafe driving acts were charged.)
- Traffic violations often do not lead to the recall, diagnosis or treatment of the driver for their behavioural deficiencies, which increases their crash risk, and, even when this does occur, it may come too late.

Concern has also been raised that providing exempt conditions within restrictions (such as allowing older passengers in passenger restrictions and purposeful driving in night-time driving restrictions) can make such restrictions too difficult to enforce (Carseldine, 1998). While this may indeed be true, it does not necessarily follow that potential benefits of the restrictions would be undermined. According to general deterrence theory, potential offenders can be motivated through fear of detection, regardless of how low that threat may be in reality (Cameron & Sanderson, 1982; Grosvenor, Toomey & Wagenaar, 1999). That is, even without extensive Police enforcement, the threat of detection can nonetheless deter young drivers from violating the restrictions. Foss and Goodwin (2003) indicate that anecdotal evidence also suggests that when young drivers violate the conditions of their licence they drive more cautiously.

Victorian intermediate-licensed drivers who receive their licence at 18 years of age or older can legally drink alcohol and have the right to vote, in comparison to American drivers who are below voting age and often are not able to drink legally until 21 years of age. Imposing significant restrictions at this time might appear to contradict this message of their changing role in society. Nonetheless, it is appropriate that driving should be viewed separately from other rights for young people due to their disproportionately high risk of being involved in an injury crash during their early stages of unsupervised driving. From this perspective, novice drivers and the community in general need to be properly educated with respect to any initiatives that are introduced so that restrictions are seen as enhancers of road safety rather than as punitive measures.

6.4 Applicability to all new drivers

A particular objection to the introduction of GLS restrictions has been that they apply to all young drivers (if not everyone) applying for a licence, including responsible drivers (Crettenden & Drummond, 1994). That is, it has been suggested that GLS models 'punish' responsible drivers together with the irresponsible ones (Meehan & McGinnis, 1999; Waller, 2003). Further, some people believe it is discriminatory to assume young drivers are immature and 'bad' drivers (Meehan & McGinnis, 1999).

In response to this concern, it should be re-iterated that the aim of a GLS is not to restrict drivers unfairly, but rather to enable inexperienced drivers to gain the necessary skills to become safer drivers under circumstances that pose lower risk. Anyone new to learning a complex skill will make more errors in the early stages of that skill acquisition (Waller, 2003). All new drivers, due to their inexperience, can benefit from restrictions that allow graduated entry into the unsupervised driving environment (Williams, 1999).

This is supported further by the finding that most novice drivers involved in fatal crashes do not have prior traffic violations or records and are not readily distinguishable from other drivers (Crettenden & Drummond, 1994). That is, up until the time of the crash they are not necessarily identifiable as problem or irresponsible drivers. Moreover, a recent study by McKnight and

McKnight (in press) has found that the great majority of young driver crashes examined were attributable to inexperience: errors in attention, visual search, speed relative to conditions, hazard recognition and emergency manoeuvres. Very few crashes could be attributed to intentional risk-taking behaviours, such as excessive speeds.

Young driver crashes are attributable to both youth and inexperience; however, inexperience appears to be the greater risk factor (e.g. Drummond & Yeo, 1992; Maycock et al, 1991; Mayhew et al, 1999; Simpson, 1996). GLS models aim to address both of these factors. Any novice, young or old, will be better protected when developing their driving skills in a comparatively lower-risk environment.

6.5 Terminology

A final issue of note regards the need to avoid using GLS terminology that has negative connotations (Williams, 1995). In the US, night-time driving restrictions are often referred to as 'curfews'. Even the term 'restriction' can imply an infringement on people's rights and freedoms as it infers that something is being taken away. To overcome such concerns, it is recommended that a GLS should be viewed and marketed as a *protective system* that gradually phases in expanded driver privileges, rather than one that bans certain types of driving (Williams, 1995). The emphasis should be placed on allowing driving experience to be gained under the safest conditions, gradually allowing driving in higher-risk circumstances, in some cases, as a reward for responsible driving.

7. CONCLUDING COMMENTS

This review clearly shows that imposing graduated driving requirements and restrictions on young drivers contributes to reductions in their crash and injury risk. However, other factors, such as contrasting methodologies, delayed and declining licensing rates and lack of distance travelled data make it difficult to quantify the extent of the contribution. Moreover, individual GLS components of a certain phase of the system do not function in isolation from other components within that phase or components in other phases. Deciding on the nature and extent of restrictions and requirements for particular GLS models requires careful consideration of a wide range of options and, potentially, further assessment of their effectiveness based on the existing licensing system and the community affected by it.

Imposing any restrictions involves a trade-off between mobility wants and needs and crash reductions. Restrictions need to be perceived as onerous or demanding enough to provide initiative to partake actively in behaviour that will lead to their removal. Perhaps surprisingly in some instances, even some of the more stricter GLS models have received acceptable levels of community support, if not at the time of their introduction, a year or so later.

Most Australian jurisdictions have had some form of GLS in place for a long time. Certainly, requirements and restrictions of extended learner and intermediate licence stages form a system that has contributed to safer driving among 16-21 year-old and even older drivers who progress through the system. However, in general terms, Australian licensing systems do not conform to the full (US) concept of GLS and, therefore, do not necessarily achieve the full benefits that GLS offer. Therefore, the question remains, whether it is time to revise current models to include components such as night-time driving restrictions and peer passenger restrictions, and/or to include additional or optional steps within licensing phases.

It is important to note that overseas GLS restrictions shown to have significant effects in reducing novice driver crashes are not the same as those that have previously raised concern in Australia. For example, most passenger restrictions in overseas GLS models do not ban all passengers. Rather they allow carriage of family members, children and adults, but not carriage of peer passengers. Night-time driving restrictions include automatic exemptions for work, education and other non-recreational purposes. Jurisdictions with such restrictions in place are achieving significant benefits and, while having penalty sanctions in place to encourage compliance, the systems primarily rely on self-compliance, compliance enforced by parents/guardians and socialisation processes. As such the ability to enforce compliance by Police is not an essential element.

While both night-time driving and passenger restrictions are effective countermeasures in their own right, the review highlights that night-time driving restrictions address only one time segment. Moreover, daytime recreational driving with peers in the US is associated with a higher crash rate for novices than when driving during night-time hours. Therefore, it has been argued that, if only one such initiative were to be introduced, peer passenger restrictions would provide a more effective countermeasure than night-time driving restrictions alone. However, some US research has shown that the crash reduction effects of night-time driving restrictions carry over to daytime hours, resulting in substantial reductions in fatalities to a similarly high or higher level than that predicted for passenger restrictions. The comparative value of these findings for Australian jurisdictions is complicated by age differences, including differences in legal drinking ages, and by differences in BAC laws. Moreover, overseas research suggests that having both of these initiatives in place, concurrently, is most effective in reducing young driver fatalities, and is considered more viable than other measures with similar effectiveness. The combination of their

reported effectiveness and viability in implementation warrants further assessment of their potential effectiveness in the Australian context.

It is appropriate to assert that driving should be viewed separately from other rights afforded to young Australians due to their disproportionately high risk of being involved in an injury crash during the early stages of driving. Vehicle crashes are the leading cause of death for young people and most are preventable. From this perspective, novice drivers and the community in general need to be educated with respect to any initiatives that are introduced so that restrictions are viewed as enhancers of road safety rather than as punitive measures. The present review provides support that this is possible.

While education clearly is an essential precursor to compliance, as has been the experience in New Zealand and elsewhere, appropriate penalties for violations of GLS requirements and restrictions are also likely to be essential to encourage high compliance rates. Any changes to current GLS models should be carefully linked to appropriate education and enforcement programs to maximise their effectiveness. Research suggests that parents could be particularly important facilitators of this process. Therefore, increased parental involvement should be an essential consideration.

In conclusion, this review details many new and varied GLS initiatives when compared to those included in current Australian models. While some have been well-evaluated and clearly show positive effects, others provide only face validity and sometimes anecdotal evidence of their effectiveness. This review has attempted to highlight these differences and identify those options worthy of further consideration. While Australian GLS models have undoubtedly contributed to crash reductions, young drivers are still over-represented in Australian crash statistics, especially at night and with peers. Therefore, it is time to review current models and to develop, implement and evaluate additional GLS initiatives in order to maximise their road safety benefits and better address the over-involvement of young Australians in crash statistics.

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APPENDIX 1: LIST OF ABBREVIATIONS

ACT	Australian Capital Territory
AGO	Australian Greenhouse Office
ATSB	Australian Transport Safety Bureau
BAC	Blood Alcohol Content
CBTA	Competency Based Training & Assessment
DAN	Description & Analysis of post-licensing measures for novice Drivers (EU Project)
DPINT	Department for Planning and Infrastructure Northern Territory
DPIWA	Department for Planning and Infrastructure Western Australia
DTIERT	Department for Transport Infrastructure, Energy and Resources Tasmania
DQT	Driver Qualification Test (NSW exit test)
DTAL	Driver Training And Licensing (NT education course)
GVM	Gross Vehicle Mass
HPT	Hazard Perception Test
ICBC	Insurance Corporation of British Columbia
IIHS	Insurance Institute for Highway Safety
L1/L2	Learner permit period 1 or 2
MUARC	Monash University Accident Research Centre
NHTSA	National Highway Traffic Safety Administration
NRMA	National Roads & Motorists' Association
NRTC	National Road Transport Commission
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
OOR	Office of Regulation Reform
P1/P2	Probationary/Provisional licence period 1 or 2
QLD	Queensland
RoSPA	Royal Society for the Prevention of Accidents
RTA	Roads & Traffic Authority (NSW)
SWOV	(Institute for Road Safety Research – Netherlands)
TAC	Transport Accident Commission
TAS	Tasmania
TOI	Institute Of Transport Economics
TOPS	Traffic Offender Programs (NSW recidivist driver education program)
VIC	Victoria
WA	Western Australia

**APPENDIX 2: HOURS OF NIGHT-TIME DRIVING RESTRICTIONS
IN NORTH AMERICAN JURISDICTIONS**

Table A.1 Night-time restrictions in North American jurisdiction

Time restriction	Jurisdiction
Sunset to Sunrise	Idaho
6:00pm to 5:00am EST 8:00pm to 6:00am EDT	South Carolina
8:00pm to 6:00am	South Dakota
9:00pm to 5:00am	New York North Carolina
9:00pm to 6:00am	Delaware
10:00pm to 5:00am	New Zealand
10:00pm to 6:00am	Mississippi
11:00pm to 5:00am	Louisiana Pennsylvania West Virginia
11:00pm to 6:00am	Tennessee
11:00pm to 6:00am (Sun-Thurs) 12:00am to 6:00am (Fri-Sat)	District of Columbia
11:00pm to 6:00am 1:00am to 5:00am*	Florida
11:00pm to 6:00am (Sun-Thurs) 12:00am to 6:00am (Fri-Sat)	Illinois
11:00pm to 5:00am (Sun-Fri) 1:00am to 5:00am (Sat-Sun)	Indiana
12:00am to 4:00am	Virginia
12:00am to 5:00am	California Colorado Kentucky Maryland Massachusetts Michigan New Hampshire New Mexico Oregon Texas Utah Wisconsin British Columbia Newfoundland & Labrador Nova Scotia Ontario Yukon
12:00am to 6:00am	Alabama Georgia Nebraska
12.30am to 5:00am	Iowa
1:00am to 5:00am	Missouri New Jersey Ohio Rhode Island Washington

Note: Adapted from IIHS (2001d & 2002a) for US & Canada

* dependent on age at licensing