



Graduated driver licensing – a review of some current systems

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Executive Summary

The accident liability of novice drivers decreases very sharply during the first few years of driving and especially in the first few months. This implies that safety could be improved by (a) enhancing the learning process, (b) preventing people from driving unsupervised until it has taken effect, and (c) influencing behaviour or reducing exposure to risk during the early months of solo driving to counter the effects of inexperience and immaturity. One approach here is to modify the driving test to improve the training and experience accumulated by learner drivers, and screen-out drivers who have not yet reached a standard acceptable for solo driving. However, the driving test is not necessarily a suitable tool for achieving all the desired improvements to driver training and experience. Also, it is difficult for a test to include in its pass/fail criterion those variables that govern the discrepancy between supervised driving performance during the test and subsequent driving behaviour. It is therefore desirable to consider whether other changes to the training/testing/licensing system would be beneficial.

TRL was asked by the Department for Transport, Local Government and the Regions to undertake a review of graduated licensing and related systems as part of a project to review the practical driving test. A graduated licensing system aims to provide a staged progression from initial learning to unrestricted solo driving by means of measures designed to restrict exposure during early driving, exert a supervisory influence over driver behaviour during the first part of a driver's solo driving career or improve the level of training and experience accumulated before driving solo without restrictions.

Examples of elements used in other countries include restrictions on where drivers may drive (i.e. the types of road that may be used), when they may drive (night-time curfews), with whom they may drive (through requirements for supervisors and restrictions on passengers) and under what conditions (for example, under zero alcohol levels, or with seat-belt wearing for all occupants where this is not otherwise mandatory). Requirements such as additional training, or periods of accident and conviction free driving, are also intended to encourage safer driving practices. As drivers move through the licensing system the restrictions are lifted until they equal those that apply to the fully licensed driving population. Other possibilities include staged testing, staged training (better matched to the natural progression of skills and knowledge acquisition), a lengthening of the period of supervised learning, and other measures to encourage or require an increase in the levels of supervised practice.

Evaluation studies and reviews of licensing systems currently in place suggest that the following elements merit serious consideration for Britain.

Increasing the amount of driving experience accumulated by learner drivers

Increasing the amount of driving experience accumulated before solo driving has generally been shown to reduce novice drivers' accident risk. If such increases in experience

could be achieved in Britain, there would probably be an improvement in novice driver safety. Possible mechanisms for achieving this increase in experience include increasing the minimum age for holding a full licence, reducing the minimum age for starting to learn to drive on the road, and/or introducing a minimum learning period. Increases in pre-solo experience can also be achieved by specifying the minimum amounts to be gained, and requiring supervisors to certify that the requirement has been met. Indications from the USA are that there could be a high level of support for this from parents and learner drivers. Advisory minimum targets for pre-solo experience also seem likely to be helpful. The introduction of a logbook for learner drivers should be useful in this regard. Increases in pre-solo experience are likely to be accompanied by small increases in the number of accidents during learning. Potential disbenefits of increasing the minimum licensing age include a reduction in the mobility and independence of young people, and a possible shift to less safe transport modes; these would need to be considered before a decision were made. Reducing the age for starting to learn to drive is likely to lead to a tendency for people to obtain their full licences somewhat earlier than they do at present. This would tend to increase the total mileage driven in a driving career, and to reduce the maturity of novice drivers – both of these changes tending to increase accidents, thus offsetting some of the benefits of the increase in experience.

Sweden achieved very large increases in the amount of pre-test experience, and substantial improvements in novice driver safety, from reducing the minimum age of learning to drive from 17.5 to 16 years – so this type of measure merits very serious consideration in Britain. Unfortunately, results from Norway have been less encouraging; the reasons for this need to be better understood.

Night-time restrictions

There is evidence that these can be very effective at reducing night-time accidents, at least during the months covered by the restricted licence – though effectiveness will depend on the level of enforcement. The weight of evidence is that curfews do not generally lead to important increases in accidents outside the curfew hours. If night-time restrictions were to be considered in Britain, the likely benefits would need to be compared with the effects on employment and mobility, which could be minimised by careful choice of the curfew period and by the use of exemptions for work-related and other essential journeys.

Passenger restrictions

Given the association between passengers and accidents, particularly amongst teenage drivers, introducing passenger restrictions for drivers when they first begin driving unsupervised is an option that merits serious consideration. Social effects, and the possibility of young people transferring to less safe forms of transport, or making car journeys as car drivers rather than passengers, would need to be taken into account before a decision were made.

Increasing penalties for traffic violations

Many licensing systems enable sanctions for novice drivers to be introduced at a lower threshold than is the case for fully licensed drivers, or require a period of conviction-free driving before drivers move to the next stage of licensing. The British system of reversion to L-driver status for drivers who accumulate six penalty points during their first two years of unsupervised driving is an example of such a provision. Such measures can be seen as a way of maintaining a supervisory influence on novice drivers during their period of early solo driving. There is, as yet, little evidence on their effectiveness, but they are relatively simple to introduce and are attractive in that they seek to address the motivational components of the novice driver safety problem.

Improving training and education

There is little research evidence that increased formal driver training improves safety. Possible reasons for this have been discussed extensively in the literature. A number of themes have emerged that offer the hope of improving the effectiveness of training, one being the desirability of improving the hazard perception skills of learner drivers. Developing and evaluating improved driver training is now an important research task.

Reduced alcohol limits for novice drivers

Given the problems of alcohol related accidents amongst novice drivers, imposing lower limits on young or novice drivers is likely to bring benefits and may also instill safer drink-driving habits after the restricted period ends. In Britain, enforcement of a differential limit for novice drivers would be difficult in the absence of a requirement to carry licences or identity cards. Drink driving is more prevalent amongst those in their early 20s than it is amongst teenage drivers. It may therefore be counterproductive to have a lower limit for novices, who would then see the limit raised just as they moved into the group in which the drink-driving problem peaks.

Driver and passenger identification

Enforcement of several of the measures listed above would be difficult unless novice drivers are required to carry identification. Passenger restrictions specified in terms of age would also need some form of passenger identification to be carried.

Probationary licences and exit tests

The British licensing system already includes a two-year probationary period after the full driving licence is granted. Simply adding an exit test to the end of this period does not have much to recommend it at present. This conclusion might change if more severe, risk-reducing restrictions were to be imposed during the probationary phase.

Altering the name of the post L-test licence to (say) the probationary licence should make novice drivers more aware of probationary conditions and facilitate enforcement. It would also provide a mechanism for making post-test training or other provisions mandatory in the future, if and when the case for such measures is judged to be strong enough.

1 Introduction

Novice drivers experience a sharp decrease in accident liability, much of it associated with experience rather than age, during the first few years of driving (Maycock *et al.*, 1991; Forsyth *et al.*, 1995; Sagberg, 1998; Mayhew *et al.*, 2000; Maycock, 2002). This invites us to search for ways of (a) enhancing the learning process, (b) preventing people from driving unsupervised until it has taken effect, and (c) influencing behaviour or reducing exposure to risk during the early months of solo driving to counter the effects of inexperience and immaturity (Baughan, 1998). One approach is to modify the driving test to induce learner drivers to improve their level of training and/or accumulate more experience, and screen-out drivers who have not yet reached a standard acceptable for solo driving. The project 'Review of the Practical Driving Test', which TRL is currently undertaking for Road Safety Division, Department for Transport, Local Government and the Regions, was set up to investigate such possibilities.

The project has identified several potential improvements to the test. These were summarised by Baughan (1998), who pointed out that despite its potential for improvement, the driving test is not necessarily a suitable tool for achieving all the desired improvements to driver training and experience. It is also difficult for a test to include in its pass/fail criterion those variables that govern the discrepancy between supervised driving performance during the test and subsequent driving behaviour. It is therefore desirable to consider whether other changes to the training/testing/licensing system would be beneficial.

At the simplest level, there are some items that it would be difficult or impossible to cover in the practical test. Night driving is one example. In principle, such items might be included as mandatory pre-test training, possibly combined with a move towards logged training and experience, though the difficulties which abound in the literature of demonstrating a positive effect of training on safety, and the evidence that certain types of training can make matters worse, would have to be born in mind.

As far as post-test driving behaviour is concerned, the licensing system could be modified to exert some continuing supervisory influence over the novice driver. The reversion to learner-status for drivers who accumulate six penalty points within two years of passing the test is an example of such a mechanism in Britain.

Examples of elements used in other countries include restrictions on where drivers may drive (i.e. the types of road which may be used), when they may drive (night-time curfews), with whom they may drive (through requirements for supervisors and restrictions on passengers) and under what conditions (for example, under zero alcohol levels, or with seat-belt wearing for all occupants where this is not otherwise mandatory). Requirements such as additional training, or periods of accident and conviction free driving, are also intended to encourage safer driving practices. As drivers move through the licensing system the restrictions are lifted until they equal those that apply to the fully licensed driving population. Other possibilities include staged testing, staged training (better matched to the natural

progression of skills and knowledge acquisition) a lengthening of the period of supervised learning, and other measures to encourage or require an increase in the levels of supervised practice.

In general these elements are intended to have one or more of the following effects:

- a Increasing or improving training, education and/or informal supervised practice during the early phases of driving.
- b Reducing risk by reducing total exposure or particular types of exposure, or changing exposure 'quality' during early driving.
- c Exerting a supervisory influence over driver behaviour during the first part of a driver's solo driving career.
- d Taking advantage of the beneficial effect of age (maturity) on accident risk. (Delaying full licensure to achieve this also has the effect of shortening driving careers, thereby further reducing total accidents).

The aim is, or should be, for (b) and (c) to be done in ways that do not prevent or discourage drivers from gaining the experience necessary to reduce their accident liability - otherwise the effect could be simply to delay the excess accident liability of novice drivers until the time when unrestricted solo driving is allowed.

Combinations of such measures are generally known as 'graduated licensing systems', a term reflecting the idea of a staged progression from initial learning to unrestricted solo driving. The term can be misleading in that these systems do not necessarily involve successive levels of driving licence. It is also used differently in different countries. In North America, for example, it tends to be reserved for systems involving on-road driving restrictions (Williams, 2000a). The term will be used in its most general sense in this report, Section 2 of which describes some systems that have been introduced in other countries and summarises the results of evaluation studies. Effects of the individual components of graduated licensing systems are discussed in Section 3. Section 4 summarises elements of graduated licensing that seem worthy of particularly serious consideration in Britain.

Appendices A and B tabulate the provisions of a selection of licensing systems.

2 Summary of some licensing systems and results of evaluation studies

2.1 USA

In 1977, the US National Highway Traffic Safety Administration (NHTSA) developed a model system for provisional licensing of novice drivers. This was based on a literature review of research on young driver problems, accident and violation data on young drivers, and existing state procedures for driver education and training. From the review, a list of potential components were drawn up and modified following discussions with NHTSA staff. Three possibilities were developed. These were then reviewed by a panel of traffic safety experts to identify the

best single model and further revised following a consultation exercise with various outside organisations and individuals. The NHTSA report (Croke and Wilson, 1977) recommended a three-stage process comprising a six-month learner phase (requiring adult supervision, driver education and voluntary driving practice supervised by parents), a six-month restricted phase (allowing unsupervised driving during certain hours, but recommending parent-supervised driving, and including a youth driver improvement programme), and a twelve month provisional licence phase during which the driver had to demonstrate a six-month crash and conviction free driving period.

The system has since been revised to combine the restricted and provisional phases into an intermediate phase, such that new drivers under 18 go through the following process over a minimum 18 month period before obtaining an unrestricted licence (Hedlund and Miller, 1996):

Stage 1: Learner's permit

- Minimum age should be recommended by the state.
- Must pass vision & knowledge tests.
- Licence should be visually distinct.
- A licensed adult (at least aged 21) is required in vehicle.
- All occupants must wear safety belts.
- Drivers under age 21 are subject to lower blood alcohol concentration (BAC < 0.02).
- Learner must remain crash and conviction-free for 6 months to move to next stage.

Stage 2: Intermediate licence

- Requires successful completion of stage 1.
- Minimum age should be recommended by the state.
- Must pass second level knowledge test, including safe driving practices and on-road test.
- Licence should be distinct from the learner and full licence.
- Restricted hours of driving unless supervised by parent/guardian or licensed adult at least 21 years old.
- All occupants must wear safety belts.
- All drivers under 21 are subject to lower blood alcohol concentration (BAC < 0.02).
- Youth oriented and more rapid driver improvement actions should be taken in the event of violations and at-fault crashes.
- Parent participation certifying that novice had minimum number of supervised hours of driving.
- Driver must remain crash and conviction-free for 12 months to move to next stage.

Stage 3: Full licence

- Requires successful completion of stage 2.

The National Transport Safety Board recommended that states enact graduated licensing, especially with night

driving curfews (Williams and Sweedler, 1995). In addition, the National Administrative Licence Revocation Coalition endorsed the concept and recommended that its members support state action on graduated licensing.

Ferguson *et al.* (1996) compared crash rates for teenagers in states with different laws/policies regarding licensure. The results showed that generally, states with more severe restrictions had lower crash rates.

In recent years, many States have introduced elements of graduated licensing systems, so that by the end of 1999 over 30 States had elements of graduated licensing and 24 of them had full, multistage systems (Williams, 2000b). More are planned. This section summarises the licensing systems in States for which evaluation results had been reported by early 2001. Licensing provisions in a selection of other States are included in Appendix A and B. Williams and Mayhew (1999) reviewed the evidence from evaluations of the graduated licensing systems which have been introduced and proposed a 'blueprint for graduated licensing' consisting of a series of recommendations for the structure and characteristics of such systems in North America.

2.1.1 California

California introduced a new licensing system from October 1983 that applied to drivers under age 18. Further changes were made in 1998 to strengthen the graduated licensing provisions. The present system allows drivers to start learning at age 15, and includes the following:

Provisional permit phase:

- Provisional permit issued from age 15 on passing knowledge test (traffic law and signs) and vision screening.
- Must be supervised by a fully licensed driver aged 25 or more.
- Permit must be held for at least 6 months before applying for a provisional licence (was 1 month prior to July 1998).
- Driver education course must be completed.
- Six hours professional driver training required.
- At least 50 hours of practice certified by supervising adult. At least 10 hours of this must be at night. Before July 1998, the requirement was 30 hours practice.
- Must pass driving test to obtain provisional licence.

Intermediate phase (provisional licence)

- During first year, must not drive between midnight and 5am unless accompanied by a driver aged 25 or more. (Introduced in July 1998)
- During first 6 months, must not carry passengers under the age of 20 unless accompanied by a driver aged 25 or more. (Introduced in July 1998)
- During second 6 months, must not carry passengers under the age of 20 in the car between midnight and 5 am unless accompanied by a driver aged 25 or more

- Licence becomes full licence at age 18 (17 prior to July 1998)
- BAC < 0.01 for drivers under 21.
- Youthful driver improvement program (e.g. a warning letter after the first offence and a 1 month licence revocation allowing supervised driving after any second conviction).
- Full licence available from age 18 years.

Following the introduction of the 1983 system, it was reported that the rate of crashes involving 15-17 year olds was reduced by 5.3 per cent (Hagge and Marsh, 1988). A preliminary evaluation of the 1998 changes cited by Mayhew (2000) has reported a 20 per cent reduction in at-fault fatal and injury accidents for 16 year old drivers, and a 21 per cent reduction in deaths and injuries amongst teenage passengers of 16 year old drivers.

2.1.2 Florida

Florida received a grant from NHTSA to implement and evaluate components of a graduated licensing system and a graduated licensing system took effect from July 1996. There have been some modifications since then. The current system is as follows:

Learner phase

- Learner permit available from age 15, with a mandatory 12-month period (was 6 months before January 2000) for holding a learner's permit. Supervised driving only.
- 50 hours of supervised practice are required, 10 of these at night.
- Must hold learner permit for at least 12 months (before January 2000 the requirement was to hold the learner permit to at least age 16).

Intermediate phase

- No unsupervised driving between 11 p.m. and 6 am for 16 year olds, or between 1 am and 5 am for 17 year olds.
- Limit on number of traffic violations allowed for all drivers under 18.
- 'Zero' alcohol tolerance: <0.02 BAC for all drivers under 21 (added January 1997).
- Minimum age 18 years for transfer to full privilege licensure.

The Florida system has been evaluated by Ulmer *et al.* (1999), who found that 16 year olds had 11 per cent fewer crashes in 1997 compared with 1995. There were also reductions of 7 per cent for 17 year olds and 19 per cent for 15 year olds. Overall, the reduction for 15 – 17 year olds was 9 per cent. No reductions during this period were apparent in the neighbouring state of Alabama which had no graduated licensing system, or amongst 18 year olds in Florida who are not subject to the graduated licensing system.

2.1.3 Kentucky

Kentucky introduced a graduated licensing system in 1996 with the following provisions:

Stage 1 Learner permit

- Learner permit available from age 16 on passing a written knowledge test and an eyesight test.
- Must be accompanied by a driver at least 21 years old.
- For drivers under 18, there is a curfew between midnight and 6 am (with some exceptions).
- Driving under the influence of alcohol and drugs is prohibited. A new 'zero alcohol tolerance' level of <0.02 BAC applies to all drivers under 21.
- Permit must be held for at least 180 days before taking the driving skills test.

Stage 2 'Provisional privileges phase'

- This stage is entered by passing a driving skills test.
- Distinctive 'under 21' licence issued to people under 21 years old.
- A hearing, leading to probation or suspension of driving privileges for drivers under 18 who accumulate 7 violation points, and for drivers over 18 who accumulate 12 points. Drivers under 18 face longer suspension periods.
- Zero alcohol tolerance (<0.02 BAC) for drivers under 21.
- For drivers under 18, there is a curfew between midnight and 6 am (with some exceptions).
- A four-hour graduated licensing education course must be completed within one year after obtaining the licence

Stage 3 Full adult licence

- Begins at age 18, except that <0.02 BAC applies to drivers under 21.

A preliminary evaluation of the Kentucky system (Kentucky Transportation Center, 1999) found a 33.5 per cent reduction in the per-driver accident rate for 16 year olds (the comparison was between a three-year average of pre GLS accident data and a two year average of post GLS accident data). There was no change in the accident rate for a control group. Accidents after midnight reduced by 33.5 per cent for 16 year olds, fatal accidents by 27.6 per cent and injury accidents by 34.5 per cent. Teenage alcohol related crashes reduced by 30.5 per cent.

2.1.4 Maryland

Maryland's licensing system was introduced in 1979 though changes have been made since then. The provisions for car drivers are as follows:

Stage 1: Learner permit

- Learners permit allowed from age 15 years 9 months.
- Permit is issued on successful completion of written knowledge test and vision test.
- Driver is given the first of two parent handbooks to assist parents in the continued training of the basic skills.
- A permit holder can only drive if accompanied by a licensed driver 21 years of age or older.

- Driver education must be completed before driver can move to next phase.
- The minimum time a permit must be held is 14 days (4 months from January 1999).
- Minimum of 40 hours supervised driving required to pass to stage 2 (from July 1999).

From age 16 years 1 month, a learner driver can take an on-road test to move to Stage 2.

Stage 2: Provisional licence

- No driving from midnight - 5.00am if under 18 years old, unless accompanied by a driver aged 21 or over (this restriction can be waived for work/educational reasons).
- Parent supervised practice - a second handbook is issued to parents to guide in the training of more complex skills.
- <0.02 BAC for drivers under 21.
- A youthful driver improvement program - for a first offence drivers sent safety pamphlet and must report for a test on its contents, for a second offence or failure to pass the test, the driver must take a driver improvement course.
- Drivers must demonstrate 1 year of conviction-free driving or be 18 before applying for full licence
- Minimum age of 18 for unrestricted licence.

An evaluation of the Maryland system was reported by McKnight *et al.* (1983) who analysed conviction and accident data for 1975-1982. Two elements were studied: the effect of the six-month violation free period, and the night-time restriction. 'Daytime' crashes (outside the restricted hours) fell by 5 per cent for 16 and 17 year old drivers overall. The differences were not considered to be due to changes in exposure. However, the benefit was not carried beyond the restricted driver phase, implying that although the restrictions had some effect, this was not reflected in safer behaviour in the long-term.

McKnight *et al.* (1983) also reported that there was a reduction in convictions of 10 per cent for 16 year olds and a statistically non-significant 5 per cent for 17 year olds.

The night-time driving restriction was not found to reduce accidents during the restricted hours of 1am - 6am for those 16 and 17 year olds who were subject to the restrictions. Another study (Pruesser *et al.*, 1984) estimated that there had been a 40 per cent reduction in accidents involving 16 year old drivers during the curfew period. However, McKnight argued that the analysis technique used for Maryland by that study (which had been published in report form in 1982) had unjustifiably relied on a stable relationship existing between the accidents of 16 year old drivers and those of drivers aged 21-24. He concluded that the weight of evidence was against the curfew in Maryland having been effective in reducing night time accidents.

The parent-supervised practice and the driver improvement program could not be assessed, as they had not been fully implemented. McKnight *et al.* reported that 30 per cent of parents provided evidence of practice, the driver improvement test and manual reached 47 per cent of eligible drivers, and the driver improvement course reached 17 per cent.

A follow-up evaluation reported a continued reduction of 5 per cent for daytime crashes and 10 per cent for violations (McKnight *et al.*, 1990).

2.1.5 Michigan

Michigan introduced graduated licensing system from April 1997 under which drivers may drive accompanied from 14 years 9 months. This includes:

Level 1

- At Level 1, only supervised driving is allowed, the supervisor being the parent, guardian, or a licensed driver over the age of 21 who has been designated by the parent or legal guardian.
- To obtain the Level 1 licence, the following must be satisfied:
 - Minimum age 14 years 9 months.
 - Complete segment one (including 6 hours of on-road driving with an instructor) of a driver education course.
 - Pass a vision test and health standards.
 - Obtain written approval from a parent or legal guardian.
- To move to Level 2, the driver must:
 - Be at least 16 years old.
 - Complete 6 months of practice driving at Level 1.
 - Complete segment two of a driver education course.
 - Have no convictions, civil infractions, licence suspensions or crashes during the 90 days prior to the application for a level 2 test.
 - Complete at least 50 hours practice driving, including 10 hours at night – this to be certified by parent or guardian.
 - Pass a road test.

Level 2

- With a Level 2 licence, unsupervised driving is allowed, except from midnight to 5 a.m. Between midnight and 5 a.m. a supervisor (defined as at Level 1) is required unless driving to or from employment.
- To obtain a level 3 licence the driver must:
 - Be at least 17 years old.
 - Have held a level 2 licence for at least 6 months.
 - Have completed 12 consecutive months of driving without a moving violation, an at-fault crash that resulted in a moving violation, a licence suspension, or a violation of the graduated licence restrictions.

Level 3

- A level 3 licence marks the exit from the graduated system.

The graduated licensing system applies only to teenage drivers, and ends at age 18. It operates in parallel with a

probationary system for all drivers that lasts for three years and until the driver has been violation and crash-free for the last 10 months of the probationary period. Probationary restrictions include <0.02 BAC for drivers under 21 years old.

The Michigan system is being evaluated by the University of Michigan under contract to the National Highway Traffic Safety Administration. Policy makers were particularly wary of imposing the requirement for supervised practice because of the potential burden on parents. A survey of parents of young drivers who had completed the supervised driving programme (Waller *et al.*, 2000) found a very high degree of approval of the Michigan graduated licensing system, including the requirement for supervised practice. Early indications from the monitoring of accident data are also very positive, with a 32 per cent reduction in accident rate per driver for 16 year olds (1996 vs. 1998 comparison) (Michigan Department of State, 1999).

2.1.6 North Carolina

North Carolina was also awarded a grant from NHTSA and a graduated licensing system began in December 1997.

Learner permit period

- Learner permit available from age 15 but required to be held for a minimum of 12 months.
- 12 months of violation free driving before eligible for provisional licence.

Provisional licence period

- 9 p.m. to 5 am curfew unless supervised or travelling to and from work.
- Provisional licence must be held for at least 6 violation-free months before driver is eligible for full licence.
- Minimum age to progress to full licence is 16yrs 6 months.
- All occupants of vehicle driven by driver under 18 must wear seatbelts.
- <0.02 BAC limit for drivers under 21.

Foss (2000) reported the preliminary findings of an evaluation, showing that for 16 year old drivers the introduction of the system was associated with a 26 per cent reduction in accidents, and a 29 per cent reduction in fatal and injury accidents. A control group, comprising drivers aged 20 or over, showed a 4 per cent increase in accidents over the same period.

2.1.7 Oregon

Oregon introduced in October 1989 a system using components from the recommended NHTSA model. It applied to all drivers under the age of 18, allowed learner permits from age 15 and included the following elements:

- Learner's permit available to 15 year olds who pass a written test.
- During learner's permit phase, driver must be supervised by a licensed adult aged 21 or more.

- 'Provisional' licence available to 16 or 17 year olds if they pass a written test and a road test. They do not have to go through the learner's permit phase unless they fail the road test, in which case they have to hold a learner's permit for a month before taking the test again.
- No mandatory driver education.
- Provisional licence allows unsupervised driving, and does not carry passenger or time-of-day restrictions (see below for later revision of this).
- Provisional licence holders suspended until age 18 for a major traffic conviction. Four-stage driver improvement system triggered by fewer convictions than for adult drivers (a warning letter following the first conviction; a one-to-one meeting with driver improvement counsellor, who may impose conditions such as 'violation school', after the 2nd conviction; suspension for a 3rd conviction, with reinstatement conditional on completing remedial actions). After the 4th conviction, driver is suspended until aged 18.
- Photo licence marked as 'provisional'.
- Zero blood alcohol tolerance for drivers under 21.

An evaluation of the effects of the system (Jones, 1994) reported a 16 per cent reduction in crashes for male drivers aged 16-17 in their first year of driving. No significant differences were found for females, though Jones argued that low statistical power meant that it was unsafe to conclude that there was in fact no effect for women. Young drivers under the new scheme took more time to prepare for the road test and had higher pass rates.

Further changes to the Oregon system have been made. Since January 2000, the system has been as follows:

Learner stage:

- Minimum entry age 15 years.
- Minimum duration 6 months.
- Minimum amount of supervised driving during the learner stage – 50 hours.

Intermediate stage:

- Minimum entry age – 16 years.
- Unsupervised driving prohibited between midnight and 05:00.
- No passengers under 20 years old during first 6 months (family excepted).
- No more than three passengers under 20 years old during second 6 months (family excepted).

2.2 Canada

2.2.1 British Columbia

A graduated licensing system was introduced in British Columbia from August 1998. To apply for a learner's licence, applicants must be at least 16, must pass knowledge and road signs tests, and have a vision and medical screening. The learner stage lasts at least 6 months, but can be reduced to three months if the driver has approved driver training. This is followed by an intermediate stage of at least 18 months, before full licence privileges. Since introduction

a number of changes have been made – including redesigning the knowledge test, introducing an on-road exit test, and revising the road test at the end of stage 1. The details of the system are as follows:

Learner stage

- Minimum period 6 months (can apply for reduction to 3 months if driver passes an approved driver education course).
- Zero blood alcohol content.
- Must display 'L' (Learner) sign.
- Must be accompanied by fully licensed adult aged 19 or over.
- Must not carry more than two passengers including the adult supervisor.
- May drive only between 5am and midnight.
- Subject to additional specific penalties for offences whilst in the graduated licensing programme:
 - A fine and three penalty points for breaking a learner stage driving condition.
 - Possible prohibition from driving for 1 or more months for four or more penalty points, with learner stage being extended accordingly.
 - Possible immediate 12 hour suspension for violating zero BAC limit, with possible one month and one year driving prohibitions for the first violation and subsequent BAC violation.

Drivers must pass a road test to move to the intermediate stage where they can drive unsupervised but with the following restrictions.

Intermediate stage

- Minimum period 18 months.
- Zero blood alcohol content.
- Must display 'N' (Novice) sign.
- Subject to the same penalties as in stage 1 for offences whilst in the graduated licensing programme.

Drivers must pass a second road test to exit the graduated system and obtain a full licence. The test includes an assessment of hazard perception in which candidates are asked to identify all the hazards around them.

No formal evaluation results are available at the time of writing.

2.2.2 Nova Scotia

Graduated licensing came into effect in October 1994. The system consists of learner, newly licensed driver, and regular driver stages. To get a learner's licence the learner must be 16 years of age, and pass a knowledge test and vision test. The restrictions are as follows:

Learner's licence

- Licence valid for 1 year.
- The licence has 'L' printed on it.

- Learner must wait 6 months before taking the road test, this period can be reduced to 3 months if an approved driver training or a driver education programme is completed.
- Learner may drive only while accompanied by licensed driver in the front seat - this licensed driver must have completed the next stage (i.e. be experienced).
- No other passengers are allowed.
- The learner is subject to a zero alcohol requirement.
- The learner is subject to suspension under a demerit point system (6 months) after one speeding or two minor moving violations.

To move to the next stage, the learner must successfully complete a road test. The second stage comprises:

Newly licensed driver

- A two-year period.
- The licence has 'N' printed on it.
- Only one front seat passenger allowed.
- Only as many passengers allowed as there are seatbelts in the vehicle.
- Learner must not drive between midnight and 5.00am unless accompanied by licensed experienced driver, or unless s/he has an employment exemption
- Zero BAC requirement.
- Violation of the zero alcohol level leads to a 6-month suspension, violations of other restrictions lead to points, and three violations leads to a licence suspension.
- If suspension or revocation occurs during the period, the two years must be repeated.
- The licence cannot be upgraded to higher class of licence.

To move to the full licensure stage, drivers must successfully complete a 6-hour defensive driving course or a recognised driver education course.

The development of the system is described in Vance (1996). It differs markedly from the system it replaced, which required 60 days, not six months, as a minimum period for holding the learner's licence, and which had no special restrictions during the following probationary phase.

Mayhew *et al.* (1999a) reported a comprehensive evaluation of its short term effect on collision rates per 1000 drivers. For drivers aged 16, they found a 24 per cent decrease in all accidents, and a 34 per cent decrease in injury accidents, during the first full year of the new system. Over the three years, the corresponding figures were 37 per cent and 31 per cent. The benefits were not restricted to young drivers: there was a 19 per cent drop in the all-accident rate for all novice drivers. The authors conclude that the Nova Scotia system has been more effective than the systems in New Zealand, Ontario or Florida.

The question of whether the benefits persist after the novice driver has finished the two-year 'newly licensed' period and left the graduated licensing system, is currently under investigation by the same authors, as is the question of which specific features of the system contribute most to improved safety.

2.2.3 Ontario

Ontario introduced a graduated licensing system from April 1994. This consists of two related systems for drivers and motorcyclists but only drivers are considered here. An exemption system operates for drivers who have experience of driving elsewhere. The system was summarised by Walker (1996) and is described below.

The minimum age for a learner permit is 16 years. New drivers must complete a knowledge and vision test and are then issued with a photo driver's licence valid for 5 years. The G1 licence period lasts 12 months but can be reduced by as much as 4 months through completion of approved driver education course. The G1 licence carries a photograph of the holder, and is valid for five years. Holders of G1 licence are subject to following conditions:

Level One Class G (G1)

- May operate a class G vehicle only (car, minivan, small truck).
- May only drive when accompanied by a fully licensed driver with 4 years experience. The accompanying driver must have a BAC <0.05.
- May carry only one front seat passenger - the accompanying driver.
- May carry only as many passengers as there are seat belts.
- May not drive between midnight and 5.00am.
- May not drive on freeways/expressways unless accompanied by a driving instructor.
- Must maintain a zero blood alcohol level (the legal limit for novice drivers had previously been <0.08 BAC).
- Is subject to early improvement interventions (warning letter on getting first points, required to attend group interview on getting 6-8 points, suspended for 60 days on getting 9+ points. On reinstatement the graduated licensing period is extended by the length of the suspension).
- A new driver sign is provided but use is optional.

After the minimum time the applicant can move to level G2 by passing an on-road driving test. The driver is issued with a G2 licence which lasts a minimum of 12 months. The following restrictions apply:

Level Two Class G (G2)

- May operate class G vehicle only.
- May carry only as many passengers as there are seatbelts.
- Must maintain a zero blood alcohol level (the legal limit for novice drivers had previously been <0.08 BAC).
- Is subject to early improvement interventions.

After the minimum time the driver can attempt the G2 exit test, an advanced level on-road test, twice as long as the G1 test.

A study by Doherty and Andrey (1997) aimed to estimate the effects of two elements of the system: the late-night curfew and the high-speed roadway restrictions. The study used accident and travel data for 1988 to calculate

accident involvement rates per kilometre for different combinations of time of day and speed limit. The rates were applied to the expected mobility profiles of young drivers affected by graduated licensing. The results suggested that the night-time curfew should reduce total accident involvements by 10 per cent and fatal accident involvements by 24 per cent, whilst only reducing total driving distance by 4 per cent. In contrast, high speed roadway restrictions were likely to increase accident involvement as these are some of the safest roads. A combination of both was expected to reduce fatal accidents but increase the number of accidents overall. Doherty and Andrey recommended that the high speed road restriction be changed to allow young drivers to choose whichever road type is most appropriate for their journey.

Mann *et al.* (1997) surveyed students in seven schools pre and post introduction of the system and reported that the graduated licensing system had resulted in a reduction of 25 per cent in the proportion of males who reported driving after drinking. No decline was found for females. However, it appears from Stoduto *et al.* (1995) that females were more likely to drive after drinking for simple practical reasons, such as the need for transport, than males; so Mann *et al.* (1997) concluded that it was the violational or recreational drinking/driving, more common among males, that was affected.

Reductions in exposure were also noted by Mann *et al.* (1997). Approximately 40 per cent fewer students had licences following the introduction of the system. However, examination of the numbers of 16-17 year old new drivers in Ontario showed that although numbers decreased in 1995 (when the system was introduced) by about 14 per cent on the year immediately preceding graduated licensing, they were still higher than in previous years. Therefore the apparent drop in the number of new drivers may be the result of a larger than average number of people obtaining licences in the year before graduated licensing was introduced.

Boase and Tasca (1998) described the interim results of the Ontario Ministry of Transportation's evaluation of the licensing system. Findings included:

- Drivers who obtained a G1, G2 or full G class licence in 1995 had a collision rate per driver 31 per cent lower than drivers who obtained their full G-class licence under the old system during 1993. The accident recording periods for the study were 1993-94 for the 1993 sample, and 1995-96 for the 1995 sample. Note that the 1993 sample consisted of fully qualified drivers who were not required to be supervised, whereas the 1995 sample included some supervised (G1) drivers, whose accident rates would be expected to be low. For the general driver population, the collision rate dropped by 4 per cent in the same period.
- Fatal and injury accident rates per driver fell by 34 per cent for female and 19 per cent for male novice drivers in the same period. The above comment about the samples applies here also.
- In the 1995 sample, Level 2 (G2) drivers, i.e. drivers allowed to drive unaccompanied, had an accident rate

per driver 16 per cent lower than the accident rate of all (unsupervised) novice drivers in the 1993 sample. This indicated that the effect of the licensing system was not just to postpone the novice driver accident problem until the start of unaccompanied driving and the lifting of most of the level one restrictions.

- The incidence of novice drivers involved in collisions related to the licensing system's restrictions fell as follows:
- Alcohol-related collisions (per driver) fell by 27 per cent. It is not clear how much of this reduction was due to the fact that the 1995 sample included some drivers at G1 (supervised) level, whereas the 1993 sample were unsupervised. This difference between the samples might be expected to lead to a difference in alcohol-related collisions even without any change in legal BAC limit.
- Collisions (per driver) between midnight and 5am fell by 62 per cent. The study attributed this change to the curfew. However, the curfew applies only to G1 (supervised) drivers, and the figure of 62 per cent describes a comparison between this subsample of the 1995 group and the (unsupervised) 1993/4 no-curfew group. Therefore the drop in collisions may in fact be due in part to the requirement for supervision.
- Freeway collisions (per driver) fell by 61 per cent. Again, the comparison was between 1995 G1 novices, whom the system requires to be supervised (and who should not have been using the freeway), and 1993 novices who were not supervised.
- The new system was estimated to produce a social cost saving (lost future earnings, pain and suffering, plus direct costs) of \$59 million per year, with a novice driver population of about 235,000.

A further finding was that 16-19 year old G2 novices who had received driver education had a collision rate per driver 45 per cent higher than those without driver education. The report urges that this result should be viewed with some scepticism until further information is available, because it is at variance with the general weight of research evidence that indicates a lack of relationship between driver education and accidents. In fact, the explanation of this finding may have little to do with the education itself. The Ontario system allows novices receiving driver education to shorten their twelve month G1 period by four months. It would therefore appear that even if no other factors contributed to it, the observed effect must have been a combination of the effects of education and the effects of shortening the G1 period. Drivers who shortened their G1 period will presumably have increased their exposure to G2 (unsupervised) driving during the accident reporting period, and will have also have reduced the amount of supervised experience gained at G1. Both these factors will have tended to increase the G2 collision rate per driver.

A further evaluation of the Ontario system is currently being completed.

The results of Boase and Tasker's study are in terms of collision rates per driver and do not, therefore, appear to

take account of any before and after differences there may have been in mileage travelled per driver. Also, as pointed out above, the 'after' group included people who were required to drive under supervision, whereas the 'before' group did not. To the extent that this represents a real difference, produced by the graduated licensing system, in the early driving careers of learner/novice drivers, Boase and Tasker's comparison would seem to be appropriate for assessing the overall effect of the system. One of the ways in which the GLS seeks to reduce accidents is to replace some unsupervised driving with supervised driving. However, depending on whether a significant amount of supervised driving was excluded from the 'before' sample, it could be that Boase and Tasker's comparison will have tended to over-estimate the true effect of the licensing system. Mayhew *et al.* (1999a) argued that Boase and Tasker's evaluation would have produced a liberal estimate of the impact of the Ontario system because it excluded supervised learners from the 'before' sample. When Mayhew *et al.* (1999a) re-analysed their own data from Nova Scotia using Boase and Tasker's approach, the decrease in the all-accident rate for novice drivers associated with the introduction of the new licensing system in Nova Scotia changed from 19 per cent to 38 per cent.

2.3 Australia

The Federal road safety package announced in December 1989 included a graduated licensing scheme recommended for adoption by the states and territories. The scheme, which was itself a revision of an earlier model proposed by the Federal Office for Road Safety in 1983, had six major components:

- No learner permits issued before 16 years of age.
- Minimum period for learner permit to be 6 months.
- Zero BAC for learners.
- No probationary licence (i.e. permitting unsupervised driving) to be issued before 17 years of age.
- Zero BAC for first 3 years after obtaining a probationary licence.
- Licences for automatic vehicles apply for the probationary period.

An evaluation was summarised by Triggs and Smith (1996). Conformance to and support for the scheme was found to be quite high but the components had not been uniformly adopted in the different states. The evaluation found that specifying a minimum duration for the learner's permit was much more effective at ensuring that a minimum amount of experience is gained before licensing than simply having a low minimum age for learner's permit and high minimum age for first licence. Triggs and Smith also cited a telephone survey of around 800 novice drivers which aimed to find out about their knowledge of the alcohol restrictions and how it had affected them (Haworth *et al.*, 1995). The study concluded that knowledge of the BAC limit was limited, that compliance was high, and that there was no clear relationship between compliance and enforcement, which raised the question of how a zero BAC should be enforced.

Triggs and Smith also concluded that increasing the licensing age and the duration of the learner permit are likely to result in a reduction in exposure rather than the desired alternative of gaining experience in a safer environment. Other potential disbenefits were reduction of mobility, and encouragement to take steps to avoid being detected when violating the licensing provisions. Triggs and Smith noted that most of the restrictions imposed by the Australian graduated licensing system are based on time rather than the quality of the driving record. They argued that motivation to drive more safely could be increased by making the driving record the determining factor, but that the adequacy of legislation and enforcement is likely to be a major factor in determining the success of the system.

2.3.1 New South Wales

In New South Wales, prior to July 2000, a learner licence was available from age 16 years on passing a knowledge and eyesight test. The following restrictions applied:

Learner licence

- Must not drive faster than 80 km/h.
- Must not drive under the influence of drugs or alcohol (BAC < 0.02).
- Must display L-plates.
- Must be accompanied by a fully licensed driver.
- Learners under 25 must hold a learners licence for at least 6 months.
- Must pass driving test (minimum age for transfer to provisional licence - 17 years).

Provisional licence

- Must not drive faster than 80 km/h.
- Must not drive under influence of drugs or alcohol (BAC < 0.02).
- Must display P-plates.
- Will lose licence for 3 months if receive 4 or more demerit points in one year.
- Must be held for 12 months (minimum age for transfer to full licence - 18 years).

From 1st July 2000, the above system was replaced by a three-stage graduated licensing scheme that extends the provisional licence phase by at least two years. The new scheme includes two additional tests – a computerised hazard perception test and a final driver- qualification test. It also introduces a new logbook for learner drivers to record details of driving experience and key skills. Drivers will be at least 20 years old when they qualify for an unrestricted licence. The speed limit for the first year of the provisional phase is increased from 80 to 90 km/h. The limit will then increase to 100 km/h for the remaining two years of the provisional licence. The intention here is to give provisional drivers the opportunity to learn to drive at a range of speeds, with the limit increasing after a year to reflect improving skills.

Learner licence

- Available from age 16.
- To obtain a learner licence, the learner must pass a computer-based knowledge test and an eyesight test.
- Display L plates.
- Be accompanied by a fully licensed driver.
- Ensure that the logbook is used.
- Not exceed 80 km/h.
- Not drive under the influence of drugs or alcohol (BAC < 0.02).
- Licence may be cancelled if a driving offence is committed.
- Learners under 25 must hold a learner licence for at least 6 months before attempting a driving test.

Provisional licence P1 (red)

- Available from age 17.
- To obtain provisional licence, learner must pass a driving test.
- Display red P plates.
- Not exceed 90 km/h.
- Not drive under the influence of drugs or alcohol (BAC < 0.02).
- Must not drive a manual gearbox vehicle for first 12 months (unless driving test used a manual vehicle, or unless accompanied by an unrestricted licence holder).
- Licence suspended for 4 months if 4 or more demerit points are received.

Provisional licence P2 (green)

- Must have held a P1 licence for at least 12 months.
- Display green P plates.
- Must have passed a hazard perception test.
- Not drive under the influence of drugs or alcohol (BAC < 0.02).
- Not exceed 100 km/h.
- Licence suspended for 3 months if 7 or more demerit points received.
- Must pass a further driving test to graduate to an unrestricted licence.

2.3.2 Victoria

Victoria has expanded its graduated licensing system over the last 15 years. Most of the elements in the current system were introduced in 1990 (McKnight, 1992). The current system consists of two stages:

Stage 1: Learner permit period

- At age 16, and if they pass eyesight and computer-based knowledge tests, people can obtain learner permit.
- Must display yellow L-plates.
- Must carry permit at all times.

- Zero BAC requirement.
- Learner must be supervised by a fully licensed driver (minimum of 3 years full licence).
- Permit must be held for at least 6 months (for drivers aged under 25) or 3 months (drivers aged 25 and over) before taking road test. These periods are reduced to 3 and 1 month for people who have held a motorcycle learning permit for 12 months or more.
- Permit is valid for 10 years to discourage people from leaving stage 1 too early.
- No towing.

Once 18, learners may move to Stage 2 if they pass a road test, knowledge test and (since 1996) a simple computerised hazard perception test..

Stage 2: probationary licence

- Must remain at stage 2 for at least a 3 year probationary period.
- Must display red P-plate.
- Must carry licence at all times.
- Zero BAC requirement.
- Increased sanctions, including extension of probationary period, for driving violations – passenger restrictions apply if offences committed in first year.
- Must not drive a vehicle classed as high powered unless obtain exemption certificate or vehicle is used during employment on request of employer. (High powered vehicles are classed as those with a power to weight ratio of over 125 kW per tonne or an engine capacity to weight ratio of more than 3.5 litre per tonne).
- Restricted to driving a vehicle with automatic transmission if the road test was conducted in an automatic.
- Minimum age of transfer to full licence is 21 years. No exit test or compulsory training.

Victoria actively promotes supervised driving experience for learners and provides all new learners and their supervising drivers with a booklet to support and guide them through the process.

Information from VicRoads (Cavallo, 1999, personal communication) suggests that the zero BAC limit for the 3 year probationary period has produced the most significant and direct reduction in accidents. An evaluation by Christie (1996) indicated a 30 per cent reduction in probationary driver casualty accidents during ‘high alcohol hours’ when this restriction was extended from 1 to 3 years – albeit in an environment of high levels of random breath testing, compulsory carriage of licence, and display of P plates.

Evaluation of the new GLS has been made difficult by the introduction of intensive random breath testing, speed cameras and publicity, and no specific evaluation of each GLS element has been attempted. A recent validation study of the VicRoads hazard perception test (Congden, 1999) indicates that it has some limited predictive power for some types of injury accident, though there were problems with low reliability. Drummond’s (1994)

discussion of the potential effects of vehicle power restrictions suggests that they will have had little direct benefit.

2.3.3 Western Australia

Elements of a graduated licensing system are being phased in over a two-year period, beginning in early 1999. The system envisaged is as follows:

Theory-based pre-learner phase

Learner phase 1

- Learner permit available from age 16 on passing a computer-based knowledge test.
- Must be accompanied by instructor or other qualified driver.
- To enter learner phase 2, must pass a practical driving test .
- Minimum age for transfer to learner phase 2 is 16 years 6 months.

Learner phase 2

- Must be accompanied by instructor or other qualified driver.
- Must complete 60 hours supervised driving, recorded in a log book, tailored to regional needs, which shows hours of driving in several specified road environments.
- Instructors/supervisors required to sign log books to confirm experience (penalties apply for false/misleading information).
- To exit phase 2, must pass a phase 2 test, probably to be a hazard perception test, and submit log book for review.
- Minimum age for transfer to provisional period is 17 years.

Provisional licence phase

- It is envisaged that the provisional licence period will last for 2 years. Lower blood alcohol limits already apply to provisional drivers and will be reviewed. Speed limits are also to be reviewed. The possibility of extending the provisional licence period for drivers who are penalised with demerit points during the provisional licence period, or requiring them to attend a road safety seminar/lecture is also being considered.

2.4 New Zealand

New Zealand introduced a complete multi-stage graduated licensing system in August 1987, the first country to do so. Prior to that date, a full car licence could be obtained at age 15 after passing written, oral and practical tests.

The graduated system applies to novice car drivers and motorcyclists. Before May 1999 it applied only to people aged 25 and under but it now covers novice drivers and motorcyclists of all ages. Only drivers are considered here. For those aged 15 to 24 inclusive, a learner’s permit is obtained by passing a written and oral test on the Road

Code, and an eyesight test. The system comprises the following stages:

Learner's permit

- Minimum age for holding learners permit is 15 years.
- Must be held for 6 months minimum (before May 1999 this could be reduced to 3 months if driver had attended a recognised driving course).
- Learner must be accompanied by supervisor (a licence holder aged 20 or older who has held licence for 2+ years) in front seat.
- A maximum BAC of 0.03 applies.
- Learners must carry their learner licence when driving.
- Violations result in extensions of up to 6 months.
- Curfew 10pm to midnight
- Must display L-plates.

To move to the next phase learners must pass a practical test. The restrictions are then as follows:

Restricted licence

- Drivers under 25 years old must hold a restricted licence for 18 months, but this can be reduced to 12 months if the driver attends an approved driving course. (Before May 1999, training could reduce the restricted phase to 9 months).
- Drivers aged 25 or over must hold the restricted licence for at least 6 months, reduced to 3 months by completing an approved driving course.
- Must not drive between 10pm-5am unless accompanied by a supervisor.
- Must not carry passengers unless accompanied by a fully licensed adult driver.
- A maximum BAC of 0.03 applies.
- The licence must be carried in the vehicle when driving.
- Any violation of the restrictions may lead to an extension of the restricted licensing period of up to 6 months (this can be imposed by Chief Traffic Officer rather than the courts).
- The Chief Traffic Officer can also grant an exemption from the restrictions if they are shown to impose undue hardship.
- From May 1999, drivers must pass an exit test at the end of the restricted stage, focussing on higher order driving skills such as hazard perception. This is a road test, and includes stopping the vehicle and reporting hazards to the examiner, and describing hazards during driving (with responses to these hazards being observed by the examiner).

Whines (1988) reported surveys of newly qualified drivers before and after the introduction of graduated licensing. The main results showed that there was no strong opposition to graduated licensing by young drivers. However, the post-graduated licensing group tended to prefer a lower minimum licensing age than did the pre-

graduated licensing group. This implied a trade off, with drivers reasoning that if the restrictions make driving conditions safer then people should be able to begin the process of learning at an earlier age.

Respondents in the post-introduction group in Whines' study felt less favourable towards the restrictions, probably because they were directly affected and had a more realistic view of the effects. Certain restrictions were thought to be inconvenient, for example finding a supervisor if the driver wished to drive in the curfew hours or if they wanted to take passengers.

A greater use of commercial driving instructors after graduated licensing was found, which could imply that drivers were opting to take an approved course in order to shorten the restricted period. Those aged 15-17 appeared less concerned with restrictions and less anxious to reduce the restricted period.

Inconvenience was greater for rural residents and females - because of lack of public transport and concern about personal safety. Lack of facilities to take driving courses in rural areas may mean that this group have less opportunity to shorten the period of inconvenience.

Some positive aspects of the system were highlighted (for example, less pressure from friends to provide lifts, to drive at night when tired or under influence of alcohol) but Whines found that these were perceived as less important than the negative aspects. The results of the survey showed that there was a tendency to have a more negative view of licensing and traffic officers post-introduction of the system. Males, especially, tended to want a lower minimum licensing age, were more likely to feel that a restricted licence was not worthwhile, and were less concerned about being caught violating the licensing law. This relative lack of concern could be because the respondents had no intention to break the law but could also be because they thought that the consequences were not particularly important or severe.

Self-reported violations fell after graduated licensing was introduced suggesting that drivers are more conscious of the law, or perceive that they are more conspicuous if they do offend. This was accompanied by a higher level of expectation that they will be caught if they violate and higher perception that parents can enforce restrictions..

Interviews with teenagers (Begg *et al.*, 1995) suggested that, overall, young drivers were positive towards driving restrictions

An evaluation of the effects of New Zealand's graduated licensing system on numbers of public hospital admissions due to motor vehicle collisions was reported by Langley *et al.* (1996). The analysis method enabled the effect of trends and seasonal and some other factors to be removed. The introduction of graduated licensing was followed by reduction in car crash injuries of 23 per cent for 15 – 19 year olds, and 12 per cent for 20 – 24 year olds. However, there was also a reduction of 16 per cent for drivers aged 25 and over (who are not subject to the GLS provisions). This suggested that factors other than the GLS provisions were influencing the results for drivers under 24 years old.

On the assumption that these other factors had an equal impact on all age groups, the authors suggest a 7 per cent

injury reduction as a conservative estimate of the benefit of the GLS on the 15-19 year group.

Langley *et al.* (1996) also reported that data on licensing trends suggesting that the reduction in crashes may be due to an overall reduction in exposure for 15-19 year olds, i.e. fewer young people licensed, as opposed to a reduction in young drivers' exposure to high risk situations. The authors did not have sufficient detail about the accidents which did occur to be able to say which types were affected. The authors suggest that the effect of graduated licensing on specific types of accidents, for example at night, involving alcohol or carrying passengers needed to be investigated.

2.5 Sweden

In Sweden, the minimum age for issue of a licence permitting unsupervised driving is 18 years. To obtain this licence, which is probationary for two years, learner drivers have to pass written and practical tests.

Prior to 1993, the minimum age for starting to learn to drive on the road was 17 years 6 months, but from September 1993 learners were given the option of starting at age 16. The two options now available are as follows:

Option one (from 16 years)

- Apply for learner permit.
- Learner must be linked to one or more personal supervisors (who must be 24 or over and have held a licence continuously for 5 years).
- Training in driving school and/or privately.
- Compulsory ½ day skid pan training.
- Licence permitting unsupervised driving available from age 18 on passing a driving test.

Option 2 (from 17.5 years)

- Apply for learner permit.
- Must be linked to supervisor but supervisor can be anyone who meets age and licence requirements.
- Training in driving school and/or privately (if all training is undertaken at a driving school, no permit is required).
- Compulsory ½ day skid pan training.
- Licence permitting unsupervised driving available from age 18 on passing a driving test. The licence issued on passing the test is probationary for two years.

An evaluation of the effects of reducing the minimum age for learning to drive from 17.5 to 16 years was summarised by Gregersen (1999). The study used police records of injury accidents; information on mileage and amount of training and practice came from questionnaire surveys. Drivers who had passed their driving test before age 19, and who had been driving unsupervised for at least two years were covered. The results showed that:

- 45-50 per cent of the Swedish population aged between 16 and 17.5 received a learner permit – i.e. they chose to start learning to driver earlier than they would have been able to under the old system.

- Drivers making use of the lowered age limit tended to come from the higher socio-economic groups.
- People who started learning before age 17.5 had, on average, accumulated 118 hours of training and practice by the time they took their practical test. The average under the old system was 47 hours, and for those in the new system who chose not to start driving before age 17.5 the average was 41 hours.
- Supervised, informal practice was fairly evenly distributed over the lengthened learning period, but formal lessons tended to be taken towards the end of the period.
- Accident rates (per hour and per driver) of 16 – 17.5 year olds during practice were no higher than those of 17.5 – 18 year olds.
- During their first two years of unsupervised driving, people who started practising before age 17.5 had an accident rate (per mile) 46 per cent lower than people under the new system who started at age 17.5 or later, and 46 per cent lower than people under the old system. When adjusted for socio-economic and other confounding factors, these reductions became 24 per cent and 40 per cent respectively. Averaged over all drivers in the age group (i.e. drivers who obtain their licence to drive unsupervised before age 19), the total effect of the reform was estimated as a 15 per cent reduction in accident rate per mile. Accident liability (accidents per driver) reduced slightly more than accident rate per mile.

Sweden plans to introduce a graduated driver education programme to cover the two-year learning period. Recommendations were submitted to the Swedish Government in December 1999 (Swedish National Road Administration, 2000).

2.6 Norway

In 1994-95 Norway introduced some changes to its driver training and licensing regulations. These were designed to extend the training period and make learning to drive less expensive. The aim was to encourage 16 year olds to start driving so that they accumulate more supervised experience before obtaining a solo licence. The changes were as follows:

- A reduction in the age limit for driver training from 17 to 16 years.
- A requirement for L-plates on the vehicle during private training.
- An increased age limit for private instructors (i.e. supervising drivers) from 21 to 25 years, and requirement that they must have held a licence continuously for 5 years.
- Minimum age for taking the practical driving test (allowing unsupervised driving) remains at 18 years.
- A two-year probationary period during which certain violations can result in withdrawal of licence followed by another test and new two-year probationary period.
- A more comprehensive theory test (i.e. a greater number of alternatives given in multiple choice questions).

- Removal of geographical restrictions on learning (for example in city centres and on motorways during private instruction).
- A reduction in mandatory training. Before the changes, the total amount of pre-test mandatory training was 19 hours (8 hours theory and 11 hours driving). This was reduced to 9.5 hours, which includes about 2 hours theory as part of the courses in darkness and slippery roads.
- A dropping of the requirement for candidates to have a recommendation from a driving school before applying for test (though the need for confirmation of the mandatory lessons is retained).
- An increase in the length of the practical driving test from 45 to 80 minutes. This was intended to compensate for the reduction in mandatory driver education. Test duration was reduced slightly to 75 minutes (55-60 minutes of driving, plus some time for feedback and information) in 1998 to enable examiners to conduct five tests per working day.
- Removal of a 'phase two' training period which consisted of three further training areas: driving on slippery roads; driving in darkness and a theory course to be taken within 2 years of obtaining a licence.

The revised system retained 5 mandatory lessons driving in traffic, 3 hours of skid pan training, and 1.5 hours of driving and demonstrations in darkness.

Further changes to the system were proposed to the Norwegian Parliament in October 2000. These include revising driver education curriculum and re-structuring it to produce a modular system.

Attention will also be given to revising the amount of mandatory driver education, and improving the training of professional instructors and examiners. Improvements will be made to the information given to private instructors (supervising drivers) to enable them to improve the training they give. A further proposal is to re-introduce mandatory theory and/or practical tests, administered by driving schools, before the official licence tests are taken. There are concerns in Norway that the 1994/95 changes have resulted in some learners trying to minimise their number of driving lessons and coming forward for the practical test too early, retaking it until they pass.

A preliminary evaluation of the 1994/95 changes was reported by Sagberg (1998). Because the study looked at only the first 18 months of driving and considered only drivers who got their licences during the first year after the change, the effects of the removal of the phase two training period and the reduced age limit were not covered. The evaluation was therefore considered to be of the combined effects of the remaining changes. The main conclusion was that there were no significant effects on the accident risk for drivers who received their licence during the first year of the change.

A further evaluation has recently been completed by Sagberg (2001a), based on postal surveys of three large samples of drivers aged 18-20 years who had held a driving licence for between 1 and 17 months. One sample obtained their licences in 1994 (before the licensing

system changed), one in 1995 (immediately after the change) and one during the period April 1998 to March 1999. Injury accident data were also available from police reports. Drivers in the 1995 sample were not affected by the reduction in minimum learning age from 17 to 16 because they were aged at least 17 when the limit was lowered. Therefore, comparisons of the 1998/9 sample with the 1995 sample capture the effects of the reduced age limit alone. Comparisons of the 1998/9 sample with the 1994 sample include the effects of the full reform of the licensing system.

The 1995-1998/9 comparison, capturing the effects of the reduced age limit, showed:

- 54.5 per cent of eligible drivers did start training before their 17th birthday.
- The proportion of learners driving more than 50 trips with an informal supervisor increased from 23 per cent to 30 per cent.
- The (tentatively) estimated average number of trips with an informal supervisor increased from 46 to 54.
- The total distance driven with an informal supervisor increased from 1027 km to 1153 km.
- There was a statistically significant increase in the number of drivers self-reporting a crash in the first few months after licensing, but this was explained by an increase in distance driven – i.e. the risk per km of being involved in a crash remained unchanged.
- Police-reported injury crashes showed an *increase* in crash risk per km that approached statistical significance.
- A reduction in the proportion of drivers from densely populated areas and an increase in the proportion of drivers who own a car and/or drive as part of their job. These changes might explain both the increase in distance driven after licensing, and the near-significant increase in risk per km.

There was no demonstrable reduction between the 1994 and 1998/9 in accident risk per km.

It is clear that the reduction in minimum licensing age in Norway had only a small effect on the amount of pre-test experience. The contrast between these findings and the experience in Sweden is striking, and will be explored further in Section 3.1 where recommendations for Britain are discussed.

The lack of any demonstrable effect on accident risk in Norway is not surprising given the small changes in pre-test experience. However, pooling the data from the three surveys showed an inverted-U relationship between crash risk per km (in the first six months of post-test driving only) and number of pre-test trips with an informal supervisor. There was also an inverted U relationship between crash risk per km in the first six months of post-test driving and the total number of pre-test training trips (professional and informal). Sagberg hypothesised that drivers with very little training and experience may drive safely because they feel insecure, whereas those with a great deal of training and experience may be safer because the experience has made them better drivers. He has pointed out (Sagberg, 2001b,

personal communication) that if this hypothesis is correct, the small increase in experience in Norway may have taken place at the crest of the curve, and that in Sweden on the descending part of the curve. If so, this would have further diminished the likelihood of finding a reduction in accident risk in Norway.

An alternative interpretation of the inverted U relationship between experience and safety might be that individuals who choose to take relatively little training or practice are intrinsically safer drivers. If so, the inverted U finding would not imply that individuals on the rising part of the curve would become less safe if they took more training or practice.

2.7 Finland

Finland adopted a two-stage driver training system in 1990. Drivers may start training at age 17 ½ years. The first phase involves 20 classroom lessons of 45 minutes duration and at least 30 half-hour practical driving lessons and is followed by theory and practical driving tests. The driving lessons may be taken privately with parents, or with a driving school. Once the tests are passed, the driver is issued with a temporary licence, valid for two years but with no other restrictions. Between six months and two years after obtaining this licence, there is a second phase of training in a driving school. It consists of a one-hour drive in traffic, three hours training on a driving range, and four classroom lessons. If this training is undertaken, a permanent licence is then issued when the temporary licence expires. There is no 'exit test'. The training, which was summarised by Keskinen *et al.* (1999), emphasises the importance of motivational influences on driver behaviour, and encourages drivers to reflect upon and evaluate their own experiences. The evaluation of the effects of introducing this system was complicated by the fact that general accident rates in Finland started to decrease at about the time the system was introduced. However, by comparing the before and after accident liabilities of novice drivers in each of the first four years after licencing, Keskinen *et al.* (1999) were able to show evidence that the introduction of the second phase of driver training reduced novice driver accident liabilities, and accident rates per mile, during their second, third and fourth years of driving unsupervised.

Further developments of the system are being debated in Finland. These include a lowering of the minimum age of starting to learn to drive to age 16 (as has been done in Sweden), improved driver testing incorporating attitudinal and motivational components, and increased emphasis on self-evaluation in the first phase of training. Also, from 1996, novice drivers who commit a traffic violation are warned that their licence will be suspended if they commit another.

2.8 France

In 1989 a scheme was implemented whereby the age for driver training was lowered from 18 to 16, but the age for licencing was retained at 18. The scheme is known as l'Apprentissage Anticipe de la Conduite (AAC). Under it, people who wish to begin at 16 must sign a contract

between themselves, an accompanying driver, and a driving school. Successful participants can obtain reductions in their insurance premiums.

The training consists of:

- Completion of compulsory training in a driving school (20 hours) and a theory test.
- Supervised driving - no restrictions except a speed restriction and must display 'AAC' on the back of the vehicle. During this period they must drive at least 3000 km, and the learner and accompanying driver must attend two sessions at a driving school.
- Practical test for driving licence may be taken from age 18.

Learners may choose to learn under the traditional system, which permits them to start learning at 18 and requires the same 20 hours of compulsory training in a driving school. A practical and theory test must then be passed to obtain a full driving licence.

Currently about 25 per cent of young learners in France opt for the AAC system. Early reports were of 70 per cent reductions in accident rates, implying that the problem of novice driver accidents was greatly reduced for those who used the system (Fafet, 1990). Later studies (Belloc and Ivaldi, 1990; Page, 1995) did not show such a reduction, but methodological difficulties mean that it is not possible to draw definite conclusions about the apparently contradictory findings. It appears that initially only 5-10 per cent of learners chose to use the new system, and this self-selected sample were more likely to benefit from the system and perhaps more likely to drive safely even without it. Chatenet and Leroux (1999) recently undertook a qualitative evaluation of the system, interviewing learners, their parents, trainers, examiners, insurance companies and others. Their findings indicated that the parents of the early AAC participants tended to be people who valued the system because of its safety and educational benefits. Nowadays, different groups of parents and learners, more interested in reducing their insurance premiums, tend to use the scheme. Chatenet and Leroux suggested that as well as being less strongly motivated by safety, these groups may be more likely to pass on undesirable behaviours such as speeding to their children. Other findings included:

- The demand from young people to learn to drive seems to have diminished over the last decade so that, for many, learning from age 16 is not especially attractive.
- Instructional practice (formal and informal) has not developed.
- Some insurance companies report big differences in accident involvement between the AAC participants and drivers who have taken the traditional approach to learning to drive, whereas others report no difference.

Chatenet and Leroux concluded that the principle of the AAC system is a good one but that, to be effective, more attention needs to be given to training driving instructors and parents.

2.9 Northern Ireland

The licensing system in Northern Ireland contains some aspects of a graduated licensing system. These are as follows:

Learner phase

- Minimum age for learner licence 17.
- Learners must display L-plates and be supervised by a qualified driver
- Speed restriction of 45 mph applies.
- Must pass practical test to move to next phase.

Intermediate phase (for 12 months following test pass)

- Minimum age 17.
- Must display R-plate.
- Speed restriction of 45 mph applies.
- If disqualified, must be subject to restrictions for a further 12 months, if commit a driving offence but not disqualified, period of restriction must be extended by 3-12 months.
- Minimum age for full licence 18.

An evaluation of the R-plate scheme was conducted (Hewitt and Ferguson, 1992; Hewitt, 1994). No firm evidence that the scheme reduced accidents was found, but this does not necessarily imply that there were in fact no such benefits.

3 Components of graduated licensing

This section summarises the results of studies that have considered the effects of the individual components of licensing systems and considers whether they might be suitable for introduction in Britain. Table 1 summarises these components and their objectives, together with the evidence of their effectiveness. Potential disbenefits are also listed.

3.1 Extending the pre-solo learning phase

There are several measures aimed at increasing the duration of the pre-solo phase of learning to drive: increasing the minimum age for solo driving, reducing the minimum age for learning, or specifying a minimum learning period. The main justification for extending the pre-solo phase is that it should increase the amount, and possibly the quality, of training and practice that a learner accumulates before being allowed to drive unsupervised. In addition, an extended period can provide a framework that allows a structured training programme to be introduced, as is being planned in Sweden.

There are several reasons to expect benefits from increasing the amount of practice accumulated by L drivers. The obvious one is the well-documented decrease in accident liability that currently occurs as experience is gained during the first few years of unaccompanied driving (e.g. Mayhew *et al.*, 2000; Maycock, 2002) This is probably associated with improvements to the novice

driver's control skills, rules base and knowledge base; and to the development of higher order skills such as those associated with detecting, interpreting and reacting to hazards – skills that rely on the driver having developed good mental models of the traffic system. Clearly, such skills and knowledge need to be based on repeated experience of a variety of driving conditions and situations, and it is also likely that they can best be achieved after vehicle control skills have become sufficiently automated to free-up attentional capacity.

If the extension to the learning period is achieved by increasing the minimum age for solo driving, there are other potential benefits to road safety in that (a) drivers are more mature when they first drive solo and (b) driving careers are shortened, at least for people who start to drive as soon as they are permitted. Potential disbenefits of any measures that increase the licensing age include reduced mobility, shift to less safe transport modes, and increased illegal unlicensed driving.

Increasing the gap between minimum age for starting to learn to drive and minimum age for solo licensing may have its effectiveness dulled because (a) people may choose not to start learning until they are near the solo licensing age and (b) the measure does not affect people who start learning to drive later in life. An approach that aims to overcome these problems is to specify a minimum period between starting to learn and taking the test – in other words a minimum period for which a learner's permit (provisional licence in the UK) has to be held before test. This has been done, for example, in California, Florida, North Carolina, New Zealand, Australia (Victoria), Nova Scotia and Ontario. Following a review of graduated licensing in Australia, Triggs and Smith (1996) suggested that such an approach is more effective at ensuring that a minimum amount of experience is gained before licensing, than simply having a lower minimum age for a learner's permit and higher minimum age for a full licence.

All measures that extend pre-solo experience are likely to lead to an increase in the number of accidents during learning – though accident rates during supervised driving are low, so the increase in numbers would be small. These measures are also likely to increase the cost of learning to drive, though this may not be inevitable, given that the current pass rate for the practical test in Britain is only about 42 per cent. A reduction in the minimum permitted age for learning to drive may be accompanied by a tendency for people to obtain their full licence earlier than they do at present. This would tend to increase the total mileage driven in a driving career, and to reduce the maturity of novice drivers – both of these changes tending to increase accidents. Increasing the minimum age for solo driving, or introducing a minimum learning period may lead to an increase in illegal unsupervised driving, a shift to other, less safe transport modes and/or increased travel as car passengers with novice drivers. Such disbenefits may, of course, be far outweighed by the accompanying improvement in novice driver safety.

Countries like Sweden, where the previous minimum age for solo driving was 18, have found it relatively easy

Table 1 Elements of licensing systems

<i>Measure</i>	<i>Objective</i>	<i>Evidence</i>	<i>Potential disbenefits</i>
Delay solo licensing age.	Lengthen learning period (if age at which learning to drive can start remains the same), encourage more pre-solo training and practice. Reduce total solo driving exposure (shortens total solo driving career, reduces exposure while young).	<i>US</i> Older licensing age found to reduce crashes (Williams <i>et al.</i> , 1983). No significant social disadvantages (Preusser <i>et al.</i> , 1985).	Shift to other less safe transport modes. Reduction in mobility. But in USA between-state differences in licensing of 16 year olds did not much affect social activities (Preusser <i>et al.</i> , 1985)
		<i>Australia</i> Reduction in exposure in terms of licences held/distance driven (Triggs & Smith, 1996).	Socio-economic disbenefits.
		<i>New Zealand</i> Reduction in exposure (Frith & Perkins, 1992; Langley <i>et al.</i> , 1996).	Unlicensed driving.
		<i>General</i> Age (maturity) as well as experience has an effect on accident liability (e.g. Maycock 2002).	Delay rather than remove the excess accidents of novice drivers.
Reduce age at which people can start to learn to drive.	Increase duration and amount of training/experience.	<i>Sweden</i> Increase in hours of private practice by a factor of 2.5 to 3; 15% reduction in accidents (averaged over the eligible population, including those who did not use the new system).	Increased accidents while learning (though Sweden found that accidents rates were no higher for (supervised) learner drivers aged 16 – 17½ than they were for those aged 17½ - 18).
		<i>Norway</i> Only small increases in amounts of pre-test practice were achieved, with no detectable reduction in accident risk. Difference in effectiveness between Norway and Sweden not yet fully understood, though possible explanations are discussed in the main text.	Possible tendency for people to obtain full licences somewhat earlier than at present. This would tend to increase the total mileage in a driving career, and reduce the maturity of novice drivers – both of these changes tending to increase accidents.
Introduce minimum learning period.	Increase duration and amount of training/experience. Reduce total solo driving exposure (shortens total solo driving career, reduces exposure while young).	<i>Australia</i> More effective than changes in ages for learner permit and full licence in increasing experience gained (Triggs & Smith, 1996).	Shift to other less safe transport modes. Reduction in mobility.
		<i>General</i> Age (maturity) as well as experience has an effect on accident liability (e.g. Maycock 2002).	Increased cost of learning. Delay rather than remove at least some of the excess accidents of novice drivers.

Table 1 (Continued) Elements of licensing systems

<i>Measure</i>	<i>Objective</i>	<i>Evidence</i>	<i>Potential disbenefits</i>
Increase training quality and/or quantity. (Mandatory, or encouraged e.g. via early lifting of probationary restrictions for people who take extra training).	Improve training quality and/or quantity.	<p>There is little evidence of relationship between driver education/training and accident involvement (e.g. Mayhew & Simpson, 1996). Another review also found that the more comprehensive/professional the training, the lower the benefits in terms of accident reductions and concluded that private training is more effective at reducing accident risk than professional training (Spurkeland, 1997).</p> <p>A review of prospective studies found that drivers with professional training had 11% more accidents per km driven than those without (Elvik <i>et al.</i>, 1997).</p> <p>Total hours of supervised driving (informal or professional) is what matters with respect to driving errors (e.g. Groeger and Brady, in press), though the explanation seems to be that drivers who are finding it difficult to learn to drive tend to seek professional instructors (Groeger, 2000).</p> <p>However, there are indications that non-traditional forms of training may be beneficial (e.g. Siegrist, 1999).</p>	<p>Increased cost of training.</p> <p>Possible increase in accidents associated with some types of training (e.g. skid training – Glad 1998).</p> <p>Even if training is beneficial, it may be counterproductive to shorten minimum learning periods or probationary periods for people who take extra training (Mayhew and Simpson, 1996). Evidence from Ontario reported by Boase and Tasker (1998) appears to support this.</p>
Night driving restrictions	<p>Reduce particular type of exposure.</p> <p>Delay night exposure until other experience has been gained, thus making driver less vulnerable to night driving.</p>	<p><i>USA</i> Curfews have been introduced in at least 25 states. Large reductions in curfew period accidents estimated in four states (Preusser <i>et al.</i> (1984) (though McKnight (1983) argued that in one of the states (Maryland) this conclusion was based on a faulty research method). Levy (1988) used a multivariate regression model to estimate the effects of several licensing provisions on the fatality rates of 15-17 year old drivers in 47 US states over a period of nine years. He concluded that curfew laws and higher minimum driving ages were particularly effective in improving traffic safety. Curfews generally well supported by parents – e.g. strong support for Michigan licensing system including night time restriction (Waller <i>et al.</i>, 2000); 73% of a nationally representative sample of parents of teenagers in favour of night time restrictions (Williams and Lund (1986).</p>	<p>Potential restriction of travel to employment/study. (but exemptions for essential trips are common).</p> <p>May delay rather than remove the excess accidents of novice drivers at night – little evidence on this.</p> <p>Possible shift to other less safe transport modes.</p> <p>Possible increase in accidents during pre-curfew hours, but indication that this can be compensated by the reduction in curfew accidents continuing beyond the curfew period. Weight of evidence is that curfews do not generally cause an important increase in accidents outside curfew hours (Williams, 2000b).</p>

Table 1 (Continued) Elements of licensing systems

<i>Measure</i>	<i>Objective</i>	<i>Evidence</i>	<i>Potential disbenefits</i>
Night driving restrictions (Continued)		<p>Ontario Assumption of 100% compliance estimated to reduce accident involvements by 24% but total driving distance by 4% (Doherty & Andrey, 1997). Collisions between midnight and 5am fell by 62% (Boase and Tasca, 1998), (but see main text, Section 2.2.3 for important caveat).</p> <p>Nova Scotia High degree of support for curfew from parents and learners (Mayhew <i>et al.</i>, 1998).</p> <p>New Zealand Reduction in total crash injuries but may be due to reduction in overall exposure rather than just at night; effect on night-time crashes needs more investigation (Langley <i>et al.</i>, 1996).</p> <p>Australia 82% of sample did not agree with late night restrictions - effects on employment/study (AGB: McNair, 1988).</p>	
Passenger bans/restrictions.	<p>Reduce particular type of exposure.</p> <p>Delay driving with passengers until other experience has been gained, thus making driver less vulnerable to influence from passengers.</p>	<p>New Zealand Passenger restriction appears to have reduced teenage passenger injuries in vehicles driven by other teenagers (Frith & Perkins, 1992).</p> <p>General Passengers shown to influence driver behaviour (e.g. Baxter <i>et al.</i>, 1990; Rolls and Ingham 1992; Whalen and McKenna (2000).</p> <p>Accident rates higher for young drivers if they carry passengers (e.g. Doherty <i>et al.</i>, 1998; Preusser <i>et al.</i>, 1998; Chen <i>et al.</i>, 2000)</p>	<p>Practical difficulties in enforcing passenger restrictions.</p> <p>Delay rather than remove the excess accidents of novice drivers at night.</p> <p>Increase number of car journeys: (a) passengers being carried by parents, (b) more single occupant journeys as novices travel as drivers rather than as passengers.</p> <p>May have less support from parents than night-time restrictions (USA - Williams <i>et al.</i>, 1998).</p>
Reduce alcohol limits.	Reduce exposure when impaired.	<p>For a substantial proportion of young drivers, accident risk increases at lower BAC than is the case for other drivers.</p> <p>US Lowering BAC limit for young drivers estimated to reduce night-time fatal crashes among teenagers in Maine, although only 40-50% knew about the law (Hingson <i>et al.</i>, 1989).</p>	<p>Problem of enforcement.</p> <p>In Britain, may be counterproductive to increase permitted BAC just as a novice driver enters the age-group in which the drink driving problems peaks.</p>

Table 1 (Continued) Elements of licensing systems

<i>Measure</i>	<i>Objective</i>	<i>Evidence</i>	<i>Potential disbenefits</i>
Reduce alcohol limits (Continued)		<p>Ontario Proportion of males who reported driving after drinking reduced by 25% (Mann <i>et al.</i>, 1997). Also, the introduction of zero BAC for novice drivers was accompanied by a 27% reduction in the incidence of their collisions involving alcohol (Boase and Tasca, 1998). See Section 2.2.3 for important caveat.</p> <p>Australia Knowledge of BAC restriction limited, compliance high, no clear relation between enforcement and compliance (Haworth <i>et al.</i>, 1995). Evidence from VicRoads (Cavallo, 1999, personal communication) suggests that zero BAC has produced the most significant direct reduction in accidents.</p>	
Increase consequences of violations (e.g. special penalties for violations during a probationary period).	Supervisory influence on behaviour during early solo driving.	New Zealand Self-reported violations fell. (Whines, 1988).	<p>Legislation and enforcement, costs.</p> <p>May encourage unlicensed driving, or driving in breach of licence restrictions.</p>
Speed/High speed road restrictions.	Reduce particular type of exposure.	Ontario Restriction of new drivers from high speed roads estimated to increase accident involvement (Doherty & Andrey, 1997).	<p>Increase in speed differentials.</p> <p>High speed roads are usually the safest.</p> <p>Problem of enforcement.</p> <p>Delay rather than remove the excess accidents of novice drivers on high speed roads.</p>
Vehicle power or performance restrictions.	Reduce particular types of exposure.	No firm evidence of the effects of engine capacity restrictions has been found.	<p>Novices could be less likely to drive the family car and more likely to acquire older /cheaper car with poorer primary and secondary safety features and higher emissions. Drivers may also be less concerned about damaging such cars.</p> <p>Could lead to less post-test accompanied driving if drive 'own' car.</p>

to introduce extended learning periods because this could be done solely by reducing the age of starting to learn to drive, thus providing young people with an opportunity, rather than a restriction. In countries such as Britain that have a lower age for solo licensing, following Sweden by introducing a two year period between minimum age for accompanied driving and minimum age for solo driving would involve an increase in the solo licensing age of at least a year, unless the minimum age for starting to learn to drive were to be reduced to below age 16. A shorter minimum learning period of six months or a year would be easier to accommodate, though a six month minimum period might not increase the actual period of learning chosen by many drivers.

A related option is to specify the training and practice that should be accumulated before taking the test - this could be done in the form of a legislative requirement and/or by encouraging it as good practice, perhaps backed up with voluntary or mandatory logbooks. Maryland, California, Michigan, and Western Australia provide examples of systems that specify minimum levels of supervised practice at either the pre-solo or intermediate phases of learning to drive.

Sweden, Norway and Finland are examples of countries that specify some aspects of training during the pre-solo phase of learning to drive. The effectiveness of such measures has not yet been convincingly demonstrated, but there are strong arguments that they ought to be effective if the content of the training is correct, and strong indications of what this content ought to be (see, for example, Siegrist, 1999).

Changes in licensing ages, and other measures designed to increase the amount of supervised practice, have often been introduced as part of wider changes to a licensing system. However, this was not so in Sweden, which therefore provides good evidence of the link between supervised practice and safety.

When the Swedish minimum permitted age for learning to drive was reduced from 17.5 to 16 years, about half of the young novice drivers made use of the system and, in so doing, increased the amount of pre-test driving experience by a factor of 2.5 to 3. The effect, averaged over all the eligible young drivers, whether or not they actually used the new provision, was estimated to be a 15 per cent drop in accidents per mile, and a slightly higher drop in accident liability (Gregersen, 1999).

In Norway, reducing the minimum age for learning to drive from 17 to 16 years (but keeping the licensing age at 18), had only minimal effects on the amount of pre-test driving experience. Not surprisingly, there was no detectable effect on post-test accident risk. Clearly the contrast between Norway and Sweden needs to be understood before the effectiveness of such a measure in Britain can be predicted with any confidence. Unfortunately, the explanation is not at present known, and we can only speculate. There would appear to be several possibilities, including the following:

- The period between minimum age for starting on-road training and minimum licensing age was quadrupled

(from 6 months to 24 months) in Sweden, but only doubled (from 12 months to 24 months) in Norway. The scope for increasing the amount of experience gained in Sweden was therefore effectively double that in Norway. It also seems possible that the old six-month period may have limited the amount of pre-test experience in Sweden much more than did the old 12-month period in Norway. In other words, learner drivers in Norway may have generally been able to satisfy their perceived need for pre-test experience before reaching the minimum age for taking the test under the old system, whereas this may not have been so in Sweden. Here it would be relevant to examine the actual amounts of pre-test experience in each country. Sagberg's results are presented in terms of numbers of trips/lessons, and number of km driven, whereas Gregersen's are in terms of hours of driving; but a rough comparison does not suggest that under the 'old' systems Swedish learners drove much more than did Norwegian learners.

- It might be that under the old systems the culture of informal, supervised practice for learner drivers was less well established in Norway than in Sweden – though this is not obvious from the data on amounts of pre-test experience mentioned above.
- When the age limit for learning was reduced in Norway, this was accompanied by a number of other changes that tended to liberalise the system of learning to drive – for example, dropping the requirement to obtain a recommendation from a driving school, and a reduction in mandatory training. It seems possible (though this is speculation) that learners and supervisors may have interpreted these other changes as indicating that they needed to put less effort than before into learning to drive.
- The tightening of the criteria for supervising drivers that took place when the minimum learning age was lowered will have reduced the supply of supervising drivers. In principle, this might have had more of an effect in Norway than in Sweden. For example, in Sweden, the minimum age for a supervising driver is 24 years, and in Norway 25 years. However, in Sweden, formal permission for driver training is required, and the accompanying driver must be registered, whereas no such registration is needed in Norway. This should tend to make informal supervision easier to arrange in Norway.
- The proportion of young people who obtain a driving licence is considerably higher in Norway than in Sweden. In 1997, less than 30 per cent of 18 year olds held a licence in Sweden, whereas the corresponding figure in Norway was over 50 per cent. Sagberg (2001b, personal communication) has suggested that there may be a stronger tendency in Sweden for young drivers to come from those socio-economic groups in which parents are more likely to provide resources for informally supervised driving.

In the US, increasing the minimum licensing age for drivers was found to be effective in reducing crashes among new drivers (Williams *et al.*, 1983).

As mentioned above, a possible problem with extending the learning period is that it may encourage younger drivers to drive unsupervised as well as supervised, and therefore increase the incidence of illegal, unlicensed driving. This problem was highlighted by Williams and Mayhew (1999) in their review of US licensing systems, some of which allow learning to start at age 14. The authors recommended that graduated licensing systems in the US should maintain or raise the minimum learning age to 16. Current DTRL research on unlicensed driving should indicate the extent of the problem in Britain under the present licensing arrangements. Also, in examining the reasons why people drive unlicensed, it may indicate whether extending the duration of learning to drive would be likely to encourage much more unlicensed driving. The research methods developed for the project ought also to provide a way of monitoring the effect on unlicensed driving of any future changes in the licensing system. It should be noted, though, that an increase in unlicensed driving would not necessarily outweigh the safety benefit of an increase in the learning period, and could presumably be tackled by improved enforcement measures.

Triggs and Smith (1996) reported that a major likely result of increases in the licensing age and duration of a learner's permit is a reduction in (solo) exposure based on licences held and distance driven. A reduction in exposure was also found in studies in New Zealand by Frith and Perkins (1992) and Langley *et al.* (1996). However Mann *et al.* (1997) argued that in Ontario the apparent drop in the number of newly licensed drivers following the introduction of the graduated licensing system could have been due to a temporary increase in demand for licences before the system came into effect.

Preusser *et al.* (1985) examined the effect of delaying full licensure on mobility and independence of young people. They surveyed the lifestyles of 16 year olds in seven US states where many, few or no 16 year olds were licensed. The results indicated that delays in full licensure did not significantly hinder social activities. However, the socio-economic consequences of delaying full licensure in Britain from age 17 to age 18, or specifying a minimum duration of 12 months for the learning period, may be greater. This is because travel to work, university or college, might be expected to be more important for the age group affected.

Changing the licensing ages, or introducing a minimum learning period seems well worthy being considered in Britain although they may require some amendments to the information shown on driving licences to enable date of issue of a licence to be checked. As discussed above, introducing a minimum learning period has several advantages over changing the licensing age. The Environment, Transport and Regional Affairs Committee (1999) recommended a six or twelve month minimum learning period, and mandatory carrying of the driving licence. Mandatory or advisory prescriptions for the amount and type of supervised practice also need to be considered seriously. The learner driver's logbook provides a possible aid to implementation.

3.2 Night driving restrictions

Young drivers are over-represented in night-time single vehicle accidents (e.g. Maycock, 2002; McKnight, 1996). Hampson (1989) suggested that alcohol does not explain all the increase in risk since the accident risk of younger drivers was four to eight times the risk of older drivers, whereas involvement of alcohol was less than twice that of the older groups.

Night driving restrictions can be used to postpone driving at night – at least for high-risk recreational journeys - until novice drivers have more experience of daytime driving. Hampson argued that this type of restriction would mirror restrictions already put in place by parents in requiring children to be home by a certain time. It would also serve an educational purpose to highlight the risk of late night driving to new drivers. Night driving restrictions have been widely introduced, especially in North America where Williams (2000b) reported that they had been adopted by 25 states.

Preusser *et al.* (1984) compared the accidents in four states with night driving curfews - Louisiana, Maryland, New York and Pennsylvania - with similar states with no curfews or, in the case of Maryland, with data from before the curfew laws were introduced. Reductions in accidents involving 16 year old drivers during the curfew hours of 25 per cent, 40 per cent, 62 per cent and 69 per cent respectively were estimated. The result for Maryland (a 40 per cent reduction) was at odds with McKnight *et al.* (1983) conclusion that there was no effect for 16 and 17 year old drivers; McKnight argued that the research method used by Preusser *et al.* (1993) (in Maryland only) was faulty, and that the weight of evidence was against the hypothesis that the Maryland curfew had been effective in reducing night time accidents. Levy (1988) used a multivariate regression model to estimate the effects of several licensing provisions on the fatality rates of 15-17 year old drivers in 47 US states over a period of nine years. He concluded that curfew laws and higher minimum driving ages were particularly effective in improving traffic safety. A fuller review of the evidence on the effectiveness of night driving restrictions is provided by Williams and Preusser (1997).

Doherty and Andrey (1997) evaluated the likely effects on exposure of the Ontario night driving restrictions. The results suggested that the night-time curfew would reduce total accident involvements for those affected by graduated licensing by 10 per cent and fatal accident involvements by 24 per cent, whilst reducing their total driving distance by only 4 per cent. It was assumed in the analysis that drivers would fully comply with the restriction. In Ontario, Boase and Tasker (1998) found a 62 per cent reduction in accidents during the curfew period itself (midnight to 5am). It should be noted that the Ontario licensing system applies a curfew only to pre-solo drivers, so that Boase and Tasker's comparison was between this (supervised) subsample of the 1995 group and the unsupervised 1993/4 group. It seems likely, therefore, that at least part of the 62 per cent reduction may have been attributable to supervision (see Section 2.2.3).

Clearly the level of compliance will depend on a number of factors, and is to some extent open to control by the licensing authority. In fact, studies of several licensing systems have found 40 – 50 per cent of drivers reporting that they had violated the curfew restrictions, though the level of compliance is generally reasonably good.

A potential problem with curfews is that people may change their journey patterns to avoid the curfew hours, such that accidents increase during the time leading up to the start of the curfew. In Pennsylvania and Maryland where the curfew did not start until midnight or 1am respectively, an increase in accidents amongst the ‘curfew-affected’ drivers in the preceding 2-3 hours was reported, this being offset by a continuation in accident reduction in the first few hours after the curfew ended. However, the general weight of evidence appears to be that night driving restrictions do not produce important increases in accidents outside the restricted hours (Williams, 2000a).

To the extent that night-time restrictions are observed, it is not surprising that accidents during the curfew periods decline. This effect in itself will benefit road safety if it is not outweighed by safety problems arising from secondary effects of the shift in driving patterns. The restriction saves night-time accidents by removing some night driving exposure from a driver’s driving career. However, the question arises as to whether night-time restrictions have the intended benefit of reducing the novice driver’s excess night-time accident liability once he or she is permitted to drive at night. In other words, do the restrictions merely delay the problem that novice drivers face with night driving, or does learning during the restricted period mean that drivers are better able to cope once the restriction is lifted?

There appears to be little research evidence on such questions. In his Maryland study McKnight *et al.*, (1983) concluded that there was no evidence of any change in the likelihood of night-time accidents for 17 year old drivers, the majority of whom had previously been subject to night-time restrictions during their 17th year. However, this is perhaps not surprising given that no effects on night-time accidents were found for these drivers when they were 16 year olds.

Some potential disadvantages of night-time restrictions are to do with effects on mobility and freedom. It might be supposed that such effects would mean that the measures would be unpopular, and that Governments would therefore be reluctant to introduce them. Resistance in Australia to night-time driving restrictions appears to have been associated mainly with effects on travel to employment and study, especially in rural areas. Surveys suggested that 82 per cent of the population did not agree with late night driving restrictions for young drivers (AGB: McNair 1988). It was suggested that this could be overcome by having a restriction that starts sufficiently late, and allows exemptions for workers or in rural areas. This would lead to some reduction in the potential benefits but the risk is mainly associated with social driving. Exemptions for essential journeys have been included in most graduated licensing systems, including the system in Nova Scotia which is supported by nearly 40 per cent of parents and around two thirds of teenagers in the system (Mayhew *et al.*, 1998).

A survey of US teenagers’ awareness and attitudes towards night-time restrictions concluded that in states where night driving curfews existed, the majority of teenagers were in favour of them (Opinion Research Corporation, 1985). Another survey of teenagers (Williams *et al.*, 1985) found that most students knew about and reported complying with night curfews in the states that had them. Williams and Lund (1986) reported that 73% of a nationally representative sample of parents with teenage children were in favour of night time restrictions. Waller and colleagues’ recent evaluation of the Michigan system also shows high levels of support for a system that includes a curfew for unsupervised driving (Waller *et al.*, 2000).

In summary, there is evidence that night-time restrictions can be very effective at reducing night-time accidents, at least during the months covered by the restricted licence – though clearly this will depend on the level of compliance. There have been instances of curfews being seen as unduly restrictive; there are others, especially in the USA, where curfews have received strong support from the drivers they restrict and their parents. If curfews were to be considered in Britain, the likely benefits would need to be compared with the effects on employment and mobility. Many of the curfew restrictions in other countries apply to drivers below age 17, whereas in Britain restrictions imposed during a probationary period would apply to drivers of 17 or upwards who are more likely to need their cars for access to work or education. Nevertheless, the impact of the restrictions on mobility could be minimised by careful choice of the curfew period, and by the use of exemptions for work-related and other essential journeys – as already incorporated in most other curfew systems. In fact, as Williams (2000a) has pointed out, the main problem in applying curfews to older novice drivers may be that they are more likely to have moved away from the parental home. Parents play an important part in enforcing driving curfews and passenger restrictions: once people move away from their parents they are less likely to comply with the restrictions. It may therefore be especially important in Britain to consider the need for other forms of enforcement, and the associated need for carriage of driving licences or other forms of identification.

In some jurisdictions (e.g. British Columbia and Ontario) curfews apply only to pre-solo drivers. Such restrictions are probably not desirable in Britain because they would restrict, rather than broaden, the experience gained during supervised driving.

3.3 Supervision by parent/other adults

Informal supervision by someone other than a professional driving instructor is a feature of many graduated and non-graduated licensing systems.

Parents are considered able to play an important role in developing safe driving behaviour, though McKnight (1996) argued that they should not be expected to provide instruction but only guide practice. However, several reviews (e.g. Brown, Groeger and Biehl, 1987; Williams, 1997; Horneman, 1993) have concluded that professional tuition has yet to demonstrate benefits over private practice.

A recent study commissioned by the Department for Transport, Local Government and the Regions (Groeger and Brady, in press) observed the rate at which learner drivers skills increased and found that this depended on the total amount of driving done rather than on the amount of informally supervised practice or the amount of professional training. What appears to be happening is that people who find it difficult to learn to drive tend to gravitate towards professional instruction (Groeger, 2000).

In their review of US graduated licensing systems, Williams and Mayhew (1999) recommend that the supervisor should be able to restrict driving under certain conditions at their discretion and that more difficult driving (such as at night) could be phased in during the learning period as part of the experience requirement.

Some countries (e.g. Sweden, France and some North American States) require the supervisor to enter into an agreement with the learner driver and the licensing authority. This provides an opportunity to give the supervisor some basic information on what is expected and emphasises that supervising a learner driver is something to be taken seriously. Parental involvement is included as part of the licensing systems in, for example, Michigan, Maryland and California, where a parent or another responsible adult must sign to confirm the number of hours practice that a learner has completed. In Britain also, a recently introduced voluntary logbook system aims to emphasise the serious nature of learning to drive, and the importance of accumulating practice. As Waller *et al.* (2000) point out, such provisions are a way of seeking to ensure that learners do not respond to other licensing provisions simply by delaying licensure – an action that would reduce accidents, but that does not have the desired effect of increasing practice under relatively safe conditions.

Parents, other supervisors, and learner drivers themselves have shown strong support for graduated licensing in general, and certified supervised practice in particular (e.g. Ferguson and Williams, 1996; Mayhew *et al.*, 1998; Mayhew *et al.*, 1999b; Begg *et al.*, 1995; Waller *et al.*, 2000). The question of how to encourage parent participation without penalising those whose parents will not or cannot help needs to be addressed. Whines (1988) reported that learners in New Zealand considered that finding a supervisor to allow them to drive during curfew hours or with passengers was inconvenient.

Recent studies of the French 'Apprentissage' system (Chatenet and Leroux, 1999) suggest that the effectiveness of parental supervision may depend on whether parents are motivated primarily by considerations of safety, or by economic aspects such as insurance discounts. Sagberg (2001b, personal communication) has also suggested that socio-economic factors might help explain why lowering the minimum learning age had very different effects on pre-test experience in Norway and Sweden. One implication here is that to maximise the effectiveness of parental supervision, attention needs to be given to helping and encouraging parent supervisors, especially those who are not themselves primarily motivated by safety.

In summary, increasing the amount of driving accumulated while learning to drive has generally been shown to produce valuable safety benefits, and 'informal' practice, supervised by a parent or other responsible adult, can play an important part in this. In Britain, any change designed to lengthen the period of learning to drive would be expected to increase supervised practice. However, the size of the increase cannot at present be predicted, as the contrast between Norway and Sweden discussed in Section 3.1 illustrates.

A logbook system would appear to be potentially useful in helping to structure the learning process and communicate to supervisors and learners the amount and type of practice that is needed. If a *requirement* for a minimum level of practice were to be introduced, this would presumably have to be certified by the supervisor. Such a requirement might be seen as an unwelcome burden on supervisors and, as such, difficult to introduce and vulnerable to dishonesty. However, the weight of evidence from other countries is of parents strongly supporting this and other provisions of graduated systems. Before introducing a requirement for certified practice in Britain the question of how to deal with learner drivers without easy access to a suitable informal supervisor needs to be addressed.

3.4 Passenger bans/restrictions

The problems associated with the carrying of passengers by novice drivers have been widely reported. Since young passengers are often carried by young novice drivers they, too, suffer from the novice drivers' high accident liability. In addition, it has been shown that the presence of young passengers can adversely influence the behaviour of young drivers. In the USA it has been estimated that two-thirds of the deaths of teenagers as passengers occur in vehicles driven by teenagers, and 16 year olds contribute disproportionately to these deaths (Williams and Wells, 1995). A study of Ontario data (Doherty *et al.*, 1998) found that the accident involvement rates of 16-19 year old drivers with passengers were disproportionately higher than those of 20-24 and 25-59 year old drivers. Accident rates were about twice as high with passengers as without, and were also significantly higher where two or more passengers were present than for one passenger. The effect was pronounced for both male and female drivers. Preusser *et al.* (1998) also found that passenger presence was associated with proportionately more 'at fault' fatal accidents for drivers aged up to 24, was a neutral factor for drivers aged 25-29, and was associated with fewer 'at fault' fatal accidents for drivers aged 30 or over. Again, fatal accident involvement was especially high for teenage drivers with more than one passenger. Chen *et al.* (2000) also concluded that, for young drivers, accident involvement increased if they were accompanied by passengers of similar age.

Baxter *et al.* (1990) examined the influence of passengers on driver behaviour and found that signalling before changing lanes was reduced in the presence of younger male or older female passengers. The tentative

explanation was that signalling may be a relatively peripheral task which is sacrificed when drivers attend to conversations with passengers, and that younger male and older female passengers are perceived to have extreme attitudes towards driving violations, thus demanding more attention as the driver tries to match behaviour to the perceived standards of the passenger. Drivers accompanied by older female passengers tended to drive more slowly than drivers with younger passengers or no passengers. There was a non-significant tendency for drivers with younger male passengers to drive faster than those with no passengers. The study could not show whether the passenger actually influences speed, or whether people who carry older passengers are in some way different from other drivers. However, the authors speculated that drivers may be unwilling to exhibit irresponsible, high risk, behaviour in the presence of an older person. They argued that the influence of passengers on speeding behaviour can best be understood in terms of the driver adjusting his behaviour to conform with what he believes to be the passenger's norm for 'good' driving. Rolls *et al.* (1991) reported that young males considered that their driving style was adversely affected by the presence of friends as passengers but was positively affected by the presence of their parents or their girlfriend/spouse. Young drivers of both sexes assessed journeys with friends as slightly more risky than journeys with their partner or spouse. A more detailed follow-up study amongst male drivers (Rolls and Ingham, 1992) confirmed that drivers tended to adopt different driving styles depending on the type of passenger. They suggested that drivers had two main reasons for this: that passengers expected them to drive in a certain way and that they felt a greater responsibility when driving. Those male drivers classed as 'safe' tended to say they drove least safely alone and more safely with passengers regardless of their type. 'Unsafe' male drivers drove least safely alone and also when accompanied by their male friends. Waylen and McKenna (2000) found that, of drivers with an estimated age of 17-24 years, males with a male passenger, and females with a male passenger, drove faster than lone drivers. The speed of young female drivers was not associated with the presence or absence of female passengers. Male drivers with female passengers drove more slowly than lone drivers. The authors argued that this last result implies that to restrict young male drivers from carrying female passengers would be to deny them the safety benefit of the reduced speeds.

Many graduated licensing systems have restrictions on the carrying of passengers. In Nova Scotia, no passengers other than the supervising driver are allowed at the learner phase, only one front seat passenger at the newly licensed phase and only as many passengers as there are seatbelts. In Ontario, only the supervising driver is allowed in the front seat although other passengers can be carried; in the newly licensed phase the only restriction on passengers is the number of seat belts. Indiana and Massachusetts have restrictions on passengers during the learning phase. In California, no passengers are allowed in the first 6 months of the intermediate phase, in Georgia no more than three passengers under 21 are allowed during the intermediate

phase (unless they are family members), and (from July 1999) in Delaware a maximum of 2 passengers is allowed in the second 6-month period after the 6-month learner phase. In New Zealand, drivers at the 'restricted licence' phase cannot carry passengers unless a fully licensed adult is present. This appears to have reduced teenage passenger injuries in vehicles driven by other teenagers (Frith and Perkins, 1992).

Given the association between passengers and accidents, particularly amongst teenage drivers, restricting passengers for drivers when they first begin driving unsupervised is an option that merits serious consideration. In Britain, there is currently no requirement for drivers/passengers to carry evidence of age or, indeed, a driving licence. This may need to be changed to facilitate enforcement though, for many young drivers, their parents will provide effective enforcement. In addition, social effects and the possibility of young people transferring to other, less safe, forms of transport, or making car journeys as car drivers rather than passengers, would need to be taken into account before a decision is made.

3.5 Reducing alcohol limits

An International Symposium on 'Young Drivers Impaired by Alcohol and Other Drugs' (Benjamin, 1986) concluded that for a substantial proportion of young drivers, accident risk increases at lower concentrations of alcohol than is the case with older and more experienced drivers. This confirmed the earlier findings of the Grand Rapids study (Borkenstein *et al.*, 1974) which showed novice drivers and inexperienced drinkers to be at increased risk.

A review of drinking and driving in Great Britain (Maycock, 1997) showed that drivers in the 20-24 year age group were the most likely to be found over the limit following an accident and also had the highest number of drink drive accidents relative to injury accidents in general. The incidence of drink driving was somewhat less for 16-19 year olds but their risk in terms of the number of drink drive accidents per 1000 injury accidents was close to that of the 20-24 year olds.

Evaluations of those countries that have included lower alcohol limits for novice drivers as part of their licensing systems generally show that the limits appear to be effective in reducing accidents (Benjamin 1986). Research by Hingson *et al.* (1989) also showed that lowering the BAC limit for young drivers was effective in reducing night-time fatal crashes among teenagers in Maine. In Ontario the GLS introduced in 1994 included a zero BAC requirement for novice drivers. This was accompanied by an overall reduction of 27 per cent in the incidence of collisions involving alcohol use for novice drivers (Boase and Tasca, 1998); although it is not clear how much of this reduction was due to some of the post-GLS sample driving under supervision (see Section 2.2.3).

Given the problems of alcohol related accidents amongst novice drivers, imposing lower limits on young or novice drivers is likely to bring benefits and may also instill safer drink/driving habits even after the restricted period ends. However, in Great Britain, enforcement of a differential BAC limit for novice drivers would be difficult in the absence of a requirement to carry licences or identity

cards. Also, drink driving is more prevalent amongst those in their early 20s than it is amongst teenage drivers, largely because the mileage of the over-20s is higher. It may be counterproductive to have a lower limit for novices, who would then see the limit 'raised' just as they moved into the group in which the drink driving problem peaks.

3.6 Increased consequences of traffic violations

The association between violating or rule-breaking behaviour and accident liability is well documented. The nature of this link remains unclear, so the extent to which the increase in accidents happens as a direct result of rule-breaking behaviour is not known. This means that the extent to which accident liability would be reduced if the rule-breaking behaviour were eliminated is not known either. Nevertheless it seems highly likely that rule breaking behaviours such as speeding, running red traffic lights and crossing double white lines do have a direct influence on accident liability. For example, they increase opportunities for conflict with other vehicles, reduce the time available to deal with hazards, increase mental workload, put increasing demands on vehicle control skills, reduce predictability to other road users and make the consequences of error more severe.

Encouraging novice drivers to comply with traffic rules is also likely to be beneficial in other respects since, for example, drivers who habitually break the rules are effectively putting themselves out of the reach of future rules that may be introduced to promote safety.

Many licensing systems contain elements that require a period of conviction-free driving before moving to the next stage, or enable licence sanctions to be introduced at a lower threshold than is the case for fully licensed drivers. The British system of reversion to L-driver status for drivers who accumulate 6 penalty points during their first two years of unsupervised driving is an example of such a restriction. Measures like this can be seen as a way of maintaining a supervisory influence on novice drivers during their period of early solo driving and are attractive in that they seek to address motivational aspects of the driver safety problem.

McKnight (1996) suggested that licence sanctions can reduce exposure for a sub-group of new drivers who are inclined towards unsafe driving, but can also encourage safer driving by acting as a deterrent. Haworth *et al.* (1995) argued that motivation to drive more safely can be increased by making the quality of the driving record the determining factor in removing restrictions or imposing sanctions rather than just including time-based restrictions.

There is, as yet, little evidence on effectiveness of such measures. However, in New Zealand, self-reported violations fell after graduated licensing was introduced, suggesting that novice drivers became more conscious of the law, or that the sanctions during the probationary period were sufficient to deter them from violating (Whines, 1988).

The adequacy of the legislation and enforcement, and the severity of the penalties applied, are likely to be major factors in the success of any system that seeks to impose on novice drivers special penalties for traffic violations.

However, penalties that delay a driver's exit from a graduated licensing system, or prolong a probationary period, run the risk of encouraging drivers to violate the licensing system itself by driving outside the provisions of the licence. This may be happening in Britain, since there are indications that drivers who accumulate six penalty points within two years of passing their test have a rather low relicensing rate, with a majority of them not having regained their full driving licence twelve months after the penalty. How many of the others are driving unsupervised in the meantime, is as yet unknown, although DTLR has commissioned research on unlicensed driving.

3.7 Increasing quality or quantity of education/training

Licensing systems may, in principle, seek to improve or increase driver training by a number of mechanisms - for example:

- Requiring specified training at one or more phases of licensing.
- Increasing the duration of the learning period.
- Introducing new testing requirements.
- Allowing a swifter exit from a licensing stage for drivers who take specified training.

Unfortunately, the benefits of driver training are at present unclear. For example, Mayhew & Simpson's (1996) review found little evidence of a relationship between driver education/training and accident involvement. The authors concluded that, until more work has been done on ways to make training more effective and/or to strengthen the relation between training and accident involvement, they could not recommend introducing training as part of graduated licensing, or allowing accelerated progress through the system for people who take optional training. In fact, as pointed out in Section 2.2.3, the results of Boase and Tasker's evaluation of the Ontario licensing system appear to demonstrate that allowing such accelerated progress is indeed counterproductive. Reflecting such concerns, the time discount allowed for training in New Zealand was reduced in 1999.

Similarly, Spurkeland (1997) reviewed a number of studies of the safety effects of professional driving instruction and private driver training (practice) and concluded that the more comprehensive the professional instruction, the more negative the effects on accident records of novice and young drivers. A selection of prospective (experimental) studies showed a negative relation between the amount of training and the number of subsequent accidents per km driven (Elvik *et al.*, 1997).

There are many possible reasons for the apparent lack of effectiveness of driver training, and these have been discussed extensively in the literature. A number of themes have emerged, which offer the hope of improving the effectiveness of training. For example, current training of learner drivers tends to concentrate on car-control skills. This may increase drivers' confidence in their ability to cope in difficult situations, and neglect higher order skills associated with hazard detection and evaluation, and decision making. Factors associated with the attitudes, goals

and motivations of drivers also appear to be important influences on driver behaviour, but are not well addressed in most conventional training. Hatakka *et al.* (1999) provide a recent review of such issues as part of the recent EU project, 'GADGET'. Training that addresses these deficiencies may well prove to be effective in improving safety. Developing and evaluating such training is an important task that needs to be addressed by future research.

3.8 Restrictions on speed or on using high speed roads

Some graduated licensing systems have incorporated speed restrictions (e.g. for learners in France) or restrictions on the use of higher speed roads (e.g. for learners in the first stage of the Ontario system).

McKnight (1996) suggested that placing lower speed limits on new drivers is of questionable benefit as the speed differential may be more hazardous than uniformly higher speeds. As reported in Section 2.2.2, Doherty and Andrey (1997) estimated that restricting new drivers from driving on high speed roadways (i.e. equivalent to motorways in this country) is likely to increase accident involvement as these are some of the safest roads.

4 Summary

The licensing system as a policy instrument for road safety

The accident liability of novice drivers decreases very sharply during the first few years, and especially the first few months, of driving. This implies that safety could be improved by (a) enhancing the learning process, (b) preventing people from driving unsupervised until it has taken effect, and (c) influencing behaviour or reducing exposure to risk during the early months of solo driving to counter the effects of inexperience and immaturity. One approach is to modify the driving test to induce learner drivers to improve their pre-solo training and experience, and screen-out drivers who have not yet reached a standard acceptable for solo driving. However, despite its potential for improvement, the driving test is not necessarily a suitable tool for achieving all the desired improvements to driver training and experience. Also, it is difficult for a test to include in its pass/fail criterion those variables that govern the discrepancy between supervised driving performance during the test and subsequent driving behaviour. It is therefore desirable to consider whether other changes to the training/testing/licensing system would be beneficial.

Licensing elements - overview

Examples of elements used in other countries include restrictions on where drivers may drive (i.e. the types of road which may be used), when they may drive (night-time curfews), with whom they may drive (through requirements for supervisors and restrictions on passengers) and under what conditions (for example zero alcohol). Other requirements such as additional training, or periods of crash and conviction free driving are also intended to encourage safer driving practices. As drivers

move through the licensing system the restrictions are lifted until they equal those which apply to the fully licensed driving population. Other possibilities include staged testing, staged training (better matched to the natural progression of skills and knowledge acquisition) a lengthening of the period of supervised learning, and other measures to encourage or require an increase in the levels of supervised practice.

In general these elements are intended to have one or more of the following effects:

- a Increasing or improving training, education and/or informal, supervised practice during the early phases of driving
- b Reducing risk by reducing total exposure or particular types of exposure, or changing exposure 'quality' during early driving.
- c Exerting a supervisory influence over driver behaviour during the first part of a driver's solo driving career.
- d Taking advantage of the beneficial effect of age (maturity) on accident risk. (Delaying full licensure to achieve this also has the effect of shortening driving careers, thereby further reducing total accidents).

The aim is, or should be, for (b) and (c) to be done in ways that do not prevent drivers from gaining the experience necessary to reduce their accident liability - otherwise the effect could be simply to delay the excess accident liability of novice drivers until the time when unrestricted solo driving is allowed.

Elements likely to improve road safety in Britain

A review of the published evaluations of licensing systems in other countries and of some other relevant research, indicates that the following elements would be likely to have beneficial effects if they could be introduced in Britain:

Increasing the amount of driving experience accumulated by learner drivers.

Increasing the amount of driving experience accumulated before solo driving has generally been shown to reduce novice drivers' accident risk. If such increases in experience could be achieved in Britain, there would probably be an improvement in novice driver safety. Possible mechanisms for achieving this increase in experience increasing the minimum age for holding a full licence, reducing the minimum age for starting to learn to drive on the road, and/or introducing a minimum learning period. Increases in pre-solo experience can also be achieved by specifying the minimum amounts to be gained, and requiring supervisors to certify that the requirement has been met. Indications from the USA are that there could be a high level of support for this from parents and learner drivers. Advisory minimum targets for pre-solo experience also seem likely to be helpful. The introduction of a logbook for learner drivers should be useful in this regard.

Potential disbenefits of increasing the minimum licensing age include a reduction in the mobility and independence of young people, and a possible shift to less

safe transport modes; these would need to be considered before a decision were made. Reducing the age for starting to learn to drive is likely to increase in the number of accidents during learning – though accident rates during learning are low, so the increase in numbers of accidents would be small. There would probably be a tendency for people to obtain their full licences somewhat earlier than they do at present. This would tend to increase the total mileage driven in a driving career, and to reduce the maturity of novice drivers – both of these changes tending to increase accidents. The size of such effects is not known at present.

Sweden achieved large increases in the amount of pre-test experience, and substantial improvements in novice driver safety, from reducing the minimum age of learning to drive from 17.5 to 16 years – so this type of measure merits very serious consideration in Britain. Unfortunately, results from Norway have been less encouraging, with small changes in pre-test experience, and no observable change in accident risk, accompanying a reduction in minimum learning age from 17 to 16 years. The reasons for these differences need to be better understood if a reduction in learning age is to be considered for Britain. Recent evidence on the shortcomings of the Apprentissage system in France would also need to be taken into account.

Night-time restrictions

There is evidence that these can be very effective at reducing night-time accidents during the months covered by the restricted licence – though clearly this will depend on the level of enforcement and penalties. There have been indications of increases in accidents during the pre-curfew hours compensated for by reductions in accidents after the curfew hours but the weight of evidence is that curfews do not generally lead to important increases in accidents outside the curfew hours. If night-time restrictions were to be considered in Britain, the likely benefits would need to be compared with the effects on employment and mobility. Many of the curfew restrictions in other countries apply to drivers below age 17, whereas in Britain restrictions imposed during a probationary period would apply to drivers of 17 years or upwards who may be more likely to be using their cars for access to work or education. Nevertheless, the impact of the restrictions on mobility could be minimised by careful choice of the curfew period and by exemptions for work-related and other essential journeys, as is commonplace with curfew systems. Enforcement, and the associated need for carriage of driving licences or other forms of identification, would also need to be considered, especially as a reasonable proportion of the drivers affected will have moved away from the supervisory influence of the parental home.

In some jurisdictions curfews apply for pre-solo driving only. Such provisions are probably not desirable in Britain because they would restrict, rather than broaden, the experience gained during supervised driving.

Passenger restrictions

Given the association between passengers and accidents, particularly amongst teenage drivers, passenger restrictions

for drivers when they first begin driving unsupervised is an option that merits serious consideration. In Britain, there is currently no requirement for drivers/passengers to carry evidence of age or, indeed, a driving licence, and this may need to be changed to facilitate enforcement, though parental influence will be important for many drivers. In addition, the social effects and possibility of young people transferring to other, less safe, forms of transport, or making car journeys as car drivers rather than passengers, would need to be taken into account before a decision were made.

Increasing penalties for traffic violations.

The association between traffic violations and accident liability, as well as other considerations, suggest that reducing novice drivers' propensity to commit traffic violations would be beneficial to safety. Many licensing systems contain elements that require a period of conviction-free driving before moving to the next stage, or enable licence sanctions to be introduced at a lower threshold than is the case for fully licensed drivers. The British system of reversion to L-driver status for drivers who accumulate six penalty points during their first two years of unsupervised driving is an example of such a provision. Such measures can be seen as a way of maintaining a supervisory influence on novice drivers during their period of early solo driving. There is, as yet, little evidence on their effectiveness, but they are relatively simple to introduce and are attractive in that they seek to address the motivational components of novice driver safety.

The adequacy of the legislation and enforcement, and the severity of the penalties applied, are likely to be major factors in the success of any system that seeks to impose on novice drivers special penalties for traffic violations. However, penalties that delay a driver's exit from a graduated licensing system, or prolong a probationary period, run the risk of encouraging drivers to violate the licensing system itself by driving outside the provisions of the licence. Measures to combat this may need to be introduced. Also, it is essential that the penalties are well-publicised, and used properly by the courts, if they are to act as deterrents.

Improving training and education

There are many possible reasons for the general lack of evidence that increased driver training improves safety, and these have been discussed extensively in the literature. A number of themes have emerged, which offer the hope of improving the effectiveness of training. For example, current training of learner drivers tends to concentrate on car-control skills. This may increase drivers' confidence in their ability to cope in difficult situations, and neglect higher order skills associated with hazard perception and decision making. Factors associated with the attitudes, goals and motivations of drivers also appear to be important influences on driver behaviour, but are not well addressed in most conventional training' Hatakka *et al.* (1999) provide a recent review of such issues as part of the recent EU project 'GADGET'. Training that addresses these deficiencies may well prove to be effective in improving safety. Developing and evaluating such training is now an important research task.

Reduced alcohol limits for novice drivers

Given the problems of alcohol related accidents amongst novice drivers, imposing lower limits on young or novice drivers is likely to bring benefits and may also instill safer drink/driving habits even after the restricted period ends. However, in Britain, enforcement of a differential limit for novice drivers would be difficult in the absence of a requirement to carry licences or identity cards. Also, drink-driving is more prevalent amongst those in their early 20s than it is amongst teenage drivers. It may therefore be counterproductive to have a lower limit for novices, who would then see the limit raised just as they moved into the group in which the drink-driving problem peaks.

Driver and passenger identification

Enforcement of several of the measures listed above would be difficult unless novice drivers, and possibly their passengers, are required to carry identification.

Probationary licences and exit tests

The British licensing system already includes a two-year probationary period after the practical driving test has been passed. At present, drivers who reach the end of the period without accumulating six or more penalty points automatically exit from the probationary phase. In principle, it would be possible to make this conditional on passing a further test, as is done in several graduated licensing systems. Such 'exit tests' may provide a suitable platform for assessing higher order skills and possibly habitual behaviours. In effect, the purpose of the exit test is to influence the training and/or practice accumulated prior to test, so that the desired skills are developed and undesired habitual behaviours do not become established.

There is not sufficient evidence available to allow the benefits of exit tests to be assessed at present, but it is possible to offer some general observations on their likely applicability to Britain. Further information should become available soon from a review of 'advanced' tests used in graduated licensing, commissioned by the Ontario Ministry of Transportation.

In Britain, current provisions during the probationary phase are relatively light. This means, first, that novice drivers are able to make full use of a car without being restricted by the need for supervision, passenger bans, or curfews. They are able to adapt their lives to the full benefits of car travel. Secondly, the provisions are demonstrably not sufficient to remove the novices' excess accident liability during the probationary period.

An exit test introduced after two years of unaccompanied driving would need to induce significant changes in driver behaviour during that two year period if it were to have an impact on the excess accident liability of novice drivers, since much of that excess occurs during the first two years of solo driving. Indeed, to induce such behaviour changes, there would have to have important consequences for drivers who failed the test. Extending their probationary period would probably not be sufficient unless the probationary restrictions were significantly more severe than they are at present, since current

restrictions allow full use of the vehicle. In principle, people who fail the exit test could be required to revert to accompanied driver status but, unless tests of very high validity and reliability could be developed, it would be hard to justify this as fair after lifestyles had adapted to two years of solo driving.

In summary, simply adding an exit test to the end of the current two year probationary period does not have much to recommend it in Britain. This conclusion might change if more severe, risk-reducing restrictions were to be imposed during the probationary phase since (a) drivers would not become accustomed to the benefits of unrestricted solo driving and (b) the current excess in novice driver accident liability would be controlled throughout the probationary phase. The function of the exit test would then be to ensure that, despite the restrictions in force, enough experience and learning occurred during the probationary period to mean that the novice driver accident excess did not simply transfer from the probationary period to the early years of unrestricted driving.

One change that would be useful would be to change the name of the post L-test licence to (say) the probationary licence. This should make novice drivers more aware of probationary conditions and facilitate enforcement of the types of new restrictions discussed above. It would also provide a mechanism for making post-test training or other provisions mandatory in the future, if and when the case for such measures becomes strong enough.

5 Conclusions

The review has identified several elements of licensing systems that have been effective in other countries, address recognised aspects of the novice driver safety problem and could be considered for introduction in Britain. However, even where there is good evidence that an element has been effective in another country, prediction of the likely benefits in Britain is difficult. The main reason is that the current situation in Britain is rather different from the situation that existed in other countries before their graduated licensing systems were introduced. In particular, New Zealand, and many States in North America, permitted driving to start at age 15 or below, with minimal requirements for supervision, training and testing, and few, if any, licence restrictions. Some States still permit unsupervised driving from age 15.

Despite this caveat, a serious case can be made for introducing some elements of graduated licensing, or graduated learning, systems in Britain. First, apart from the difference in licensing age, for some drivers the current British system is perhaps not so different from the pre-graduated licensing situation in the North America. Those who are able to develop vehicle control skills and observational procedures quickly, can find themselves driving unsupervised and unrestricted after very small amounts of training or practice.

Secondly, results from Sweden indicate that increasing the amount of experience gained by learner drivers while they are being supervised by another driver is very

effective at reducing their accident liability once they are allowed to drive solo. In other words, it appears that some of the learning responsible for the steep decline in accident liability currently seen in the first year or two of solo driving in Britain would take place in relative safety if the driver were being supervised.

Thirdly, novice drivers in Britain do have problems with alcohol, night driving, and passengers, and there is good reason to expect benefits from measures that address these problems directly.

Fourthly, the emerging indications of where current driver training and education are deficient, and how they could be improved, offer the likelihood of our being able to develop training for pre and/or post solo driving that could be incorporated in licensing requirements with confidence that it would improve safety.

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Appendix A: Summary of some licensing systems (Learner phase: pre-solo driving)

Country/State	<i>Learner phase (pre-solo driving)</i>						<i>Minimum age for next phase (solo driving with restrictions)</i>
	<i>Minimum age</i>	<i>Minimum period</i>	<i>Minimum training</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Other</i>	
United States							
California.	15 years.	6 months (1 month prior to July 1998).	50 hrs certified supervised driving (incl. 10 at night).	Not in pre-solo phase.		Parent-teen handbook issued. BAC < 0.01 for drivers under 21.	16 years.
Delaware.	15 years 10 months.	6 months.			Maximum 2 plus supervisor.	BAC < 0.02 for drivers under 21.	16 years 4 months.
Florida.	15 years.	6 months (for drivers aged 15-17).		After 7pm (1st 3 months), After 10pm (remaining time as learner).		BAC < 0.02 for drivers under 21.	16 years.
Georgia.	15 years.	12 months.					16 years.
Illinois.	15 years.	3 months.	25 hrs certified supervised driving.			Zero BAC if under 21.	16 years.
Indiana.	15 years.	2 months.			None in 1st 3 months (unless supervised by driver aged 21+).	BAC < 0.02 for drivers under 21.	15 years 2 months.
Iowa.	14 years.	6 months.	20 hrs certified supervised driving (incl. 2 at night).			BAC < 0.02 for drivers under 21.	16 years.
Kentucky.	16 years.	180 days.					
Louisiana.	15 years.	3 months.				BAC < 0.02 for drivers under 21.	16 years.
Maryland.	15 years 9 months.	4 months.	Parent training handbook provided. Driver must complete driver education. Since July 99, certification of 40 hrs supervised practice is required during this phase.	Midnight to 06:00 (some exceptions allowed).		BAC < 0.02 for drivers under 21. New Drivers sign provided, but use is optional.	16 years 1 month.
Massachusetts.	16 years.	6 months.	12 hrs supervised driving.		None under 18 except family (unless accompanied by supervisor age 21+).	BAC < 0.02 for drivers under 21.	16 years 6 months.

Learner phase (pre-solo driving)

<i>Country/State</i>	<i>Minimum age</i>	<i>Minimum period</i>	<i>Minimum training</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Other</i>	<i>Minimum age for next phase (solo driving with restrictions)</i>
Michigan.	14 years 9 months.	6 months.	50 hrs supervised driving, including 10 at night, certified by parent or guardian. Complete segment two of a driver education course.		Road test to be passed for entry to level 2. No crashes or violations for 90 days before this test.	Segment 1 of driver education course (including 6 hours of on-road driving with an instructor) is required before obtaining the level 1 (supervised driving) licence.	16 years.
Minnesota.	15 years.	6 months.	30 hrs supervised driving (incl. 10 at night).				16 years.
Nebraska.	15 years.	–	50 hrs supervised driving (if do not take driver education).				16 years.
New Hampshire.	16 years.	3 months.					16 years 3 months.
North Carolina.	15 years.	12 months.	6 hrs supervised driving.		All occupants of vehicle must wear seatbelts if driver under 18.	BAC < 0.02 for drivers under 21. 12 months of violation-free driving before driver is eligible for next phase.	16 years.
Ohio.	15 years 6 months.	6 months (or until age 18 if this is reached sooner).	Supervisor must be licensed driver aged 21 or over. (Before age 16, supervisor must be licensed parent, guardian or instructor). 50 hrs supervised driving (incl. 10 at night). 24hr classroom instruction plus 8 hours behind wheel with an instructor.	1:00 am to 5:00 am unless with licensed parent, guardian or custodian. (Applies only to drivers under 17).	Occupancy must not exceed number of originally installed safety belts. All occupants must wear belts if driver is under 16.	BAC < 0.02. Suspensions for violations.	16 years.
Oregon.	15 years.	6 months (since Jan 2000). Previously none, or 1 month if fail road test.	50 hrs supervised driving (since Jan 2000). Previously, none.				16 years.

Learner phase (pre-solo driving)

<i>Country/State</i>	<i>Minimum age</i>	<i>Minimum period</i>	<i>Minimum training</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Other</i>	<i>Minimum age for next phase (solo driving with restrictions)</i>
Canada							
British Columbia.	16 years.	6 months (3 months if take approved driver training).	Must pass Level 1 road test to move to next phase.	Midnight - 5am.	Maximum 2 (incl. supervisor aged 19+).	0 BAC. Driver subject to additional penalties for motoring offences. Must display L-plates.	16 years 6 months (16 years 3 months with driver education).
Nova Scotia.	16 years.	6 months (3 months if take approved driver training).	Must pass on-road test to move to next phase.		No passengers apart from supervisor(who must have completed next phase).	0 BAC. Driver subject to additional penalties for motoring offences.	16 years 6 months (16 years 3 months with driver education).
Ontario.	16 years.	12 months (8 months if take approved driver training).	Must pass on-road test to move to next phase.	Midnight - 5am.	Supervisor is only front seat passenger allowed (must have 4 years driving experience). Passengers limited by no. of seatbelts.	0 BAC (supervisor <0.05 BAC). Driver subject to early improvement interventions for motoring offences. Cannot drive on freeways or expressways unless with driving instructor.	17 (16 years 8 months with approved driver training).
Australia							
New South Wales.	16 years.	6 months for drivers aged under 25.	Must pass road test to move to next phase.			80 km/h speed limit. BAC limit of 0.02. Display L plates.	17 years.
Victoria.	16 years.	6 months for drivers aged under 25. 3 months for drivers aged 25 or over.	Must pass road test to move to next phase.			0 BAC; no towing; yellow L plate; carry licence; permit valid for 10 years so as not to encourage premature licensing.	18 years.
Western Australia.	16 years.		Must pass learner phase 1 test to move to next phase.				16 years 6 months.

Learner phase (pre-solo driving)

<i>Country/State</i>	<i>Minimum age</i>	<i>Minimum period</i>	<i>Minimum training</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Other</i>	<i>Minimum age for next phase (solo driving with restrictions)</i>
<i>New Zealand</i>							
	15 years.	6 months. (Since May 1999 this can no longer be reduced to 3 months by taking an approved driving course.).	Must pass practical test to move to next phase.	10pm to midnight.	Supervisor aged 20+ (with 2+ years experience) must be in front seat.	BAC <0.03. Learners must carry licence. Violations result in up to 6 month extension to learner phase.	15 years 6 months.
<i>Sweden</i>							
(Option 1).	16 years.	None.	1/2 day skid pan training. Must pass practical test to move to full licensure.		Supervisor must be 24+ with 5+ years continuous experience.	'Driver learning' sign to be displayed (red for driving school, green for accompanied driving).	18 (full licensure).
(Option 2).	17 years 6 months.	None.	1/2 day skid pan training. Must pass practical test to move to full licensure.		Any licensed driver.	Ditto.	18 (full licensure).
<i>Norway</i>							
	16 years.	None.	2 hrs theory and 7.5 hrs practical in driving schools. Must pass theory and practical test to move to full licence.		Supervisor must be 25+ with 5+ years continuous experience.	Certain violations lead to loss of licence, retest, and new 2-year probationary period. Must display 'L' or 'School' sign. Changes to Norwegian system are being considered.	18 (full licensure).

Learner phase (pre-solo driving)

<i>Country/State</i>	<i>Minimum age</i>	<i>Minimum period</i>	<i>Minimum training</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Other</i>	<i>Minimum age for next phase (solo driving with restrictions)</i>
France							
(for learners aged 16).	16 years.	None.	Driving school training – minimum of 20 hours. Theory test. Learner and accompanying driver must attend 2 sessions at a driving school.			Must display AAC on back of vehicle (non-professional supervisor). Must sign contract with driving school and accompanying driver if want to drive with non-professional supervisor. Speed restriction (non-professional supervisor). Must driver at least 3000 km before next phase.	18 (full licensure).
Finland							
	17½ years. (Reduction to 16 years being considered)		15h of practical lessons (with parents or driving school); 15h of classroom lessons. Theory and practical tests must be passed to move to next phase. (Improved testing being considered)				17½ years.
Northern Ireland							
	17 years.	–	Must pass practical test to move to next phase.			Must display L-plates. Speed restriction of 45mph.	17 years.

Appendix B: Summary of some licencing systems (Intermediate phase: solo driving with restrictions)

<i>Intermediate phase (solo driving with restrictions)</i>							<i>Minimum age for next phase (full licensure)</i>
<i>Country/State</i>	<i>Minimum age</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Reduced alcohol limit</i>	<i>Consequences of motoring offences</i>	<i>Other</i>	
United States							
California.	16 years.	Midnight - 5am if driving unsupervised (for 12 months). Exemptions permitted.	No passengers under 20 in 1st 6 months (unless supervised by a licenced driver aged 25+). Exceptions for family need.	0.01 BAC (if under 21).	Driver improvement programme, warnings, licence restrictions and suspensions for offenders.		18 years.
Delaware.	16 years 4 months.	9pm - 6am (for 6 months) unless supervised.	Maximum 2 passengers.	0.02 BAC (if under 21).			16 years 10 months.
Florida.	16 years.	11pm - 6am (if 16) 1am - 5am (if 17).	Being considered for drivers under 18.	0.02 BAC (if under 21).	Limit on violations allowed for drivers under 18.		18 years.
Georgia.	16 years.	1am - 5am (if under 18) with exceptions – e.g. for driving to and from work or school.	Maximum 3 passengers under 21 (except family) unless supervised by adult.	0.02 BAC (if under 21).	12 months driving without major traffic convictions is required before a full licence is granted.		18 years.
Illinois.	16 years.	11pm - 6am Su-Th Midnight - 6am Fri/S at (if under 17).		0.00 BAC (if under 21).			17 years.
Indiana.	15 years 2 months.	1am - 5am Sat/Sun after 11pm Su-Th (if under 18).	No passengers in first 3 months from getting learner permit (unless supervised by driver aged 21+).	0.02 BAC (if under 21).			18 years.
Iowa.	16 years.	12.30am - 5am (for 12 months).		0.02 BAC (if under 21).		10 hrs supervised driving (incl. 10 at night).	17 years.
Kentucky.	16 years 6 months.	Midnight to 6 am if under 18. (Some exceptions allowed).		0.02 BAC (if under 21).	Probation, or suspension of license privileges for exceeding stated number of penalty points. This provision is stricter for drivers under 18.	Distinctive 'under 21' licence issued. 4 hour education course must be completed within 1 year of obtaining intermediate licence.	18 years.

Intermediate phase (solo driving with restrictions)

<i>Country/State</i>	<i>Minimum age</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Reduced alcohol limit</i>	<i>Consequences of motoring offences</i>	<i>Other</i>	<i>Minimum age for next phase (full licensure)</i>
Louisiana.	16 years.	11pm - 5am (if under 17).		0.02 BAC (if under 21).			17 years.
Maryland.	16 years 1 month.	Midnight - 6am (if under 18, unless supervised by driver aged 21+). Restriction can be waived for work/education.		0.02 BAC (if under 21).	Driver improvement programme. Must demonstrate 1 year conviction free driving or be 18 years old before applying for full licence.	Second parent training handbook issued to guide training of more complex skills.	18 years.
Massachusetts.	16 years 6 months.	Midnight - 5am (if under 18) unless supervised.		0.02 BAC (if under 21).			18 years.
Michigan.	16 years.	Midnight - 5am unless supervised or driving to and from work.		0.02 BAC (if under 21).	12 consecutive violation-free months required before full licence can be obtained.	Intermediate licence must be held for at least 6 months.	17 years.
Minnesota.	16 years.			0.00 BAC (if under 21).			17 years.
Nebraska.	16 years.	Midnight - 6am (for 12 months).		0.02 BAC (if under 21).			17 years.
New Hampshire.	16 years 3 months.	1am - 5am (if under 18).		0.02 BAC (if under 21).			18 years.
North Carolina.	16 years.	9pm - 5am (for 6 months) unless supervised or travelling to or from work.	Limited by no. of seatbelts (if driver aged under 18).	0.02 BAC (if under 21).	Licence must be held for at least 6 violation-free months before driver is eligible for full licence.		16 years 6 months.
Ohio.	16 years.	1am - 5am (if under 17) unless supervised (exceptions belts for work / school / emergencies).	Limited by number of originally installed safety belts.	0.02 BAC (if under 21).	Suspensions for violations.		18 years.

Intermediate phase (solo driving with restrictions)

<i>Country/State</i>	<i>Minimum age</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Reduced alcohol limit</i>	<i>Consequences of motoring offences</i>	<i>Other</i>	<i>Minimum age for next phase (full licensure)</i>
Oregon.	16 years.	Midnight to 05:00 unless supervised.	No passengers under 20 during first 6 months (family excepted). Not more than 3 passengers under 20 during 2 nd 6 months (family excepted).	0.00 BAC (if under 21).	Accelerated driver improvement actions on fewer convictions (if aged under 18).		18 years.
Canada							
British Columbia.	16 years 6 months (16 years 3 months with approved training).			0.00 BAC.	Subject to additional penalties for motoring offences.	Must display 'N' sign. Must pass Level 2 road test (from early 2000) to exit from intermediate phase.	18 (17 years 9 months with approved driver training).
Nova Scotia.	16 years 6 months (16 years 3 months with approved training).	Midnight - 5am (unless accompanied by fully licenced driver or have employment exemption).	Only 1 front seat passenger. Passengers limited by no. of seatbelts.	0.00 BAC.	Violations can lead to 6 months suspension, after which the 2 year intermediate period must be repeated.	Must complete 6 hr defensive driving course.	18 years 6 months (18 years 3 months with driver education).
Ontario.	17 (16 years 8 months with approved training).		Passengers limited by no. of seatbelts.	0.00 BAC.	Driver subject to early improvement interventions for violations.	Must pass advanced level on-road test to exit from this phase.	18 (17 years 8 months with approved driver training).
Australia							
New South Wales.				0.02 BAC.	Lose licence for 3 months if get 4 or more demerit points in a year.	80 km/h speed limit (From July 2000 this was changed to 90 km/h for the first year, and 100 km/h for the next 2 years). Display P plates. Licence must be held for at least 12 months (extended to 3 years in July 2000).	18 (20 from July 2000).

Intermediate phase (solo driving with restrictions)

<i>Country/State</i>	<i>Minimum age</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Reduced alcohol limit</i>	<i>Consequences of motoring offences</i>	<i>Other</i>	<i>Minimum age for next phase (full licensure)</i>
Victoria.	18 years.		Yes if offence is committed during first year.	0.00 BAC.	Increased sanctions, including extension of P-plate period and passenger restrictions, for driving violations.	Maximum engine capacity:wt ratio (3.5 litres per tonne) and power:wt ratio (125kW per tonne) (Exemptions apply). Carriage of licence; display red P- plate.	Probationary licence must be held for 3 years before a full licence is issued.
Western Australia.	16 years 6 months.					To exit this phase: 60 hrs logged, supervised driving (certified by a supervisor or instructor). Hazard perception test. Submit logbook for review.	17 (probationary restrictions then apply).
<i>New Zealand</i>							
	15 years 6 months (Before May 1999 this could be reduced to 15 years 3 months with approved driver training).	10pm - 5am (unless accompanied by supervisor).	None unless accompanied by fully licenced adult.	BAC <0.03.	Violation of restrictions can lead to extension of up to 6 months.	Must carry licence. Exemptions from restrictions can be granted if they cause undue hardship. Road-based exit test must be passed (from May 1999).	Drivers under 25 must hold the restricted licence for at least 18 months; can be reduced to 12 months if driver attends approved driving course. (Before May 1999 it could be reduced to 9 months). Drivers aged 25 or over must hold restricted licence for at least 6 months, or 3 months with approved training.

Intermediate phase (solo driving with restrictions)

<i>Country/State</i>	<i>Minimum age</i>	<i>Night restriction</i>	<i>Passenger restriction</i>	<i>Reduced alcohol limit</i>	<i>Consequences of motoring offences</i>	<i>Other</i>	<i>Minimum age for next phase (full licensure)</i>
Sweden							
(Option 1 & 2).	18 years					A two-year post-licensing period during which violators receive driver improvement education is being considered.	
Norway							
	18 years				Violations can result in withdrawal of licence followed by another test and a new 2 year probationary period.		
France							
Finland							
	Licence is issued once required testing and training have been completed.				Suspension for 2 violations; warning about this is issued after first violation.	No exit test. Training: 1h drive in traffic; 3h on driving range; 4 classroom lessons. This concentrates on motivational aspects and self-evaluation, and must take place between 6 months and 2 years after entering this phase. Further developments are being debated in Finland.	
Northern Ireland							
	17 years.				If disqualified, restricted for further 12 months. If not, restriction extended by 3-12 months.	Must display R-plates. Speed restriction of 45mph.	18 years.

Abstract

The accident rate of novice drivers decreases markedly during their early driving careers. Graduated licensing systems aim to improve novice driver safety by providing a staged progression from initial learning to unrestricted solo driving. They include measures designed to restrict exposure to risk during early solo driving, exert a supervisory influence over driver behaviour during the first part of a driver's solo driving career and/or improve the level of training and experience accumulated before driving unsupervised without restrictions. TRL was asked by the Department for Transport, Local Government and the Regions to review graduated licensing and related systems as part of a project to review the practical driving test. This report describes some of the systems currently in use, and summarises the results of published evaluations. Components considered to be potentially suitable for Great Britain are discussed.

Related publications

- TRL527 *Novice driver accidents and the driving test* by G Maycock. 2002 (price £25, code AX)
- TRL323 *A new system for recording contributory factors in road accidents* by J Broughton, K A Markey, and D Rowe. 1998 (price £25, code E)
- TRL295 *Accident liability of novice drivers* by R West and J Hall. 1998 (price £25, code E)
- TRL293 *Accident rates and behavioural characteristics of novice drivers in the TRL cohort study* by R West. 1998 (price £20, code C)
- TRL275 *Cohort study of learner and novice drivers - Part 4* by G Maycock and E Forsyth. 1997 (price £35, code H)
- TRL274 *Accident script analysis* by R West. 1997 (price £25, code E)
- TRL232 *Drinking and driving in Great Britain - a review* by G Maycock. 1997 (price £25)

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