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EXECUTIVE SUMMARY

Background

‘Cohort II’ was a major six-year study, funded by the Department for Transport, providing an up-to-date picture of how ‘cohorts’ of learner drivers in Great Britain undertake driver training and testing, and of their subsequent experiences as new drivers. It builds upon and further develops the evidence base from the smaller Cohort I study in 1988–89. The aims of the study were:

- to investigate how people learn to drive, including the number of hours of tuition and practice, and to compare this to outcomes from the theory and practical driving tests;
- to assess the impact of changes to the testing regime, specifically the hazard perception test which was introduced during the period of study;
- to explore new drivers’ experiences and attitudes to driving; and
- to identify their level of accident involvement over time.

It is important to note that, while associations have been established between many variables – for example, some variables associated with driver training and accident liability – these are not necessarily causal relationships.

The sample initially comprised 42,851 learner drivers, however not all of these passed their practical tests to be involved in the subsequent surveys of new drivers. The sample of new drivers in Cohort II varied from over 10,000 at six months after the practical test to just fewer than 2,000 at three years after taking the test.

Owing to differences in survey design and the sample composition of Cohort I and Cohort II it can, at some times, be difficult to make direct comparisons between the results. The Cohort II sample is markedly younger than the Cohort I sample has a higher proportion of female respondents, 63% and 55% respectively. However, where possible and indeed appropriate, this report highlights differences between the findings from the two studies, representing changes over time.

Main findings

Learning to drive

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**Passing the test**

- A higher proportion of males than females passed the practical test.
- The proportion of people passing the practical test decreased with age – younger age groups had higher pass rates.
- Those who passed the test learned to drive over a shorter period of time than those who attempted the test but did not pass.
- **Any amount of practice** with friends and relations was associated with higher pass rates.
- Respondents were more likely to pass the practical test if they reported fewer barriers to learning to drive, such as restrictions on private practice or professional tuition.
- More than two-thirds (69%) of respondents who failed agreed with the examiner’s decision. Respondents were most likely to cite ‘nerves’ and ‘bad luck’ as reasons for failing the practical test. Four per cent admitted that they had not ready for the practical test.
- Half of all respondents who failed the test (51%) did not think it was necessary to alter their learning pattern and they said they would continue to take professional tuition with the same frequency.

**The new driver**

- The majority of new drivers drove on most days of the week once they had passed their test.
- New drivers in the survey reported a need to improve aspects of their driving – particularly, driving in snow and fog, parking, and judging what other drivers will do.

**Attitudes and behaviour**

- Drivers tended to enter the driving population with fairly fixed ideas about themselves – both in absolute terms and in relation to others. This indicates that interventions to influence attitudes need to be in place very early in a learner driver’s training, or even prior to practical training.
- Drivers began their driving careers with relatively high levels of confidence in their driving ability, but after six months their confidence was much lower and did not change to any great extent in the subsequent time periods.
**Accident involvement**

- As new drivers gained experience, the number of accidents they reported and their corresponding accident rates (per year) decreased.
- The severity of the accidents occurring, however, increased over time, corresponding to a reduction in the proportion of accidents taking place in car parks and private drives and an increase in the proportion occurring on public roads – an effect that was especially marked between the first two six-month reporting periods.

**The impact of hazard perception testing**

- The introduction of the hazard perception component in the theory test appears to have been associated with some reduction in subsequent accident liability, although the size of the estimated effect varies with the type of accident.
- For reported non-low-speed accidents on a public road where the driver accepted some blame, the size of the accident reduction in the first year of driving for those who had taken the hazard perception test (controlling for age, sex, experience and exposure) compared with those who had not was at least 3%.
- There is a predictive relation between the hazard perception score achieved by respondents and levels of reported accidents in the first year of driving. For non-low-speed public road accidents, in which the driver accepted some blame, those in the highest scoring group in the hazard perception test had an accident liability estimated to be at least 4.5% lower than that of the lowest scoring group.

**Changes over time**

- The Cohort II sample (based on respondents who took practical tests in 2001–05) had a higher proportion of young and female respondents earlier Cohort I study (based on respondents who took practical tests in 1988–89).
- In both Cohort I and Cohort II almost all respondents had lessons with an Approved Driving Instructor (ADI) but the mean total duration of these increased from 31 hours to 52 hours.
- Cohort I passers had a mean of 49 hours of total driving experience (including practice), while in Cohort II the equivalent figure was 67 hours, with the majority of the increase being accounted for by the increase in professional driving instruction.
Detailed findings

Learning to drive (including those who passed and those who failed their practical test)

Virtually all respondents (99%) took some lessons with an ADI. For all respondents, the mean number of hours of lessons with an ADI taken prior to the practical test was 52 hours – although this was less for younger learners and for male learners. It is important to note, however, that the ‘mean’ value can be somewhat misleading, as it is influenced by the fact that some respondents took very large amounts of training or practice. The median value of 40 hours perhaps gives a more useful picture and takes into account extreme values (the median is the midpoint of the distribution, with half the respondents reporting less than this and half reporting more).

Just over half of respondents (55%) who were learning to drive had practice sessions with friends or relations. Respondents who were able to have private practice amassed a mean of 34 hours of practice across their learning period before taking the practical test.

Prior to taking their first theory test, nine out of ten respondents (90%) gained at least some driving experience. When preparing for the theory test:

- almost all respondents (99.5%) had studied for the multiple-choice component with the help of a book, web site or interactive multimedia product;
- a marginally smaller proportion of respondents (96%) had used some type of study material for the hazard perception component.

In contrast to preparation for the theory test, more than a fifth of respondents (22%) opted not to use any study materials to prepare for the practical test, although the Highway Code was still used by more than half of all respondents.

Overall, male respondents learned to drive over a shorter period than female respondents, and younger respondents in a shorter period than their older counterparts. While, given the majority of first-time takers were in the youngest age group (17-19 years), they differed from others in that they had:

- generally driven fewer miles;
- fewer hours of tuition with an ADI; and,
- fewer hours of practice with friends and relations.

A number of respondents failed to experience a full range of driving conditions when learning to drive, for example 6% of those who took the test, irrespective of the outcome, did not drive on country roads, 14% did not drive in darkness and 57% did not drive in snow or ice prior to taking their practical test.
From June 2003, the Driver and Vehicle Licensing Agency (DVLA) sent the Driving Standard Agency (DSA) Driver Record, designed to record progress during the training period, with all new provisional licences. While learning to drive, six out of ten respondents were in possession of a form of driver record (59%). In total, only 37% of respondents held the DSA version; and of these, almost a third (31%) of DSA Driver Records were never used.

More than two-thirds (69%) of respondents who failed agreed with the examiner’s decision. Respondents were most likely to cite ‘nerves’ and ‘bad luck’ as reasons for failing the practical test: 56% of respondents who failed practical test claimed that they were too nervous to perform to the required standard and 44% claimed that they were just ‘unlucky’. However, just over a quarter of those who failed (27%) acknowledged that their driving was simply not good enough on the day of the test and around 4% admitted that they had not ready for the practical test. However, in spite of not being successful, half of failed respondents (51%) did not think it was necessary to alter their learning pattern and they said they would continue to take professional tuition with the same frequency.

**Passing the test**

Almost half of all respondents (49%) passed the practical test. The key characteristics of these respondents (or ‘passers’) were that:

- A higher proportion of males than females passed, 55% and 47% respectively.
- Females who passed were, on average:
  - older than males;
  - had more hours of tuition; and,
  - took longer to learn.
- The proportion of people passing decreased with age.
- Passers took a mean of 47 hours of professional tuition (a median of 36 hours). Although passers tended to have fewer hours of tuition if they were young.
- Passers who had the opportunity to practice with friends and relations took a mean of 34 hours.
- **Any amount of practice** with friends and relations was associated with higher pass rates. Respondents were also more likely to pass the practical test if they reported fewer barriers to learning to drive (such as restrictions on private practice or professional tuition).
- Passers learned to drive over a shorter period of time than those who attempted the test but did not pass.

Those who were taking the practical test for the first time were not as successful as those who were attempting their second, third or fourth driving test. While the youngest passers made the fewest minor driving faults on the practical driving test
(as recorded by the examiner). The most common driving fault was incorrect use of mirrors and signals.

Nearly all passers (95%) felt that their driving skills could be improved after taking their practical and almost a third (31%) felt a lot of improvement was needed for at least one driving skill.

The new driver

Nine out of ten new drivers (90%) drove at least once a week once they had passed their test. This proportion remained stable over the three years of the study. New drivers in the survey reported a need to improve aspects of their driving. In particular, driving in snow and fog represented specific areas of concern, as well as judging what other drivers will do, and parking.

Eighteen per cent of respondents had taken Pass Plus in the 12 months after passing their practical test, however further analysis of Cohort II study found that it was not an appropriate tool to assess the impact of Pass Plus on accident rates (see Elliot, 2006).

Attitudes and behaviour

The self-reported attitude and behaviour measures collected in this study were, on the whole, remarkably stable over the three years after passing the practical test. Respondents began their independent driving career with relatively high levels of confidence in their driving ability, but after six months confidence was much lower and did not change to any great extent in the subsequently.

Female compared with male respondents and young compared with older respondents were more likely to report:

- more confidence in their driving ability;
- having a more unsafe driving style; and,
- committing more violations when driving.

On the whole, new drivers tended to enter the driving population with fairly fixed ideas about themselves, both in absolute terms and in relation to others. Changes in attitude and behaviour that did occur over time were not usually in a direction that would benefit road safety.
**Accident involvement**

Most accidents reported in the survey occurred in dry conditions and during daylight hours. As respondents gained more driving experience after passing the practical test:

- the number of accidents they reported and their corresponding accident rates (per year) decreased.
- accident severity increased – corresponding to a reduction in the proportion of accidents taking place in car parks and private drives and an increase in the proportion occurring on public roads.

In the first six months of driving after passing the test, older drivers have a lower reported accident rate (per year) than younger drivers. In this study, the age effect was clearest for drivers in the first year of driving.

Male respondents reported more public road accidents than females in all four reporting periods. After controlling for the effects of differences in exposure, accident liability changes more sharply with the age of passing the test for male than for female respondents. For those with very low levels of driving exposure and for people who passed their test after the age of 22, the estimated accident liabilities for female respondents are higher than those for male respondents.

When the effects of exposure and age of passing the practical test were controlled statistically:

- public road accident liability was found to fall rapidly as drivers mature and gain experience.
- the frequency of reported involvement in ‘near-accidents’ is strongly and positively related to drivers’ accident liability.
- drivers with poor awareness (i.e. those reporting more awareness errors) have a higher accident liability than those whose awareness skills were superior.
- Aggressive violations, inexperience errors and slips, measured using the Driver Behaviour Questionnaire (DBQ) were found to be dominant predictors of accident liability.

Learner drivers with a more tolerant attitude to driving violations (many of them speed-related) tend to go on to have a higher post-test accident liability, based on measures from the Attitudes to Driving Violations Scale (ADVS).

There is not a strong relationship between accident liability and hours of professional tuition and hours of practice with friends and relations.
The impact of hazard perception testing

After the introduction of the hazard perception test in November 2002, respondents:

- tended to take the theory test earlier in the learning to drive process, though without any decrease in the amount of driving experience gained before the practical test.
- spent more time studying for the theory test;
- were more likely to use visual materials in preparation;
- were more likely to reporting feeling ‘ready’ or ‘nearly ready’, for the practical test, if they passed the theory test including hazard perception.

Experience of a theory test which included the hazard perception component appeared to reduce the perceived need to improve the ability to spot hazards although it cannot be determined to what extent hazard perception testing might have been responsible for this change, if at all.

Univariate analyses were inconclusive regarding the effect of hazard perception on accident involvement. More complex multivariate techniques showed that the hazard perception element within the theory test appears to have a beneficial effect in reducing subsequent accident liability for some types of accident. The size of the effect varies with the type of accident and is largest for reported non-low-speed accidents on a public road where the driver accepted some blame. Furthermore, there is also a predictive relation between the hazard perception score and reported accidents in the first year of driving for this accident type.

Having controlled for age, sex, experience and exposure, for reported non-low-speed accidents on a public road where the driver accepted some blame:

- there was at least a 3% reduction in accident liability in the first year of driving for those who had taken the hazard perception test compared with those who had not;
- those in the highest scoring group in the hazard perception test had an accident liability estimated to be at least 4.5% lower than that of the lowest scoring group.

Overall, the study provides good evidence that introducing the hazard perception test has had some road safety benefit, i.e. that it has had good consequential validity. It cannot provide absolute proof, but the reduction in accident liability associated with the introduction of the hazard perception element into the theory test, together with the relationship that was found between drivers’ scores on the hazard perception test and subsequent accident liability, provides persuasive evidence.
Changes over time

Comparing Cohort II with Cohort I shows that over time there has been:

- an increase in the mean number of hours of instruction undertaken by all respondents (including those who failed the practical test) from 31 hours in Cohort I to 52 hours in Cohort II.

- a reduction in the proportion of respondents who reported having driving practice with friends or relations from 65% in Cohort I to 55% in Cohort II, but the mean number of hours of practice (including those who had none) increased from 17 hours to 19 hours.

- an increase in total driving experience for passers in Cohort I to passers in Cohort II: from a mean of 49 hours to 67 hours – the majority of the increase was accounted for by an increase in professional driving instruction.
1 INTRODUCTION

1.1 Background to the study

The recent Department for Transport review of road safety strategy, *Tomorrow’s Roads – Safer for Everyone. The Second Three Year Review* (Department for Transport, 2007), discusses the need to reform fundamentally the way people learn to drive. Among the options proposed are the development of a new framework of competencies for safe driving and making efforts to influence the attitudes of young people to road safety issues.

It has long been known that young drivers are over-represented in accidents and, as a result, they have been a major focus of research and policy in traffic safety in the developed countries of the world for many years. Research has shown that much of this problem is associated with inexperience, in that both younger and older new drivers have an elevated risk of accident involvement in the early stages of their driving careers (Maycock *et al.*, 1991; Forsyth *et al.*, 1995; Mayhew *et al.*, 2000; Maycock, 2002). This raises the question of just what happens in the first few years of driving to turn a high-risk new driver into a lower-risk experienced driver.

‘Cohort II’ was a major six-year study, funded by the Department for Transport, of the experiences of driver training and testing for cohorts of learner drivers in Great Britain and of their subsequent experiences as new drivers. It followed the first large-scale investigation of new drivers, the Cohort I study (Forsyth, 1992a,b; Forsyth *et al.*, 1995; Maycock and Forsyth, 1997). Every three months, from November 2001 to August 2005, a cohort of 8,000 practical driving test candidates was sent postal questionnaires. Each person who passed the practical test and responded to the original survey was subsequently followed for a period of up to three years, through further postal questionnaires.

The aims of the Cohort II study were:

- to investigate how people learn to drive, including hours of tuition and practice;
- to compare this with outcomes from the theory and practical driving tests;
- to explore new drivers’ experiences and attitudes to driving;
- to identify their level of accident involvement over time; and
- to assess the impact of changes to the testing regime, specifically the hazard perception test which was introduced during the period of study.
1.2 Outline of how driver training and testing has changed since 1990

The results from Cohort II provide valuable evidence on changes in new drivers’ experiences of driving since the first cohort study of learner and new drivers in 1988–89, in light of the modifications to policy on driver training and testing. These changes summarised in Table 1.1.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 May 1990</td>
<td>Driving examiners required to give candidates a brief explanation of the faults committed during the test plus advice on areas for improvement</td>
</tr>
<tr>
<td>1 October 1990</td>
<td>Accompanying drivers required to be over 21 and have held a full licence for at least three years</td>
</tr>
<tr>
<td>1 April 1991, November 1995</td>
<td>The reverse parking manoeuvre introduced into the practical test</td>
</tr>
<tr>
<td>1 July 1996</td>
<td>The introduction of a separate theory test replacing questions asked on the Highway Code during the practical car and motorcycle tests</td>
</tr>
<tr>
<td>1 October 1996</td>
<td>Theory test pass mark increased from 26/35 to 30/35</td>
</tr>
<tr>
<td>1 June 1997</td>
<td>Introduction of the New Drivers Act, whereby drivers accumulating six or more penalty points on their licence within two years of passing the test have their licence revoked and must revert to learner status and pass a further L-test in order to regain a full licence</td>
</tr>
<tr>
<td>29 September 1997</td>
<td>Minimum wait between tests of the same category for unsuccessful candidates introduced (10 clear working days for car tests)</td>
</tr>
<tr>
<td>4 May 1999</td>
<td>The introduction of changes to the practical test, including extension of the length of the test, randomisation of the emergency stop manoeuvre and failure for committing 16 or more driving faults</td>
</tr>
<tr>
<td>4 January 2000</td>
<td>The introduction of the touch-screen theory test</td>
</tr>
<tr>
<td>14 November 2002</td>
<td>The introduction of the hazard perception component into the theory test (since the start of Cohort II)</td>
</tr>
<tr>
<td>April 2003</td>
<td>The Driver and Vehicle Licensing Agency (DVLA) start to send the Driving Standards Agency (DSA) Driver’s Record out with provisional licences</td>
</tr>
<tr>
<td>1 September 2003</td>
<td>Show me/tell me vehicle safety questions added to the beginning of the practical driving test</td>
</tr>
</tbody>
</table>

Of all the changes to the driver training and testing regime, only the introduction of a hazard perception element into the theory test, which drivers in the UK must pass before taking their practical test, represented a significant change to driver testing during the period of study. Prior to November 2002 the theory test consisted of a series of multiple-choice questions delivered by computer on a range of topics, including road signs, first aid, driving techniques and stopping distances. The hazard perception part of the test is in addition to this and is also delivered on a computer. It consists of a series of video clips that feature everyday road scenes. In each clip there is at least one developing hazard where a candidate’s response is measured. A theory test pass certificate, valid for 24 months, is required before a candidate can apply for the practical test.

A number of studies have shown that experienced drivers detect hazards earlier than novices (e.g. McKenna and Crick, 1994). Cohort II provided an ideal opportunity to investigate the impact of the introduction of the hazard perception testing on the
training of learner drivers and on their accident rates over their first years as newly qualified drivers.

1.3 Key research questions

The following questions were central to the analysis of Cohort II data:

1. What is the current pattern of learning to drive and how has this changed between Cohort I and Cohort II?

2. What impact did the introduction of hazard perception testing have on the following:
   - how learner drivers structure their learning;
   - the timing of the theory test within the total period of learning to drive;
   - levels of confidence in driving ability;
   - new drivers’ reported attitudes; and
   - accident rates for those who passed the hazard perception test?

3. To what extent does the grade of Driving Instructors affect pass rates in the practical driving test?

The analysis of Cohort II builds upon a number of studies which attempt to distinguish between performance and behaviour (e.g. Evans, 1991). The Cohort II project has sought to assess behaviour in association with accidents, attitudes and driving experience over a relatively long period (three years).

1.4 Structure of the report

Section 2 of this report describes the methodology for the project and Section 3 discusses the driver samples, including questionnaire response rates at various stages of the project. Section 4 looks at the information obtained on learning to drive, including preparation for both the theory test and the practical test, while Section 5 considers the factors which relate to passing the practical test. Section 6 considers the new drivers and their early experience, while Section 7 concentrates on attitudes and looks at how they change with driving experience. Section 8 presents analyses of accidents, considering the types of accident which new drivers have. Section 9 covers multivariate modelling of accidents, which takes account of interactions between the many factors influencing accident involvement. In Section 10 the various impacts of the introduction of the hazard perception element into the theory test are brought together.

Further data tables are presented in Cohort II: A Study of New Drivers. Volume 2 – Questionnaires and Data Tables (Wells et al., 2008; from now on referred to as ‘Volume 2’ for cross-references). Volume 2 is available online at http://www.dft.gov.uk/pgr/roadsafety/research/rsrr/theme2/cohort
2 OUTLINE OF METHODOLOGY

2.1 Survey design

2.1.1 Main study

Every three months, from November 2001 to August 2005, a random sample of 8,000 practical test candidates was drawn by the Driving Standards Agency (DSA) from candidates in a given week (this was approximately one-third of those taking their test in that week). For the purposes of the study, the resulting 16 cohorts were labelled A to P. Postal questionnaires were sent to these candidates and, if they passed their test, follow-up questionnaires were sent at specific points in their driving career. The flow chart in Figure 2.1 shows how this was done. For all questionnaires, reminders were sent if a response was not received within two weeks.

All questionnaires were piloted prior to being finalised. Details of other methodological issues are given in Appendix 1.

2.1.1.1 Questionnaire on learning to drive

The first element of the project involved a questionnaire to investigate respondents’ experience of learning to drive. It included questions about preparation for both the theory and practical elements of the driving test, including time spent in different types of driving environment and whether this was with an instructor or with a friend/relation. It also included some basic attitude questions. This Learning to Drive Questionnaire was sent within 10–16 days of a driver taking the practical driving test and went to all drivers regardless of the practical test outcome. A copy of the questionnaire is in Volume 2: Appendix B, Table B1. The questionnaire incorporated many similar questions to the equivalent questionnaire in Cohort I, but was also able to include the Attitudes to Driving Violations Scale (ADVS) developed by West and Hall (1997), which looks primarily at attitudes to speed, as well as measures of self-reported driving style based on Guppy et al. (1990).

2.1.1.2 Questionnaire on the experiences of newly qualified drivers

The second element of the project was to follow the experiences of new drivers in the early part of their driving careers. Respondents who had passed the practical test were sent a questionnaire at 6, 12, 24 and 36 months after completing the original questionnaire on learning to drive. Cohorts A to H received all four questionnaires. Subsequent cohorts received just the first three or the first two questionnaires because of the overall project duration. The Driving Experience Questionnaire covered accidents, exposure and offences, as well as attitudes and reported behaviour (see Volume 2: Appendix B, Table B1 for a copy of the Driving Experience Questionnaire1). The questionnaires included:

1 Driving Experience Questionnaires 1–4 all include the same questions, but for different time periods.
Practical test taken

Learning to Drive Questionnaire sent 10 – 16 days after practical test

Was a response received?

Reminder sent

Was a response received?

Did respondent pass practical test?

Follow-up questionnaire sent 6 months after test

Follow-up questionnaire sent 12 months after test

Follow-up questionnaire sent 24 months after test

Follow-up questionnaire sent 36 months after test

End – no further action

NB Second, third and fourth follow-up questionnaire sent whether or not response received to previous follow-up questionnaire(s)
• the Attitudes to Driving Violations Scale (ADVS);
• the Guppy scale for self-reported driving style;
• the Driver Behaviour Questionnaire (DBQ); and
• the Quimby ‘hazard awareness’ scale.

The repeated questionnaires allowed an accident history to be built up, which enabled the tracking of risk as drivers became more experienced.

2.1.2 Theory test study

In addition to the main study, a questionnaire on preparation for the theory test was sent out to learners who had just taken that test. The DSA provided a sample of 800 theory test candidates every six months. This was independent of the main sample and these respondents received no follow-up questionnaires. The purpose of this questionnaire was to check that responses to the Learning to Drive Questionnaire were not adversely affected by memory effects and also to obtain more data on studying for the theory test than was possible within the main survey (see Volume 2: Appendix A for a copy of the Theory Test Questionnaire).

2.1.3 Amendments to questionnaires

It was necessary to make some changes to the questionnaires over time to reflect changes in the training and testing regime, specifically in relation to the introduction of the hazard perception component of the theory test and of the DSA Driver’s Record (see Section A1.2 in Appendix 1 for more information).

2.2 Analysis of the data

A huge amount of data was generated from this project and, as a result, it is possible to use a range of analytic techniques to generate findings. The report presents ‘univariate’ and ‘multivariate’ analyses. The main distinction between the two is that univariate analyses look at the relationship between just two variables, for example pass rates and the number of hours of instruction, and multivariate analyses (sometimes referred to as ‘statistical modelling’) control for confounding variables, for example considering the relationship between pass rate and hours of instruction when age, sex and experience are taken into account.

Conventionally, univariate analysis is used initially to describe the dataset, before multivariate techniques are applied to control for confounding variables. However, given the amount of data that has been collected, the possibilities for univariate analysis are almost endless. Therefore, multivariate analysis has been used to inform the direction of the univariate analysis, and to ensure that only the salient variables are presented.
In a project of this size, with such large samples (there were 42,851 respondents to the Learning to Drive Questionnaire), testing for statistical significance serves little purpose. When virtually all differences are statistically significant, owing to such large numbers of respondents, the real issue is whether they are of practical significance, which is not a statistical question.

Significance testing has therefore only been described in this report in the few situations where the numbers involved are small, and in the multivariate modelling.

2.3 Differences between Cohort I and Cohort II

The Cohort II project was intended to update the information from the Cohort I project, and advances in data processing and technology also allowed many more in-depth analyses to be undertaken and a greater volume of data to be collected.

One of the key differences between the two studies is that in Cohort II a questionnaire was sent out six months after the practical test was passed (in Cohort I the first follow-up questionnaire was at 12 months). This allowed a more detailed investigation of the early driving experience than was possible in the previous study. Unlike in Cohort I, it was also possible to link questionnaire data with other data on the candidates.

The questionnaires used in the study were informed by the Cohort I questionnaires but took advantage of other research carried out since then – in particular, the development of tools to measure self-reported attitudes and behaviours.
3 THE COHORT II SAMPLE

3.1 Sample characteristics

A total of 128,000 practical driving test candidates, representing cohorts A to P, were sent the Learning to Drive Questionnaire. Figure 3.1 shows the age and sex distribution for this original sample – 52% were females and 48% were males, and nearly half (46%) were less than 20 years of age.

The information from the driving examiner form DL25\(^2\) was available for 95% of this sample for cohorts A to P. The pass rate for males was 45% compared with 39% for females, and decreased with age as shown in Figure 3.2. The overall pass rate for the whole sample was 42%.

3.2 Responses to the Learning to Drive Questionnaire

3.2.1 Response rates

A total of 42,851 responses to the Learning to Drive Questionnaire were received from all cohorts – an overall rate of 33%. The response rate for each cohort ranged from 27% for Cohort M to 39% for Cohort B. There was a tendency for response

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\(^2\) Form DL25 is the driving test report which is used to categorise driving faults, and also records information such as the candidate’s driver number, date and time of test, and the Approved Driving Instructor (ADI) number if the candidate is booked for a test in an instructor’s car.
rates to be lower in November and for the final-year cohorts (see Volume 2: Appendix C, Table C1).

### 3.2.2 Demographics and the pass/fail status of respondents

The response rate was greater for females: 40% of females responded compared with only 26% of males. The response rate by age and sex is shown in Figure 3.3. For both males and females, the response rate for the 20–24 year age group was

![Figure 3.2: Pass rates for original sample by age group and sex](image)

![Figure 3.3: Response rates to the Learning to Drive Questionnaire by age group and sex](image)
lower than that for the 17–19 age group. Those who passed their driving test were more likely to respond to the questionnaire: 39% of those who passed responded compared with only 29% of those who failed (see Volume 2: Appendix C, Table C2). Overall, 49% of the respondents to the Learning to Drive Questionnaire passed their driving test compared with 42% of the original sample, therefore those who passed were over-represented in the sample.

A very small number of learner drivers (28) who responded to the Learning to Drive Questionnaire were aged 16. These were omitted from further analyses.

Fifty-three per cent of the respondents were aged 17 to 19, ranging from 49% for Cohort H to 56% for Cohort F. The percentage of female respondents ranged from 58% for Cohort A to 65% for Cohorts K and L, with a mean of 63%. The age and sex distribution for each cohort is shown in Volume 2: Appendix C, Table C3.

### 3.2.3 Comparison with sampling frame

Figure 3.4 gives the age distribution for the original sample and for the respondents to the Learning to Drive Questionnaire, and shows that, among the respondents, 17–19-year-olds and the 40+ age group were slightly over-represented, while 20–39-year-olds were slightly under-represented.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Original sample</th>
<th>Learning to Drive Questionnaire respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>17–19</td>
<td>53</td>
<td>46</td>
</tr>
<tr>
<td>20–24</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>25–29</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>30–39</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>40–49</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>50+</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 3.4: Age distribution of the original sample and of respondents to the Learning to Drive Questionnaire
3.3 Responses to the Driving Experience Questionnaire

3.3.1 Response rates for the Driving Experience Questionnaires

The first Driving Experience Questionnaire was sent out six months after the test date to respondents of the Learning to Drive Questionnaire who had passed their practical test. In total, 20,512 of the first Driving Experience Questionnaires were sent out and the overall response rate was 49%, ranging from 42% for Cohort O to 57% for Cohort A (see Volume 2: Appendix C, Table C1).

The second Driving Experience Questionnaire was sent six months later (i.e. 12 months after the test date) to the same people as the first Driving Experience Questionnaire. The overall response rate for this survey was 36%, ranging from 29% for Cohort M to 42% for Cohort D (see Volume 2: Appendix C, Table C1).

The third Driving Experience Questionnaire was sent out 12 months later (i.e. 24 months after the test date) to Cohorts A to L. The overall response rate for this survey was 27%, ranging from 22% for Cohort E to 32% for Cohort D (see Volume 2: Appendix C, Table C1).

The fourth Driving Experience Questionnaire was sent out 12 months later again (i.e. 36 months after the test date) to Cohorts A to H. The overall response rate was 26%, ranging from 20% for Cohort E to 31% for Cohort H (see Volume 2: Appendix C, Table C1).

3.3.2 Comparison of response rates for the Driving Experience Questionnaires

The response rates for all the Driving Experience Questionnaires showed a similar pattern to that for the Learning to Drive Questionnaire shown in Figure 3.4. The response rates for 20–24-year-olds were lower than for 17–19-year-olds, then gradually increased up to the 50+ age group. For each age group, females had a higher response rate than males.

The response rates for the different age groups for all four Driving Experience Questionnaires are shown in Figure 3.5 and Figure 3.6 for male and female respondents respectively (see Volume 2: Appendix C, Tables C4 to C7).
For both male and female respondents, the response rates declined from the first survey (six months after test date) to the second survey 12 months after the test date. Response rates for the third and fourth surveys were broadly similar.
As mentioned in Section 2, however, there are gaps in the response records of many of the respondents. Within questionnaires many respondents omitted at least one question or gave a response which could not be used (e.g. a date for an accident or a test which was too far outside the likely range to be valid). In order to maximise the data available, the analyses have been based on the maximum responses for individual questions. This results in different base numbers for each of the analysis tables throughout the report.

3.4 Theory Test Questionnaire

The overall response rate for the Theory Test Questionnaire was 35%. The seven theory test samples were broadly similar in terms of age and sex distribution. Details of the theory test sample and results are given in Appendix 2 (Sections A2.1 and A2.2).

3.5 Summary of response rates

Table 3.1 gives a summary of the response rates for the different questionnaires.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Cohorts</th>
<th>No. of questionnaires issued</th>
<th>No. of questionnaires returned</th>
<th>No. of respondents who passed their driving test</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning to Drive Questionnaire</td>
<td>A to P</td>
<td>128,000</td>
<td>42,851</td>
<td>20,512</td>
<td>33%</td>
</tr>
<tr>
<td>Driving Experience Questionnaire (at 6 months)</td>
<td>A to P</td>
<td>20,512</td>
<td>10,064</td>
<td></td>
<td>49%</td>
</tr>
<tr>
<td>Driving Experience Questionnaire (at 12 months)</td>
<td>A to P</td>
<td>20,512</td>
<td>7,450</td>
<td></td>
<td>36%</td>
</tr>
<tr>
<td>Driving Experience Questionnaire (at 24 months)</td>
<td>A to L</td>
<td>15,819</td>
<td>4,189</td>
<td></td>
<td>26%</td>
</tr>
<tr>
<td>Driving Experience Questionnaire (at 36 months)</td>
<td>A to H</td>
<td>10,711</td>
<td>2,765</td>
<td></td>
<td>26%</td>
</tr>
<tr>
<td>Theory Test Questionnaire</td>
<td>7 samples</td>
<td>5,600</td>
<td>1,983</td>
<td></td>
<td>35%</td>
</tr>
</tbody>
</table>

3.6 Comparison with Cohort I

The Cohort II sample was markedly younger than that in the earlier study. In Cohort I, less than half the respondents (43%) were under 20 years of age, and just under
two-thirds (65%) were under 25 years of age. In the Cohort II sample, these proportions were 54% and 73% respectively. There was also a change in the male/female mix. While females accounted for the majority of respondents in both studies, the proportion of females increased from 55% in Cohort I to 63% in Cohort II. It is not possible to say whether this reflects a real change in the proportion of female practical test applicants or just an increase in the willingness of females to answer lengthy questionnaires, since the Cohort I study did not provide response rates in detail. The practical driving test pass rate among survey respondents was 52% in Cohort I, compared with 49% in Cohort II. The national pass rates were 52% in 1988 and 43% in 2002, implying that there was an increased willingness to participate in the later survey if the test had been passed but this was not the case in the earlier survey.

3.7 Limitations of the method

3.7.1 Representativeness of responses

The use of postal questionnaires as the data collection method will inevitably result in some level of response bias. Although the initial sample drawn by the DSA is a random one, those who are willing or able to respond to a questionnaire (i.e. the achieved sample) will be a sub-group of the original sample.

It is important, therefore, to keep in mind that all the analyses undertaken in this study have been on respondents to individual questions within the questionnaires.

The issue of representativeness is concerned with how closely the Cohort II samples compare with the population of new drivers and, should differences exist, to what extent these could have implications for interpreting the results of the analyses. Owing to the limited amount of information that is available about the population, only a few comparisons are possible, and these are confined mostly to demographics.

The age and sex of the sample, and of the respondents, is known (it can be extracted from the driver number which is issued by the Driver and Vehicle Licensing Agency (DVLA) and shown on the provisional driving licence) and can be compared with the original sample, but other demographic data is not available.

When comparing the characteristics of those who responded to the Learning to Drive Questionnaire with the population of driving test applicants, there is a clear sex difference, with 63% of the sample being female compared with 52% in the population. There was a slight tendency for the young to be over-represented but, on the whole, the age distributions of the sample and of the population were similar. However, of more importance might be the difference between the 49% of respondents who were test passers compared with the national figure of 42% of the
practical test applicants who passed. This difference could be a potential source of bias, but its effects, if any, would only be relevant to the analyses in Section 4, which examines the learning to drive process. The results presented in Sections 5 to 9 are based only on those who passed the test.

Table C8 in Volume 2: Appendix C shows that females comprised a higher proportion of respondents who passed the test when compared with the population of applicants who passed, but that the age distributions were similar. The age distributions were also similar in each of the four follow-up studies, but there was a tendency for the proportion of female respondents to increase over time. The greater propensity of females to respond to questionnaires does not in itself pose major problems, as much of the analysis presented shows results separately for males and females. While respondents and non-respondents may differ in other ways that are difficult or even impossible to measure, where demographics are concerned, respondents to the Cohort II surveys did not differ greatly from the population of new drivers.

No data were collected in this study on socio-economic grouping (SEG).

The age of the sample (52% under 20, 72% under 25) meant that employment status or address (the normal way to collect SEG data) would be unlikely to reflect actual or potential social groupings and could, in fact, lead to misleading conclusions being drawn on the composition of the responding group.

3.7.2 Missing data

As any respondent may miss out any question within a questionnaire (by accident or by design), the number of respondents to any specific question may be less than the number of respondents overall. To maximise the amount of data available for any specific analysis, if an individual failed, for example, to provide an answer on mileage driven but did provide data on attitudes, the analyses involving mileage did not include that respondent but the analyses of attitudes did. Initial assessment of missing data throughout the database suggests that this has not introduced any systematic biases in terms of responses.

In general, it has been assumed that this does not introduce an identifiable bias into the results, i.e. there is no systematic response bias.

The treatment of these missing values had to be different when the modelling was undertaken because the dataset for the model needed to be complete and so excluded all respondents with any missing data on those variables of interest. It was then possible to compare, in a consistent way, how well these variables explained the data.
3.7.3 **Weighting**

The results from comparisons of characteristics of the initial sample supplied by the DSA and the respondents to the Learning to Drive Questionnaire could have been used to carry out a weighting exercise using the age and sex of the initial sample. However, other factors which may be unrepresentative of the sample are ethnicity, home language and literacy skills of the sample (as drivers who are unfamiliar with English, or who read with difficulty, are less likely to complete a questionnaire), and data on these was not available. Nevertheless, the actual differences between response groups at the five time-periods were similar on the measures which were available (see Section 3), and the differences between these and the initial sample were relatively small.

**Basic, unweighted data has been used in the analyses.**

It should also be noted that, since the follow-up questionnaires covered different time periods (the first two covered six months each, but the third and fourth covered 12 months), this had to be allowed for in all the analyses.

3.7.4 **Self-reported behaviour**

The attitude and behaviour scales used in the study are well established. However, the self-reporting of experience and accidents is likely to be subject to some self-censoring, which we had no way of assessing.

Respondents’ memories may have affected the reporting of experiences of learning to drive and of accidents. For example, the Learning to Drive Questionnaire asked respondents to recall how many lessons they had and how many hours of practice, when these were spread over an appreciable length of time. Within the Driver Experience Questionnaires some respondents may have reported the same accident in two adjacent questionnaires because of uncertainty about whether they had reported it before. This issue has been addressed in the accident analyses by considering the reported dates of each accident (see Section 8).

It should also be noted that, since the analyses are of self-reported accidents, these include a large number of non-injury accidents which are not reported to the police and not included in the national STATS19 accident records.³ The number of injury accidents reported at different points in the study was only 10–20% of the total and the bulk (two-thirds) of these were described as slight injury accidents, which may not always have been reported to the police, making comparison between the accident levels in this study and those in the national accident records inappropriate.

³ STATS19 is the national database of road accidents which are reported to the police as involving injury and occurring on a public road. Non-injury accidents are not included in the database.
Respondents to the questionnaires were reporting on their own attitudes, behaviour, experience and accidents, which might not reflect the reality.

3.7.5 Responses to individual questionnaires

Any respondent who returned the Learning to Drive Questionnaire but then missed one of the later questionnaires remained on the database and was sent further questionnaires at the appropriate intervals.

The data for some individuals are therefore incomplete in respect of whole questionnaires (as well as individual questions).

Overall, about half (1,404 out of 2,760; 51%) of the respondents to the final questionnaire had returned all four of the previous questionnaires (see Section 3).

3.7.6 Attrition

The issue of attrition is complex. Any longitudinal study that uses repeated surveys, such as Cohort II, must consider the possibility that declining response rates over time may lead to a situation where the respondents to the later surveys may differ in characteristics from those to the earlier surveys by virtue of the fact that they continue to participate, even though their demographics may be similar. Of concern to this study is the possibility that the characteristics that lead people to be regular respondents could also influence their attitudes, behaviours and accident liabilities, even though, as shown in Table C8, their demographics are very similar at all the survey points.

Such concerns can be allayed but only by recognising that the study did not operate in the way in which it was intended. Cohort II was designed as a longitudinal study but was not treated as such by its respondents, who tended to move in and out of the study to an unexpected degree. If one examines the total number of responses to the four follow-up surveys, only 11% came from all respondents who completed four surveys, 17% from respondents to three surveys, 31% from respondents to two, and 41% came from respondents to only one survey (not necessarily the first). Further, it can be seen that one respondent in five returned the second follow-up questionnaire but not the first, one in four returned the third but not the second, and one in three returned the fourth but not the third follow-up questionnaire. Thus, in effect, only a small proportion of the Cohort II data can be regarded as being longitudinal, and the majority is made up of separate, but related, cross-sectional datasets. The problem of attrition is minimal, but the pattern of responses means that analyses of the survey data must necessarily be cross-sectional in nature.
4 LEARNING TO DRIVE 1: CHARACTERISTICS OF ALL RESPONDENTS

4.1 Introduction

Every respondent in this study took a practical driving test. This section is based on the analysis of results from all 42,581 respondents to the Learning to Drive Questionnaire, irrespective of the outcome of their practical test. As mentioned in Section 3, males and respondents aged 20 to 39 years are under-represented.

The process of learning to drive can vary. Typically, learners will take professional tuition from an Approved Driving Instructor (ADI). Some may choose to practise (additionally or exclusively) with friends and relations, or use study guides or other tools. Learning experiences are explored here with a view to understanding what characterises particular groups of respondents.

Taking a theory test is the one common experience for every respondent. It can potentially shape learning experiences when people start driving, especially as some use the many study aids now available. Assessing how the theory test impacts upon the learning process has been complicated by the introduction of the hazard perception test; the relationship between taking this test and various elements of the learning process has been explored.

4.2 The theory test

The current theory test combines multiple-choice questions with a video-based hazard perception test. How respondents prepare for the test was investigated in detail using an additional survey of 2,100 respondents who took a theory test (see Appendix 2). Since the results from the Theory Test Questionnaire survey were similar to those from the Learning to Drive Questionnaire survey, the results for the larger sample from the latter survey have been analysed in this report.

The pass certificate for the theory test is only valid for 24 months. This means that candidates taking a practical test in November 2002, after the introduction of the hazard perception component, had not all completed a hazard perception theory test. Some candidates had passed the previous version of the theory test, without the hazard perception component. In fact, it was not until Cohort M (candidates taking their practical test in November 2004) that all respondents to the study were assumed to have taken a hazard perception test.
4.2.1 Studying for the theory test

4.2.1.1 Learning materials

A variety of materials is available to help learners prepare for their theory test. Learning materials range from books and interactive multimedia specifically targeted at helping people to pass their theory test, to more general sources of driving-related information, such as the *Highway Code*. Few respondents to the Learning to Drive Questionnaire (less than 1%) took a theory test without using any materials to study for at least part of it.

There were clear differences in the preferred study materials for the hazard perception and multiple-choice components of the theory test. A higher proportion used no materials to study for the hazard perception component than did so for the multiple-choice component (4% and 0.5%, respectively). When preparing for the multiple-choice component of the theory test, the most commonly used materials were:

- the *Highway Code* (76%);
- the DSA book *The Official Theory Test for Car Drivers* (65%); and
- driving-school-based multimedia products, such as CDs and DVDs supplied by ADIs and driving schools (35%).

When preparing for the hazard perception component of the theory test, no single type of study aid was a clear favourite among respondents and the most commonly used materials were:

- driving-school-based multimedia products, such as CDs and DVDs supplied by ADIs and driving schools (45%);
- other driving-related videos, CDs and DVDs (42%); and
- the *Highway Code* (38%).

Overall, multimedia-based materials perhaps represented the most appropriate study aids for the complete theory test in its current form as they were commonly used when preparing for both multiple choice and hazard perception. Example multimedia products include those with videos of hazardous driving events, similar to the hazard perception component of the theory test, and multiple-choice interactive tests.

Males and females differed very little in the study materials they used. Males were slightly less likely to use printed study materials overall, such as official DSA books, and were more likely to use no materials at all. The percentage of respondents using each type of learning material to study for the different components of the theory test can be found in Table 4.1.
4.2.1.2 Instruction prior to taking the theory test

Ten per cent of all respondents had no lessons with a professional driving instructor prior to their first theory test (13% of males and 9% of females). However, respondents who did receive professional tuition were often given additional training to help prepare them for the theory test (see Volume 2: Appendix D, Table D1). Most common was for ADIs to teach or test respondents on their knowledge of road signs and markings, or to recommend particular driving-related books and other materials (both 72%). Respondents were also commonly taught or tested on hazard awareness skills (65%) and other driving-related knowledge (62%), or went through example theory test questions with the help of an ADI. A small proportion (7%) received no assistance from an ADI to specifically prepare them for the theory test. Whether or not respondents’ first theory test included hazard perception had no marked effect on the assistance given by professional driving instructors, with the exception of teaching and testing hazard awareness skills – 70% of those whose first theory test included hazard perception received help in this area, compared with 62% of respondents who took a theory test without hazard perception.

### Table 4.1: Percentage of respondents using learning materials to prepare for the multiple-choice and hazard perception components of the theory test, by sex

<table>
<thead>
<tr>
<th>Study materials</th>
<th>Percentage using materials for multiple-choice component</th>
<th>Percentage using materials for hazard perception component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>DSA book, <em>The Official Theory Test for Car Drivers</em></td>
<td>68%</td>
<td>60%</td>
</tr>
<tr>
<td>DSA book, <em>The Driving Manual/Driving – The Essential Skills</em></td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>DSA Roadsense</td>
<td>7%*</td>
<td>8%*</td>
</tr>
<tr>
<td>Highway Code</td>
<td>79%</td>
<td>70%</td>
</tr>
<tr>
<td><em>Know Your Traffic Signs</em> book</td>
<td>15%*</td>
<td>14%*</td>
</tr>
<tr>
<td>Other books or sets of example questions</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>An interactive video, CD or DVD based at a driving school</td>
<td>34%*</td>
<td>36%*</td>
</tr>
<tr>
<td>Other driving-related video(s), CD(s) or DVD(s)</td>
<td>31%*</td>
<td>32%*</td>
</tr>
<tr>
<td>A website</td>
<td>25%</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>I did not use anything</td>
<td>&lt;1%</td>
<td>1%</td>
</tr>
<tr>
<td>BASE</td>
<td>25,072</td>
<td>14,435</td>
</tr>
</tbody>
</table>

Note, column percentages will exceed 100% due to multiple responses.
4.2.2 Passing the theory test

The sample was divided equally between those who had passed a theory test with hazard perception or with multiple-choice questions only. Overall, 72% passed the theory test on their first attempt, 21% had taken just one theory test previously and 6% had taken two previous theory tests. Few respondents (4%) had taken more than two previous theory tests and, overall, males took slightly more theory tests than females in order to pass\(^4\) (Figure 4.1).

Overall, respondents passed their theory test after an average (mean) of 1.41 attempts (1.40 for females and 1.44 for males). It took males, on average, more attempts than females in (almost) all age groups (Figure 4.2), although sex differences were marginal among respondents aged 17 to 19. Respondents aged 17 to 19 years also had the lowest number of attempts and the highest proportion passing the theory test first time (see Volume 2: Appendix D, Tables D2 and D3). For respondents of all ages, the mean number of theory tests taken was skewed by the high proportion passing first time (the median number of theory tests taken was 1.0 for all age groups).

As a theory test pass remains valid for up to two years, by the end of the study all respondents presenting for the practical test had, logically, passed a theory test with hazard perception, even if the first theory test taken had not included the hazard perception component (Figure 4.3). Consequently, the percentage of respondents

\(^4\) It is assumed that multiple theory tests were mostly taken by respondents who failed on earlier attempts. However, some theory test passes may have expired, forcing a few respondents to retake a successful theory test.
passing a theory test with hazard perception rose approximately 10 percentage points when compared with respondents passing their first or only theory test with hazard perception.

Whether a theory test was only ever experienced with, or without, hazard perception is an important differentiation in this study. Figure 4.4 shows that in Cohorts A to E, no respondents had experienced hazard perception in their first or only theory test.
After hazard perception was introduced, the percentage of respondents experiencing hazard perception in their first or only theory test rose rapidly for each cohort, from just 9% in Cohort F to 79% of respondents by Cohort K. In the final cohort (Cohort P), 90% of all respondents had experienced hazard perception in their first or only theory test.

**Figure 4.4: Percentage of all respondents with, and without, experience of hazard perception in their first or only theory test, by Cohort A–P**

Respondents taking a theory test with the hazard perception component passed after 1.33 attempts, compared with the 1.48 attempts made by respondents who took the theory test with only multiple-choice questions. For respondents in the 17 to 19 age group, the number of theory tests taken for those who did or did not take the hazard perception component were similar. However, older respondents appeared to take the hazard perception theory test fewer times before passing when compared with respondents of a similar age who had taken the theory test without hazard perception (Figure 4.5). Otherwise, similar patterns of passing based on sex were found irrespective of whether the theory test included hazard perception (i.e. females were more likely to pass the theory test in fewer attempts than males of a similar age; see Volume 2: Appendix D, Table D4).

### 4.2.2.1 Driving experience prior to taking the theory test

Prior to taking their first theory test, 90% of respondents had at least some driving experience. Females were more likely than males to have driven prior to their first theory test (92% compared with 88%; see Volume 2: Appendix D, Table D5), but the mean time spent by each group was similar. Mean driving time prior to the first theory test increased systematically with age (see Volume 2: Appendix D, Table D6). Mean hours of driving experience prior to the theory test were also similar for those whose first theory test included hazard perception and for those whose first
test did not. This might indicate that the hazard perception component of the theory test did not encourage respondents to obtain additional practical driving experience.

### 4.2.2.2 Practical test readiness

In all age groups, respondents who recalled feeling ready to apply for the practical driving test at the time of their theory test were more likely to have had greater driving experience at that time (see Figure 4.6). Males were more likely to report being ready to apply (Figure 4.7).

Respondents with some prior driving experience were more likely to state that they were either ‘ready’ or ‘nearly ready’ to take the practical driving test than those with no prior driving experience at the time of taking their theory test (Figure 4.8). This would suggest that gaining some driving experience prior to the theory test does improve perceived practical test readiness at that time.
Figure 4.6: Reported readiness to apply for the practical driving test (at the time of taking the theory test) and total hours spent driving prior to first theory test, by age group (all respondents)

Figure 4.7: Reported readiness to apply for the practical driving test at the time of taking the theory test by sex (all respondents)
If respondents’ first theory test included hazard perception, they were more likely to report feeling ‘ready’ or ‘nearly ready’ to apply for the practical test, compared with respondents whose first theory test did not include hazard perception (Figure 4.9). Thus, taking a hazard perception test was associated with an increase in subjective readiness for the practical test. It is not possible to state whether this association is causal, and different explanations for this relationship may exist. For example, the increased availability of learning materials for the hazard perception component of the theory test might have influenced perceived practical test readiness.5

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5 It could also be speculated that perceived readiness for the practical test may be associated with confidence levels at the time. However, confidence at the time of the theory test was measured retrospectively and may lack validity. Therefore, this potential relationship was not explored further for this report.
4.2.2.3 Number of months to first theory test

On average (mean), respondents had a period of 6.2 months from starting to drive to taking a theory test for the first time. Respondents\(^6\) whose first or only theory test included hazard perception took their theory test almost one month sooner than respondents whose first theory did not include hazard perception (5.8 months compared with 6.7 months). This disparity was not evident for respondents aged 17 to 19 years and was marginal for those aged 30 to 39 years (Figure 4.10). Among other age groups, mean differences of up to four months were observed (see Volume 2: Appendix D, Table D7). As taking a theory test with, or without, the hazard perception component appeared to be unrelated to **hours of driving experience** prior to the first theory test, it could be assumed that the introduction of hazard perception encouraged learners to condense their driving experience pre-theory test (but not to reduce or increase it).

![Figure 4.10: Number of months of uninterrupted driving experience prior to first theory test, with or without hazard perception (all respondents)](image)

4.3 The practical test

4.3.1 Studying for the practical test

As with the theory test, a range of materials could be used to help prepare for the practical driving test. Nevertheless, more than a fifth (22%) of respondents chose not to use any materials to help them prepare for the practical test, far greater than the

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\(^6\) All respondents to the Learning to Drive Questionnaire who drove before their theory test \textit{without} a break of more than six months. Respondents who took breaks from driving of more than six months were excluded from this analysis as the information they provided to determine the precise length of each break was often inconsistent.
percentage of respondents who claimed that they did not use any materials to study for the theory test (less than 1%).

The majority (78%) of respondents reported using at least one study aid in preparing for the practical driving test. The most popular was the *Highway Code*, used by more than half of the respondents (52%). More than a fifth of respondents (23%) referred to the DSA’s *The Driving Manual/Driving – The Essential Skills* (DSA 1999; 2005. Almost 18% referenced other books and 17% used the DSA book *The Official Theory Test for Car Drivers* (DSA, 2004). Although the survey did not explore the reasons for using specific materials, it is possible to speculate that respondents continued to use the DSA book *The Official Theory Test for Car Drivers* because the information it contains is still relevant even after the theory test has been taken. Interactive and online materials were least used for practical test preparation (13% and 10%, respectively; see Table 4.2).

<table>
<thead>
<tr>
<th>Study materials</th>
<th>Percentage using materials for multiple-choice component</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSA book, <em>The Official Theory Test for Car Drivers</em></td>
<td>17% 19% 17%</td>
</tr>
<tr>
<td>DSA Roadsense</td>
<td>6%* 8%* 6%*</td>
</tr>
<tr>
<td><em>Highway Code</em></td>
<td>53% 51% 52%</td>
</tr>
<tr>
<td><em>Know Your Traffic Signs</em> book</td>
<td>11% 12% 11%*</td>
</tr>
<tr>
<td>Other books or sets of example questions</td>
<td>19% 16% 18%</td>
</tr>
<tr>
<td>An interactive video, CD or DVD based at a driving school</td>
<td>12%* 14%* 13%*</td>
</tr>
<tr>
<td>Other driving-related video(s), CD(s) or DVD(s)</td>
<td>16% 17% 16%</td>
</tr>
<tr>
<td>A website</td>
<td>10% 10% 10%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1% &lt;1% &lt;1%</td>
</tr>
<tr>
<td>Did not use anything</td>
<td>21% 23% 22%</td>
</tr>
<tr>
<td>BASE</td>
<td>15,637 (n=10,217) 8,435 (n=5,429) 24,072 (n=15,646)</td>
</tr>
</tbody>
</table>

Note, column percentages will exceed 100% due to multiple responses.

Respondents seem to have referred to the rules of the road when preparing for the practical test but to have made limited use of other study materials. The reason for this may be that driving instructors were less than half as likely to recommend study materials to respondents who were preparing for the practical driving test compared with when they were preparing for the theory test (33% and 72%, respectively).

Accordingly, when preparing for the practical test, more ADIs helped teach and test respondents on driving-related knowledge (other than road signs and markings) and on hazard awareness skills (see Volume 2: Appendix D, Table D8). Very few ADIs (5%) did nothing additional during lessons to help prepare respondents for the practical test.
4.3.2 **Time to learn**

Respondents were asked when they first started to learn to drive a car. Where applicable, they were also asked to estimate the total duration of any breaks from driving that were longer than six months. The number of months from commencing learning to the practical test was reduced by this amount in order to produce an estimate of ‘active’ learning time.

4.3.2.1 **Active learning period prior to the practical test**

The mean ‘active’ learning time for all respondents was 14.1 months, with females taking more time to learn than males (15.1 and 12.3 months, respectively). For females, the mean active learning time increased with age (Figure 4.11) but for males it decreased from 40 years upwards. However, between the ages of 17 to 39 years, the mean active learning period was similar for males and females. On average, respondents aged 17 to 19 years spent half as much time learning as respondents aged over 30 years (see Volume 2: Appendix D, Table D9).

When all respondents who took breaks from driving were excluded from the analysis, the mean time spent learning was reduced (see Volume 2: Appendix D, Table D10). Respondents who took no breaks from driving had a mean learning duration of 11.7 months, more than two months less than the overall mean. This would suggest that any sustained absence from driving while learning increases the **active** learning time before taking a practical test. Such findings refer to respondents irrespective of whether they passed their practical test; later analyses (see Section 5) examine the time spent learning by those who passed.

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7 In total, 6,515 respondents were excluded from this analysis because they had taken breaks from learning for more than six months.
4.3.2.2 Learning duration

A total of 62% of respondents took their practical test within 12 months of starting to learn to drive, comprising 72% of males and 57% of females. Overall, it was most common for respondents to take their practical test within seven to nine months of starting to learn to drive (see Figure 4.12), although 25% did so four to six months after starting and 23 did so seven to nine months after starting. In contrast, females typically allowed more months between starting to drive and taking a practical test. Almost one in ten males took their practical test within three months of starting to learn to drive.

![Figure 4.12: Percentage of all respondents by number of months between starting to learn to drive and taking a practical test, by sex](image)

### 4.3.3 Hours of tuition and practice prior to taking a practical test

The number of hours of tuition that were undertaken with an ADI are explored in this section in relation to a respondent’s age, sex and the type of theory test that was taken (whether with, or without, hazard perception). These factors are later examined in Section 5 for passers of the practical driving test. Overall, respondents had a mean of 52 hours of professional instruction and a mean of 19 hours of practice with friends and relations. Excluding those who had no practice with friends or relations, the mean hours of practice was 34.

#### 4.3.3.1 Effects of age and sex

Almost every respondent (99%) received some professional driving instruction. This proportion was similar for both males and females. It was substantially greater than the proportion of respondents who practised with friends or relations (55%). A
slightly larger percentage of females practised driving with friends or relations than males (56% and 53%, respectively). The introduction of the hazard perception test did not affect the proportion of respondents who chose to take professional instruction from an ADI or who chose to practise with friends and relations.

Figure 4.13 (and Volume 2: Appendix D, Tables D11 and D12) show the mean number of hours of professional tuition and practice with friends/relations by age and sex. Both types of learning increased with age for males and females up to age 40–49 years. Beyond this age, only female respondents’ hours with an ADI continued to increase. On average (mean), females spent an additional 18 hours with an ADI compared with males; however, compared with females, males spent an average (mean) of three hours more driving with friends/relations.

A very small proportion of respondents claimed to have had no driving experience with a professional driving instructor (just 236 people, equivalent to less than 1% of respondents). Males were over-represented in this group (58% compared to 38% of all respondents). Over half of respondents without any professional tuition (56%) were aged 17 to 19 (see Volume 2: Appendix D, Table D13), although this figure is comparable to the 53% of respondents aged 17 to 19 in the full sample. A much larger group of respondents did not practice with friends and relations; the age distribution of these respondents was slightly different from the overall sample, with a lower proportion aged 17 to 19 years. This, perhaps, reflects the availability for private practice of vehicles and friends/relations: 17–19-year-olds may be more
likely to be able to turn to parents for practice than older respondents. The distribution by sex of respondents with no practice was similar to the overall sample (only 39% were male). A further, very small, group of respondents claimed to have had no driving experience whatsoever (just 69 people); of these respondents, 47 were male (see Volume 2: Appendix D, Table D13).

4.3.3.2 Relating hazard perception testing to hours of tuition and practice

A simple analysis of the data suggested that respondents who had taken a hazard perception theory test had undergone fewer hours of tuition than those without experience of the hazard perception test. However, this result was likely to be confounded by a number of factors, in particular: respondent age; learning duration; and the ‘transition period’ from a multiple choice theory test to a theory test that included multiple choice and hazard perception.

Restricting the sample for analysis to those responding in Years 1 and 4 of the study (representing Cohorts A to D and M to P) overcame the difficulty inherent in including respondents from Years 2 and 3 of the study. When presenting for the practical test with experience of a hazard perception theory test, such respondents typically had far shorter overall learning durations than those without experience of a theory test with hazard perception. This is because the theory test had changed at the start of Year 2, so anyone presenting for test with experience of hazard perception in that year, or the following year, typically had a below average amount of driving experience, whereas anyone without experience of a hazard perception test typically had an above average amount of driving experience. This systematically affected the relationship between learning duration and hazard perception experience for respondents in Years 2 and 3 of the study, and created a risk of generating a false effect, hence their exclusion from this analysis.

The data for the reduced sample of respondents from Year 1 and 4 were analysed in two ways:

- by simple comparison of the mean (‘unadjusted’) hours of professional tuition for respondents who did take the hazard perception test and those who did not; and
- through an analysis of covariance, with respondent age and months from starting to learn to drive to taking a practical test as the covariates, giving ‘adjusted’ hours of professional tuition (this process is described in Appendix 3). The results of these analyses are presented in Table 4.3.

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Both analyses are presented to illustrate the confounding effect of other factors, such as age and learning duration, when interpreting how the introduction of hazard perception testing may have altered the learning process.
Both approaches gave similar results. They indicate that mean hours of professional tuition were quite similar for respondents who took a hazard perception theory test and for respondents who did not. The robust analysis (which provides the adjusted mean hours of tuition in Table 4.3) showed that respondents whose first or only theory test included hazard perception had taken only marginally more tuition time (by a mean of just under an hour) than respondents who had not taken a hazard perception theory test. The difference was almost two hours for females, whereas adjusted hours of tuition were almost identical for male respondents who had taken a theory test with, or without, the hazard perception component.

Professional tuition was not the sole source of driving experience; over half of respondents (55%) also practised with friends and relations. However, no change in hours of driving practice with friends and relations was associated with taking a hazard perception theory test, even when accounting for the separate effects of age and learning duration.

### 4.3.3.3 Relating hazard perception testing to learning duration

This analysis also required confounding factors (such as respondent age and hours of professional tuition) to be controlled for, and so only respondents from Years 1 and 4 were again considered. The process is described in Appendix 4. In this case the resulting unadjusted and adjusted mean learning durations for the subset both indicate that experience of a hazard perception theory test was related to a shorter learning duration.

The adjusted values show that, overall, respondents who had taken a hazard perception theory test took on average (mean) 1.7 fewer months to learn to drive than those who had not. Female respondents who had taken a hazard perception theory test learnt to drive 1.9 months faster than females who had not and males who had did so 1.5 months faster (see Volume 2: Appendix D, Table D17). Since the reduction in learning duration was matched by only a minimal reduction in the number of hours of tuition, the results suggest that respondents who had taken a
hazard perception theory test were simply condensing their tuition. Considering learning durations prior to the theory test, respondents preparing for their first theory test took it almost one month earlier if it included the hazard perception component, compared with respondents who had not taken a hazard perception theory test (see Section 4.2.2). This corresponds with the finding that, on average, taking a hazard perception theory test was associated with a shorter learning duration.

4.3.4 Type of tuition and practice

4.3.4.1 Professional driving tuition

As shown in Section 4.3.3, respondents of all ages received the majority of their driving tuition from an ADI, rather than practising with friends and relations. Females spent a greater percentage of their overall learning time with an ADI when compared with males of all ages, on average. The youngest and oldest age groups spent the lowest percentage of their overall learning time with an ADI than other age groups, on average (see Figure 4.14 and Volume 2: Appendix D, Table D18).

Slightly more than half of all respondents (56%) received professional driving tuition from just one ADI. Approximately one-quarter (27%) had used two ADIs and 2% had used five or more. Males reported using fewer ADIs in general; 65% learnt with just one ADI compared with 52% of females (Figure 4.15).
A personal recommendation was the main reason given by both male and female respondents for choosing their most recently used driving instructor or school (36% and 39%, respectively, gave this main reason; see Volume 2: Appendix D, Table D19). Knowing that the ADI or driving school had a good reputation was the second most common reason (given by just over a quarter of all respondents). Overall, male and female respondents differed little in the reasons they gave for selecting professional tuition from a specific provider.

The majority of respondents (71%) reported taking professional driving lessons at regular intervals from the point of starting to learn to drive until taking a practical driving test. Females were slightly more likely than males to do this (Figure 4.16). The remaining respondents were more likely to bunch lessons near to the practical test than at other times. The overall distribution was independent of age.

### 4.3.4.2 Practice with friends and relations

As stated earlier, 55% of all respondents practised their driving with friends and relations. The distribution of exposure when driving with friends and relations was similar across age groups and for males and females.

Of the respondents who practised driving with friends and relations, almost half (49%) claimed to practise regularly from the point of starting to learn to drive until taking a practical driving test (Figure 4.17). The most common alternative was to bunch practice sessions closer to the test. There were only marginal differences by sex and between age groups.
Figure 4.16: Distribution of professional driving lessons by sex

<table>
<thead>
<tr>
<th>Distribution of professional driving lessons</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly up to practical test just taken</td>
<td>73</td>
<td>67</td>
</tr>
<tr>
<td>Most at the beginning with a few near the test</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Most near the test with a few at beginning</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Some at beginning and near test with few in between</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Few at beginning and near test with most in between</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 4.17: Distribution of practice sessions with friends and relations by sex

<table>
<thead>
<tr>
<th>Distribution of practice with friends/relations</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly up to practical test just taken</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>Most at the beginning with a few near the test</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Most near the test with a few at beginning</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Some at beginning and near test with few in between</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Few at beginning and near test with most in between</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>16</td>
<td>13</td>
</tr>
</tbody>
</table>
4.3.4.3 Exposure to different environments

Respondents were asked to estimate how much professional tuition they had received, and how much practice with friends and relations they had had, prior to taking their driving test, when driving in certain environments.

Seventy-one per cent of respondents stated that they had received more than four hours of tuition in busy town centres, compared with 47% who had been instructed for more than four hours on country roads (Figure 4.18). Prior to their practical test, only a small percentage of respondents had never driven with their ADI in a busy town centre or in the rain, although this is obviously influenced by the time of year someone is learning to drive and their learning duration. However, 7% had never had any professional driving tuition on country roads, 22% had never driven with an ADI in darkness and 61%9 had never done so when snow or ice was present. A higher proportion of females had spent more than four hours driving in each of the environments compared with males. This reflects how females receive more hours of professional tuition overall (see Volume 2: Appendix D, Table D20).

The level of exposure to different driving environments during practice with friends and relations was lower than the level during professional instruction (see Figure 4.19 and Volume 2: Appendix D, Table D21).

9 It is interesting that 39% of respondents did claim to have experienced snow or ice. It is quite possible that cold conditions may have been reported as icy when, in reality, ice was not present.
Figure 4.20 shows combined exposure to different environments for those who received professional tuition and/or drove with friends/relations. Almost all respondents had at least some exposure to driving on country roads (94%), on fast dual carriageways (97%), in busy town centres (98%) and in the rain (99%) before taking their driving test. Indeed, very few respondents had not been exposed to these environments in their pre-test experience; however, 6% were never exposed to driving on country roads and 14% never drove in darkness prior to taking their driving test. Furthermore, more than half of all respondents (57%) were never exposed to driving in snow or ice before taking their driving test. The proportion of males and females exposed to each of the driving environments was almost identical, although a slightly higher proportion of females had been exposed to snow or ice prior to their practical test compared with males (44% and 40%, respectively; see Volume 2: Appendix D, Table D22). The few respondents who had never experienced some driving conditions did not differ from the overall sample in terms of age and sex.
4.3.4.4 Reported barriers to tuition and practice

The amount of professional driving tuition and private practice was affected by external factors. A slightly higher percentage of females than males reported that cost affected the number of professional driving lessons they took (44% and 40%, respectively). Cost as a barrier to professional driving tuition affected fewer respondents aged 17 to 19 years than those aged above 19 years (10 percentage points fewer; see Volume 2: Appendix D, Table D23). Overall, the majority (87%) of respondents felt that they had professional driving tuition that was frequent enough. There were no age or sex effects. More than two-thirds (68%) did not find it difficult to fit in professional driving tuition (again, there were no age or sex effects).

More than half (56%) of females and about three-fifths (62%) of males had no difficulty finding a friend or relation to accompany them for practice driving sessions. Respondents aged 17 to 19 years were more likely than older respondents to find someone to practise with, as were males when compared with females (see Volume 2: Appendix D, Table D24). Almost half (47%) of respondents aged 17 to 19 years were able to have as much driving practice with friends or relations as they wanted compared with a third (34%) of older respondents (see Volume 2: Appendix D, Table D25). However, younger respondents were more likely to have difficulty finding time to fit in driving practice with friends or relations. Females were more likely to find it difficult to schedule practice with friends and relations when compared with males (55% and 46%, respectively; see Volume 2: Appendix D, Table D26).
4.3.5 Miles driven prior to the practical test

Respondents reported covering a wide range of distances when learning to drive. Estimating the total number of miles from starting to learn to drive to taking the practical test was unlikely to have been easy for respondents. Most learners take tuition in an instructor’s car, and some practise in vehicles belonging to friends or relations. It is unlikely that odometer readings would have been noted by respondents for each period of driving. Furthermore, the nature of the learning process means that most driving is done without a clear destination, which again is likely to make mileage estimation difficult. Mileage estimates were therefore almost certainly an approximation, though it was assumed that the estimates had similar precision (or lack of precision) regardless of other factors such as age and sex, and that group estimates could be compared meaningfully.

Calculation of the number of miles driven per hour of stated driving experience suggested that most of these lay within a tenable range (see Volume 2: Appendix D, Table D27). About a third of respondents (32%) drove less than 300 miles prior to their practical driving test, while 10% covered more than 2,000 miles (including 104 respondents who reported driving more than 20,000 miles). Females were more likely to report driving longer distances (Figure 4.21). Excluding those claiming to have driven more than 20,000 miles, respondents reported covering a mean of 810 miles prior to their practical test (with females covering 846 miles and males covering 762 miles). In median terms, 400 miles were covered prior to the practical test (500 for females, 400 for males). Average mileage generally increased with age for both males and females (see Volume 2: Appendix D, Table D28).

Figure 4.21: Total reported mileage prior to most recent practical driving test by sex

<table>
<thead>
<tr>
<th>Miles driven</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;299</td>
<td>31</td>
</tr>
<tr>
<td>300–499</td>
<td>18</td>
</tr>
<tr>
<td>500–699</td>
<td>14</td>
</tr>
<tr>
<td>700–999</td>
<td>9</td>
</tr>
<tr>
<td>1,000–1,999</td>
<td>17</td>
</tr>
<tr>
<td>2,000+</td>
<td>11</td>
</tr>
</tbody>
</table>

- **Female**
- **Male**
4.3.6 Driver records

In June 2003, the DSA introduced the ‘Driver’s Record’ for learners. This document is intended to help people who are learning to drive to record and monitor their progress, both with ADIs and when practising with friends and relations. A range of other driver records are also available. Overall, 59% of respondents reported holding some form of driver record to monitor their learning (although not all reported using it). Most commonly held was the DSA Driver’s Record (by 37%), which the DVLA typically distribute with a new provisional driving licence, although copies can also be obtained directly from the DSA or from an ADI. Seventeen per cent of respondents exclusively held a non-DSA driver record, while a further 5% possessed both DSA and non-DSA records (Figure 4.22). Being in receipt of a driver record did not appear to vary by sex or by age.

Almost a third of all respondents with a DSA Driver’s Record reported never using it when learning to drive, compared with only 10% of respondents with another type of driver record. The survey did not explore the reasons for this, although the Department for Transport has commissioned further research on the use of the DSA Driver’s Record by learners and ADIs. Indeed, of those respondents who reported holding any driver record, 60% used other types of driver record ‘most of the time’ compared with 34% who used the DSA Driver’s Record ‘most of the time’ (Figure 4.23).
Several measures of driving experience did not appear to be affected by the possession, or use, of a driver record, where perhaps an effect might have been expected. For example, mileage and hours of tuition and driving practice were not different for those who used a driver record and those who did not. Nor was possession of a driver record associated with any differences in how respondents spread out their tuition and practice sessions, the percentage of overall learning time spent receiving professional tuition, or the level of exposure to different driving conditions (such as busy town centres, country roads and darkness). What impact the DSA Driver’s Record and other types of driver record might have on pre-test driving experience may emerge after they have been in use for a longer period of time.

4.3.7 Grade of driving instructor

It is possible that the experience of respondents when learning, and their performance on the practical driving test, may have been affected by the grade of their ADI. ADIs are generally given one of six grades, which correspond to their level of competence. Three of these grades describe ADIs that are still in training, while the remaining three describe qualified ADIs that are of a competent, good or high standard. The grade for all ADIs was made available by the DSA and was linked to respondents’ driving test records where the ADI had identified themselves when the test was booked.

In this study, ADI grade was known for just over half of respondents (52%) taking a practical driving test. Where the grade of an ADI was known, 52% were of a competent standard, 42% of a good standard and 7% of a high standard. ADI grade was (weakly) associated with the total time taken to learn to drive, from the point of...
starting to drive to taking the practical test. ADIs of a high standard achieved this half a month faster, on average, than ADIs of a competent standard (see Volume 2: Appendix D, Table D29), and slightly faster than the overall mean of 14.1 months. Respondents learning with ADIs of the highest grade reported a mean of one to two hours fewer professional tuition than respondents using ADIs of a lower grade.

ADIs of a higher grade appeared to provide slightly fewer hours of tuition in less elapsed time than did lower-grade ADIs. However, the differences were marginal and do not necessarily reflect the quality of tuition delivered by ADIs. The relationship may not be causal. For example, it could be speculated that the small percentage of respondents who were taught by an ADI of a high standard actively sought an ADI of this level. The individual characteristics of the respondents would therefore be a confounding factor.

ADI grade is explored in the context of passing the practical driving test and subsequent driving experience in Section 5.

4.3.8 Confidence when learning to drive

Respondents were asked to rate their confidence in four aspects of their own driving ability:

- confidence in their general driving ability while learning;
- confidence in passing the practical test one week before being tested (at which point they might be assumed to be ‘test ready’);
- confidence in being able to drive unsupervised one week before being tested; and
- confidence in their current driving ability.

A higher proportion of male respondents reported being ‘very’ confident in each aspect when compared with females (by between 13 and 14 percentage points; see Volume 2: Appendix D, Table D30).

Each measure of reported confidence was highest for respondents who chose to have the fewest hours of professional tuition. For all four measures of confidence, respondents who received 1 to 10 hours of professional driving instruction were most likely to report being ‘very’ confident and least likely to report a lack of confidence (see Volume 2: Appendix D, Tables D31, D32, D33 and D34). However, these respondents comprised a small proportion of the sample (less than 3%). The largest group of respondents (approximately 21% of the sample) reported receiving 31 to 40 hours of professional tuition. Of this group, three-quarters (75%) reported being at least ‘fairly’ confident in their driving ability when learning; and a week before taking the practical test, 83% were at least ‘fairly’ confident they would pass, 92% were at least ‘fairly’ confident in their ability to drive unsupervised, and 97%
were confident in their current driving ability (at the time of completing the
Learning to Drive Questionnaire).

It should be noted that confidence for all items, except current driving ability, was
reported retrospectively. Reported confidence is therefore subject to the accuracy of
respondents’ recollection, as well as any influence that subsequent training or testing
may have had.

4.3.9 **Expectation of passing the test**

At the time that they applied for their practical driving test, the vast majority of
both male and female respondents believed that they had a good chance of passing it
(92% and 87%, respectively). Levels of confidence were similar among respondents
aged 17 to 19 years and those aged 19+ (see Volume 2: Appendix D, Table D35).
Respondents retained much of their confidence when they actually took their
practical test, and 89% of males and 83% of females reported feeling that they had a
good chance of passing. Males were slightly less likely to change their mind about
their ability between applying for, and taking, the practical test (by 2 to 4 percentage
points; see Volume 2: Appendix D, Table D36).

When learning, a higher proportion of males than females of all ages were keen to
take their practical driving test (84% of male and 75% of female respondents, overall;
see Volume 2: Appendix D, Table D37). A higher proportion of males than females of
corresponding ages also reported finding it easier to learn to drive (73% and 51%,
respectively). Perceptions of how easy it was to learn to drive also varied with age:
younger respondents found it easy to learn when compared with older respondents
(66% and 51%, respectively, found it easy; see Volume 2: Appendix D, Table D38).

4.3.10 **Number of tests taken**

Almost half (46%) of all respondents had come to their most recent practical driving
test for the first time. A higher proportion of males than females were in this
position (51% and 43%, respectively). The same proportion of males and females
had experience of one previous practical test (26% for each group). Overall, 14% of
respondents had taken two previous driving tests, 7% had taken three and a further
7% had taken more than three (Figure 4.24).

4.3.11 **Characteristics of first-time takers**

Respondents aged 17 to 19 accounted for 64% of all respondents who were taking
their test for the first time (referred to throughout this report as ‘first-time takers’).
Figure 4.25 shows the percentage of respondents taking the practical test for the first
or subsequent times by age and sex. A higher proportion of male respondents were
taking the practical test for the first time compared with female respondents (70%
and 59%, respectively).
Figure 4.26 shows the distribution of first-time takers by age and sex. Fifty-two per cent of respondents aged 17 to 19 were first-time takers. The proportion of first-time takers within each age group decreased with age. Within all age groups (except among respondents aged 60 years or above), a greater proportion of males were first-time takers when compared with females (by 1–5 percentage points).
As might be expected, respondents who were taking a practical test for the first time had driven fewer miles on average than those who were attempting a practical test for at least the second time; the mean difference between these groups was 184 miles.\textsuperscript{10} This difference was fairly consistent across all age groups (see Figure 4.27 and Volume 2: Appendix D, Table D39).

A similar difference was observed for hours of professional driving instruction: first-time takers had consistently received fewer hours than respondents not taking a practical test for the first time (Figure 4.28). The difference was smallest for those aged 17 to 19 years and generally increased with age (see Volume 2: Appendix D, Table D40).

\textsuperscript{10} Respondents claiming to have travelled more than 20,000 miles while learning to drive were excluded from the analysis, as in Section 4.3.5.
Figure 4.27: Mean mileage for respondents who were/were not taking a practical driving test for the first time, by age\textsuperscript{11}

Figure 4.28: Mean hours of professional driving instruction for respondents who were/were not taking a practical driving test for the first time, by age\textsuperscript{12}

\textsuperscript{11} Respondents aged 50 years or above were aggregated in Figure 4.27 due to a small number of respondents aged 60 or above reporting a very high average mileage.

\textsuperscript{12} Respondents aged 50 years or above were aggregated in Figure 4.28 due to a small number of respondents aged 60 or above reporting a very high number of hours of tuition.
Fewer hours were also spent by first-time takers gaining driving practice with friends and relations;\textsuperscript{13} the mean difference between the two groups of respondents was fairly consistent across the age groups, at approximately three hours (see Figure 4.29 and Volume 2: Appendix D, Table D41).

As for all respondents, first-time takers reported receiving most of their professional tuition in busy town centres (Figure 4.30). However, the exposure of first-time takers to different driving environments during professional tuition was not as high as for all respondents (Section 4.3.4), with a smaller proportion spending more than four hours in each condition (by 1–6 percentage points). A higher proportion of female than male first-time takers reported driving for longer than four hours in different conditions (the greatest difference was 9 percentage points for driving on fast dual-carriageways, the smallest difference was 1 percentage point for driving in the rain, and there was no difference by sex when driving in snow or ice; see Volume 2: Appendix D, Table D42).

\textsuperscript{13} Mean hours of practice was calculated for respondents who reported practising with friends and relations, rather than for the total sample.

\textsuperscript{14} Respondents aged 50 years or above were aggregated in Figure 4.29 due to a small number of respondents aged 60 or above reporting a very high number of hours of practice.
First-time takers reported less exposure to different driving conditions when practising with friends and relations when compared with driving during professional lessons (Figure 4.31). However, only 16% never drove in darkness during practice compared with 26% who never did so during professional lessons. A higher proportion of male than female first-time takers reported driving in the different conditions (by 1–5 percentage points; see Volume 2: Appendix D, Table D43).

Figure 4.30: Reported time spent by first-time takers driving in different conditions when receiving professional tuition prior to their first practical test

![Chart showing time spent by first-time takers driving in different conditions when receiving professional tuition prior to their first practical test.]

Figure 4.31: Reported time spent by first-time takers driving in different conditions when practising with friends and relations prior to their first practical test

![Chart showing time spent by first-time takers driving in different conditions when practising with friends and relations prior to their first practical test.]

The proportion of first-time takers presenting for their first practical test having never experienced some of the different driving conditions was similar to the proportion of all respondents (see Volume 2: Appendix D, Table D44).

4.4 Respondents’ awareness of the need to improve their driving skills

All respondents were asked to indicate whether any of their driving skills required improvement. For each of the 15 skills listed on the Learning to Drive Questionnaire\(^{15}\), they were asked to identify whether any improvement was required and, if so, was ‘some’ or ‘a lot’ of improvement necessary (Figure 4.32). Overall, it was found that:

- 95% of all practical test respondents perceived a need for at least ‘some’ improvement in at least one of the 15 categories of driving skills;
- 29% of all respondents had a subjective need for ‘a lot’ of improvement to at least one of the driving skills listed and this need was more commonly reported by female than male respondents (33% and 21%, respectively); and
- male respondents were three times as likely as females to report not needing to improve any of the listed driving skills.

![Figure 4.32: Percentage of respondents reporting a perceived need for improving their driving skills, by sex](image)

Situations listed were: the use of car controls, pulling out at junctions, reversing, parking, judging the speed of other drivers, spotting hazards, driving in heavy traffic, driving in the dark, overtaking, using roundabouts, joining with moving traffic, changing lanes, driving on high-speed roads, driving on country roads, driving in heavy rain, driving in thick fog, driving on snow or ice, turning right and knowing what speed is safe.
The level of desired improvement for each of the 15 skills was explored separately (see Volume 2: Appendix D, Table D46):

- fewer males reported needing to improve each of the driving skills, with the exception of spotting hazards, for which males and females reported an equivalent need for improvement;
- for every driving skill, at least two-fifths of all respondents felt that there was no need to improve;
- for both ‘joining fast moving traffic’ and ‘changing lanes on fast multilane roads’, 11% of all respondents reported they needed a lot of improvement – the highest percentage reporting a need for ‘a lot’ of improvement in any of the 15 categories of skills (see Volume 2: Appendix D, Figure D1);
- between 5% and 8% of all respondents reported needing ‘a lot’ of improvement when parking, when overtaking, when driving in the dark and when reversing, but these figures were heavily influenced by female respondents’ needs; and
- at least 70% of all respondents felt that there was no need to improve their use of car controls, driving in heavy traffic and driving on country roads.

4.4.1 Hazard perception

Respondents from Year 4 of the study (whose first or only theory test included hazard perception) were compared with respondents from Year 1 (who had no experience of a hazard perception theory test). As before, this removed the effects of age and learning duration. The result showed that 69% of respondents with experience of a hazard perception theory test felt no need to improve their ability to spot hazards compared with 59% of respondents without experience of a hazard perception theory test. This suggests that experience of a hazard perception theory test may have furnished respondents with an improved ability to spot hazards. However, it is possible that respondents were more likely to believe that they did not need to improve their hazard perception skills simply because they knew they had had hazard perception experience.

4.5 Failing the practical test

Fifty-one per cent of all respondents taking their practical driving test did not pass. More than two-thirds (69%) of these respondents agreed with the examiner’s decision to fail them. The proportion of respondents who agreed with the examiner’s decision increased with age and was more common among females (see Volume 2: Appendix D, Table D47).
The survey explored the reasons to which respondents attributed their test failure. Being too nervous to perform to the required standard was the most common reason given by females who had not passed (62%); being ‘unlucky’ was the second most common reason (43%). However, males who failed were most likely to attribute their test failure to poor luck (51%) or being nervous (44%). Just over a quarter of all respondents (27%) acknowledged that their driving was simply not good enough on the day of the test, and 10% reported that they were unable to cope with something unexpected during the test (Figure 4.33). Males were more likely than females to blame another road user when they failed. Very few respondents (less than 4%) claimed to have not been ready for the practical test and, overall, the results suggest that most respondents believed they failed for reasons that were beyond their control (see Volume 2: Appendix D, Table D47).

![Figure 4.33: Percentage of respondents who attributed their failure on the practical test to a specific reason](image)

The survey also explored the number of minor driving faults made by respondents during the practical test. Respondents failed the practical test if they made more than 16 minor driving faults, or any serious or dangerous faults. The mean number of faults in each of the eight categories of driving error was calculated for all respondents who failed the practical test. On average (mean), respondents failed after making 9.7 minor driving faults. The mean number of driving faults increased with age but varied little by sex (see Volume 2: Appendix D, Table D48). Although fewer than 10 minor faults would not be enough for a respondent to fail the practical test, 96% of respondents who failed had also made at least one serious driving fault.
In addition, 13% of respondents who failed had made one or more dangerous faults (see Volume 2: Appendix D, Table D49).

The incorrect use of mirrors and signals during the practical test was the most common minor driving fault. On average, male respondents in the survey made more faults of this type than female respondents (a mean of 2.3 and 2.1 faults, respectively). Otherwise, females typically made more faults than males in each category (Figure 4.34).

In the few weeks between failing the practical test and returning the Learning to Drive Questionnaire, 83% of respondents who had failed the test had already applied for another driving test. Respondents who had failed were asked about the type and amount of driving experience they thought they would take before attempting the practical test once more. About a half of these respondents (51%) believed they would continue to obtain professional tuition as often as they had done before the test (see Volume 2: Appendix D, Table D50). However, almost a third (30%) believed they would take driving lessons less often than before, with just 11% claiming they would take driving lessons more often. In addition, 7% of respondents who failed their most recent practical test, and had not previously practised with friends and relations, reported that they would start practising before their next test.
Overall, the most common plan for obtaining further driving experience after failing the practical test (shared by 24% of unsuccessful respondents) was to continue to take the same number of professional driving lessons and not to have any additional practice with friends and relations (see Volume 2: Appendix D, Table D51). Twelve per cent of respondents reported that they would continue to receive professional tuition and driving practice at the same frequency as before failing the test. A further 12% reported that they would reduce the frequency of their professional tuition and not obtain any further practice with friends/relations. Only 5% would increase the frequency of both professional tuition and driving practice, while just 2% would not obtain either type of driving experience before taking another practical test.

4.6 Comparison with Cohort I

There was some variation in how people learnt to drive between the two Cohort studies. While virtually all respondents in both studies had some professional driving instruction (98% in Cohort I and 99% in Cohort II), there was a marked increase in the mean number of hours of instruction undertaken, from 31.2 hours in Cohort I to 52.2 hours in Cohort II. The proportion of respondents who reported having driving practice with friends or relations declined from 65% in Cohort I to 55% in Cohort II, although the mean number of hours of practice (including those who had none) increased from 17.4 hours to 18.5 hours in Cohort II.

4.7 Discussion and implications

4.7.1 Diversity of approaches to learning to drive

Three out of every five respondents (62%) learned to drive within 12 months of starting to learn. However, respondents demonstrated a variety of strategies to learning to drive in terms of:

- how frequently they took driving lessons and when in their learning cycle;
- with whom they practised and how often;
- the age at which they took their theory and practical tests; and
- the period of time between starting to learn to drive and taking a theory test for the first time.

4.7.2 Use of training materials for theory and practical test

The findings from this study show that nearly everyone taking a theory test used some kind of learning material to prepare for it; only one out of every 200 respondents (0.5%) did not use any form of learning material in preparation. In contrast, a much higher percentage of respondents (22%) did not refer to any learning material, such as the Highway Code, when preparing for the practical
driving test. The reasons for this are not explored in this study, but could reflect the availability of material which is targeted at preparing for each of these tests. However, it is also possible that both learners and their instructors view the theory test as a separate hurdle to deal with rather than part of the whole integrated learning experience.

4.7.3 Use of a driver record

Some information on the use of driver records was collected in this study. The purpose of a driver record is to allow learners, their instructors and their accompanying drivers (if they have practice with friends and relations) to structure the learning process and monitor progress. Its use is intended to help learner drivers better understand when they are ready to take the practical test.

Although three out of five respondents (59%) held some form of driver record, it is not possible to determine how they were used. Furthermore, owing to the voluntary nature of its use, it is not possible to determine from this study whether training would be improved by the consistent use of such a document. There was, however, no indication of any differences in the driving experiences of respondents who reported holding a driver record and those who did not.

4.7.4 Integrated approach to hazard perception training

A higher proportion of respondents who had taken a theory test for the first time with the hazard perception component reported that they were ready (or nearly ready) to apply for the practical test than of those who took a theory test for the first time without the hazard perception component (67% and 59%, respectively). Of course, test readiness is subjective and was measured retrospectively, so it may not be representative of actual readiness for the practical test. In addition, it may not have been the hazard perception theory test per se that was associated with increased practical test readiness – the study materials used by respondents to prepare for a hazard perception theory test may have made them feel more prepared for the practical test as well.

There has been a good deal of research (e.g. Grayson and Sexton 2002) which suggests that hazard perception training is most effective once learners have at least some experience of real driving. The purpose of the hazard perception training is to improve hazard awareness (and not just to pass the hazard perception test). Therefore, it is perhaps surprising that one out of ten respondents (10%) who had taken a theory test which included hazard perception had not had any lessons with a professional driving instructor, giving them real hazard perception experience and training. However, even if learners do not recognise hazard perception training directly as part of their preparation for the practical test, it is possible that the testing of hazard perception could still have a positive effect on their understanding of hazards and their future accident involvement.
4.7.5 Experience of driving conditions prior to taking practical test

Generally, respondents reported limited experience of driving on fast dual-carriageways and driving in the dark, prior to taking their practical test. A lack of experience of these conditions represents gaps in new drivers’ ability and preparation for driving solo.

Three per cent of respondents had not had any professional instruction on fast dual-carriageways prior to their practical driving test, while 34% had less than two hours’ instruction in these conditions. This could suggest poor test preparation and understanding of test requirements, as the test almost always includes driving on fast dual-carriageways. It is direct evidence that respondents are not effectively preparing for their practical test.

For both ‘joining fast moving traffic’ and ‘changing lanes on fast multilane roads’, 11% of all respondents reported they needed a lot of improvement. This suggests that they acknowledge their lack of experience of these situations and it is possible that they would not reject advice from ADIs to increase the amount of time spent in these conditions.

One in seven respondents (14%) reported no experience of driving in the dark prior to taking their practical test. However, candidates are not tested on their knowledge or ability to drive at night within the current practical test. Given that dark conditions are common, the lack of some new drivers’ experience of driving in the dark is of concern because there is no current provision within the current training system to induce or encourage learners to acquire this experience. Instead they acquire this experience in post-test driving.

4.7.6 Reasons for failing the practical driving test

It is interesting that 69% of respondents who failed the practical test agreed with the examiner’s decision. This suggests that they acknowledge that they made an error within the test, even though they presumably thought they were sufficiently prepared beforehand.

It is also interesting that half (51%) of all respondents who failed the practical test attributed their failure to poor luck. This, again, suggests that they thought they were sufficiently skilled and prepared for the test but met with an unexpected problem during the test. Other research commissioned by the Department for Transport has shown that there is a tendency for people to come for the test when they have only a moderate probability of passing it (Baughan et al., 2005). However, less than 4% of the respondents in the Cohort II study who failed the practical test reported afterwards that they had not been ready for the practical test. This small proportion of failed candidates was willing to accept that more preparation prior to the test was likely to have changed their result. The majority of respondents who failed the
practical test however, believed that they had failed because of their actions **during** the test, and felt that the test outcome was in some way beyond their control.

### 4.7.7 Learning strategies after failing the practical driving test

It is perhaps surprising that most respondents who had failed a practical driving test reported that they would not change their learning strategy. It would seem that respondents believed that their strategy was correct even if it resulted in test failure. This may be related to their beliefs (as discussed above) that the test result may be a matter of ‘luck’.

### 4.8 Summary

When preparing for the theory test:
- almost all respondents (over 99%) studied for the multiple-choice component with the help of a book, website or interactive multimedia product – the *Highway Code* was used most commonly;
- marginally fewer respondents (96%) used some type of study material for the hazard perception component but there was no one item that was clearly favoured by respondents – they used a variety of learning materials;
- the majority of respondents (90%) gained at least some driving experience before taking their first theory test; however, the amount varied little after the hazard perception component was introduced;
- respondents preparing to take their first (or only) theory test tended to take it 5.8 months after starting to learn to drive if it included hazard perception, compared with 6.7 months if it did not; and
- nearly three-quarters of respondents (72%) went on to pass their first theory test, and females were more likely to do so than males.

Preparation for the practical test was different. More than a fifth of respondents opted not to use any study materials to prepare for the practical test, although the *Highway Code* was still used by more than half of all respondents (52%).

Overall, respondents learned to drive in 14 months; generally males learnt to drive in less time than females, and younger respondents learnt in less time than their older counterparts.

Virtually all respondents took at least some lessons with an ADI:
- the mean amount of professional tuition taken before the practical test was 52 hours (median 40 hours), less for younger learners and male learners;
- for 55% of respondents, learning to drive also included practice sessions with
friends and relations – respondents who were able to have private practice amassed a mean of 34 hours (median 15 hours) across their learning period before taking their practical test; and

- when all respondents were included, the mean amount of practice was 19 hours.

Not all respondents experienced a full range of driving conditions when learning:

- 6% had not driven on country roads;
- 14% had not driven in darkness (rising to 16% for first-time takers); and
- 57% had not driven in snow or ice.

While learning to drive, 59% of respondents held a driver record, the majority of which were produced by the DSA. However, almost a third of DSA driver records went unused.

When it came to taking the practical test, 46% of respondents were first-time takers. The majority of first-time takers were in the youngest age group. First-time takers differed from other respondents in that:

- they had generally travelled fewer miles;
- they had had fewer hours of tuition with an ADI; and
- they had had fewer hours of practice with friends and relations.

More than 95% of all respondents felt that their driving skills could be improved. Almost a third of respondents felt a lot of improvement was needed for at least one driving skill, although 9% of male respondents reported that they did not need to improve any of their driving skills. In addition, experience of a hazard perception theory test appeared to reduce the perceived need to improve the ability to spot hazards, although it cannot be determined to what extent hazard perception testing might have been responsible for this change, if at all.

For 51% of respondents, the learning experience resulted in a practical test failure, with ‘bad luck’ and ‘nerves’ being given as the most common reasons. In spite of not being successful, 51% of failed respondents did not think it was necessary to alter their learning pattern and said that they would continue to take professional tuition with the same frequency.
5 LEARNING TO DRIVE 2: CHARACTERISTICS OF RESPONDENTS WHO PASSED THE PRACTICAL DRIVING TEST

5.1 Introduction

This section describes the driving experience and characteristics of respondents who passed the practical driving test. It is based on all respondents to the Learning to Drive Questionnaire who passed the test, who are referred to as ‘passers’. The findings define the experience that new drivers begin with as a foundation for their driving career, which, in the majority of cases, is a combination of tuition and private practice. It is important to remember that these measures of experience cannot be assumed to have a causal effect on pass rates because of the many other confounding factors. Respondents who pass the test do so after gaining whatever experience they feel is necessary for them to achieve the required standard.

The section also presents data on pass rates and how they were related to other factors. Pass rate is calculated as the percentage of all respondents who passed the practical test. These are referred to in this report as ‘passers’.

5.2 Overall pass rates

The overall pass rate for the total sample was 49%, somewhat higher than the 42% of all Driving Standards Agency (DSA) candidates who pass. Forty-eight per cent of respondents passed their first test. The figure increased for successive tests, peaking at 52% for fourth-time takers (see Volume 2: Appendix E, Table E1). This result may be due to the effects of improvement in driving as a result of additional training between unsuccessful and successful practical tests. After four attempts, however, pass rates were lower and were probably indicative of respondents who found driving difficult and did not manage to improve substantially with training or experience.

The pass rate was at its highest among the youngest respondents and decreased with age (Figure 5.1). A higher proportion of male respondents of all ages passed the practical test when compared with female respondents (55% and 47%, respectively).
5.3 Characteristics of passers

On average (mean), female passers were older than male passers (23.2 years compared with 21.5), had taken longer from starting driving to passing a practical test (14.3 months compared with 11.5 months), had obtained substantially more driving experience from professional instructors (54.6 hours compared with 37.1 hours), and had taken a slightly higher number of practical tests before passing (2.1 compared with 1.9). In contrast, male respondents practised slightly more with friends and relations (34.3 hours compared with 33.9 hours; see Volume 2: Appendix E, Table E2).

5.4 Riders of powered two-wheelers

A small proportion of respondents (6%) had regularly ridden a motorcycle, moped or scooter before learning to drive a car. Almost three-quarters of these were male. The proportion of female respondents who rode a motorcycle, scooter or moped and who passed the test was 50% (compared with 46% for females who had not reported riding these vehicles). The pass rate for male respondents who had ridden a motorcycle, scooter or moped was the same as for those who had not (55%; see Volume 2: Appendix E, Table E3).
5.5 Time to learn

It was possible to calculate the number of months from starting to learn to drive to the most recent practical test taken for about 85% of respondents. This period of time excluded any breaks from driving of more than six months and therefore represented ‘active’ learning time.

Figure 5.2 shows that male respondents were consistently more likely to pass the practical driving test than were female respondents who spent a similar amount of time learning to drive (see Volume 2: Appendix E, Table E4). As time spent learning increased, the male pass rate decreased, but people who learn over a very long period of time might do less well at the practical test because they lack aptitude, or their approach to learning is ineffective. Among the 5% of respondents who learnt to drive in less than three months, male respondents had a pass rate of 62%. It was most common for respondents to take seven to nine months to learn.

<table>
<thead>
<tr>
<th>Months from starting to drive to the practical test (minus breaks)</th>
<th>Percentage passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3</td>
<td>45</td>
</tr>
<tr>
<td>4–6</td>
<td>53</td>
</tr>
<tr>
<td>7–9</td>
<td>60</td>
</tr>
<tr>
<td>10–12</td>
<td>56</td>
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<tr>
<td>22–24</td>
<td>48</td>
</tr>
<tr>
<td>24+</td>
<td>46</td>
</tr>
</tbody>
</table>

5.6 Amount and type of learning experience

5.6.1 Pass rates associated with amounts of professional tuition and practice

Figure 5.3 and Figure 5.4 show the pass rates for differing amounts of professional tuition and practice with friends and relations, and Figure 5.5 shows the rates

16 Calculations were made using the dates provided by respondents on the questionnaires – 6,651 respondents did not provide all the required information.
relating to **combined** amounts of tuition and practice. Volume 2: Appendix E, Table E5 provides further detail.

Taken together these show that:

- the pass rate decreased with increasing amounts of professional tuition for both males and females (Figure 5.3);
- the pass rate was highest for males with 1 to 10 hours of professional tuition (though this strategy was adopted by only 4% of passers) (Figure 5.3);
- for those with at least some professional tuition, the pass rate increased as the proportion of Approved Driving Instructor (ADI) experience decreased (see Volume 2: Appendix E, Table E5);
- pass rates were higher for those taking even small amounts of practice than for those taking no practice (see Figure 5.4 and Volume 2: Appendix E, Table E5);
- the pass rate did not change markedly with increasing amounts of practice (Figure 5.4);
- the pass rate for males declined as the combined hours of driving experience increased; and
- the pass rate for females peaked at 31 to 40 hours of combined driving experience and was slightly lower both sides of this range.

![Figure 5.3: Pass rate by hours of professional tuition and by sex](image-url)
5.6.2 Characteristics of passers associated with amounts of professional tuition and practice

Less than 1% of passers claimed to have passed without any professional tuition (122 passers; see Volume 2: Appendix E, Table E7) and even fewer claimed to have
passed without any tuition or practice with friends and relations (42 passers; Volume 2: Appendix E, Table E9 gives further details). The claimed success of these few passers is likely to be attributable to unique circumstances and should certainly not be taken as a model approach to learning to drive.

A fifth of male passers (21%) reported taking 31 to 40 hours of combined tuition and practice, and a further fifth (20%) reported taking 21 to 30 hours. Female passers tended to take more hours of tuition and practice combined, with 17% reporting 31 to 40 hours and a further 17% reporting 41 to 50 hours.

Respondents passing the practical driving test had received, on average (mean), 67 hours of driving experience (47 hours of professional tuition and 20 hours of practice with friends and relations). The youngest passers (aged 17 to 19) reported taking the fewest hours of professional tuition (39 hours). Hours of professional tuition reported by female passers increased with age so that, by the age of 50, female passers were receiving twice the professional tuition of 17–19-year-old females. Hours of tuition reported by male passers also increased with age up to 40 years and then decreased (see Volume 2: Appendix E, Table E10). Male passers of all ages had consistently fewer hours of tuition than females of a comparable age.

The number of hours of practice with friends and relations was more consistent across both the age and sex groups (see Volume 2: Appendix E, Table E10).

Similar patterns for age and sex were evident when considering combined hours of professional tuition and private practice to those for tuition alone (see Volume 2: Appendix E, Table E10). Male passers reported a mean of 20 fewer combined hours than female passers (55 hours and 75 hours, respectively). Male passers aged 17 to 19 passed after a combined mean of 52 hours of learning (a median of 40 hours) compared with a combined mean of 66 hours for female passers of the same age group (a median of 50 hours). As age increased, the mean proportion of total learning time spent with an ADI also increased (see Volume 2: Appendix E, Table E11).

5.6.3 *Pass rates and competency of driving instructors*

There was a strong relationship between ADI competency (as graded by the DSA) and the proportion of respondents who passed the practical test. Higher grade ADIs were associated with higher pass rates amongst respondents than were lower grade ADIs. Pass rates were 59%, 53% and 51% respectively for respondents taught by ADIs of a ‘high’, ‘good’ and ‘competent’ standard. For female respondents, there was a greater difference between the pass rates obtained with different standards of ADI than there was for males (see Volume 2: Appendix E, Table E12). These relative differences were still present even when adjusting for the effects on pass

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17 This sum includes those with zero hours of practice with friends/relations.
rates of age and hours of tuition and practice (also see Volume 2: Appendix E, Table E11). However, it is worth noting that the majority of ADIs were of a ‘competent’ or ‘good’ standard and the difference in pass rates for respondents using such ADIs was only about two percentage points. Furthermore, respondents themselves are responsible for choosing an ADI, leading to potential self-selection bias. For these reasons, and many other potential confounding factors, the relationship between ADI grade and pass rate cannot be considered as causal.

5.6.4 Effects of the introduction of hazard perception into the theory test

5.6.4.1 Pass rate

The introduction of the hazard perception component of the theory test was not directly associated with any substantial change in practical driving test pass rates. Respondents who passed a theory test without the hazard perception component had, on average, the same chance of passing the practical test as those who passed a theory test with hazard perception. The analyses that were conducted to investigate any relationship between passing a hazard perception test and passing the practical test accounted for the effect of other factors that were known to be related to passing the practical test.

5.6.4.2 Hours of tuition

Experience of a hazard perception theory test might be hypothesised to result in increased hours of tuition, especially prior to passing a theory test, but also afterwards, if hazard perception testing works to highlight the potential hazards on the road and the need for defensive driving (skills that can be taught by an ADI). However, an initial look at the mean hours of professional experience amassed by passers with and without hazard perception experience was as misleading as it was for all respondents (see Section 4), and similar preliminary analyses were therefore carried out for passers to those for all respondents.

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18 When hazard perception testing was introduced in November 2002, the pass mark was lower than it is currently. Over the following year, the pass mark was gradually increased. The hazard perception pass mark has been at its current level since November 2003. The effect of this change was accounted for in the analyses presented in this section by excluding the small proportion of respondents who passed the hazard perception theory test with a lower pass mark (645 respondents, equal to 1.6% of the sample).

19 To explore the relationship between pass rates and passing a hazard perception theory test, a binary logistic regression was conducted that included respondent age and hours of tuition and practice as covariates in the model. No significant effect of passing a hazard perception theory test was observed among male or female respondents. Analysis was also conducted separately within groups of respondents taking their first, second, third, fourth, or more than fourth, driving test; again, no significant relationship between taking a hazard perception theory test and practical test pass rates was observed.
A final analysis of covariance on hours of tuition for passers in Years 1 and 4 of the study was undertaken to remove the effects of learning duration of a mixed sample of respondents coming to practical test both with, and without, experience of a hazard perception test. Respondent age and learning duration were used as covariates to account for the variation in hours of professional tuition that was already related to these two variables.

The findings showed that first-time passers in this study with experience of a hazard perception theory test had, on average (mean), an additional 2.7 hours of tuition over those without experience of a hazard perception theory test – this relationship was more evident for females (for whom the difference was 3.8 hours) than for males (a difference of 1.7 hours) (see Figure 5.6 and Volume 2: Appendix E, Table E16).

Furthermore, there were no significant differences between the adjusted mean hours of tuition (adjusted for respondent age and learning duration) for practical test passers who did not pass the test for the first time depending on whether or not they took a hazard perception theory test. While overall, passers with experience of a hazard perception theory test (irrespective of which number practical test was passed) had marginally more tuition (1.4 hours) than passers without comparable hazard perception test experience – this slight difference in tuition hours for all passers was similar to that observed for all respondents (see Section 4.3.3).

**Figure 5.6: Adjusted mean hours of professional driving instruction by number of passed practical test for passers whose first or only theory test did/did not include hazard perception (restricted to passers in Years 1 and 4 of the study)**
5.6.4.3 Hours of practice with friends or relations

For respondents who passed the practical test and who practised with friends and relations, the mean number of hours of practice did not differ according to whether or not their first or only theory test included hazard perception. This was also true when considering which practical driving test they had passed and when accounting for the covariate effects of age and learning duration.

5.6.4.4 Learning duration

The simple relationship between experience of a hazard perception theory test and learning duration among passers, as measured by months to the practical test from starting to learn to drive, was very similar to that observed for all respondents in Section 4 (see Volume 2: Appendix E, Table E17). Further analysis of this relationship was conducted in a similar way to that reported in earlier sections: the sample of passers was restricted to those taking a practical test in Years 1 and 4 of the study and respondent age and hours of tuition were entered as covariates to account for their separate effects on learning times. The results indicated that passers with experience of a hazard perception theory test were learning to drive in a shorter duration than passers without hazard perception experience, even when age and hours of tuition were allowed for. Overall it was observed that:

- the adjusted mean learning duration from starting driving to taking a practical test was 11.5 months for passers in the sample with experience of a hazard perception theory test and 13.2 months for passers without hazard perception experience – a difference associated with hazard perception experience of 1.7 months (see Volume 2: Appendix E, Table E18); and

- a typical female passer in this study with experience of a hazard perception theory test learnt to drive in 11.7 months, whereas before hazard perception testing was introduced, she would have learnt in 13.6 months. The typical male passer with experience of a hazard perception theory test would have done the same in 11.3 months but prior to hazard perception testing, he would have taken a mean of 12.8 months.

The relationship between shorter learning durations and having taken a hazard perception theory test is not necessarily causal. It is also not indicative of respondents taking less tuition or practice. This reported condensation of learning duration might be partly attributable to a general change in how people learn to drive (taking more ‘double’ lessons with ADIs, for example) or in the study materials available to help them. Indeed, it was speculated in Section 4.2.2 that a wider variety of available learning materials for the theory test may have been responsible for respondents taking the hazard perception theory test a month earlier after starting to learn to drive than respondents who did not take a hazard perception theory test.
5.7 Learning strategies of passers

It was reported in Section 4 that the majority of respondents chose to take professional driving lessons at regular intervals leading up to their test. On average, 48% of respondents who adopted this approach passed the practical test — close to the average pass rate in this study. However, those who took the majority of their professional lessons when starting to learn to drive, with fewer lessons closer to the test, had a higher pass rate (59%), while those who chose to have few lessons when they started driving and most near to their practical test obtained the lowest pass rate (46%) (see Figure 5.7 and Volume 2: Appendix E, Table E19). This could indicate that practical test performance might be enhanced by having one or more intense periods of tuition, as opposed to lessons at regular intervals throughout the learning process. However, it may simply be that an atypical learning strategy better suited a minority of respondents.

Pass rates were highest for respondents who had more practice driving sessions with friends and relations at the start, or near, the practical test, although regular driving practice still yielded a better-than-average pass rate of 53% (see Figure 5.7 and Volume 2: Appendix E, Table E20). Overall, the highest pass rates were associated

![Figure 5.7: Pass rate by distribution of professional driving tuition and practice with friends and relations](image-url)
with intensive periods of tuition and practice, rather than regularly spaced driving experience. However, as with the different approaches to distributing professional tuition, it is most likely that private practice was also distributed to best suit the motivations, individual learning styles and circumstances of respondents.

5.8 Reported barriers to tuition and practice for passers

The pass rates of both male and female respondents who passed the practical test were strongly affected by barriers that restricted or prevented gaining driving practice with friends and relations. The percentage of passers was above average when they reported that it was not difficult for them to find the time to practice driving with willing friends/relations as much as they wanted (see Volume 2: Appendix E, Table E21). It should also be noted that respondents who reported being affected by barriers to taking professional tuition (e.g. time and money) were found to have less chance of passing the practical test compared with those who were unaffected (see Volume 2: Appendix E, Table E21).

When referring to such data, it can be difficult to determine whether respondents have provided an honest report of how they felt when preparing for the practical test. For example, respondents may falsely attribute a test failure to these items when retrospectively assessing their learning experience – although it does logically follow that they would have a greater chance of passing the practical test if they were able to receive the practice and professional tuition that they felt they needed.

While the vast majority of passers (90%) felt they had taken professional driving lessons as often as they felt necessary, there were still many passers who reported being affected by other barriers to learning to professional tuition. More than a third of passers (35% of males and 39% of females) reported that the cost of professional tuition affected the number of lessons they took. In addition, around three out of ten male and female passers (28% and 31%, respectively) reported that it was difficult to find the time to take professional tuition. Similar time issues affected even more passers when practising with friends and relations (52% of females and 44% of males). Furthermore, more than a third of male and female passers (35% and 38%, respectively) reported finding it difficult to find friends and relations with whom they could practice driving – and almost half (49% of male passers and 45% of female passers) were unable to practice as much as they wanted (Table 5.1).
5.9 Passers’ expectations of passing the test

Pass rates for respondents who felt they had a ‘good chance of passing’ the practical test (when they applied for it or when they took it) were lower than pass rates for those who did not (see Volume 2: Appendix E, Table E23). Respondents who were confident of passing tended not to meet their own high expectations when compared with respondents who did not report the same confidence. However, it seems unlikely that respondents who genuinely believed they would not pass would actually have greater success and it seems far more likely that these respondents were modestly concealing some degree of confidence. This finding could therefore be attributed to reporting confidence retrospectively.

It is interesting to note that four-fifths of female passers reported that they had a ‘good chance of passing’ the practical test (80% when they applied for it and 81% when they took it). An even higher proportion (89%) of male passers also reported that they had a ‘good chance of passing’ the practical test (when they applied for it and when they took it). Thus, while the pass rate was higher for respondents who did not report a ‘good chance’ of passing the practical test, overall, the majority of respondents who did actually pass reported a belief that they had a ‘good chance’ of passing (Table 5.2).

In contrast, respondents who reported being ‘keen’ to take the practical test had better pass rates than those who were not (51% compared with 47%; see Volume 2: Appendix E, Table E21). At least three-quarters of passers were respondents who were ‘keen’ to take their test as soon as possible (76% of females and 85% of males; Table 5.2).

There was no association between pass rates and the reported ease with which participants learnt to drive (see Volume 2: Appendix E, Table E21), although it is notable that three-quarters of male passers (74%) reported that learning was easy compared with half of all female passers (Table 5.2).

| Table 5.1: Percentage of passers reporting barriers to professional tuition and practice with friends and relations, by sex |
|---|---|---|---|
| When preparing for the practical driving test . . . | % female passers in agreement | BASE | % male passers in agreement | BASE |
| Was it hard to find friends/relations to take you for driving practice? | 38% | 11,265 | 35% | 7,667 |
| Did you practice with friends/relations as much as you wanted? | 45% | 11,231 | 49% | 7,665 |
| Was it difficult to find time to practice with friends/relations? | 52% | 11,083 | 44% | 7,590 |
| Did the cost of professional lessons affect the number you took? | 39% | 11,589 | 35% | 7,857 |
| Did you feel you had professional lessons often enough? | 90% | 11,609 | 91% | 7,889 |
| Was it difficult to find time for professional lessons? | 31% | 11,575 | 28% | 7,864 |
5.10 Faults on the driving test for passers

Respondents passed the practical driving test if they made fewer than 16 minor driving faults and no serious or dangerous faults. In each of the eight categories of driving error, the mean number of minor driving faults was calculated for all respondents who passed the practical test. On average (mean), respondents passed after making 6.7 minor driving faults. Females made slightly more minor driving faults than males (6.8 and 6.5, respectively). As age increased, so did the number of minor driving faults (Table 5.3).

The most common minor driving fault made was the incorrect use of mirrors or signals during the practical test. This was the only fault that males were more likely to make than females (Figure 5.8). Minor driving violations were uncommon.

Over the four years of the study, the frequency of minor driving faults committed by passers and reported by examiners on the DL25 form changed for all categories of error. The total number of minor driving faults reduced by a mean of 0.5 faults over the four-year period (after adjusting for the separate effects of age and sex). This reduction was accounted for by respondents making fewer control faults, fewer hesitation faults, and incorrectly using mirrors and signals less often. Reports of manoeuvring faults and violations increased slightly during the four-year period of
fieldwork. There was no notable change in the frequency of normal driving errors, awareness errors or errors due to driving too fast.

There was also no apparent relationship between the total number of reported minor driving faults and whether or not test respondents had passed a theory test with hazard perception. More specifically, there was no relationship between the mean number of minor ‘awareness’ faults and experience of taking a theory test with hazard perception. This may be because the practical driving test is only a brief snapshot of a respondent’s overall ability and the opportunity to demonstrate to an examiner a far greater awareness due to experience of hazard perception is quite limited. Furthermore, most respondents would probably be inclined to demonstrate high levels of awareness in a test situation anyway. The effect of hazard perception testing should be to engender a better awareness of potential hazards in all driving situations, and being unable to establish a relationship between experience of hazard perception and the number of awareness faults in a test situation does not preclude there being an overall effect of the hazard perception theory test.

5.11 Confidence of passers

Less than a fifth (19%) of respondents who were not at all confident of their current driving ability managed to pass the practical test. Respondents who reported feeling very confident in the week before their test also tended to have a pass rate that was lower than average. Those who, one week before their test, lacked confidence in their ability to pass the test and drive unsupervised, actually recorded higher than
average pass rates (Figure 5.9). Being fairly confident when learning to drive was associated with slightly higher pass rates than being very confident or having little or no confidence.

The levels of confidence reported by passers were similar to those reported by all respondents in Section 4. The newly-qualified drivers in this study almost all reported being confident of their current driving ability (just after passing). More than half (55%) reported that they were ‘very confident’ and more than two-fifths (43%) reported that they were ‘fairly confident’. About a third of respondents who reported that they were not confident of their current driving ability actually passed the test (Figure 5.9), however they comprised less than 2% of all passers (Figure 5.10).

Confidence at other time points was also reported, retrospectively. It was found that the percentage of passers who were not confident of their driving ability when learning to drive was much higher (24%) than when having just passed the practical test. Furthermore, one week before the practical test, this proportion reduced marginally (to 20%), while, at the same time, just 9% of passers were not confident of driving unsupervised (Figure 5.10; see Volume 2: Appendix E, Table E23).

The proportion of male passers who reported being ‘very confident’ at each of the time points was consistently greater than the proportion of female passers who did so (by 13–16 percentage points; see Volume 2: Appendix E, Table E23).
Differences between the sexes reflected those found in the total sample of respondents.

### 5.12 Attitudes to driving violations for passers

The Learning to Drive Questionnaire included eight items to measure self-reported attitudes to speeding on a five-point scale of agreement – the Attitudes to Driving Violations Scale (ADVS). A high score was indicative of a positive attitude to the safe use of speed, whereas a low score was indicative of a negative attitude to the safe use of speed. A composite score was calculated from the mean of the eight ratings provided by each respondent.

Mean attitudinal scores were calculated separately for male and female passers, by age group (Table 5.4). The table includes, for comparison, mean scores for male and female respondents who failed the practical test. Passers’ attitudes to speeding behaviour were marginally less safe than those of respondents who failed the practical test (mean scores of 3.5 and 3.6, respectively). The attitudes of older passers were safer, on average, than those of younger passers (passers aged 17 to 19 scored 3.3 whereas passers above 40 years scored 4.0) – a similar pattern was observed for respondents who failed the practical test.

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20 Before calculating the mean of the eight question items, the scales were reversed where appropriate to ensure that a positive attitude was assigned to a high rating and a negative attitude was assigned to a low rating.
Female passers had safer attitudes to speeding than male passers (difference in mean score of 0.3); and male passers aged 17 to 19 had the least safe attitudes of all respondents (mean score of 3.2).

Passers collectively reported a score that was close to the mid-point on the ADVS, which generally indicates that this sample of newly-qualified drivers had moderate attitudes to speeding violations on average. Although some of the differences in mean scores for different age groups and between sexes were relatively small, they do represent meaningful differences in attitudinal position on the ADVS.

The practical test pass rate for respondents with ADVS scores of less than 3.0 was about 15 percentage points higher than that of respondents scoring more than 3.0 (Figure 5.11). This observed difference was notable even when accounting for the separate relationship between pass rates and age/driving experience. Respondents with the safest attitudes to speeding (an ADVS score of between 4.0 and 5.0) had the lowest practical test pass rates in each age group. However, they still comprised a fifth (22%) of all passers (Table 5.5).

Although respondents with the safest attitudes to speed-related driving violations (score of 4.0 to 5.0) had the lowest practical test pass rates, they still comprised a fifth (22%) of all passers (Table 5.5). Overall, 81% of passers reported having moderately safe attitudes on the ADVS (score greater than 3.0).

More than twice the percentage of male passers than female passers reported low scores on the ADVS (less than 3.0), but only 2% of male passers had a particularly unsafe attitude to the use of speed (score of 1.0–1.9).

<table>
<thead>
<tr>
<th>Age group</th>
<th>Mean score on the Attitudes to Driving Violations Scale (ADVS)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>Failed</td>
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<td>17–19</td>
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<tr>
<td>Mean</td>
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</table>
5.13 Passers’ awareness of the need to improve their driving skills

For each of the 15 categories of driving skills listed, all passers reported whether they perceived a need to improve the skill. Overall, the perceived need for improvement among passers was similar to that reported by all respondents, with an identical 95% stating that they had a need for at least ‘some’ improvement to their driving skills in at least one of the 15 categories (Figure 5.12). Almost a third of all passers (31%) had a subjective need for ‘a lot’ of improvement to at least one of the driving skills listed. This need was more commonly reported by female passers when compared with male passers (38% and 22%, respectively). It was also more common for female passers to report a need for ‘a lot’ of improvement to at least
one of their driving skills when compared with all female respondents (38% and 33%, respectively). Male respondents were four times as likely as females to report not needing to improve any of the listed driving skills (9% and 2%, respectively).

![Figure 5.12: Percentage of passers by reported perceived need to improve their driving skills, by sex](image)

The percentage of passers who reported that ‘no’, ‘some’ or ‘a lot’ of improvement was required in their driving skills in each of the 15 categories is presented in Volume 2: Appendix E, Table E25. Generally, passers had similar needs for seeking improvement in all of the 15 driving skills to those found among all respondents (and reported in Section 4.4). Almost all (95%) of the newly-qualified drivers in the study felt that their driving skills in at least one of fifteen categories could be improved. Almost a third of passers (31%) felt that ‘a lot’ of improvement was needed in at least one driving skill.

More than half of passers wanted ‘some’ improvement in parking skills (69%), joining fast-moving traffic (61%), judging the actions of other drivers (57%), overtaking (55%), changing lanes on fast multilane roads (55%) and reversing (54%). About a third of passers wanted ‘some’ improvement in control skills (32%), spotting hazards (36%), using roundabouts (31%), pulling out at junctions (30%), driving in heavy traffic (32%) and driving on country roads (31%).

Male passers were more likely than female passers to report not needing any improvement in parking skills (45% and 33%, respectively), overtaking skills (54% and 38%, respectively), driving on high-speed roads (67% and 56%, respectively), changing lanes on fast multilane roads (56% and 39%, respectively), and joining fast-moving traffic (48% and 33%, respectively).
Figure 4.32 shows that the pass rate for males varied very little according to the level of improvement that was subjectively needed. In contrast, the pass rate for females ranged from 38%, when there was no reported need for improvement, to 53%, when the need for ‘a lot’ of improvement in at least one skill was reported (Figure 5.13).

There was a positive relationship between pass rates on the practical test and the perceived level of improvement that respondents felt was required of them for:

- parking;
- joining fast-moving traffic;
- changing lanes on fast multilane roads;
- driving in heavy traffic;
- overtaking; and
- driving on high-speed roads (see Volume 2: Appendix E, Figure E1).

Such a finding (i.e. a higher pass rate being associated with the need for more improvement) could easily be influenced by the small number of respondents who felt they needed ‘a lot’ of improvement as well as the possibility of respondents perhaps falsely appraising and reporting their driving skills based upon their recent practical test performance rather than their genuine skill level in each area. Nevertheless, there is some commonality in these skills, which does suggest that respondents may underestimate their driving skills when travelling on fast, heavily-trafficked roads.
A negative relationship between the pass rate and the level of improvement that a respondent felt that they required was found for using roundabouts and pulling out at junctions. Although there are again risks in drawing conclusions from such findings, there is an indication that respondents may have been better at assessing their own capability at junctions because of the higher pass rate of those who felt no improvement was needed in this skill.

Consideration was also given to the association between the level of perceived improvement that passers reported they required for each category of driving skill and their reported exposure to different driving conditions when learning. There were no simple univariate relationships between the level of exposure and perceived need for improvement in specific categories, although it is possible that a more complex relationship may exist between learning conditions and the need for improvement among passers. However, it was beyond the scope of this report to explore these further associations.

### 5.14 Comparison with Cohort I

The introduction of the theory test in 1996 might have been expected to increase the time taken to pass the practical test, but this does not seem to be the case. In fact, the time taken from starting to drive to passing the practical test (excluding breaks) was 14.0 months in Cohort I and 13.2 months in Cohort II, though it must be borne in mind that ‘breaks’ were defined differently in the two studies.\(^{21}\) The practical test pass rate among survey respondents was 52% in Cohort I compared with 49% in Cohort II.

Although the time taken to pass the practical test decreased between the two studies, the amount of driving experience acquired before passing the test increased by more than a third. Cohort I passers had a mean of 48.6 hours of driving experience, while in Cohort II the equivalent figure was 67.2 hours, with the majority of the increase being accounted for by professional driving instruction (an increase of 11.9 hours of professional tuition, from a mean of 35.5 hours in Cohort I to a mean of 47.4 hours in Cohort II).

### 5.15 Discussion and implications

#### 5.15.1 Factors associated with higher pass rates for the practical test

Although the findings showed that different amounts and types of driving experience were related to different practical test pass rates, these relationships are not necessarily causal. A multitude of factors (for example, attitudes, behaviours and experiences of respondents) will have influenced whether someone passes the test. The findings in this report do not indicate the most appropriate way to learn to drive.

\(^{21}\) A ‘break’ from learning to drive was defined as 12 or more months in Cohort I and six or more months in Cohort II.
in order to pass the practical test. Instead, they reflect the diverse learning strategies adopted by respondents to meet their perceived individual needs in order to pass the practical test. Some respondents may have found it easy to learn the skills required for driving, they learned them quickly and a high proportion of these passed their test. The pass rate for first-time takers among respondents was higher than the national pass rate. However, for respondents who had taken the test for the first time, the pass rate was 49%, rising to 52% for those on their fourth attempt but falling to 46% for those taking more tests. Respondents who found driving difficult may have taken longer to learn but still were proportionally less successful when taking the practical test. Their respective pass rates may not necessarily change if they had more or less driving experience and training.

Any associations between passing the practical test and other variables need to be treated with caution.

5.15.2 The training experiences and characteristics of new drivers

The length of time which respondents took to pass the practical test decreased between the Cohort I and Cohort II studies. However, the amount of driving experience acquired before passing the test increased by more than a third. Cohort I passers had a mean of 49 hours of driving experience, while in Cohort II the equivalent figure was 67 hours, with the majority of the increase being accounted for by professional driving instruction (an increase of 11.9 hours of professional tuition, from a mean of 36 hours in Cohort I to a mean of 47 hours in Cohort II).

New drivers face a more complex driving environment with higher traffic levels than they did at the time of the Cohort I study. However, the requirement to obtain a driving licence may be more pressing with reductions in public transport. This may provide an incentive for learners to concentrate their learning into a shorter period, in spite of requiring more hours of driving experience.

5.15.3 Attitudes to safe driving

Respondents with relatively unsafe attitudes towards driving violations (mainly speeding) had substantially higher pass rates than respondents with safer attitudes. This difference persisted even when the effects of age and driving experience were adjusted for. The practical test pass rate for respondents with ADVS scores of less than 3.0 was about 15 percentage points higher than that of respondents scoring more than 3.0. The current testing system places too much emphasis on practical skills rather than attitudes (see, for example, Hatakka et al., 1999). The association between unsafe attitudes to driving and the pass rates suggests that driver training should seek to reform or moderate attitudes.
5.15.4 Improvements in the skills of new drivers

Many respondents identified ‘joining fast moving traffic’ (61%) and ‘changing lanes on fast multilane roads’ (55%) as areas where a lot of improvement was needed after they had passed their practical test. This suggests that, despite changes to the practical test to include more testing on higher speed roads, this type of road still presents problems for new drivers. ADIs probably need to be aware of the need to increase the amount of time spent on faster roads to increase new drivers’ ability and confidence in coping with the challenges of dealing with fast-moving traffic. Improvement in these basic skills is an area which needs to be addressed by ADIs before testing but also in any post-test training (such as Pass Plus).

5.15.5 Confidence of new drivers

Confidence was reported in this study at several time points. At the time they completed the questionnaire (just after passing their test) the new drivers almost all reported being confident of their current driving ability (55% ‘very confident’ and 43% ‘fairly confident’). However, the percentage of passers who were confident of their driving ability when learning to drive was much lower (76%) than when having just passed the practical test. This would seem to be a reflection of a surge of confidence as the new drivers approached the date of their test.

It should be noted, however, that confidence levels reduced over time after the test. This will be discussed in Section 7.

5.15.6 Grades of Approved Driving Instructors

ADIs are examined and graded by the DSA. Grade 6 ADIs (high standard) presented their candidates for the practical test in a shorter time than those who were Grade 4 (competent standard) or Grade 5 (good standard). Pass rates were 59%, 53% and 51% respectively for respondents taught by ADIs of a ‘high’, ‘good’ and ‘competent’ standard. The candidates of Grade 6 ADIs also demonstrated higher pass rates. These differences might suggest that Grade 6 ADIs are providing more effective training. However, the difference in pass rates between Grade 6 ADIs and Grade 5 ADIs is not large, and a number of other factors may influence these findings. For example, some instructors may ‘specialise’ in particular types of learner, such as female learners or older learners, which may affect their pass rates independently of their grade.
5.16 Summary

Of those respondents who took the practical test, 49% passed (46% of females; 55% of males). In particular:

- females who passed were, on average, older than males, took longer to learn and had more hours of tuition (although male passers had slightly more practice with friends and relations);
- the proportion who passed decreased with age; and
- a lower proportion of respondents passed the practical test when taking it for the first time when compared with those who were taking their second, third or fourth practical test (49% compared with 51%, 51% and 52%, respectively).

Relating different experiences of driving to passing the practical test showed, for example, that:

- female respondents with previous motorcycle/moped experience were more likely to pass than female non-riders (however the same association was not observed among males); and
- a higher proportion of respondents passed the practical test if they learned over a shorter period of time, although only a small minority of respondents had very brief learning periods.

Corresponding to shorter learning durations, fewer hours of professional tuition were also associated with higher pass rates. However, this finding is most likely to be a reflection of how a few respondents felt able to drive after receiving far less tuition than others; it should not be seen as a causal relationship between brief periods of learning and passing the practical test. Other findings concerning hours of tuition and practice include the following:

- Passers took a mean of 47 hours of professional tuition and, for respondents who took any practice with friends and relations, a mean of 34 hours of practice of this kind. When all passers were included the mean amount of practice was 20 hours.
- As with all respondents, younger passers tended to have fewer hours of tuition.
- Any amount of practice with friends and relations was associated with higher pass rates than having no such practice.
- A higher proportion of respondents passed the practical test if they reported no barriers to learning to drive (such as restrictions on private practice or professional tuition).

The youngest passers made the fewest minor driving faults on the practical driving test. Females made consistently more errors than males. The most common fault
was the incorrect use of mirrors and signals, and this was the only fault that males were more inclined to make. Experience of a hazard perception theory test did not seem to affect the number of reported ‘awareness’ faults but it was related to an increase in confidence when learning to drive. Males were typically more confident about their driving ability when learning to drive. However, confidence levels can often vary with a number of factors, including age, sex and personality traits, which can make it difficult to identify possible causal relationships. This is further complicated by the retrospective measures of confidence reported in this study.

Attitudes to speed-related driving violations were less safe among passers, especially if young and male.

Almost all (95%) of the newly-qualified drivers in the study felt that their driving skill in at least one of fifteen categories could be improved. Almost a third of passers (31%) felt ‘a lot’ of improvement was needed for at least one driving skill. The skills that were reported by at least half of all passers as requiring at least ‘some’ improvement were:

- parking (69%);
- joining fast-moving traffic (61%);
- judging the actions of other drivers (57%);
- overtaking (55%);
- changing lanes on fast multilane roads (55%); and
- reversing (54%).

Overall, just 5% of passers in this study entered the driving population with no reported need to improve any of their driving skills. This was more common among male passers than it was among female passers (9% and 2%, respectively).
6 TRAINING AND EXPERIENCE OF NEW DRIVERS

6.1 Introduction

For the majority of new drivers, passing the test marks the end of formal instruction. However, learning does continue, albeit largely in an unstructured and informal way. As Grayson and Sexton (2002) point out, ‘in the first few years a new driver is learning not just new skills, but formulating new rules, developing a new repertoire of strategies, and learning new patterns of interaction’. This process involves the exposure of drivers to both learning situations and the risk of accidents. This section looks at these issues, drawing upon the data from the Driver Experience Questionnaires sent out 6, 12, 24 and 36 months after the date of passing the practical test to those in the main sample who reported passing their practical test. The number of respondents to these questionnaires was lower than the initial sample size (see Section 3) because of reducing response rates over time. Most of the analyses in this section are split to show males and females separately. This is because previous research shows that males and females report differing amounts of experience as new drivers, and more females than males responded at all stages of the survey (see Section 3).

Data for the first six-month period and the second six-month period (i.e. for the first full year) were available for all 16 cohorts in the study, while data for the second year were available for the first 12 cohorts, and data for the full three years were only available for the first eight cohorts.

6.2 Further training

Only 22% of respondents took any form of further instruction or training in the first year after passing their practical driving test. Table 6.1 shows this in more detail. For most drivers, this additional instruction was Pass Plus. Males were more likely than females to take most types of further training.

<table>
<thead>
<tr>
<th>Type of instruction</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>73%</td>
<td>81%</td>
<td>78%</td>
</tr>
<tr>
<td>Pass Plus</td>
<td>23%</td>
<td>16%</td>
<td>18%</td>
</tr>
<tr>
<td>Motorway lessons</td>
<td>5%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Driver training for company car drivers</td>
<td>1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Other advanced training</td>
<td>1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>BASE</td>
<td>3,533</td>
<td>6,284</td>
<td>9,817</td>
</tr>
</tbody>
</table>

Table 6.1: Further instruction in the first year of driving, by sex

Based on data from first two Driver Experience Questionnaires at 6 months and 12 months. Note, totals add to more than 100% because some respondents had taken more than one type of further instruction.
6.2.1 Pass Plus

Pass Plus is a training scheme designed to enable new drivers to gain experience and confidence, especially in conditions they may not have met during pre-test training (e.g. motorway driving). The Driving Standards Agency (DSA) report that the national take-up rate for Pass Plus is currently around 13% (2006 data), which is rather lower than the results from this survey. Pass Plus was designed by the DSA, with the help of the motor insurance and driving instructor industries. Training is delivered by Approved Driving Instructors (ADIs) who are registered to deliver the Pass Plus course. One of the incentives for new drivers is that the scheme is supported by many in the insurance industry (representing over 63% of the private car insurance market), most of whom offer a one year’s no claims bonus as a discount to new drivers who have successfully completed Pass Plus. This is likely to make it particularly attractive to those who buy and insure their own vehicle soon after passing their practical driving test.

Pass Plus requires a minimum of six hours’ training and consists of six modules which are generally taken within 12 months of a new driver passing their practical test. The modules cover:

- town driving;
- all-weather driving;
- driving out of town;
- night driving;
- driving on dual-carriageways; and
- driving on motorways.

There is no formal test at the end of the programme, but the ADI will assess whether the new driver has achieved the required level of competency on each module.

6.2.2 Other training

Table 6.1 shows that 4% of drivers took training other than Pass Plus in the first 12 months after passing their test. Apart from Pass Plus, the only form of training taken by more than 1% of the respondents was specific training on motorways.

6.3 Driving experience

The first stage in the investigation of driving experience was to ask respondents how often they drove. Respondents tended to adopt regular patterns of driving when they had passed their test. In each survey period, just over a half said that they drove every day, and about 90% that they drove at least once a week (see Table 6.2 and Volume 2: Appendix F, Table F1). Only 2–3% reported not driving at all in any of
the survey periods. There was very little difference between males and females in the frequency of driving.

Table 6.2: Frequency of driving reported by respondents to follow-up questionnaires

<table>
<thead>
<tr>
<th>Frequency of driving</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>13–24 months</th>
<th>25–36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day</td>
<td>53%</td>
<td>54%</td>
<td>53%</td>
<td>52%</td>
</tr>
<tr>
<td>4–6 days a week</td>
<td>26%</td>
<td>25%</td>
<td>26%</td>
<td>26%</td>
</tr>
<tr>
<td>1–3 days a week</td>
<td>14%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>About once a fortnight</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>About once a month</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Never</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>BASE</td>
<td>10,046</td>
<td>7,428</td>
<td>4,178</td>
<td>2,753</td>
</tr>
</tbody>
</table>

Based on all four Driver Experience Questionnaires, at 6, 12, 24 and 36 months. Note, percentages may not add to 100% due to rounding errors.

Respondents were also asked to provide ‘as good an estimate as you can’ of how far they had driven in each period. Table 6.3 and Figure 6.1 show this data, with reported mileage in the six-month periods doubled to provide an annualised mileage for comparison purposes. Drivers find their mileage difficult to estimate so the data cannot be assumed to be very reliable; however, it is the best available for this difficult variable. Respondents claiming mileages in excess of 20,000 miles per year were excluded from the analysis. Median values are presented in addition to mean values in Table 6.3 as these will also take some account of those reporting unusually high mileages. Figure 6.1 shows that, by the later periods, more of the respondents were driving higher mileages. More detailed data are presented in Volume 2: Appendix F, Table F2.

Respondents were asked how often they had driven more than 100 miles in a day in the survey period, and the data show that long journeys do not make up a large part of the experience of new drivers. Table 6.3 shows that, on average, slightly more respondents made these longer journeys in the second six months than in the first six, and more did so in the third year of driving than in the second year. Even in the third year, about a third claimed not to have made a journey of more than 100 miles in a day. Throughout, males were more likely than females to have undertaken long journeys.
In addition to the total amount of driving, respondents were asked how often in the survey period they had driven in a variety of driving conditions and environments. Table 6.4 summarises the percentage who had not driven at all in a range of driving conditions and environments (see Volume 2: Appendix F, Table F3 for details).

The results of this analysis show that female respondents were less likely than males to have driven on motorways or fast dual-carriageways at all stages. Both males and females were slightly less likely to have driven on motorways in their first six months of driving than in their second six months, and in their second year of driving than in their third year. It is clear that driving in urban environments, in the dark and in the rain were all part of almost all new drivers’ experience in each survey period.
The only questions about journey purpose related to driving to and from a place of work or study and driving specifically on employers’ business. Table 6.4 shows that there were only small differences between males and females.

Driving on an employers’ business was a regular occurrence (at least once a fortnight) for about one in five respondents, but driving to a place of work or study was much more common. Over 91% of those who passed their test at the age of 17 drove to study or work at least once a fortnight during the first six months after passing their test. This figure dropped over time, with only 84% doing so 36 months after passing the test. This still suggests that driving was an important travel mode for them. Drivers who were over 21 when they passed their test were initially less likely to drive to study or work, but the proportion reporting that they drove to study or work at least once a fortnight was more stable, at about 80% throughout the period (see Volume 2: Appendix F, Table F4).

<table>
<thead>
<tr>
<th>Driving condition</th>
<th>Survey period</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In busy town or city centres</td>
<td>1–6 months</td>
<td>7–12 months</td>
<td>13–24 months</td>
<td>25–36 months</td>
<td>1–6 months</td>
<td>7–12 months</td>
<td>13–24 months</td>
<td>25–36 months</td>
<td>1–6 months</td>
<td>7–12 months</td>
<td>13–24 months</td>
</tr>
<tr>
<td>Male</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Female</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>In quiet parts of towns or cities</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>On country roads</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>On fast dual-carriageways</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
<td>&lt;1%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>On motorways</td>
<td>10%</td>
<td>14%</td>
<td>9%</td>
<td>13%</td>
<td>7%</td>
<td>13%</td>
<td>7%</td>
<td>13%</td>
<td>7%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>In the dark</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>In the rain</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>In fog</td>
<td>13%</td>
<td>13%</td>
<td>13%</td>
<td>13%</td>
<td>12%</td>
<td>11%</td>
<td>10%</td>
<td>13%</td>
<td>13%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>In snow or ice</td>
<td>27%</td>
<td>23%</td>
<td>27%</td>
<td>22%</td>
<td>18%</td>
<td>15%</td>
<td>18%</td>
<td>15%</td>
<td>18%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>To or from place of work/study</td>
<td>6%</td>
<td>6%</td>
<td>7%</td>
<td>7%</td>
<td>8%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>On employer’s business</td>
<td>37%</td>
<td>34%</td>
<td>38%</td>
<td>37%</td>
<td>48%</td>
<td>44%</td>
<td>47%</td>
<td>45%</td>
<td>47%</td>
<td>45%</td>
<td>47%</td>
</tr>
<tr>
<td>BASE</td>
<td>5,875</td>
<td>13,492</td>
<td>3,751</td>
<td>9,292</td>
<td>1,466</td>
<td>4,255</td>
<td>949</td>
<td>2,711</td>
<td>949</td>
<td>2,711</td>
<td>949</td>
</tr>
</tbody>
</table>

Table 6.4: Percentage never driving in specific conditions in the survey period by sex

Based on all four Driver Experience Questionnaires, at 6, 12, 24 and 36 months. Note, multiple responses were allowed and percentages may not add to 100% due to rounding errors.

6.4 Awareness of the need for improvement

Respondents were asked whether they thought they needed to improve their ability for a range of driving skills and situations. These included specific manoeuvring skills, different road environments (e.g. motorways, roundabouts) as well as weather conditions (e.g. fog, snow). Table 6.5 shows whether drivers perceived a need for improvement in any of the situations covered at the four questionnaire points. A
higher proportion of females than males in each survey period reported a need for a lot of improvement, and the overall perceived need for a lot of improvement decreased over time. However, even three years after passing their driving tests, 26% of all respondents still recognised a lot of improvement was needed in one or more of the skills listed, and only 9% perceived no need for improvement in any skill listed.

Three years after passing their tests, almost two-thirds (63%) of drivers saw a need to improve their driving in thick fog and three-quarters (77%) saw a need to do so in thick snow or ice. Furthermore, 38% of males and 46% of females still recognised a need to improve ‘judging what other drivers are going to do’ even three years after passing their tests, and parking was still reported as an issue for almost two-thirds of females (but far fewer males; see Volume 2: Appendix F, Table F5).

### 6.5 Driving offences

Offending was relatively uncommon. At each stage of the survey, between 0.04% and 0.3% of respondents reported that they had had to revert to learner status and similar percentages were banned from driving (Table 6.6). However, those who reported having these penalties are probably a minority of those who actually have them because of under-reporting. In each of the first two (six-month) survey periods about 3% of respondents had either received or were waiting for a fixed penalty notice or summons; in each of the last two (12-month) periods, the figure exceeded 6%. It is possible that there could be some double counting in these figures as someone reporting waiting for a summons in one period may report the same

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22 Situations listed were: the use of car controls, pulling out at junctions, reversing, parking, judging the speed of other drivers, spotting hazards, driving in heavy traffic, driving in the dark, overtaking, using roundabouts, joining with moving traffic, changing lanes, driving on high-speed roads, driving on country roads, driving in heavy rain, driving in heavy fog, driving on snow or ice, turning right and knowing what speed is safe.
offence as having received a penalty in the next, but this has not been investigated. However, the numbers of those awaiting a summons was relatively low. The most common form of infraction was to have been warned by the police: approximately 5–6% of respondents reported having experienced this in each of the four survey periods, although the periods varied in length (six months, six months, twelve months and twelve months respectively).

Table 6.6 shows that reported offending was very much a male activity. The percentage of offences in which males reported that they had been warned by the police (about 8–12%) was about three times the percentage of such offences reported by females (2–3%).

### 6.6 Comparison with Cohort I

Only some of the analyses reported in Cohort 1 could be repeated with the Cohort II data. However, some of the exposure issues are of interest.

Overall, respondents to Cohort I reported driving about as often as respondents to Cohort II. However, in Cohort II respondents reported much more driving in busy town centres than was the case in Cohort I. In Cohort II almost all (99%) of respondents reported having driven in a busy town or city centre, but in Cohort I, even by the third year of driving, 5% of males and 9% of females reported that they had never done so.

There is also a difference in the level of motorway driving, with 11% of male and 28% of female respondents to Cohort I reporting no motorway driving in the third year after passing the practical test but only 7% of males and 12% of females in Cohort II reporting this.
6.7 Discussion and implications

6.7.1 Further training for new drivers

The recognition by new drivers that some of their skills need further improvement, in theory, should result in an interest in them gaining further training or experience. However, DSA figures suggest no increase in the take up of Pass Plus.

Elliot (2006), using data from the Cohort II study to assess the effect of Pass Plus, concluded that volunteer bias may mask any effects of taking Pass Plus. This means that people who volunteer to take Pass Plus are not representative of new drivers and could represent those who recognise that they may need additional training. Elliot controlled for variables that might explain why some people choose to take Pass Plus and others do not, and then examined differences between characteristics and performance of Pass Plus takers and non-takers (using measures for self-reported accidents and driver behaviour measures). This approach showed that, in terms of self-reported driving behaviour and accident rates, there were no differences between respondents who took Pass Plus as new drivers and those who did not. There was, however, one exception, involving ‘aggressive violations’. The analysis found that Pass Plus takers were less likely to report this form of aberrant driver behaviour during the first six months of driving than were non-takers. However, owing to volunteer bias it was not possible to determine conclusively whether Pass Plus has a positive effect.

6.7.2 Driving experiences of new drivers

Drivers find it difficult to estimate their mileage, especially when they are not the sole users of a vehicle so the data cannot be assumed to be very reliable. However, data from respondents who passed their practical test show that, over time, the reported mileage covered and the number of longer journeys undertaken increased. The slight, but steady, increase in annualised mileage for both males and females (males’ annualised mileage rose from almost 6,000 miles per year to 7,500 miles per year over the three years covered by this study) may be due to combinations of a range of things, including:

- increasing confidence in respondents’ own abilities;
- increasing access to a vehicle; and
- changes in personal circumstances (e.g. increasing financial resources allowing more travel).

6.7.3 Driving offences reported by new drivers

Overall reported offence levels were low, with males reporting more offences than females. Warnings from the police were more common than other forms of police action.
6.8 Summary

A high percentage (almost 80%) of respondents drove most days once they had passed their test, and this percentage was stable over the three years of the study. Smaller percentages had made long journeys (over 100 miles in a day).

The annualised mileage travelled increased with time since test, with the median mileage for males increasing from 5,000 to 7,000 and the median for females from 3,600 to 5,000.

The drivers in the survey reported a continuing need to improve aspects of their driving, with driving in snow and fog being specific areas of concern, as well as judging what other drivers will do and parking.

Respondents reporting driving offences were in a small minority. However, males reported more offences than did females in all the survey periods, despite there being many more female than male respondents.
7 ATTITUDES AND ASSESSMENTS

7.1 Introduction

This section examines the attitudes, assessments and self-reported behaviours of new drivers. Most of the analyses are of data from the Driving Experience Questionnaires that were sent to respondents who were followed up at 6, 12, 24 and 36 months after they had passed the practical driving test. The results, to be presented in this section, are specific to those time points, unlike the preceding and the following sections of the report, which are concerned with experiences over periods of six or twelve months. It should be noted that a few analyses also draw upon Learning to Drive Questionnaire data for those who passed the practical driving test. Six-month and twelve-month data were available for all 16 cohorts in the study, 24-month data was available for the first 12 cohorts, and data for the full three years were available for the first eight cohorts.

Attitudes and self-reported behaviours play an important role in the Cohort II study. The study presents an opportunity to examine how such measures develop and change as a sample of new drivers gain experience during the first three years of their driving careers, and how they differ among different sub-groups of drivers. The extent to which they influence accident liability will be examined in a multivariate context in Section 9.

7.2 Comparison of own and others’ driving

In each of the four follow-up surveys, respondents were asked to compare different aspects of their driving with that of other drivers of their own age and sex. The results are summarised in Table 7.1. Only a small proportion of new drivers rated themselves as being ‘worse’ than their peers in terms of being more likely to be accident-involved, less cautious and less likely to avoid risky situations, but a rather higher proportion were prepared to rate themselves as less skilled and as faster drivers than others.

Changes over time were, on the whole, relatively small. The ratings that changed most were those of skill and speed of driving, but even here the biggest difference was only of the order of five percentage points over the three years of the study. Assessments of the relative likelihood of being involved in an accident were virtually unchanged over the four time points, with a third of respondents claiming that they felt less likely to be involved in an accident than others in their peer group. Comparisons of the likelihood of avoiding risky situations were equally stable over time. The other sets of comparisons moved in predictable directions, with small increases over time in the proportions of those who considered themselves as being more skilled, and a small decrease in those seeing themselves as more cautious than their peers.
Splitting the respondents into those aged 17 to 24 and those aged 25 years and over when they took the practical test showed that the younger age group believed that they were less likely to be accident-involved, were more skilled, were less cautious, were less likely to avoid risky driving situations, and were faster drivers than their peers than did those in the older age group (see Volume 2: Appendix G, Tables G1 and G2 for details).

A higher proportion of males than females believed that they were less likely than others to be involved in an accident. Compared with females, males were also more likely to consider themselves as more skilled, less cautious and less likely to avoid risky driving situations than other drivers of their age and sex. In addition, a greater
proportion of males than females considered themselves to be faster than other drivers. In general, these differences were stable over time. It should be noted that all these comparisons are, in effect, composite measures that combine self-perceptions with generalisations about groups of people, and that the relative accuracy with which each type of assessment can be made is a moot point.

In addition to asking about how they felt they compared with their peers, respondents were asked how they considered that their driving compared with that of drivers in general. The results are shown below in Table 7.2.

Whereas Table 7.1 showed that only about one in seven respondents regarded themselves as more skilled than their peers, Table 7.2 shows that around a half of the respondents felt that their driving was above average compared with drivers in general, with the proportion increasing over time. Very few thought that they were worse than average, even in the first six months of driving.

A higher proportion of males regarded themselves as above average than did females, as shown in Figure 7.1. At all four time points, less than half of the female respondents considered their driving to be above average. A similar pattern of age differences emerged, where drivers in the 17 to 24 year age group rated themselves more highly than did those aged 25 or more (see Volume 2: Appendix G, Table G3.)

### 7.3 Confidence

At each of the five time points (that is, shortly after passing the practical test, and 6, 12, 24 and 36 months later), respondents were asked to rate how confident they felt in their driving ability at the time, as shown in Table 7.3.

Table 7.3 shows that there were very few respondents who reported they were not confident in their driving ability, and that nearly all (over nine out of ten) of the new drivers said that they felt confident or very confident. However, there were also changes over time, with confidence in driving ability two to three weeks after
passing the practical driving test starting at a high level, but reducing markedly after six months, and showing little change in the subsequent time periods.

The way in which confidence varies by age and sex is best illustrated by the frequently used method of scoring the responses from ‘very confident’ as 4 to ‘not at all confident’ as 1 in order to provide mean confidence scores. Figure 7.2 shows age differences in confidence over time.
The youngest age group (17 to 24 years) reported higher levels of confidence at all time points, but the difference was not so pronounced just after having passed the practical test. Differences between the younger and older age groups were, on the whole, smaller than those between males and females. The full analyses are given in Volume 2: Appendix G, Tables G5 and G6.

Figure 7.3 shows the changes in mean confidence scores over time for males and females. Males were more confident in their driving ability than females at all time points, and also showed a proportionally smaller decline in confidence in the six months after passing the practical test.
The finding that respondents’ confidence in their driving ability decreased over the first six months may have reflected a combination of an overestimation of driving skills and a lack of experience, as they had just passed the driving test. With six months of driving experience, it is possible that respondents may have begun to develop a more realistic perception of their driving abilities as they encountered driving situations that they would probably not have experienced while learning to drive. Alternatively, the act of passing the practical driving test may have resulted in an initial boost to confidence ratings, which diminished over time. Given the finding that, over time, respondents believed they needed less improvement to their driving skills, the latter explanation may be more plausible.

### 7.4 Self-reported driving style

Shortly after passing the driving test, and in each of the four follow-up surveys, respondents were asked to describe ‘what kind of driver’ they thought they were by ticking one of seven points on twelve scales with labels such as ‘Attentive – Inattentive’ and ‘Patient – Impatient’. These scales are a subset of those originally proposed by Guppy et al. (1990) as a measure of driver style, and are usually referred to as the ‘Guppy scales’. Factor analysis of these scales has consistently produced three factors that have been found to be related to accident liability in varying degrees in a number of studies (e.g. Maycock and Forsyth, 1997; Quimby et al., 1999). The contribution that these factors make to the accident liability of new drivers in this study is explored further in Section 9.
The factors are shown in Table 7.4. Factors 1 and 2 have tended to be positively associated with accident liability in past studies (Maycock and Forsyth, 1997; Quimby et al., 1999).

| Table 7.4: Factors previously related to accident liability based on driving style scales used in the study |
|---|---|---|
| Factor 1 | Factor 2 | Factor 3 |
| Inattentive/attentive | Irritable/placid | Indecisive/decisive |
| Careless/careful | Impatient/patient | Inexperienced/experienced |
| Irresponsible/responsible | Selfish/considerate | Nervous/confident |
| Risky/safe | Intolerant/tolerant | Slow/fast |


A high score on the scales in Factor 1 indicates a self-reported driving style that is more ‘attentive, careful, responsible and safe’. A high score on Factor 2 indicates a style that is more ‘placid, patient, considerate and tolerant’, while a high score on Factor 3 indicates a style that is more ‘decisive, experienced, confident and fast’. The mean scores for these factors at each time point of the study are shown in Figure 7.4.

This analysis shows that, apart from a slight increase in scores for Factor 3, self-reported driving style was remarkably stable over time. Given that at the time of the first survey respondents had had little or no experience of unsupervised driving, it might at first sight seem surprising that the self-assessments are so similar at the
later time points. However, earlier research by West and Hall (1998) has shown that
drivers with even very limited experience have the ability to make self-assessments
that have predictive value.

At all time points, younger respondents (17 to 24 years) and males described a more
unsafe driving style in that they said they reported being less attentive, careful,
responsible and safe, less placid, patient, considerate and tolerant, and more
decisive, experienced, confident and fast than did older respondents (25+ years) and
females (see Volume 2: Appendix G, Tables G5 and G6).

It is of interest that, at all time points, age differences were larger than sex
differences for Factors 1 and 2, while the reverse was the case for Factor 3.

7.5 Self-reported driving behaviours

Information about self-reported driving behaviour was collected within the Driver
Experience Questionnaires using a version of the Driver Behaviour Questionnaire.
This was a 34-item scale derived from work by Åberg and Rimmö (1998), and
which seemed particularly appropriate as it had been developed for use with new
drivers. Respondents were asked how often they carried out each of 34 specified
behaviours, and the answers were scored from ‘never’ = 1 through to ‘nearly all the
time’ = 6. The version of the Driver Behaviour Questionnaire used in this study
measured the frequency with which respondents reported carrying out five types of
behaviour:

- slips/lapses;
- errors;
- inexperience errors;
- violations; and
- aggressive violations.

The figures that follow (Figures 7.5 to 7.14) show the mean scores of these five
behaviours analysed by age and sex over the four follow-up surveys (see Volume 2:
Appendix G, Tables G9 and G10 for full analyses). The mean scores in the figures
all lie in the range 1.0 to 2.0, i.e. between ‘never’ and ‘hardly ever’.
According to Reason et al. (1990), slips – or lapses – are the most benign form of aberrant driving behaviour, and result mainly from attention failures. Thus, in the Driver Behaviour Questionnaire, slips were behaviours such as ‘forget that the headlights are on full beam’, or ‘forget where the car was left in a car park’. The frequency of slips increased slightly over the four time points, more so for the older age group than for the younger, and more so for females than males. At each of the follow-up surveys, slips were reported more by the younger age group than by the older, and more by females than by males.
Reason *et al.* (1990) maintain that ‘errors’ are, in effect, mistakes, and in their phrase can be seen as ‘deviations from an intended path’. Examples in the Driver Behaviour Questionnaire would be: ‘take the wrong turning off a roundabout’ and ‘get in the wrong lane when approaching a junction’. The reported commission of errors changed less over time than did that of slips. The younger respondents reported making slightly more errors than did the older age group, but differences between males and females were very small.
Åberg and Rimmo (1998) have suggested that in studies of new drivers, the category of ‘errors’ as used by Reason et al. (1990) can be described better by using the two sub-groups of ‘driving errors’ and ‘inexperience errors’, the distinction being that the former derive from more stable aspects of cognition, and the latter are more transient and are attributable to the amount (or, more specifically, the lack) of experience that the driver has gained.

Figure 7.9 and Figure 7.10 show that the frequencies of reported inexperience errors declined for both age groups and for males and females over the four time points,
but only to a very small extent. Theory might predict that after three years of driving, inexperience errors should become less frequent, but this study does not support that position. At all time points, older drivers and females reported committing more inexperience errors.

According to Reason et al. (1990), violations differ from slips and errors in that they have a motivational base and are ‘actions of choice’, rather than resulting from some form of cognitive failure to perform an action that has been planned. They have also been shown to be positively associated with accident liability in a number of studies (e.g. Reason et al., 1990; Parker et al., 1995; Maycock and Forsyth, 1997).
It is evident from Figure 7.11 and Figure 7.12 that reported violations increased over time for both younger and older age groups and for males and females. In line with previous studies, such as those cited above, younger drivers reported committing more violations than did older ones, and males reported doing so more than did females. It is noticeable, however, that differences between males and females are smaller than those between age groups.

Figure 7.13: Aggressive violations – changes over time by age

Figure 7.14: Aggressive violations – changes over time by sex
The category of aggressive violations was introduced by Parker et al. (1995). They held that, while all violations could be seen as being motivated by a need to make progress, aggressive violations also had a social component. Thus, ‘cross a junction knowing that the traffic lights had turned’ is a violation, while ‘race away from traffic lights with the intention of beating other drivers’ is an aggressive violation.

Figure 7.13 and Figure 7.14 show that, like violations, aggressive violations increased over time for both younger and older age groups and for males and females; younger drivers reported committing aggressive violations more than older ones, and males reported doing so more than females. Once again, the differences between males and females are smaller than those between age groups.

As will be seen in Section 9, there was a considerable degree of inter-correlation among the five Driver Behaviour Questionnaire variables. For example, aggressive violations were highly correlated with both violations and errors, and slips were highly correlated with both errors and inexperience errors. Also of interest is the high correlation between errors and violations, indicating that the same people tended to report both types of behaviour.

7.6 Hazard involvement

A further measure of self-reported driving behaviour data was collected in the Driver Experience Questionnaires using the seven-item hazard involvement scale developed by Quimby et al. (1999). The instrument was designed to measure the frequency with which drivers become involved in hazardous situations through a lack of awareness, on a six-point scale ranging from ‘never’ to ‘nearly all the time’. The higher the score, the more often drivers report being involved in hazardous situations (Figure 7.15).
Overall, respondents reported being involved in hazardous situations only infrequently when driving in the first three years. There was little change over time, and the scores were greater for the younger compared with the older age group. There were no differences between the hazard involvement scores of males and females (see Volume 2: Appendix G, Table G11).

7.7 Learning experience and attitudes

It is well established in the literature that both attitudes and self-reported behaviours have an influence on accident liability. It was clearly demonstrated in the Cohort I study (Maycock and Forsyth, 1997), and in more specific studies Parker et al. (1995) have linked the commission of driving errors and violations to increased accident risk, Quimby et al. (1999) have associated an increased risk of accident involvement with some aspects of self-reported driving style, and West and Hall (1998) have shown a relationship between drivers’ attitudes towards driving violations and accident risk.

By contrast, very little is known about how patterns of learning to drive influence the development of attitudes and behaviours that could influence road safety. Much of the research effort in the past has looked at attitudes as independent variables that could influence outcomes, rather than treating attitudes as dependent variables that can be influenced by preceding conditions. An exploration of how different experiences of learning to drive influence attitudes and behaviour could provide an indication of the ways to promote desirable attitudes and behaviours during the learning process.

To this end, a preliminary analysis was carried out on the data from the six-month follow-up survey to examine the effect of a range of learning to drive variables on attitudes and self-reported behaviour. The results showed that, at face value, the univariate analyses seemed to provide some indication that differences in learning to drive characteristics could have an effect on subsequent attitudes and behaviour. However, the effect sizes were, at best, only small, and more importantly some, or many, of the effects could be attributable more to demographics such as age and sex than to the learning process. The conclusion must be that univariate analysis is not well-suited to answering the question of whether learning experiences influence attitudes. This is a multivariate problem and, as such, will be considered more fully in Section 9.

7.7.1 Hazard perception and attitudes

A comparison was made between the first four cohorts (A to D) and the last four cohorts (M to P) in order to see whether there were any differences in attitudes and self-reported behaviours that might be attributable to the introduction of the hazard perception component into the theory test. The analyses were confined to the data
from the first six months, since this is the period when any effects of hazard perception should be most apparent.

Examination of the data showed that differences between the two sub-samples were small, and often of negligible magnitude, and suggests that there is little evidence – at a univariate level – that hazard perception has affected attitudes or self-reported behaviours. Multivariate analysis of the effects of introducing hazard perception on accident liability will be considered later in the report.

7.8 Comparison with Cohort I

Attitudes and opinions were examined in the first cohort study (Forsyth, 1992b). The driver style scales (Guppy et al., 1990) and the violation scales from Reason et al. (1990) were directly comparable with the present study, and both of these showed similar patterns of age and sex differences, where younger drivers and male drivers reported less desirable behaviours than did older and female drivers. Also directly comparable were the ‘comparison of self with others’ scales. These indicate that the new generation of Cohort II drivers considered themselves to be less skilled, less cautious and less likely to avoid risky situations than did their counterparts in the earlier study, but that they were also less likely than those in the earlier study to report that they drove faster than their peers.

7.9 Discussion and implications

The pattern of age and sex differences in attitudes and self-reported behaviours identified in this study are consistent with much of the research in the field. However, this study has additionally provided an opportunity to investigate how such behavioural variables develop and change as new drivers gain experience in the first three years of driving. The self-report measures collected in this study were, on the whole, remarkably stable over time, suggesting that new drivers tend to enter the driving population with fairly fixed ideas about themselves, both in absolute terms and in relation to others. It is also the case that, where changes do occur over time, they are not usually in a direction that would benefit road safety, such as the observed increase in self-reported violations and aggressive violations over the four surveys. This could imply that efforts to improve attitudes to safety need to be made as early as possible in a new driver’s career, and ideally before driving is started.
7.10 Summary

The main focus in this section has been on how attitudes and self-reported behaviours change over the first three years of driving, and how they differ by age and sex:

- Male respondents to the follow-up surveys had a higher opinion of, and more confidence in, their driving ability than did females, and younger respondents regarded themselves in a more favourable light than did older respondents.

- Male respondents reported having a less safe driving style than did females, and also reported committing more violations when driving, as did younger respondents when compared with older ones.

- The measures of attitude and self-reported behaviour were, on the whole, remarkably stable over the four follow-up surveys. Where changes were observed, they were generally small in magnitude.

- However, when new drivers entered the driving population they had relatively high levels of confidence in their driving ability, but after six months their confidence was much lower and did not appear to change to any great extent in the subsequent time periods.
8 SELF-REPORTED ACCIDENT INVOLVEMENT OF NEW DRIVERS

8.1 Introduction

This section describes the extent to which respondents were involved in accidents after passing the practical test, based on their responses in the Driver Experience Questionnaires completed after 6, 12, 24 and 36 months. It also provides an analysis of ‘near-accidents’ – on-road incidents in which a driver has had the impression of only just avoiding an accident. It does not consider statistical models which quantify the relationship between accident numbers and the associated variables – these are presented in Section 9. It should be noted that these are self-reported accidents and it is possible that those having accidents may be less likely than those without accidents to return the questionnaires. There is, thus, a potential under-reporting, especially of more serious accidents.

Accidents are relatively uncommon events, and most of those reported in this study were damage only accidents, involving no injury. There is no requirement to report damage only accidents to the police and they are not included in the national STATS19 accident records.

Since the reporting periods are of different durations (the first two are six months, the latter two are 12 months), an annualised rate has been calculated. For the purpose of this calculation, the six-month rates for the first two reporting periods have been doubled.

8.1.1 Types of accident

For the purpose of the analysis, accidents have been grouped into a number of non-exclusive categories:

- all accidents;
- public road accidents (i.e. accidents in car parks, private drives, etc., have been omitted);
- non-low-speed public road accidents (i.e. further omitting accidents classified by respondents as low-speed manoeuvring accidents);
- non-low-speed public road accidents where an element of blame is accepted by the driver; and
- ‘active’ public road accidents in which the first event involves the driver hitting another road user or object.

23 This definition was first proposed by West (1997).
In the case of most of these categories, the accident analyses reported in this section have been aggregated across sex and age. In the case of public road accidents however, a more detailed analysis has been carried out. For this group of accidents, accident involvement has been related by sex and age to other variables – specifically, exposure measures, driving experience and the amount of preparation the driver had undertaken for the practical test. The information about preparing for the test was derived from responses to the Learning to Drive Questionnaire.

8.2 Near-accidents

Figure 8.1 shows the distribution of the number of near-accidents reported in each of the four reporting periods and shows that at least 70% of respondents in each of the survey periods had experienced at least one near-accident. The mean annualised number of ‘near-accidents’ is also shown below Figure 8.1. For the purpose of this calculation of annualised rate, the six-month rates for the first two reporting periods have been doubled.

The data presented in Figure 8.1 gives the impression that the distribution of near-accidents is quite similar in all four reporting periods. However, the first two bars in the diagram reflect six-month periods, whereas the third and fourth bars reflect 12-month periods, so they cannot be directly compared. If the mean annualised near-accident rates shown below Figure 8.1 are considered, the rate is almost twice as high in the first two six-month periods as in the later years or, put another way, there is a drop of just over 40% in this rate between the first and second years of driving. These figures do not, however, take account of any changes in exposure to risk over the three-year period.
8.3 The characteristics of the ‘all accidents’ category

8.3.1 Accidents by reporting period

The analyses in this section have been based on all the accidents reported by respondents. The total numbers reported are given in Table 8.1. Overall, 19% of respondents reported an accident of some sort in the first six months after passing the test. The distribution of the number of accidents in each reporting period is shown in Figure 8.2. The mean annualised rates are given below Figure 8.2. The highest accident rate occurred in the first six months of driving (equivalent to a rate of 0.44 accidents per year), and this rate dropped by over 40% in the next six months to an equivalent of 0.24 accidents per year. In the second year of driving, the accident rate fell a further 35% to 0.17 accidents per year, and remained virtually unchanged in the third year.

Table 8.1 and Figure 8.2 relate to all accidents regardless of the type of accident. It is of interest to explore how this overall picture is composed of accidents of different types. Again, it should be noted that the figures take no account of changes in exposure to risk over the three-year period.

<table>
<thead>
<tr>
<th>Reporting period</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>13–24 months</th>
<th>25–36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total reported accidents in period</td>
<td>2,161</td>
<td>857</td>
<td>694</td>
<td>423</td>
</tr>
<tr>
<td>Number of respondents</td>
<td>9,736</td>
<td>7,190</td>
<td>4,092</td>
<td>2,696</td>
</tr>
</tbody>
</table>

Figure 8.2: Distribution of all reported accidents by reporting period

- None: 81%
- One: 16%
- Two: 10%
- Three: 1%

1–6 months, mean rate = 0.44 p.a.
7–12 months, mean rate = 0.24 p.a.
13–24 months, mean rate = 0.17 p.a.
25–36 months, mean rate = 0.16 p.a.
8.3.2 Accidents by type

The Driver Experience Questionnaires requested details of respondents’ three most recent accidents in each reporting period. This enabled the accidents to be classified into the four sub-categories described in Section 8.1.1. Figure 8.3 shows the mean annualised accident rates for ‘all accidents’ and for the four sub-categories of accidents, by reporting period.

Figure 8.3 shows that, in general, the mean annualised rate of all categories of accident fell as the new drivers gained experience. The proportionate rate for accidents occurring on public roads increased over time from about 60% of the rate for ‘all accidents’ in the first six months (0.27 per year compared with 0.44 per year) to nearly 80% in the second year of driving (0.17 per year compared with 0.13 per year).

The mean annualised accident rate for ‘active’ public road accidents was very similar to that for non-low-speed public road accidents. Each of these types of accident represents between a third and a half of the total number of public road accidents.

8.3.3 Location of reported accidents

The majority of accidents that were not on a public road occurred in a car park or service area; a private driveway was the most common location for the remainder. Table 8.2 shows the total number of reported accidents per reporting period by the location of the accident.
Figure 8.4 shows that, as the new drivers in this study gained experience (i.e. in the later reporting periods), their accident rate in all locations reduced.

As the proportionate rate of accidents occurring on the public road increased, that occurring in car parks or private drives reduced (from about a third in the first six months of driving – a rate of 0.15 per year compared with 0.44 per year – to below 20% in the second year of driving – 0.03 per year compared with 0.17 per year). This may be due to improvements in respondents’ manoeuvring skills and, possibly, to respondents doing an increasing proportion of their driving on public roads.

<table>
<thead>
<tr>
<th>Table 8.2: Total number of reported accidents by location and reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Public road</td>
</tr>
<tr>
<td>Car park, service area or petrol station</td>
</tr>
<tr>
<td>Private driveway</td>
</tr>
<tr>
<td>Private road</td>
</tr>
<tr>
<td>Somewhere else</td>
</tr>
<tr>
<td>Number of respondents</td>
</tr>
</tbody>
</table>

8.3.4 Reported injury accidents

Respondents were asked to report whether there were injuries to themselves or to others as a result of each accident. If injuries were involved, they were asked to classify them as slight (cuts and bruises), serious (needing hospital care) or fatal.
(someone was killed). Only a minority of all reported accidents (526 out of 4,135, 13% overall) involved any injury. Very few fatalities were involved in any of the reported accidents, so that, in what follows, fatal and serious injury accidents have been combined to form a total representing accidents in which someone (not necessarily the respondent) was seriously injured or someone else was killed.

Table 8.3 shows the mean annualised rate of reported accidents in the four study periods by accident severity. It will be seen that the ‘any injury’ accident rate, after falling from a rather higher rate in the first six months of driving, remained fairly constant over the following two and a half years. The severity ratio (ratio of the total number of injury accidents to all accidents), however, shows a continuous increase in accident severity over time. This is consistent with the finding that, with increasing experience, drivers had more accidents on the public road and fewer accidents in car parks and private drives. However, it is important to note that the absolute numbers are very small and may be reduced by the possibility that people who had injury accidents were less likely to return the questionnaires.

<table>
<thead>
<tr>
<th>Injury severity</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>13–24 months</th>
<th>25–36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.397</td>
<td>0.208</td>
<td>0.143</td>
<td>0.127</td>
</tr>
<tr>
<td>Slight</td>
<td>0.035</td>
<td>0.023</td>
<td>0.020</td>
<td>0.024</td>
</tr>
<tr>
<td>Killed or seriously injured (KSI)</td>
<td>0.012</td>
<td>0.008</td>
<td>0.007</td>
<td>0.006</td>
</tr>
<tr>
<td>Any injury</td>
<td>0.047</td>
<td>0.030</td>
<td>0.026</td>
<td>0.030</td>
</tr>
<tr>
<td>Severity ratio (see text for definition)</td>
<td>0.11</td>
<td>0.13</td>
<td>0.16</td>
<td>0.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Count of reported accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>Slight</td>
</tr>
<tr>
<td>KSI</td>
</tr>
<tr>
<td>Respondents</td>
</tr>
</tbody>
</table>

### 8.4 Reported accidents – public road accidents

Any accident that occurs on a public road and involves injury should be reported to the police and recorded on the national STATS19 database. However, the public road accidents discussed in this section include those classified by respondents as a ‘low-speed manoeuvring accident’ and as a ‘minor bump or scrape’ – categories which are less likely to result in injury and thus are unlikely to appear in the national accident records.
8.4.1 Public road accidents by age and sex

The mean annualised reported rate of public road accidents has been estimated for males and females by age\(^{24}\) of the respondent. These are given in Table 8.4. The fall in accident rates over the first two years of driving is clear; however, the rate in the third year of driving was slightly higher than that in the second year of driving.

<table>
<thead>
<tr>
<th>Sex of respondent</th>
<th>Reporting period</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>13–24 months</th>
<th>25–36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td></td>
<td>0.249 (n = 6,190)</td>
<td>0.158 (n = 4,656)</td>
<td>0.116 (n = 2,714)</td>
<td>0.136 (n = 1,829)</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td>0.311 (n = 3,479)</td>
<td>0.191 (n = 2,486)</td>
<td>0.163 (n = 1,353)</td>
<td>0.167 (n = 849)</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>0.271 (n = 9,669)</td>
<td>0.169 (n = 7,142)</td>
<td>0.132 (n = 4,067)</td>
<td>0.146 (n = 2,678)</td>
</tr>
</tbody>
</table>

Figure 8.5 and Figure 8.6 show the mean annualised public road accident rate for female and male respondents by age group and reporting period. In general, the relationship between mean annualised accident rate and age was similar for male drivers and female drivers. Overall, female respondents had a lower accident rate per year than males (Table 8.4). These results have, however, not taken account of exposure to risk (annual mileage).

In the first six months of driving the 17-, 18- and 19-year-old groups had the highest annualised accident rates, and these rates decreased over time (as shown in Figure 8.5). Accident rates for the older groups were lower, reducing with age. The accident rates in the second six-month period (i.e. 7 to 12 months after passing the practical test), and in the second and third years of driving, were generally lower than the rates in the first six months of driving, and were less influenced by the age of the driver. The considerable fluctuations in the data which reflect the relatively small sample sizes involved, particularly for the older drivers (nearly 75% of the sample was under 25 years of age) make other trends difficult to identify.

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24 The age here and in all later analyses is the age at which the respondent took the practical driving test, not the age at which they completed a specific questionnaire.
8.4.2 Types of road where the reported public road accidents occurred

Most respondents who had accidents in the first six months reported having more than half of those accidents in towns or city centres. As the drivers became more experienced, the proportion of accidents in towns or on city roads decreased, and the proportion of accidents on fast dual-carriageways and on motorways increased.
correspondingly. This is likely to be an exposure effect, with drivers making more use of faster roads as they become more experienced.

Table 8.5 shows mean annualised reported accident rates on the different classes of road for the four reporting periods. As the earlier analyses have shown, annualised accident rates decreased as respondents gained more driving experience. The decrease was most marked for accidents that occurred in towns or city centres, where the rate dropped from 0.167 to 0.105 (40%) between the first two six-month periods and from 0.105 to 0.074 (a further 25%) between the second six-month period and the last two years of driving.

<table>
<thead>
<tr>
<th>Road type</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–6 months</td>
</tr>
<tr>
<td>Town or city centre</td>
<td>0.167</td>
</tr>
<tr>
<td>Country roads</td>
<td>0.068</td>
</tr>
<tr>
<td>Fast dual-carriageways</td>
<td>0.021</td>
</tr>
<tr>
<td>Motorways</td>
<td>0.005</td>
</tr>
<tr>
<td>Elsewhere</td>
<td>0.031</td>
</tr>
</tbody>
</table>

8.4.3 **Blame for the accident**

Respondents who reported accidents were asked to what extent they thought that they were to blame for the accident. The distribution of responses is given in Figure 8.7. This shows that the proportion of drivers claiming to be ‘not at all’ to blame for the accident increased from about 38% in the first six months of driving to 48% for those who had been driving for two years. More than 20% of respondents in all the reporting periods assessed themselves as ‘entirely to blame’.

**Figure 8.7: Distribution of reported public road accidents by extent of blame for the accident and reporting period**

<table>
<thead>
<tr>
<th>Reporting period</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>13–24 months</th>
<th>25–36 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>No blame</td>
<td>38</td>
<td>43</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>A little blame</td>
<td>24</td>
<td>24</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Quite a lot of blame</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Entirely to blame</td>
<td>26</td>
<td>21</td>
<td>21</td>
<td>23</td>
</tr>
</tbody>
</table>
8.4.4 What happened first?

Figure 8.8 shows what respondents said happened first in the accident. For all but the third reporting period, the most common response (about a third of accidents) was that the respondent hit another vehicle in the side or rear (one type of ‘active’ accident). This proportion changed very little as driver experience increased. By contrast, the percentage of accidents in which another driver hit the respondent’s car in the side or rear (one type of ‘passive’ accident) increased from about 30% in the first year of driving to 39% in the second year of driving, dropping back to 28% in the third year of driving. The percentage of accidents involving hitting roadside objects decreased from 17% in the first six months of driving to 11% in the second year of driving, but went back up to 18% in the third year of driving.

Overall, approximately 55% of accidents fell into the ‘active’ category while 40% could be described as ‘passive’ (with 5% ‘other’). The 40% figure is similar to the percentage of accidents in which respondents claimed to be ‘not at all’ to blame in the first year of driving (see Figure 8.7), which suggests some consistency between the subjective idea of blame and the more objective description of how the accident occurred. Overall, the pattern of ‘active’ and ‘passive’ accidents in the terms shown in Figure 8.8 changed relatively little with increasing experience. The number of reported accidents together with the number of respondents are given in Table 8.6.
8.4.5 Weather conditions

Respondents who reported accidents were asked what the weather was like at the time of the accident using four categories: ‘dry’, ‘raining’, ‘fog’ or ‘snow or ice on the road’.

More than 70% of accidents happened in dry conditions and about 20% when it was raining (see Table 8.7). Very few of the reported accidents occurred when there was snow or ice on the road, and hardly any in fog, perhaps reflecting the relatively limited exposure of drivers to these conditions (see Section 6).

<table>
<thead>
<tr>
<th>Weather</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–6 months</td>
</tr>
<tr>
<td>Dry</td>
<td>1,747 (75%)</td>
</tr>
<tr>
<td>Raining</td>
<td>479 (20%)</td>
</tr>
<tr>
<td>Fog</td>
<td>32 (1%)</td>
</tr>
<tr>
<td>Ice/snow</td>
<td>84 (4%)</td>
</tr>
<tr>
<td>Number of accidents</td>
<td>2,342</td>
</tr>
</tbody>
</table>

8.4.6 Traffic conditions

Respondents were also asked to provide an assessment of traffic conditions at the time of the accident, in one of four categories: ‘very busy’, ‘busy’, ‘not very busy’ and ‘not at all busy’. The numbers and distribution of responses in each reporting period is shown in Table 8.8 and grouped into either ‘busy’ or ‘not busy’ categories in Figure 8.9.
Over the four time periods, between 10% and 20% of the accidents occurred in ‘very busy’ conditions. A rather higher percentage of the accidents (between 23% and 30%) occurred when the traffic conditions were recorded as ‘busy’ or ‘not very busy’, and an even higher percentage (between 27% and 40%) when the traffic was classified as ‘not at all busy’.

Table 8.8: Distribution of accidents by traffic conditions

<table>
<thead>
<tr>
<th>Traffic condition</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–6 months</td>
</tr>
<tr>
<td>Very busy</td>
<td>236 (14%)</td>
</tr>
<tr>
<td>Busy</td>
<td>439 (25%)</td>
</tr>
<tr>
<td>Not very busy</td>
<td>461 (27%)</td>
</tr>
<tr>
<td>Not at all busy</td>
<td>599 (35%)</td>
</tr>
<tr>
<td>Number of accidents</td>
<td>1,735</td>
</tr>
</tbody>
</table>

Over the four time periods, between 10% and 20% of the accidents occurred in ‘very busy’ conditions. A rather higher percentage of the accidents (between 23% and 30%) occurred when the traffic conditions were recorded as ‘busy’ or ‘not very busy’, and an even higher percentage (between 27% and 40%) when the traffic was classified as ‘not at all busy’.

Figure 8.9: Distribution of reported public road accidents by traffic conditions

8.4.7 Public road accidents by time of day

There were very few reported accidents before 6 a.m., and they peaked in the afternoon between 1 p.m. and 4 p.m. The numbers of reported accidents in the evening periods (18% to 22% occurred between 6 p.m. and midnight) were higher than in the morning periods (10% and 18% occurred between 6 a.m. and noon). The differences between reporting periods were small.

The overall pattern of results across time of day and between reporting periods probably reflects complex exposure effects – though other factors such as fatigue and social activities (including drinking) may contribute to the higher number of accidents in the evening periods.
8.4.8 **Natural light conditions**

Respondents were asked about the natural light conditions at the time of the accident – whether the accident occurred in daylight, at dawn or dusk, or in the dark. Overall, most accidents (between 65% and 70%) in all reporting periods occurred in daylight and the proportion of accidents occurring in the daylight, at dawn/dusk or in the dark were much the same throughout the first three years of driving.

8.4.9 **Purpose of journey**

Respondents were asked about the purpose of their journey at the time of the accident. More than 60% of respondents were travelling for personal reasons. The next most frequent response was for travelling to and from work (about 30%), with only a very small percentage (3% in the first six months rising to 7% in the third year) driving as a part of their work. Again, there was no indication of any systematic relationship between journey purpose and the length of time since the practical test.

8.5 **Reported non-low-speed public road accidents**

Accidents on public roads that do not involve low-speed manoeuvres are of interest because they represent accidents which are more likely to be due to driving errors or violations than to a lack of control skills. For this type of accident, therefore, the relationship between accident rate, mileage driven and sex has been examined by reporting period.

8.5.1 **Reported accident rate changes by reporting period and sex**

The change in non-low-speed public road accident rates (per year) as respondents gained experience is shown in Figure 8.3. The results are shown separately for males and females in Figure 8.10; this clearly shows that males had a higher annualised accident rate than females – though Figure 8.10 does not take any differences in exposure to risk (annual mileage) into account.
8.5.2 **Reported accident rates taking mileage driven into account**

High mileage drivers are obviously more exposed to driving than low mileage drivers and therefore to the risk of having an accident. The distribution of (annual) mileage was shown in Section 6, Table 6.3. As expected, the mileage driven by respondents increased in their second and third year of driving as they gained more experience. The average number of miles driven in the first **six months** of driving was 3,113 (median 5,000 for males and 3,600 for females); in the second **six months** it was 3,230 (median 6,000 for males and 4,000 for females); in the **second year** it was 7,007 (median 6,000 for males and 5,000 for females); and in the **third year** it was 7,261 (median 7,000 for males and 5,000 for females).

The mean annualised reported accident rates for non-low-speed public road accidents have been calculated in mileage bands\(^{25}\) for each reporting period. These are shown in Figure 8.11 for males and in Figure 8.12 for females. The figures show a clear relationship between accident rate and mileage. Female respondents generally had lower accident rates than males for similar mileages covered in all reporting periods. There was a tendency, particularly clear for females and for the higher mileages, for accident rates to be higher in the first six-month period of driving and to reduce with increasing experience. This is in line with previous research findings (e.g. Mayhew *et al.*, 2000; Maycock, 2002).

\(^{25}\) For this purpose, drivers who covered 20,000 miles or more have been included and grouped together, and the mileages driven in the two six-month reporting periods have been doubled to give an annual mileage.
These data can only provide an indication of the trend between accidents and exposure; it should be noted that the doubling of the six-month period mileages gives a relatively crude measure of absolute accident rates because accident-mileage relationships have been shown in past research to be non-linear (doubling the mileage does not double accidents).

Figure 8.11: Reported non-low-speed public road accident rate by annual mileage and reporting period (females)

Figure 8.12: Reported non-low-speed public road accident rate by annual mileage and reporting period (males)
8.5.3 Reported accident involvement in relation to preparing for the driving test

The effects on accident involvement resulting from the preparation which a driver undergoes for the driving test have been explored by analysing:

- the number hours of professional tuition;
- the amount of tuition (or practice) with friends;
- various measures of the time taken in learning to drive before taking the theory or practical test; and
- the number and type of driving faults registered on the test.

Respondents who were involved in a non-low-speed accident on a public road in their first six months of driving were compared with those who were not involved. This initial period of a driver’s experience was chosen for this analysis because, as seen in Section 8.5.2, accident involvement in non-low-speed public road accidents was highest in the first six months of driving, and it is this early period of driving where any future changes to pre-test training might be expected to have most effect.

Accident-involved respondents tended to be younger than the accident-free, and they took less time in preparing for both the theory and the practical test. These differences tended to be more pronounced for female drivers than for male drivers (see Volume 2: Appendix H, Table H1 for detailed results). However, there were no statistically significant differences for either male or female respondents between the accident-involved and accident-free drivers in the mean hours of professional tuition taken or of practice with friends. Nor were there statistically significant differences in the number of driving faults on the test (see Volume 2: Appendix H, Table H2). This makes it difficult to make firm recommendations about changes to pre-test training based only on accident involvement.

8.5.4 Reported accident involvement and measures of behaviour, attitudes and skills

The Driver Experience Questionnaires contained sets of questions that have been designed to assess various behavioural and attitudinal measures, as described in Section 7.

Mean values of the measures of driver style, driver behaviour and attitude for those who were involved in at least one non-low-speed public road accident in their first six months of driving, and for those who were not, were compared. This showed that for all these measures there was a statistically significant difference between the mean values for drivers who were accident-involved and those for drivers who were not involved (see Volume 2: Appendix H, Table H3).
Accident-free drivers tended to say they were:\(^{26}\)

- more attentive, careful, responsible and safe;
- more placid, patient, considerate and tolerant;
- less decisive, experienced, confident and fast;
- less likely to engage in behavioural violations;
- less likely to make behavioural errors;
- less likely to engage in aggressive violations;
- less likely to make behavioural slips;
- have better skills of observation, perception and anticipation; and
- more likely to have a more conservative attitude to speeding.

8.5.5 Reported accident involvement in terms of the characteristics of the car occupants

Respondents were asked if there were passengers in the car at the time of each accident and, if so, how many were male and how many were female. The rates of reported non-low-speed public road accidents for four combinations of drivers and passengers of different sexes were considered:

- a female driver with female passenger(s);
- a female driver with male passenger(s);
- a male driver with male passenger(s); and
- a male driver with female passenger(s).

Only these combinations have been considered – driving alone or with passengers of both sexes has not been included. The mean annualised rate of accidents for all four reporting periods is shown in Table 8.9.

The table suggests that, when passengers are involved, it is opposite sex combinations (male drivers with female passengers and female drivers with male passengers) that are associated with the lowest average accident rates. The effect was reduced in the later years of driving.

\(^{26}\) All these differences were statistically significant at the 5% level.
Passenger age has been shown to be associated with accident risk for young drivers (see, for example, research reviewed in Baughan et al., 2005). In the Cohort II study, the age of the oldest passenger when an accident occurred was supplied by respondents. Most drivers when they had an accident were driving either with passengers in the same age group as themselves or with passengers who were older. For example, accident-involved 17-year-old drivers were not likely to be carrying passengers in the 17–18-year-old group, but who could be anything from 16 to over 30. (The joint age distribution of drivers and oldest passengers is shown in Volume 2: Appendix H, Table H4.) However, this variation of accident frequency with age of passenger tells us more about the amount of driving people do with passengers of different ages than it does about the influence of passenger age on driver behaviour. In other words, the pattern of results is, again, likely to be dominated by exposure effects. The study cannot determine whether older passengers have a moderating effect on the behaviour of young or new drivers.

### Table 8.9: Reported mean accident rate (annualised) by sex of driver and passenger

<table>
<thead>
<tr>
<th>Sex of driver and passenger</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–6 months</td>
</tr>
<tr>
<td>Female driver and passenger(s)</td>
<td>0.019</td>
</tr>
<tr>
<td>Male driver and passenger(s)</td>
<td>0.019</td>
</tr>
<tr>
<td>Female driver and male passenger(s)</td>
<td>0.012</td>
</tr>
<tr>
<td>Male driver and female passenger(s)</td>
<td>0.010</td>
</tr>
</tbody>
</table>

8.6 Reported ‘active’ accidents and hazard perception

One hypothesis is that the effect of having taken a theory test which included hazard perception is likely to be greatest on accidents where the driver is responsible for the accident (‘active’ accidents) and during the first six months of driving. There are, however, several other potential factors that could also affect the accident rate in this period (including the total amount of driving and the frequency of driving).

A composite exposure measure will be used in Section 9 when modelling accidents, that combines annual mileage driven and the frequency of driving. This exposure measure is defined as the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven.\(^{27}\) Figure 8.13 shows the relationship between this exposure measure and the annualised accident rate for ‘active’ accidents in the first six months of driving for respondents who took the hazard perception component of the theory test and for those who did not. As expected, there was a clear increase in the accident rate with increasing exposure. However, there was no clear difference between the accident rates of those who took the hazard perception component of the theory test and those who did not when considering these univariate analyses (see Section 9 for multivariate analysis where this is explored in more detail).

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\(^{27}\) This measure has been derived to optimise the fit of models developed in Section 9.
The relationship between the annualised reported accident rate for ‘active’ accidents in the first six months and the age of the respondents when they passed their test is given in Figure 8.14. This clearly shows that older new drivers had a lower accident rate than young new drivers. Again, however, there was no clear difference between the accident rates of those who took the hazard perception component of the theory test and those who did not, using these univariate analyses, but this is explored further by multivariate analyses in Section 9.

Examining ‘active’ accident rates in the first six months by the number of months between starting to drive and passing the practical driving test showed no clear difference between those who had taken the hazard perception component of the theory test and those who had not.

There was, as already mentioned, a difference in annualised accident rates for male and female drivers, and accident rates changed as driving experience developed.

Figure 8.15 shows how the annualised ‘active’ accident rate fell for males and females as drivers became more experienced during their first year of driving. Male respondents clearly had a higher annualised accident rate than female drivers. However, it is still difficult to distinguish much difference between drivers who took the hazard perception component of the theory test and those who did not. In considering the results in Figure 8.15, it needs to be borne in mind that neither age
Figure 8.14: Reported 'active' accident rate (first six months) by age and type of theory test taken

Figure 8.15: Reported 'active' reported public road accident rate by reporting period and sex
nor exposure has been controlled for. These factors will certainly have an affect when comparing sex differences and will be included in the multivariate analyses in Section 9.

The analyses presented in this sub-section indicate that there were significant relationships between annualised ‘active’ accident rate and driver age, exposure and the increasing experience of the driver. When investigating the effect of having taken the hazard perception component of the theory test, these variables need to be properly controlled. This will be addressed by using the multivariate modelling reported in Section 9.

8.7 Comparison with Cohort I

Comparisons between Cohort I and Cohort II are confounded by the way accidents were defined in the two studies. Cohort I asked about ‘accidents’, without any definition being presented. In the Cohort II study the question asked about accidents ‘regardless of how they were caused, how slight they were, or where they happened’. Additional questions were then included to allow better definition of public road accidents by specifically asking about accidents in car parks, private roads and driveways, some of which may have been included within the Cohort I accidents. The Cohort II questions also enabled separation of low-speed manoeuvring accidents and ‘bumps and scrapes’. Some of these will have been included in the accidents reported in Cohort I. Comparisons are, therefore, only possible at a general level. In Cohort I, data were also collected for full years only so that the important issue of early accident involvement (the first six months) was not explored.

Overall, reported accident involvement gives a mixed picture when comparing Cohort II with Cohort I. Looking at the full year data for the second year of driving, the mean annualised reported accident rate for males was higher in Cohort I than in Cohort II (0.179 compared with 0.163). The equivalent accident rates for females were lower but show less difference at 0.113 and 0.116, and the third year data show an opposite effect (males in Cohort II reporting more accidents than in Cohort I). However, since the accident definitions are not matched, these differences may be an artefact of the question wording.

8.8 Discussion and implications

The finding that respondents have higher accident rates in their early months of driving is consistent with previous research in this area (e.g. Maycock et al., 1991). The results reported here are also consistent with the findings by Maycock which show that new drivers who start driving when they are older have lower accident rates than those starting when they are young.
As stated in Section 2, it would have been possible to consider a very wide range of variables in relation to accident rates. However, the analyses reported in the present section have, in the main, looked at variables which were also found to be of importance in the multivariate analysis described in Section 9.

It is important to recognise that the accidents described in this section were self-reported accidents and include all accidents, wherever they occurred and whether or not they involved injury. They are, therefore, not comparable with national accident data from the STATS19 database, which only includes accidents on public roads that involved injury.

The overall mean reported annualised accident rate decreased with experience but it is clear that the type of accident reported by Cohort II respondents changed over time. There was a reduction in the proportion of accidents taking place in car parks and private drives, and a corresponding increase in the proportion occurring on public roads. This suggests that new drivers are improving the skills involved in manoeuvring in confined spaces as they gain overall driving experience, but it may also be associated with a change in where driving takes place.

In the early stages of their driving, respondents were apparently aware of their lack of skill because they were likely to accept some or all of the blame for their accidents. However, with increasing experience the percentage of accidents for which respondents accepted at least some blame dropped from 62% to 52%, possibly reflecting some improvement in skill, either actual or perceived.

As new drivers gained experience over time they were more likely to report an accident which involved injury. This is also probably related to the fact that they reported an increasing percentage of accidents on public roads, where traffic speeds and the potential for injury are higher.

Although it is recognised that respondents may have had difficulty in making accurate estimates of their mileage in each survey period, there was a clear indication of reported annualised accident rates increasing with increasing exposure (mileage).

Owing to the complexity of the relationships between accidents, exposure, experience and other factors, conclusions have not been drawn from the univariate analyses of data described in this section. The implications for accident involvement will be discussed in Section 9 where the multivariate analyses are described.

8.9 Summary

This section has considered the accident experience of drivers in their first three years of driving in relation to a range of personal and exposure factors. The
approach used has been largely descriptive, and more complex statistical models will be presented in Section 9:

- As respondents gained experience of driving, the number of accidents they reported and their corresponding annualised accident rates decreased.
- There was a clear increase in the accident rate with increasing exposure (mileage).
- The severity ratio of the accidents occurring increased over time – this corresponds to a reduction in the proportion of accidents taking place in car parks and private drives, and an increase in the proportion occurring on public roads.
- The relationship between the age of respondents when they passed the practical test and accidents followed the pattern of earlier studies in showing that, in the first six months of driving, older respondents had a lower annualised accident rate than younger ones. Moreover, this relationship decreased systematically.
- In this study, the age effect was clearest for respondents in the first year of driving (i.e. new drivers at different ages).
- In the second and third years of driving, the age effect on accident rates was relatively small and the trend with age was more difficult to discern because of data scatter and relatively small numbers.
- About 40% of accidents were classified as ‘passive’ (i.e. the first thing which happened in the accident was that another driver hit the respondent’s car).
- In a similar number of accidents (around 40%, though this increased slightly in later reporting periods) the respondent claimed to have been not at all to blame for the accident.
- Most accidents occurred in dry conditions and during daylight hours.
- No link was found between accident involvement and journey purpose.

An attempt was made to identify the key training and personal factors that can distinguish an accident-involved driver from one who is not accident-involved. Using non-low-speed public road accidents reported in the first six months of driving, the analysis showed that the amount of professional tuition and the number of driving faults recorded on test did not distinguish the accident-involved from the accident-free, but that some aspects of the time taken to prepare for the test did, especially for female drivers.

A higher proportion of respondents were accident-free if they said they were:
- more attentive and careful;
- more placid and patient;
- less decisive, experienced, confident and fast;
• less likely to engage in behavioural violations;
• less likely to make behaviour errors;
• less likely to engage in aggressive violations;
• less likely to make behavioural slips;
• have better skills in observation, perception and anticipation;
• more likely to have a conservative attitude to speeding.

There was no clear difference between the accident rates of those who took the hazard perception component of the theory test and those who did not when considering univariate analyses in this section.
9 ACCIDENT MODELLING

A considerable amount of information relating to various aspects of drivers’ experience in learning to drive and their driving record after having passed the practical driving test was collected using the Learning to Drive Questionnaire and the Driver Experience Questionnaires described earlier. Section 8 of this report presented a basic analysis of this data in which reported accidents were related to key driver variables. This section now examines some aspects of these relations in greater depth, and describes statistical models which allow the effects on reported accidents of age, sex, experience and exposure to risk to be established. The models are used to control for the effects of these variables while investigating the relation between reported accidents and the learning to drive and driver experience variables describing pre-test driving experience, driver attitudes, self-reported driving style and various types of self-reported driving behaviour.

A further aim of the statistical modelling was to assess the impact that introducing hazard perception testing to the theory test has had on new driver safety.

For the purposes of this section there is a focus on the first 12 months after the test. This is the period in which the effects of pre-test experience are most likely to be seen. As drivers gain more experience it is likely that their post-test experiences will outweigh the effects of initial training and testing. However, analysis of the effects on later accident liability are included in Appendix 5.

Only the main findings are summarised in this section. Other findings, the details of the modelling process and the characteristics of the variables used are included in Appendix 5.

9.1 The modelling method

The modelling reported in this section uses a multivariate regression method known as Generalised Linear Modelling (GLM). Multivariate regression is designed to explore the relationship between a ‘dependent’ or ‘response’ variable (the $y$ variable) and any number of ‘independent’ or ‘explanatory’ variables (the $x$ variables) upon which the $y$ variable is assumed to depend, and which are correlated with one another to varying degrees. In the present analysis, the $y$ variable to be modelled is the predicted annualised reported accident rate in a given period – i.e. the predicted number of accidents in the period divided by the duration of the period in years or fractions of a year. In previous TRL work, e.g. Maycock et al. (1991), this variable has been termed accident liability, a practice that will be followed here as well.

The choice of the model form and the choice of the variables included were based on the work carried out in the Cohort I study. The modelling process involved:
(i) establishing, statistically, the extent to which drivers’ reported accidents were related to age, sex, experience and exposure – this resulted in a ‘base’ model; and

(ii) determining the influence of a range of variables on drivers’ accident liability by adding these other variables to the ‘base’ model.

Stage (ii) had several components. First, each variable was added individually to the ‘base’ model to establish whether the unexplained variation in accident liability was reduced by a statistically significant amount. This provided a measure of the explanatory power of each variable fitted to the ‘base’ model on its own, and avoided the problems of interpreting the coefficients of the variables in a model in which a number of correlated explanatory variables have been jointly added. However, if there were strong inter-correlations between the explanatory variables, then this relatively simple approach would not do adequate justice to the more complex relationships existing between the variables. This issue was addressed by fitting additional generalised linear models, which included as many of the learning to drive and driver experience variables as were statistically significant when they were together added to the ‘base’ model.

9.1.1 Types of accident

In Section 8, reported accidents were grouped into a number of non-exclusive categories:

- all accidents;
- public road accidents (i.e. accidents in car parks, private drives, etc., have been omitted);
- non-low-speed public road accidents (i.e. further omitting accidents classified by respondents as low-speed manoeuvring accidents);
- non-low-speed public road accidents where an element of blame is accepted by the driver; and
- ‘active’ public road accidents in which the first event involves the driver hitting another road user or object.

Most of the analyses in this section have been carried out on total reported public road accidents since these provide the most general index of road safety. However, when looking at the association of hazard perception testing with accident liability, sub-categories of public road accidents are also reported.

28 This definition was first proposed by West (1997).
9.1.2 The number of reporting periods

Accidents were modelled in three ways:

(i) Models were developed for each of the four reporting periods treated as independent datasets. (This helps to identify changes in the relative importance of different variables as drivers gain experience over time.)

(ii) A ‘first year’ model was fitted which incorporated the data from the Driver Experience Questionnaires covering the first two reporting periods (i.e. up to 12 months after passing the practical test).

(iii) An ‘all periods’ model was fitted which incorporated the data from all of the Driver Experience Questionnaires returned – i.e. including the reporting periods for the first 6 months, 7–12 months, 13–24 months and 25–36 months.

The statistical power of these analyses varies because of the increase in sample size produced by combining the data for periods 1 and 2 (for the ‘first year’ models) or from all four reporting periods for the ‘all periods’ models.

The first year of driving is assumed to be where the maximum effect of pre-test experience will be seen. As drivers gain experience, this is likely to dilute the specific effects of what they did prior to the test. Therefore, for the purpose of this section, only results from the ‘first year’ model are reported and commented upon in any detail. Results from this period were, in general, similar to those from all periods combined, and when there are important differences they are mentioned in the text. Modelling results from individual reporting periods tended not to reach statistical significance – which is unsurprising in view of the much reduced statistical power of these analyses. For completeness, many analyses of the other periods are included in Appendix 5.

9.2 The model variables and form

9.2.1 The model variables

The ‘base’ model, as defined above, includes variables which influence a respondent’s accident liability (age, sex, experience and exposure) but they are not the main modelling variables of interest, they simply need controlling for when looking at other potential influences. In this modelling context (as in the rest of this report) age is taken as the age at which the respondent passed the practical driving test. The experience measure is simply the number of years the respondent has been driving. Exposure is a composite measure which includes the annualised mileage driven within the reporting period plus a factor to allow for the frequency of driving as defined in Section 8.6.
The main modelling variables of interest have been taken from the Driver Experience Questionnaire, the Learning to Drive Questionnaire and from data supplied by the Driving Standards Agency (DSA) on hazard perception scores. Each of the variables of interest is described in the sub-section where it is reported. The datasets used in different analyses vary to a small degree because of missing data.

9.2.2 The general form of the accident model

The model form for analysing accidents requires that the dependent variable (accident liability) is transformed using a logarithmic function, so that the variability in the data can be appropriately handled by modelling software.

The form of the model used for the ‘first year’ model thus has a dependent variable \(y\) which is the logarithm of annualised accidents, and independent variables \(x\). The ‘base’ model includes a constant term plus the independent variables age, sex, experience and exposure. Models investigating a specific driver experience or learning to drive measure include an additional term for this as well as the ‘base’ model terms.

The inclusion of any modelling terms is determined by the associated statistical significance, i.e. the term should be statistically significantly different from zero in order to be included in the model. Here the 5% level of significance has been used. Further details of the terms used and the structure of the models can be found in Section A5.2 in Appendix 5.

9.3 Modelling public road accidents

9.3.1 ‘Base’ model for public road accidents

An example of a ‘base’ model for public road accidents for the first year of driving is described below, and illustrates the basic structure of models used for the analysis reported here:

\[
\text{Public road accident liability} = \exp(k_{\text{sex}})(\text{exposure})^{0.407} \exp(-0.69 \text{ sex} + 15.13 / \text{AGE} + 14.53 \text{ sex} / \text{AGE} - 1.01 \text{ experience})
\]

This first year ‘base’ model shows that:

- the exposure coefficient is 0.407, which is similar to that found from previous studies;

- the age at which people passed the test has a statistically significant effect on accident liability. This applied overall but with a different parameter for females and males. Sex is coded as 0 = female and 1 = male, therefore the AGE parameter for females is 15.13 and for males is \((15.13 + 14.53) = 29.66\);

- the term \(k_{\text{sex}}\) takes the value \(-5.44\) for females and \(-6.13\) for males; and
• in their second six months of driving, people have a lower underlying estimated accident liability since the associated experience parameter value is negative. (Experience is coded as 0.25 for those who are reporting the first six months of driving and 0.75 for those reporting their second six months of driving.)

Figure 9.1 shows accident liabilities for males and females in their second six months of driving computed from this ‘first year’ model for reported public road accidents, assuming they have an exposure measure of either 2,000 units or 10,000 units. The model suggests that older female drivers in their second six months of driving have a slightly higher public road accident liability than equivalent male drivers, whereas younger female drivers have a lower accident liability than males of the same age. The age at which males and females have the same estimated accident liability varies according to the exposure value used.

Figure 9.1 shows slices of the three-dimensional relationship between accident liability, age, and exposure taken at two different exposure values where experience has been fixed at 0.75 years, representing the second six months of driving. The relationships, using three dimensions, are shown in Figure 9.2. Again, it is clear that the differences in accident liability between male and female drivers are dependent on that age at which they pass the test. Young male drivers have a higher reported accident liability than young females, but male accident liability falls steeply as age at which they pass the test increases. This means that the difference between males and females reverses for people who pass their test after their early 20s; the precise age of at which they crossover is dependent on exposure. This analysis demonstrates

29 The exposure measure combines mileage and driving frequency. It is defined as the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven.
the complexity of the relationships between the variables, and the need for care when considering differences in accident liability between males and females.

9.3.2 Assessing the effects of driver experience and the learning to drive variables on public road accident liability

The effect on accident liability of the driver experience and learning to drive variables was explored using appropriate models in which each variable was added individually as a single additional term to the ‘base’ models described above. It should be noted that this approach, in which each variable is added alone to the ‘base’ model, is appropriate for indicating the unique effect\(^{30}\) of the variable in the presence of the variables in the ‘base’ model plus the effect it has by virtue of its correlations with the other predictor variables absent from the model. If causality is assumed, then the analysis can also indicate the changes in accident liability that would be expected if, when the single variable under consideration were changed (e.g. by some safety intervention), the ‘absent’ predictor variables also changed in such a way as to maintain the pattern of inter-correlations. For other purposes, an alternative approach, which estimates each variable’s (unique) contribution in the presence of other added variables, is required. This is described later.

Generally a ‘free-fit model’ was generated; free-fitting allowed the coefficients in the ‘base’ model to change as the extra variable was added. However, for some analyses the ‘base’ model was fixed when each extra variable was added in turn – in this way the relative importance of similar variables could be assessed using a fixed ‘base’ model derived from a common dataset. The resulting model was termed a ‘constrained fit’ model.

\(^{30}\) ‘Effect’ here means statistical association. On their own these analyses cannot demonstrate causality.
The variables used are listed in Appendix 5, which also reports findings using alternative models.

For those variables that did produce a statistically significant parameter estimate when fitted to the model, their practical importance was assessed by using the models to estimate the change in accident liability that would result from a shift between either the 25th percentile value and the 75th percentile value (the 'inter-quartile' range) or between the maximum and minimum values taken by each variable, as appropriate. In other words, the effect size of the variable was estimated by using the models to predict what effect the variable, as it shifts across a range, has on predicted accident liability.

9.3.2.1 Near-accidents

In the Driving Experience Questionnaires, drivers were asked to record how many times in the relevant period they had had the impression of only just avoiding an accident. Drivers were asked to respond using five categories – ‘Never’, ‘1 or 2 times’, ‘3 to 5 times’, ‘6 to 10 times’ or ‘more than 10 times’. For simplicity, these responses were re-coded as 0, 1.5, 4, 8 and 12 respectively. This variable was strongly related to reported accidents.

The mean value of the ‘near-accidents’ variable for drivers was just over 1.5 (corresponding to 1–2 accidents). Compared with a driver who never reported a near-accident (25th percentile value), a driver who reported 1–2 near-accidents (75th percentile value) is estimated to have an accident liability larger by a factor of 1.27, i.e. 27% larger – given that the other key variables have been controlled by means of the ‘base’ model. This result is derived from the ‘first year’ model, but effects for the ‘all periods’ model and individual reporting periods are similar.

9.3.2.2 The behavioural variables

The Driving Experience Questionnaire contained a number of items on driver behaviour. These included self-reported driving styles as defined by the Guppy scales (Guppy et al., 1990); questions on confidence as a driver and on how respondents rated their driving compared with others; and self-reported driving errors and violations (the Driver Behaviour Questionnaire (DBQ) – Reason et al., 1990).

Table 9.1 shows the coefficients and effect sizes of these behavioural variables (and the number of near-accidents) when added individually to the ‘first year’ base model for self-reported public road accidents. Columns four and five show the inter-quartile range of values occurring in the data used for the modelling (i.e. a dataset which excludes drivers who failed to supply accident information, or who reported driving less than 100 miles or had an exposure value of more than 25,000 units in the reporting period). The change in accident liability over this ‘range’ was
calculated as \( \exp(\text{coefficient} \times \text{range}) \) and is given in column six of the table. Thus, the column headed ‘Factor’ gives the factor by which reported accidents change as the variable changes from the 25\(^{\text{th}}\) percentile value to the 75\(^{\text{th}}\) percentile value (or the reverse in cases where the coefficient is negative). Whether or not this addition to the model produces a statistically significant improvement is assessed by the magnitude of the change in a statistic termed ‘deviance’, which is computed by the statistical routine when the new variable is added to the model (see Section A5.3.2 in Appendix 5 for the definition). The variables are presented in the table ranked according to the size of the amount of variability (deviance) explained.

### Table 9.1: Coefficients and practical effect sizes for the behavioural variables and the near-accident variable added individually to the ‘first year’ base model for self-reported public road accidents

<table>
<thead>
<tr>
<th>Variables (added individually)</th>
<th>Measurement scale</th>
<th>Coefficient</th>
<th>Deviance†</th>
<th>Inter-quartile range</th>
<th>Effect size (factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Experience of near-accidents in reporting period</td>
<td></td>
<td>0.16</td>
<td>257.4*</td>
<td>0.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Self-reported attentive, careful, responsible safe driving style</td>
<td>Guppy Driving Style 1</td>
<td>−0.32</td>
<td>111.9*</td>
<td>5.50</td>
<td>6.50</td>
</tr>
<tr>
<td>Awareness of hazards</td>
<td></td>
<td>0.51</td>
<td>71.8*</td>
<td>1.14</td>
<td>1.71</td>
</tr>
<tr>
<td>Aggressive violations</td>
<td>DBQ(^{31}) scale</td>
<td>0.35</td>
<td>60.4*</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Violations</td>
<td>DBQ scale</td>
<td>0.36</td>
<td>59.7*</td>
<td>0.25</td>
<td>0.75</td>
</tr>
<tr>
<td>Errors</td>
<td>DBQ scale</td>
<td>0.60</td>
<td>57.9*</td>
<td>1.00</td>
<td>1.38</td>
</tr>
<tr>
<td>Slips</td>
<td>DBQ scale</td>
<td>0.38</td>
<td>55.6*</td>
<td>1.29</td>
<td>2.00</td>
</tr>
<tr>
<td>Frequency of speeding</td>
<td></td>
<td>0.16</td>
<td>45.3*</td>
<td>2.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Confidence in driving</td>
<td></td>
<td>0.30</td>
<td>38.6*</td>
<td>1.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Self-reported placid, patient, considerate, tolerant driving style</td>
<td>Guppy Driving Style 2</td>
<td>−0.14</td>
<td>36.3*</td>
<td>4.50</td>
<td>6.00</td>
</tr>
<tr>
<td>Your driving compared with others</td>
<td></td>
<td>0.17</td>
<td>19.8*</td>
<td>2.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Self-reported decisive, experienced, confident, fast driving style</td>
<td>Guppy Driving Style 3</td>
<td>−0.14</td>
<td>17.4*</td>
<td>4.25</td>
<td>5.50</td>
</tr>
<tr>
<td>Inexperience errors</td>
<td>DBQ scale</td>
<td>0.20</td>
<td>13.2*</td>
<td>1.29</td>
<td>1.86</td>
</tr>
</tbody>
</table>

* Statistically significant at the 5% level or better. 
† A measure of the variability explained – see Section A5.3.2 on Appendix 5 for definition.

The awareness of hazards scale is a self-report scale developed by Quimby et al. (1999) which assesses a driver’s perception, observation and anticipation skills. The scale requires drivers to respond to seven questions in which they report, using a six-point scale from ‘never’ to ‘nearly all the time’, how often specific incidents that involve failures of awareness happen to them when driving. The incidents asked

\(^{31}\) DBQ is the Driver Behaviour Questionnaire which forms part of the Driver Experience Questionnaire.
about are related to observational and anticipatory driving scenarios which should have been recognised by a ‘very aware’ driver. Table 9.1 shows that this scale was very influential as far as reported accidents are concerned. The effect size shown in the table indicates that those at the 75th percentile point are estimated to have a 33% higher public road accident liability than those at the 25th percentile point. It should be noted that the failures of awareness included in the scale are, in effect, critical incidents or near-accidents – for example, ‘you have to brake sharply to avoid a collision with the vehicle ahead of you because it has slowed’ or ‘you misjudge the gaps in main road traffic when pulling out of a side road’.

In Table 9.1, the Driver Behaviour Questionnaire variable with the largest 25th to 75th percentile effect size is the ‘slips’ measure – drivers at the 75th percentile point for this measure have an accident liability 31% higher than those at the 25th percentile point. The first factor of the driving style scales (attentive, careful, responsible, safe) devised by Guppy et al. (1990) also reflects a strong effect, in that there is a 38% difference in predicted public road accident liability between the upper and lower quartile points. The negative coefficient indicates that drivers who see themselves as being attentive, careful, responsible and safe have a lower predicted accident liability than those who assess themselves as having the opposite characteristics.

It can be seen from Table 9.1 that the signs of the coefficients for the behavioural scales associated with accident liability are generally in the expected direction. Of particular interest are the scales ‘your driving compared with others’ and ‘confidence in driving’. The first is a five-point scale in which a driver assesses his or her own driving in comparison to that of other drivers, from ‘much worse than average’ (scored 5), through ‘average’ (3) to ‘much better than average’ (scored 1). Table 9.1 shows that those who regard themselves as ‘about average’ (3) drivers have 19% higher accident liability of those who rate themselves as ‘a bit better than average’ (2), these values corresponding to the 75th and 25th percentile points respectively.

‘Confidence in driving’ is a four-point scale which reflects a driver’s assessment of his or her confidence in driving, from ‘very confident’ (scored 1) to ‘not at all confident’ (scored 4). The positive coefficient in this case (Table 9.1) indicates that those who rate themselves as ‘fairly confident’ (2) have an accident liability which is 35% higher than those rating themselves as ‘very confident’ (1) (these values corresponding to the 75th and 25th percentile points respectively) – again, other variables, including exposure to risk, having been controlled for (these values corresponding to the 75th and 25th percentile points respectively).

‘Frequency of speeding’ is a six-point scale which asks how often respondents exceed the speed limit. The associated coefficient is positive and the model indicates that those drivers who said they ‘occasionally’ (3) exceed speed limits have a 17% higher accident liability than those who said they ‘rarely’ (2) exceed the speed limit.
There is a considerable degree of inter-correlation between these behavioural scales, so the effect that each variable has on its own may give a spurious impression of the importance it has when acting alongside other, correlated, variables. To some extent the variables will share their predictive power with each other. The modelling work was therefore extended to take this into account. The behavioural variables were added simultaneously to the ‘first year’ base model for reported public road accidents. Variables that were not statistically significant at the 5% level were then removed one by one to yield the most parsimonious model. The results from the analysis are shown in Statistically significant variables (added together) and are presented in the table ranked according to the size of the amount of variability (deviance) explained.

Six of the behavioural variables remained in the model as statistically significant explanatory variables. The self-reported driver style ‘attentive, careful, responsible safe’ remained a major statistically significant component of the model, as did the awareness scale. The confidence variable was also one of the behavioural variables with a relatively high deviance value. As expected, the coefficients in this model are lower than those shown in Table 9.1 because each inter-correlated variable is now taking up only its estimated share of the variation.

The coefficient of the confidence scale is positive (0.27) and the corresponding factor for effect size is 1.30 (column six). This means that if all the other variables in the model are controlled for statistically, a driver who is ‘fairly confident’ (2) is predicted to have $\exp(0.266 \times 1) = 1.30$ times the accident liability of a driver who is ‘very confident’ (1). The direction of this finding is consistent with the results reported in connection with Table 9.1 above, but the apparent size of the effect is smaller (1.30 instead of 1.35).

<table>
<thead>
<tr>
<th>Statistically significant variables (added together)</th>
<th>Measurement scale</th>
<th>Coefficient</th>
<th>Deviance†</th>
<th>Inter-quartile range</th>
<th>Effect size (factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Self-reported attentive, careful, responsible safe driving style</td>
<td>Guppy Driving Style 1</td>
<td>−0.20</td>
<td>96.8*</td>
<td>5.50</td>
<td>6.50</td>
</tr>
<tr>
<td>Confidence in driving</td>
<td></td>
<td>0.27</td>
<td>23.4*</td>
<td>1.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Awareness of hazards</td>
<td>DBQ</td>
<td>0.14</td>
<td>16.3*</td>
<td>1.14</td>
<td>1.71</td>
</tr>
<tr>
<td>Aggressive violations</td>
<td>DBQ</td>
<td>0.22</td>
<td>10.5*</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Inexperience errors</td>
<td>DBQ</td>
<td>−0.18</td>
<td>7.3*</td>
<td>1.29</td>
<td>1.86</td>
</tr>
<tr>
<td>Slips</td>
<td>DBQ</td>
<td>0.16</td>
<td>4.8*</td>
<td>1.29</td>
<td>2.00</td>
</tr>
<tr>
<td>Sample size = 13,859</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Statistically significant at the 5% level or better.
† A measure of statistical significance – see Section A5.3.2 in Appendix 5 for definition.
Only three of the ‘DBQ’ measures remain in this behavioural model – slips, aggressive violations and inexperience errors. Table 9.3 suggests a possible reason. The table shows that there are considerable inter-correlations between the ‘DBQ’ variables. Aggressive violations are highly correlated with both violations and errors, but they obviously do a more effective explanatory job in the model of public road accident liability than the other related ‘DBQ’ variables do. Nevertheless, all of these ‘DBQ’ driving behaviours have been associated with reported accidents in earlier studies, with violations generally being found to be more important than errors as predictors of accidents.

### Table 9.3: Correlation between the DBQ measures

<table>
<thead>
<tr>
<th></th>
<th>Violations</th>
<th>Errors</th>
<th>Aggressive violations</th>
<th>Inexperience errors</th>
<th>Slips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violations</td>
<td>1.00</td>
<td>0.51</td>
<td>0.58</td>
<td>0.22</td>
<td>0.39</td>
</tr>
<tr>
<td>Errors</td>
<td>0.51</td>
<td>1.00</td>
<td>0.45</td>
<td>0.47</td>
<td>0.55</td>
</tr>
<tr>
<td>Aggressive violations</td>
<td>0.58</td>
<td>0.45</td>
<td>1.00</td>
<td>0.17</td>
<td>0.35</td>
</tr>
<tr>
<td>Inexperience errors</td>
<td>0.22</td>
<td>0.47</td>
<td>0.17</td>
<td>1.00</td>
<td>0.52</td>
</tr>
<tr>
<td>Slips</td>
<td>0.39</td>
<td>0.55</td>
<td>0.35</td>
<td>0.52</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### 9.3.2.3 The driving offence variables

Table 9.4 shows the association between reported public road accidents and the driving offence variables (‘warned by the Police’ or ‘receiving a fixed penalty notice’) in a way similar to that used in Table 9.1 above. These are simple two-level category variables corresponding to the driver responses ‘Yes’ or ‘No’, and each variable was added independently to the ‘base’ model.

### Table 9.4: Coefficients and practical effect sizes for driving offence variables added individually to the ‘first year’ base model for reported public road accidents

<table>
<thead>
<tr>
<th>Variables (added individually)</th>
<th>Coeff.</th>
<th>Deviance†</th>
<th>Range of values</th>
<th>Effect size (factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower = yes</td>
<td>Upper = no</td>
</tr>
<tr>
<td>Warned by the police for motoring offence during reporting period</td>
<td>–0.45</td>
<td>24.3*</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Received a fixed penalty or summons for offence during reporting period</td>
<td>–0.39</td>
<td>10.3*</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

* Statistically significant at the 5% level or better.
† A measure of statistical significance – see Section A5.3.2 in Appendix 5 for definition.

The factor values in the final column show that those drivers who have received a warning from the police have a 57% higher accident liability than those who have not been warned. Those who have received a fixed penalty notice or summons have a 48% higher accident liability than those who have not, when statistical modelling is used to adjust for differences in age, sex, experience and exposure.
9.3.2.4 The ‘how often’ variables

Respondents were asked a series of questions related to exposure. These took the form ‘How often did you drive in . . . ?’ and covered the 11 different driving conditions shown in Table 9.5. The table shows the size of the effects of these ‘how often’ variables on reported accidents in a way similar to that used previously – each variable added singly to the ‘base’ public road accident model – and ranked by the size of the deviance change from the ‘base’ model. In this instance the ‘constrained fit’ coefficients for the ‘first year’ model have been used.

The first six of the variables in Table 9.5 proved to be statistically significant when added singly to the ‘base’ model for reported public road accidents, and all of these variables yielded positive coefficients. This means that the more times that drivers experience these conditions, the higher their overall accident liability on public roads would be expected to be. However, all of these variables are highly correlated with the overall frequency of driving variable included in the exposure term and appear to be functioning in a similar way. The inclusion of these terms in the model simply improves the fit of the exposure component of the model.

Some of these coefficients need interpreting with care. In particular, the positive coefficient for ‘driving in the dark’ ought not to be interpreted to mean that driving in the dark is more dangerous (though it almost certainly is), but simply that the more driving that is done in the dark, the higher the accident liability (accidents in any lighting condition) is expected to be. The analysis does not separately identify accidents that happened in darkness.

<table>
<thead>
<tr>
<th>Variables (added individually)</th>
<th>‘Constrained fit’ model</th>
<th>Range of values</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often did you drive in . . .</td>
<td>Coeff.</td>
<td>Deviance† change</td>
<td>Lower = never</td>
</tr>
<tr>
<td>Busy town or city</td>
<td>0.08</td>
<td>13.7*</td>
<td>1</td>
</tr>
<tr>
<td>Quiet part of town or city</td>
<td>0.08</td>
<td>11.6*</td>
<td>1</td>
</tr>
<tr>
<td>In dark</td>
<td>0.07</td>
<td>8.4*</td>
<td>1</td>
</tr>
<tr>
<td>To/from work</td>
<td>0.05</td>
<td>8.0*</td>
<td>1</td>
</tr>
<tr>
<td>Motorways</td>
<td>0.05</td>
<td>6.4*</td>
<td>1</td>
</tr>
<tr>
<td>Fast dual-carriageways</td>
<td>0.05</td>
<td>5.6*</td>
<td>1</td>
</tr>
<tr>
<td>In rain</td>
<td>−0.04</td>
<td>2.0</td>
<td>1</td>
</tr>
<tr>
<td>Country roads</td>
<td>0.01</td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>In fog</td>
<td>−0.02</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>In snow/ice</td>
<td>0.02</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td>On business</td>
<td>0.00</td>
<td>0.0</td>
<td>1</td>
</tr>
</tbody>
</table>

* Statistically significant at the 5% level or better.
† A measure of statistical significance – see Section A5.3.2 in Appendix 5 for definition.
9.3.2.5 The learning to drive variables

Table 9.6 shows the effects on accident liability of the learning to drive variables when added individually to the ‘base’ model for the first year of driving. The Attitudes to Driving Violations Scale (ADVS) was the variable with the highest deviance (i.e. which explained the most variability). Drivers towards the less safe end of the scale (75th percentile of 3.88) go on to have, during their first year of driving, 17% higher accident liability than those near the safer end of the scale (25th percentile of 3.13).

There was no statistically significant effect on the first year public road accident liability of having been a motorcycle (moped or scooter) rider prior to learning to drive. There was also no statistically significant association between the confidence expressed by drivers immediately after having passed their practical driving test and public road accident liability in the first year. (The effect of having regularly ridden a motorcycle, moped or scooter just reached statistical significance in the ‘all periods’ model – see Section A5.3.3 in Appendix 5 – the direction of the effect being that people who were previously riders of motorcycles, mopeds or scooters tended to have a higher accident liability than other drivers.)

<table>
<thead>
<tr>
<th>Table 9.6: Coefficients and practical effect sizes for learning to drive variables added individually to the ‘first year’ base model for reported public road accidents</th>
<th>Coeff.</th>
<th>Deviance†</th>
<th>Inter-quartile range</th>
<th>Effect size (factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25th percentile</td>
<td>75th percentile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADVS (a low scorer is less tolerant of driving violations)</td>
<td>–0.209</td>
<td>22.9*</td>
<td>3.13</td>
<td>3.88</td>
</tr>
<tr>
<td>A motorcycle rider before learning to drive?</td>
<td>–0.064</td>
<td>0.3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>– 1 = Y, 2 = N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving confidence now passed test (1 = very confident, 4 = not at all confident)</td>
<td>–0.001</td>
<td>0.02</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Hours of professional instruction</td>
<td>0.001</td>
<td>6.8*</td>
<td>8.4</td>
<td>51.0</td>
</tr>
<tr>
<td>Hours of practice with friends and relations</td>
<td>0.000</td>
<td>1.0</td>
<td>0.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Hours of professional instruction plus practice with friends and relations</td>
<td>0.001</td>
<td>6.2*</td>
<td>35.0</td>
<td>75.0</td>
</tr>
</tbody>
</table>

* Statistically significant at the 5% level or better.
† A measure of statistical significance – see Section A5.3.2 in Appendix 5 for definition.

Hours of tuition with a professional driving instructor has been modelled as a continuous variable and was statistically significant. The factor suggests that once the effects of the other variables in the ‘base’ model are taken into account, people taking 51 hours of professional tuition (the 75th percentile value) have a 6% higher liability for reported public road accidents during their first year than do people taking only 8.4 hours (the 25th percentile value).
Here, it must be borne in mind that drivers who take large amounts of tuition or practice may have very different characteristics from those who take less. Such individual differences may far outweigh the direct effects of tuition and practice on accident liability. In other words, the present study cannot show whether increasing the amount of tuition or practice taken by individual drivers would have a beneficial effect on road safety. The finding that people who report taking a lot of tuition tend to have a relatively high accident liability probably just means that these are people who find it difficult to learn to drive.

There was no statistically significant association between the number of hours of practice taken with friends and relations and public road accident liability in the first year modelled as a continuous variable (there were over 30% who took no such practice). However, when the hours of professional tuition were combined with the hours of practice with friends and relations, a small (3%) effect was found – with people reporting more hours of pre-test driving tending to have a raised accident liability. Again, the explanation is probably that these are people who find it relatively difficult to learn to drive – the finding cannot be taken to indicate that increasing pre-solo driving would reduce road safety.

9.3.3 Summary

Males reported more actual public road accidents than females did in all four reporting periods. The statistical modelling showed that accident liability changes more sharply with age of passing the test for male drivers than for female drivers, after controlling for the effects of differences in exposure. For very low levels of exposure, or for people who pass their test after their early 20s, female accident liabilities are estimated to be higher than those for males.

An exposure variable incorporating both mileage and frequency of driving gave a better prediction of accident liability than did mileage alone. The exposure measure used is the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven. The magnitude of the exposure effect is similar to that found in previous studies.

In common with other studies, when the effects of exposure and age of passing the practical test were controlled statistically, public road accident liability was found to fall rapidly as a driver matures and gains experience.

The number of reported involvements in a ‘near-accident’ is strongly and positively related to the driver’s accident liability.

The ‘awareness’ scale, which measures the self-reported failures of the driver in observing and anticipating hazardous situations, is strongly related to reported accidents, with drivers at the ‘poor’ end of the scale having a higher accident liability than those whose awareness skills were superior.
The ‘DBQ’ measures – slips, errors, aggressive violations, inexperience and violations – are all related to reported accidents. However, these variables were highly inter-correlated, and in the model fitted in this study to the first year of accident data, aggressive violations, inexperience errors and slips tend to be the dominant accident predictors.

The ADVS was the most predictive of the learning to drive scales in relation to reported accidents: learner drivers with a more tolerant attitude to driving violations (many of them speed-related) tend to go on to have a higher post-test accident liability.

The relationships between accident liability and hours of professional tuition and hours of practice with friends and relations were not very strong. There seems to be a small effect such that more tuition or practice is associated with a higher accident liability.

Table 9.7 shows the variables which were shown to be significant in the ‘first year’ base model.

### Table 9.7: Variables added individually to the ‘first year’ base model for reported public road accidents

<table>
<thead>
<tr>
<th>Variables shown to be significant at the 5% level or better</th>
<th>Variables not shown to be significant at the 5% level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience of near-accidents in reporting period</td>
<td>Driving . . . in rain; on country roads; in fog; in snow/ice; on business</td>
</tr>
<tr>
<td>The three driver style measures</td>
<td>ADVS</td>
</tr>
<tr>
<td>Awareness of hazards</td>
<td>Experience of riding a motorcycle/moped/scooter</td>
</tr>
<tr>
<td>Frequency of speeding</td>
<td>Driving confidence once test is passed</td>
</tr>
<tr>
<td>Confidence in driving</td>
<td>Hours of practice with friends and relations</td>
</tr>
<tr>
<td>“Your driving compared with others”</td>
<td></td>
</tr>
<tr>
<td>Five DBQ measures</td>
<td></td>
</tr>
<tr>
<td>Driving . . . in busy town or city; in quiet part of town or city; in dark; to/from work; on motorways; on dual carriageways</td>
<td></td>
</tr>
<tr>
<td>Hours of professional instruction</td>
<td></td>
</tr>
<tr>
<td>Hours of professional instruction plus practice with friends and relations</td>
<td></td>
</tr>
</tbody>
</table>

### 9.4 Hazard perception testing and accident liability

The purpose of hazard perception testing is to enable an assessment of a driver’s anticipation, scanning and hazard recognition skills to be made so that only those candidates who have demonstrated a certain level of hazard awareness are allowed to take their practical driving test. The previous sub-sections have been confined to public road accidents in the first year of driving. This sub-section also concentrates on the first year of driving and explores the link between the hazard perception component of the theory test and public road accidents. In addition, it investigates non-low-speed public road accidents, ‘active’ public road accidents and non-low-
speed public road accidents where the respondent accepts some blame. Section A5.4 of Appendix 5 contains findings for all the reported periods.

9.4.1 Modelling of accidents and hazard perception testing

The approach used to model accidents in this study has been explained earlier in this section; an identical approach has been used in order to determine the association between accident liability and having taken a hazard perception component of the theory test. A two-level (i.e. dichotomous) variable (hazard perception taken or not taken) was added to the ‘base’ model to indicate whether or not the driver had taken (and necessarily passed) the hazard perception test. The effect size of this variable in the model (i.e. the size of association with estimated accident liability) provides a measure of the consequential validity of having introduced hazard perception testing into the licensing system.

In further analysis, the predictive validity of the hazard perception component of the theory test was also examined – statistical models were used to establish whether or not there is an association (for test passers) between hazard perception score and subsequent accident liability.

Statistically significant coefficients for the hazard perception score were found for non-low-speed reported public road accidents but not for all reported public road accidents. Drivers who took (and passed) the hazard perception component of the theory test had, on average, a lower accident liability than those who had not taken the test, other differences between these two groups of drivers in terms of age, sex, experience and exposure being controlled for statistically in the model.

Table 9.8 shows the results of this modelling expressed as the estimated percentage reduction in the first year accident liability associated with the introduction of the hazard perception component of the theory test. The top row of the table gives the central estimates of this effect, but these estimates have very wide confidence intervals which means that little meaning can be attached to their absolute values. However, one can be 95% confident that the true values are at least as great as the values shown in the second row of the table. So, for example, one can be confident that introducing the hazard perception component of the theory test is associated in the first year of driving with at least a 3% reduction in reported non-low-speed public road accidents where the driver accepts some blame, and with at least a 0.3% reduction in all reported non-low-speed public road accidents. The negative confidence limits for the other two classes of accident show that there was no statistically significant association with the introduction of hazard perception testing for these classes of reported accidents during the first year of driving.

32 Here, one-tailed significance tests were used (rather than the two-tailed tests used elsewhere) since the hypothesis was that introducing hazard perception testing would reduce accidents.
The effect size is illustrated in Figure 9.3 for female and male drivers separately. The figure shows the modelled results for non-low-speed reported public road accidents plotted as a function of exposure and whether or not a driver took the hazard perception component of the theory test, for 20-year-old drivers in their second six months of driving. It can be seen from the figure that, for these 20-year-old drivers, female accident liability is lower than that of males for all levels of exposure. For both males and females, taking a hazard perception test is associated with lower accident liabilities, but the accident liability of males who have taken a hazard perception test is still higher than that of females.

<table>
<thead>
<tr>
<th>Percentage reduction in accident liability</th>
<th>All public road accidents</th>
<th>Non-low-speed public road accidents</th>
<th>Non-low-speed public road accidents where some blame</th>
<th>‘Active’ public road accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central estimate</td>
<td>1.3%</td>
<td>11.3%</td>
<td>17.4%</td>
<td>6.8%</td>
</tr>
<tr>
<td>95% confidence value*</td>
<td>−7.5%</td>
<td>0.3%</td>
<td>3.0%</td>
<td>−4.7%</td>
</tr>
</tbody>
</table>

* One can be 95% confident that the true values are at least as great as this.

The exposure measure combines mileage and driving frequency. It is defined as the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven.
These results indicate the consequential validity of hazard perception testing for accidents of this type, i.e. that introducing hazard perception testing has had the intended effect of reducing these new driver accidents. The predictive validity of the hazard perception component of the theory test was explored by investigating whether there is a relation between the score achieved on the test and subsequent accident liability. This was done by introducing a different hazard perception variable into the statistical modelling, defined as the actual hazard perception score achieved (treated as a grouped variable):

- 0 – did not take hazard perception (given a score of 25);
- 1 – score of 38 to 45 (central value = 41) on test (this will include some drivers who passed before the pass mark was raised to 44);
- 2 – score of 46 to 50 (central value = 48);
- 3 – score of 51 to 55 (central value = 53);
- 4 – score of 56 to 60 (central value = 58); and
- 5 – score greater than 61 (central value = 63).

The results demonstrate that there was a statistically significant relation between the hazard perception score and subsequent accident liability for non-low-speed public road accidents and for non-low-speed public road accidents where the driver accepted some blame. Table 9.9 shows, for the ‘first year’ models, the estimated difference in accident liability between those passing the hazard perception test in

<table>
<thead>
<tr>
<th>Hazard perception test score variable</th>
<th>All public road accidents</th>
<th>Non-low-speed public road accidents</th>
<th>Non-low-speed public road accidents where some blame</th>
<th>‘Active’ public road accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage* reduction in accident liability</td>
<td>Central estimate</td>
<td>1.4%</td>
<td>9.4%</td>
<td>15.6%</td>
</tr>
<tr>
<td>95% confidence value†</td>
<td>−5.3%</td>
<td>0.9%</td>
<td>4.5%</td>
<td>−1.6%</td>
</tr>
</tbody>
</table>

* The reduction in accident liability from those in the lowest scoring group (score taken to be 41) to those who scored 63 or more on the test, i.e. the high-scorer group.
† One can be 95% confident that the true values are at least as great as this.

34 Clearly, no score was available for those drivers who had not taken the hazard perception test, however a score of 25 was assumed when estimating the associated parameter coefficient. This is justified by reference to the hazard perception development work carried out by Grayson and Sexton (2002), and meant that all the available data were utilised.
the lowest score group (score assumed to be 41) and those in the highest scoring group (taken to have a score of 63). Again, both the central estimates of the effect and their 95% confidence values are shown – the width of the confidence interval being such that little meaning can be attached to the absolute value of the central estimate. One can be 95% confident that the high scoring group had a liability for non-low-speed public road accidents that was at least 0.9% lower than that of the low-scoring group. The corresponding figure for non-low-speed public road accidents where the driver accepted some blame was at least 4.5%.

9.4.2 Summary

It can be concluded that introducing the hazard perception component within the theory test appears to have been associated with a reduction in subsequent accident liability. As expected, the size of the estimated effect varies with the type of accident and is largest for reported non-low-speed accidents on a public road where the driver accepted some blame. The size of the accident reduction in the first year of driving for those who had taken the hazard perception test (having controlled for age, sex, experience and exposure) compared with those who had not was, for this type of accident, at least 3%. Further, there is a predictive relation between the hazard perception score and reported accidents in the first year of driving for this accident type – those in the highest scoring group (with a central score of 63 on the hazard perception component of the test) have an accident liability estimated to be at least 4.5% lower than that of the lowest scoring group (with a central score of 41).

It was also found that (all) non-low-speed public road accident liability was lower in the case of drivers who had taken the hazard perception test. For these accidents, drivers who had taken the hazard perception component of the theory test had an accident liability at least 0.3% lower than those who had not. Similar findings apply to the ‘all periods’ model covering the first three years of driving, which can be found in Section A5.4 in Appendix 5.

9.5 Comparison with Cohort I

Differences in definition and techniques mean that it is difficult to compare reported accidents and accident rates between the Cohort I study and the present Cohort II study. However, one of the main conclusions of the accident modelling in Cohort I was that, in the 1990s, males had an accident liability that was 12.5% higher than that of females. The findings of the modelling reported above indicate that the male excess in accident liability is restricted to the younger candidates, and that for drivers who pass their tests after their early 20s, females have a higher accident liability than males. These male-female differences merit further attention in order to gain a better understanding of the situation.
9.6 Discussion and implications

This section has reported a series of investigations aimed at exploring the effects of a range of variables on different types of accidents in the first year of driving, and has developed statistical models of accident liability. The analysis has not only been concerned with the relationship between reported accidents, driver experience variables and some of the learning to drive variables, but has also evaluated changes in the determinants of accident liability as drivers gain experience over the three-year period of the study (see Appendix 5 for individual period and the ‘all period’ analyses).

The following summarises and discusses the main results of the modelling work and their implications for new driver safety.

9.6.1 ‘Base’ models

People who pass the test at a young age tend, initially, to drive less safely than others. This effect is strongest soon after the test, and declines during the first three years of driving. The pattern of results is consistent with the notion that residual effects of starting to drive young become diluted by other influences as time progresses. It shows that there is not something persistently different about those who start to drive very young – in terms of driving safety, they become like other drivers within a year or two. However, within this period they do have an excess accident liability, and this result re-emphasises the importance of finding ways of targeting safety interventions at very young drivers.

Males reported more actual public road accidents than females did in all four reporting periods. At mid-range values of exposure and test-passing age, this pattern was also apparent after differences in exposure and age have been controlled for by statistical modelling – the estimated male to female ratios in accident liability during the successive reporting periods being 1.09, 1.05, 1.29 and 1.10 (see Table A5.3 in Appendix 5). However, these ratios are sensitive to age, since accident liability changes more sharply with age of passing the test for male drivers than for female drivers. The ratios are also sensitive to exposure, so that for very low levels of exposure, or for people who pass their test after their early 20s, female accident liabilities are estimated to be higher than those for males.

An exposure variable incorporating both mileage and frequency of driving gave a better prediction of accident liability than did mileage alone. The magnitude of the exposure effect was similar to that found in previous studies. The need for a ‘frequency of driving’ component in the exposure index should be borne in mind in future studies of accident liability.

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35 The exposure measures used is the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven.
When exposure and age of passing the practical test are controlled statistically, public road accident liability falls by an estimated 30% between the first and second six months of post-test driving, by 15% between the second six months and second year, and by 19% between the second and third years (see Section A5.3.2 in Appendix 5), and older new drivers experience slightly lower percentage declines in reported accidents between periods 1 and 2. The pattern of a sharp reduction in accident liability as a driver matures and gains experience is consistent with previous studies, and illustrates both the problem and the opportunity for new driver safety.

The problem is clear: new drivers have a substantial excess accident liability during their first two years (and particularly during their first six months) of post-test driving. The opportunity is that the nature of the problem suggests its own remedies. New drivers are clearly learning something very useful during their early post-test driving, and measures to encourage that learning to take place more quickly, more effectively, or in protected circumstances should prove valuable.

9.6.2 Driver experience variables

The number of reported involvements in a ‘near-accident’ was strongly and positively related to the driver’s accident liability. This reinforces the notion that actual accidents are at the end of a continuum of accident-like events and that reports of near-accidents can provide useful data. This applies both for the study of accident causation and as ‘indirect’ indices of safety in the evaluation of safety interventions, thus helping to avoid the central difficulty with accident-based evaluations – namely that accidents are rare events and necessitate very large sample sizes in evaluation studies.

The ‘awareness’ scale, which measures the self-reported failures of the driver in observing and anticipating hazardous situations, was strongly related to reported accidents. The direction of this finding is as expected: those drivers at the ‘poor’ end of this scale have a higher accident liability than those whose awareness skills are superior. At face value, this finding reinforces the need for drivers to develop good hazard perception skills as well as the case for having introduced hazard perception testing. However, the self-reported failures that make up the questionnaire scale can also be regarded as critical incidents or near-accidents, and so the finding can also be regarded as supporting the relationship between near-accidents and actual accidents.

The ‘DBQ’ measures – slips, errors, aggressive violations, inexperience and violations – were all related to reported accidents. However, these variables were highly inter-correlated, and in the ‘first year’ model fitted in this study to the first year of accident data, aggressive violations, inexperience errors and slips tended to be the dominant accident predictors. The more of these faults the driver exhibited, the higher the driver’s accident liability. While not providing evidence of causality in
this relationship, the finding taken together with other considerations does strongly suggest that violational behaviour needs to be tackled to improve road safety. Violational behaviour, by definition, is a departure from rules designed to reduce risk by reducing potential collision speeds, making driving more predictable to others, reducing the likelihood of conflicts between vehicles, and increasing the time that drivers have available to assimilate information and react accordingly. The importance of slips as a predictor of accidents in these data is unusual, and less easy to interpret. For the Driving Style 1 scale, scores towards the ‘attentive, careful, responsible and safe’ end of the scale were associated with a relatively low accident liability.

9.6.3 **Learning to drive variables**

The ADVS was the most predictive of the learning to drive scales in relation to reported accidents – learner drivers with a more tolerant attitude to driving violations (many of them speed-related) tend to go on to have a higher post-test accident liability.

The relationships between accident liability and hours of professional tuition and hours of practice with friends and relations were not very strong. There seems to be a small effect, such that more tuition or practice is associated with a higher accident liability. However, this should not be taken to imply that increasing the amount of training and practice accumulated by learner drivers would reduce safety. People who choose to take larger amounts of training and practice will tend to be those who need them, a choice that will tend to reduce, remove or reverse the relation between training or practice and accident liability in a study like the present one. A controlled study that observes the effects of actual changes in training and practice on reported accidents is needed if the benefits of increased training and practice are to be investigated.

9.6.4 **Hazard perception testing**

The most important change to the testing regime which took place during the course of the study was the addition of hazard perception testing into the theory test. The purpose of introducing the hazard perception test into the licensing system was to induce learner drivers to improve their hazard perception skills before driving unsupervised.

Improved hazard perception skills can be assumed to have an effect on accidents which occur on public roads rather than in car parks, petrol stations or other off-road areas. Improved skills are also more likely to have an effect on accidents in which the driver had some chance of avoiding the accident if their behaviour had changed. It is also unlikely that improved hazard perception skills could have a marked effect on accidents which are described as ‘low-speed manoeuvring accidents’.
The analyses in this section have shown that adding the hazard perception component to the theory test appears to be associated with reductions in new drivers’ liability, and the size of the estimated association does vary with the type of accident. It is largest for that group of accidents which took place on a public road, were not classified by the driver as ‘low-speed manoeuvring accidents’ and for which the driver accepted some blame. Introducing the hazard perception test was estimated (with 95% confidence) to have reduced such accidents by at least 3% during the first year of driving. It was also found that (all) non-low-speed public road accident liability was lower for drivers who had taken the hazard perception test. The average size of the effect of introducing the hazard perception test for this accident type was at least 0.3% (with 95% confidence). These relationships suggest that the introduction of the hazard perception test has had the intended result of reducing new driver accidents, and the benefits are seen in the expected accident types.

A second approach to assessing the validity of the hazard perception test was to investigate the relation between drivers’ scores on the test and their subsequent accident liability. This indicated the ‘predictive validity’ of the test. There was a statistically significant relation between hazard perception test score and accident liability. The existence of this relationship, as well as providing further evidence of test validity, also suggests that future efforts to improve the hazard perception skills of learner drivers are likely to be rewarded by greater reductions in reported accidents.
10 KEY FINDINGS AND CONCLUSIONS

10.1 Introduction

The Cohort II study has provided a wealth of information about how new drivers prepare for their driving careers, on which decisions about the development of the training and testing regime can be soundly based. The design of the Cohort II study incorporated 16 cohorts over four years to ensure that the effect of any changes to the training and testing system in Great Britain could be monitored in detail. It was designed to provide information about the way in which new drivers prepare for their driving tests and how their experiences affect their subsequent accident liability. It also offered an opportunity to compare the data with previous data from the Cohort I project conducted in the late 1980s.

While the methodological issues identified in Section 2 mean that the results apply directly only to the sub-set of the population who completed questionnaires, it nonetheless offers a valuable insight into the links between learning to drive, passing the practical test and subsequent accident liability. These links are not simple and cannot offer a straightforward solution to the problem of new driver accident liability. However, the data collected within the study will allow the assessment of new ideas relating to driver training and testing, and should offer a reliable basis for further policy considerations.

Overall, the study provides good evidence that introducing the hazard perception test has had some road safety benefit – i.e. that it has had good consequential validity. It cannot provide absolute proof, but the reduction in accident liability associated with the introduction of the hazard perception element into the theory test, together with the relationship that was found between drivers’ scores on the hazard perception test and subsequent accident liability, provides persuasive evidence.

10.2 Key findings from the study

10.2.1 Amount of professional tuition and practice

From Table 10.1 it can be deduced that, on average, respondents who passed the practical test had fewer hours of professional tuition than those who did not. This is probably because the failing group includes people who find learning to drive more difficult. A slightly higher proportion of those who passed (59%) compared with those who did not (55%) also reported having practice with friends and relations, although the actual number of hours reported by those who had practice did not, on average, differ between the passers and the whole respondent group.

The number of hours of tuition with an Approved Driving Instructor (ADI) is skewed positively towards those who report taking a greater number of lessons. It is
also important to note that the ‘mean’ value for the number of hours that respondents spent with ADIs prior to the test can be somewhat misleading, as they are influenced by the fact that some respondents took very large amounts of training or practice (for example, 200 respondents or 0.005% of the total sample, reported taking more than 450 hours of lessons with an ADI). The median values shown in the Table 10.1 perhaps give a more useful picture. The median number of hours with an ADI (which is the midpoint of the distribution, with half the respondents reporting less than this and half reporting more) is lower than the mean, and takes into account extreme values.

<table>
<thead>
<tr>
<th></th>
<th>All respondents</th>
<th>Respondents who passed the practical test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean number of hours with an instructor (ADI)</td>
<td>52</td>
<td>47</td>
</tr>
<tr>
<td>Median number of hours with an instructor (ADI)</td>
<td>40</td>
<td>36</td>
</tr>
<tr>
<td>Percentage who had practice with friends and relations</td>
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<td>59%</td>
</tr>
<tr>
<td>Mean hours of practice with friends and relations (including those with no practice)</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Mean hours of practice with friends and relations (including only those who had practice)</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Mean ‘active’ learning time (months)</td>
<td>14</td>
<td>13</td>
</tr>
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</table>

### 10.2.2 Attitudes

The data presented in Section 7 suggest that drivers tend to enter the driving population with fairly fixed ideas about themselves, both in absolute terms and in relation to others. This implies that interventions to influence attitudes need to be in place very early in a learner driver’s training, or even prior to practical training.

Drivers began their driving careers with relatively high levels of confidence in their driving ability, but after six months confidence was much lower, and did not change to any great extent in the subsequent time periods.

### 10.2.3 Accidents

As new drivers gained experience, the number of accidents they reported and their corresponding accident rates (per year) decreased. The severity of the accidents occurring, however, increased over time, corresponding to a reduction in the proportion of accidents taking place in car parks and private drives. This also reflected an increase in the proportion occurring on public roads over time – an effect that was especially marked between the first two six-month reporting periods.

Male respondents reported more public road accidents than female respondents in all four reporting periods. The statistical modelling showed that accident liability changed more sharply with the age of passing the test for male drivers than for
female drivers – after controlling for the effects of differences in exposure. For very low levels of exposure, or for those who passed their test after the age of 22, the accident liabilities for females were estimated to be higher than those for males.

An exposure variable incorporating both mileage and frequency of driving gave a better prediction of accident liability than mileage alone. The magnitude of the exposure effect is similar to that found in previous studies. When the effects of exposure and age of passing the practical test were controlled statistically, public road accident liability was found to fall rapidly as a driver matures and gains experience.

The number of times respondents reported being involved in a ‘near-accident’ is strongly and positively related to the driver’s accident liability.

The ‘awareness’ scale, which measures the self-reported failures of the driver in observing and anticipating hazardous situations, is strongly related to reported accidents, with drivers at the ‘poor’ end of the scale having a higher accident liability than those whose awareness skills were superior.

Slips, errors, aggressive violations, inexperience and violations (measures from the Driver Behaviour Questionnaire) are all related to reported accidents. However, these variables are highly inter-correlated. In the model using the first year of accident data, aggressive violations, inexperience errors and slips tended to be the dominant predictors of accidents.

The Attitudes to Driving Violations Scale (ADVS) was the most predictive of the scales in the Learning to Drive questionnaire in relation to reported accidents: learner drivers with a more tolerant attitude to driving violations – many of them related to speed – tended to go on to have a higher accident liability after taking their test.

There were not strong relationships between accident liability, hours of professional tuition and hours of practice with friends and relations.

10.2.4 Further training

Eighteen per cent of respondents who passed the practical driving test took Pass Plus training in the 12 months after passing. However, volunteer bias means that it is not possible to determine from the Cohort II study whether Pass Plus had any effect on accident liability (see Elliott, 2006 for more information).

10.2.5 Use of the Driving Standards Agency Driver’s Record

The DSA Driver’s Record was held by 37% of respondents, although not all reported using it. However, in several of the measures of driving experience where it would have been expected to have had an effect, it did not. For example, having a Driver’s...
Record had no impact on mileage, the number of hours of tuition and practice, in how respondents spread out their tuition and practice sessions, in the proportion of learning time spent receiving professional tuition, or in the level of exposure to different driving conditions (such as busy town centres, country roads and in darkness).

### 10.2.6 Changes over time

The Cohort II sample was markedly younger than that in the earlier study. In both Cohort I (practical tests in 1988/89) and Cohort II (practical tests in 2001–05) almost all respondents had lessons with an ADI but the mean duration of these increased from 31 hours to 52 hours. Cohort I passers had an mean of 49 hours of total driving experience (including practice), while in Cohort II the equivalent figure was 67 hours, with the majority of the increase being accounted for by the increase in professional driving instruction.

### 10.3 Key findings on the impact of the hazard perception test

The impact of the introduction of the hazard perception test has been discussed on a number of occasions in the preceding sections. The aim of this sub-section is to pull together and summarise those findings.

#### 10.3.1 The theory test and hazard perception testing

Respondents whose first or only theory test included a hazard perception component, on average allowed less (elapsed) time to pass before taking their first theory test than respondents who only took the multiple-choice theory test. Those whose test included hazard perception took the theory test 5.8 months (mean value) after starting to learn to drive while those who took only the multiple choice test took it after 6.7 months. It should be noted, however, that this disparity was not evident for candidates aged 17–19 years, who made up half the sample.

#### 10.3.2 Learning to drive and hazard perception testing

Analysis of the data indicated:

- There was no difference in the number of hours of practice with friends and relations between those who took only the multiple-choice theory test and those who took the one which included the hazard perception component.

- After adjusting for separate effects of age and hours of tuition, the mean learning duration was 1.7 months shorter for those who took a theory test with hazard perception compared with those who did not. This is related to the finding noted above that theory tests which included the hazard perception component were, on average, taken earlier after starting to learn to drive than were those without this component.
10.3.3 The practical test and hazard perception testing

The introduction of the hazard perception test affected respondents’ readiness for the practical driving test.

- A higher proportion of respondents said they were ‘ready’, or ‘nearly ready’, when they took the practical test if their first theory test had included hazard perception (68% compared with 59%).

- The introduction of the hazard perception component of the theory test had no effect on the pass rate for the practical driving test.

- Candidates who took a theory test without hazard perception had, on average, the same likelihood of passing the practical test as those who took a theory test with hazard perception.

- A substantially higher proportion of new drivers passed the practical test first time when their first, or only, theory test included hazard perception (53% compared with 39%). This effect was still found even when learning time was controlled for.

10.3.4 Attitudes and assessments and hazard perception testing

Differences in attitudes between those who took the hazard perception test and those who did not were small and often of negligible magnitude. Unsurprisingly, those who had taken the hazard perception component of the theory test were less likely to feel the need to improve the driving skill of ‘spotting hazards’ than were those who had not. An analysis of data on driving experience in the first six months of driving comparing Cohorts A to D (before the introduction of hazard perception) with Cohort M to P (with hazard perception testing experience) showed that there is little evidence that hazard perception affected attitudes or self-reported behaviours.

10.3.5 Accidents and hazard perception testing

The purpose of hazard perception testing is to enable an assessment of a driver’s anticipation and scanning skills to be made so that only those candidates who have demonstrated a certain level of hazard perception ability are allowed to take their practical driving test. Those drivers with good hazard perception skills should be better able to avoid collisions. To investigate the impact of hazard perception testing in the theory test on accident liability, several factors were considered. The number of accidents, for example, is likely to be related to exposure, i.e. the more often and the more miles driven, then the more likely a driver is to be involved in an accident. Driving style is likely to be related to the age of the driver (older drivers are generally safer than very young new drivers) and to sex. The length of time between passing the theory test and taking the practical test also varies and may well be associated with driver type; for example, those who take a long time may be less confident drivers than those who take only a short period of time to reach the
required standard. All these factors need to be considered together when comparing drivers who took the hazard perception test with those who did not take the hazard perception test, and controlled for if necessary. Univariate analyses cannot achieve this and so more complex multivariate techniques were employed. The main findings from these were as follows:

- The introduction of the hazard perception component within the theory test appears to have been associated with some reduction in subsequent accident liability.
- The size of the estimated effect varied with the type of accident and was largest for reported non-low-speed accidents on a public road where the driver accepted some blame. For this type of accident, the size of the accident reduction in the first year of driving in the case of those who had taken the hazard perception test (having controlled for age, sex, experience and exposure) compared with those who had not was at least 3%.
- Accident liability on (all) non-low-speed public road accidents was lower for drivers who had taken the hazard perception test. For these accidents, drivers who had taken the hazard perception component had an accident liability at least 0.3% lower than those who had not.
- There is a predictive relationship between the hazard perception score and reported accidents in the first year of driving for public road non-low-speed accidents, where the driver accepts some blame. Those in the highest scoring group for the hazard perception test have an accident liability estimated to be at least 4.5% lower than that of the lowest scoring group. For all public road non-low-speed accidents, those in the highest scoring group have an accident liability estimated to be at least 0.9% lower than that of the lowest scoring group.

10.3.6 Discussion and implications of hazard perception testing

The ‘trainability’ of hazard perception was first demonstrated by McKenna and Crick (1994) and since then other studies have suggested that novice drivers can be trained to recognise and respond to hazards. This recognition of hazards is clearly important in the avoidance of accidents. The Cohort II study is the first piece of research to provide robust evidence of a benefit, in accident reduction, from hazard perception testing.

The results of this study suggest that the type of hazard awareness which the test is measuring is a factor in reducing accidents and that the new drivers who are better at identifying hazards in the test are better at avoiding accidents. The association is largest for ‘non-low-speed accidents on public roads where the driver accepts some blame’, which is not surprising since these are the types of accidents where one would expect increased hazard awareness to have most effect.
The initial research on which the introduction of the hazard perception test into the theory test was based was carried out by Grayson and Sexton (2002), who developed and tested a training package for a hazard perception test that was similar to the one eventually introduced into the theory test. The findings from this study suggest that, while ADIs do include hazard awareness when training learner drivers, most of the training for the hazard perception test is done by learners working on their own, using some form of electronic media (e.g. video, CD or DVD). The training programme for developing hazard perception skills, designed by the DSA and evaluated by Grayson and Sexton (2002), used group sessions with the opportunity for learners to interact and discuss their developing awareness of hazards. They felt that this was the most effective way of developing these skills. ADIs do not traditionally use this kind of group training, but there is a good case for increased discussion of hazard awareness during the normal in-car training.

The reduced **learning duration** for those who took the hazard perception test seems to be a result of the compression of the learning experience, since the mean **hours of tuition** actually went up. It is not clear why this effect should occur, but it is not associated with differences in reported attitudes or confidence levels.

The results also suggest that the inclusion of the hazard perception component into the theory test may have brought about a slight increase in pass rates for first-time takers of the practical test, and that more new drivers passed the practical test on their first attempt if they have started learning since the introduction of hazard perception testing.

### 10.4 What next?

This report includes analyses of many of the issues which are of interest when considering the training and post-test experience of new drivers. However, it is clear that there is a wealth of data on new drivers which has not been analysed here. The database generated as part of the Cohort II project will provide researchers with opportunities to address questions which may arise in the future.

Other investigations will require the collection of new data, for example the Department for Transport has commissioned further research on the use of the Driver’s Record.

It has been suggested that a passenger’s age may influence his or her effect on the driver’s behaviour and accident risk, and there have been discussions on the effectiveness of restrictions on the carriage of passengers for new drivers (see Baughan *et al.*, 2005). While the Cohort II data include the age of the oldest passenger when an accident occurred, which was supplied by respondents, any variation of accident frequency with the age of a passenger in this study is likely to tell us more about the amount of driving which people do with passengers of different ages than it does about the influence of passenger age on driver behaviour.
Further research to establish the amount of driving with passengers of different ages would allow the Cohort II data to be used to assess the effects of passenger restrictions on accidents.

Although the Cohort II study investigated relationships between how participants learned to drive and their subsequent accident liability, a study of this type is not able to show what the best pattern of learning to drive is, or to show how accidents would be affected if learning patterns were changed. For example, the study is not able to predict the effect on accidents of increasing the amount of pre-test driving accumulated by learners. This is because participants in the study were free to choose how much pre-test driving they did, based on need, ability, opportunity, for example. However, learners who choose to take larger amounts of training and practice will tend to be those who actually need it. Choices over pre-test driving experience will tend to reduce, remove or reverse the relationship between training or practice and accident liability. In order to assess the impact of changes in training and practice on reported accidents a controlled study is required.

Similarly, although this study found that pass rates were lower for people who took more professional instruction, this is probably just a reflection of the fact that some people find it more difficult than others to learn to drive and therefore need more training, yet still find it more difficult to pass the test. It does not give any indication of what would happen to pass rates if the amount of training or practice taken by learner drivers was changed. To provide such information would require a study in which the amount of training and practice undertaken by learner drivers are manipulated. For example, samples of learners could be persuaded to increase the amount of training they take, and the effect on pass rate could be observed.
11 ACKNOWLEDGEMENTS

The work described in this report was carried out in the Safety, Security and Investigations Division of TRL Limited. The authors are grateful to all the respondents who took the time to complete the questionnaires. They are also grateful to Chris Baughan, Marie Taylor and Geoff Maycock who carried out the quality review and auditing of this report, and to Professor Robert West (University College London) and Dr Richard Hall (University of Southampton), who acted as independent peer reviewers.


APPENDIX 1
Methodological issues

A1.1 Survey programme
### Table A1.1

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A1.2 Survey design details

A1.2.1 Questionnaire design

The Learning to Drive Questionnaire incorporated many similar questions to the equivalent questionnaire in Cohort I with the intention that comparisons could be drawn between the Cohort I and Cohort II results. However, it was also possible to include the Attitudes to Driving Violations Scale (ADVS) developed more recently by West and Hall (1997), which looks primarily at attitudes to speed, and a scale including measures of self-reported driving style based on Guppy et al., (1990).

In the follow-up questionnaires on driving experience, the ADVS and the Guppy scale were repeated. The Driver Behaviour Questionnaire (DBQ), first developed by Reason et al. (1990) and elaborated further by Parker et al. (1995) and Åberg and Rimmö (1998), was incorporated. This measures the frequency of driving errors, slips/lapses, violations, aggressive violations and inexperience errors. The hazard awareness scale developed by Quimby et al. (1999) was also incorporated. This measures how often drivers report experiencing a range of hazardous situations.

A1.2.2 Theory test study

The main Learning to Drive Questionnaire included questions on preparation for the theory test but this had taken place, for most candidates, several months prior to the practical test. In order to check whether there were memory effects, i.e. whether the pattern of responses made immediately after taking the theory test was the same as that for candidates who looked back and described the experience some months later, a separate survey of theory test candidates was undertaken. The Theory Test Questionnaire was sent to seven samples of 800 theory test candidates, drawn at six-monthly intervals by the Driving Standards Agency (DSA) within 10 to 16 days of the candidates taking their theory test. There was no follow-up of these respondents and there was no link to the main sample.

The Theory Test Questionnaire collected information about preparation for the theory test, previous performance (if the subject had failed a previous test) and intentions for the future (if they had just failed the test). The questionnaires were updated to reflect the introduction of the hazard perception element of the theory test in November 2002. The final version of the Theory Test Questionnaire is shown in Volume 2: Appendix A.

A1.2.3 Piloting the questionnaires

All the questionnaires were piloted prior to being finalised. In all the pilot studies both male and female subjects were included, as were a range of ages and a mix of candidates who had passed and failed their test. The purpose of the pilot testing was to ensure that subjects could follow the requirements of the questionnaires. Subjects
were asked to complete the questionnaires in the presence of a researcher, who recorded the time taken for each section and who was available to help if there were problems. The questionnaires all proved to have been well designed and none of the subjects in the pilot tests had problems with either the wording or the layout of the questionnaires. Time taken was, in general, 10 to 20 minutes (less for the Theory Test Questionnaire), an acceptable level of commitment for this type of study. The Learning to Drive Questionnaire was piloted with subjects who had just taken their practical test, and the Theory Test Questionnaire with subjects who had just taken a theory test. The follow-up Driver Experience Questionnaire was piloted with subjects who had passed their practical test between five and eight months earlier. For this pilot, a particular focus was to ensure that the attitude questions were understood and that they were not seen as over-demanding.

**A1.2.4 Amendments to questionnaires**

After the introduction of the hazard perception component of the theory test, the questions on the theory test in the Learning to Drive Questionnaire and the Theory Test Questionnaire were revised to separate out information about the two components of the test. This enabled a distinction to be made between the training materials used in preparation for the multiple choice component and the hazard perception component.

A second change was included to obtain some basic information about the use made of the DSA Driver’s Record which began to be sent out to all applicants for provisional licences in 2003, during the course of the data collection (though its use was not compulsory).

**A1.3 Other data**

A range of other data was linked to the Learning to Drive Questionnaire sample data. While problems with data availability meant that not all the data were available for all sample candidates, the linking of these other data to the Learning to Drive Questionnaire data has allowed additional analyses to be undertaken. The linkage was based on the driver number, which is the identifier used by the DSA on driver licences.

The DSA allowed access to the DL25 records. These are the forms completed by examiners during the practical test and include data on all the driving faults (the number of faults and the type, e.g. control, manoeuvring, etc.) committed by candidates. Those who passed their practical test are still likely to have a number of faults, but these will not have been sufficient (in number or severity) to result in test failure. At the time of the surveys, the maximum allowable number of minor driving faults was 15. A single serious or dangerous fault resulted in test failure. The DL25 also records the number of the Approved Driving Instructor (ADI) who presented the candidate for test, and it was possible to obtain the grade of the instructor from...
DSA records (ADIs are graded on entry to the profession and at check tests; pass grades are 4, 5 and 6, representing ‘competent’, ‘good’ and ‘high’ standards respectively).

The theory test scores for most of the sample were also obtained. All those in the sample were candidates for the practical test and must, therefore, have passed the theory test. The score for the multiple-choice part of the theory test and (where applicable) for the hazard perception component were data elements which were linked to the candidate’s data record.

**A1.4 Data handling**

The overall timetable for questionnaire distribution is given in Section A1.1. A total of 128,000 Learning to Drive Questionnaires were sent out over the period of the project, and 20,500 Driver Experience Questionnaires. This was therefore a major project in which logistics were an important factor. For all the questionnaires, reminders were sent if a response had not been received within approximately four weeks (Section A1.5.3). The management of this volume of paperwork, ensuring that questionnaires from each individual were linked together and coding the incoming questionnaires, were the responsibility of the National Foundation for Educational Research. TRL received the coded data in a form suitable for importing into a Microsoft Access database. In order to ensure that the large volumes of data were controlled, TRL developed systems using Access databases and statistical analysis tools. These offered rapid and flexible procedures for extracting information.

**A1.5 Sample retention**

**A1.5.1 Cover letters**

With a project of the scale of the Cohort II study, the recruitment and retention of participants becomes a major issue. Motivating respondents to remain involved in a relatively long study was dealt with at several levels. It was essential that respondents felt that their continued participation was valued and that their contributions would make a difference to the project. The cover letters were carefully worded with this in mind, and they also informed participants about a web site that was available during the course of the project which gave more information about the project (the web site has since been closed down).

**A1.5.2 Warning of potential involvement**

It is generally accepted in the field of survey design that if potential subjects are warned in some way that they will be sent a questionnaire they are more likely to respond. The method used in this study was to give a short leaflet to all candidates taking their practical test during the test weeks. This leaflet invited their
participation in an important study of new drivers. The sampling selection for the questionnaires resulted in about a third of these candidates being sent a questionnaire, making this a reasonably cost-effective method of warning potential subjects. Posters advertising the study were also placed in test centres for a week either side of each test week. These were aimed mainly at driving instructors (especially ADIs), who were asked to encourage their pupils to take part in the study.

A1.5.3 Reminders

All subjects who failed to respond to a questionnaire were sent a reminder four to five weeks after the initial posting of the questionnaire. This added to the administrative complexity (and hence the cost) of the data collection exercise, but reminders were considered to be an essential element in obtaining a representative sample.

A1.5.4 Updating details

All questionnaires requested an updated address in order to help maintain contact with the respondents. The opportunity was also offered of changing the contact address to a 'stable' address (such as a parent's address) when asking subjects to update their address. All questionnaires included a pen marked with the contact details for the project.

After the first three questionnaires (the Learning to Drive Questionnaire, the first and second Driver Experience Questionnaires) there was a 12-month gap before the next questionnaire was sent. A newsletter was sent out in this interval, and in the interval between the third and fourth Driver Experience Questionnaires, giving information about the study, reinforcing the value of every response and inviting subjects to update their address if necessary.

A1.5.5 Length of questionnaire

The questionnaires were, necessarily, fairly long. By ensuring that the questionnaires were well laid out and that the time taken to complete them was acceptable, any possible effect on response rate was mitigated. The results of the pilot studies were encouraging in this respect, with even the longest questionnaires being assessed by the majority of respondents as 'interesting' and 'no problem to complete'.
APPENDIX 2
Theory Test Questionnaire responses

The purpose of the Theory Test Questionnaire was to check that responses to the Learning to Drive Questionnaire were not adversely affected by memory effects and to obtain more data than was possible within the main survey on how candidates study for the theory test.

Figure A2.1 shows the response rates for each of the seven theory test samples. Each sample consisted of 800 theory test candidates. Some respondents had not taken their theory test in the week designated for the sample; these respondents were excluded from any further analyses. The overall response rate for questionnaires was 35%, ranging from 31% to 41%.

A2.1 Respondent demographics and pass/fail status for the Theory Test Questionnaire

The seven test samples were broadly similar in terms of age and sex distribution (see Volume 2: Appendix C, Table C9). Figure A2.2 shows the age and sex distribution of Theory Test Questionnaire respondents. More than 58% of respondents were aged 17–19 across all seven test samples. However, the percentage of 17–19-year-olds ranged from 65% in the first sample to 56% in the last. The mean age was 22.9 years across all samples (see Volume 2: Appendix C, Table C9).
Overall, 74% of respondents passed their theory test, ranging from 82% of the first two samples to 65% of the fourth sample (see Volume 2: Appendix C, Table C10).

The hazard perception component was introduced into the theory test between the second and third samples. The pass rate was 88% for respondents to the third questionnaire. This decreased for samples 4 and 5 (77% and 67%, respectively) as the pass score increased over the first year (the initial pass mark was set low to allow for the need for training to be recognised). The last two samples had a pass rate of 84% and 82% respectively. The multiple-choice theory test pass rate decreased steadily between the first and fourth samples (from 82% to 77%). It increased markedly after that, peaking at 89% (see Volume 2: Appendix C, Table C11).

**A2.2 Comparisons with the initial sample for the Theory Test Questionnaire**

Figure A2.3 shows that a disproportionately high percentage of respondents to the Theory Test Questionnaires were females when compared with the sex distribution in the initial theory test sample. Figure A2.4 shows that the age distribution for respondents was similar to that for the original sample except that the 17–19 age group was slightly over-represented and the 20–24 age group slightly under-represented.
A2.3 Results

The results from the Learning to Drive Questionnaires were compared with the results from the Theory Test Questionnaires. This showed that the information reported in the two surveys was similar, allowing the use of only the much larger
Learning to Drive Questionnaire sample in subsequent analyses. However, in addition, the detailed Theory Test Questionnaires revealed the following:

• Virtually all respondents said that they had spent time studying for the multiple-choice component of the test, but a sizeable minority (39%) in the first year after the change to the test said that they had not studied for the hazard perception component. However, this proportion decreased over time.

• Following the introduction of hazard perception, the average amount of time spent studying for the theory test increased from 13.1 to 20.8 hours. The amount of time spent on hazard perception also increased over time (from three hours in the surveys prior the introduction of the hazard perception component of the theory test to 5.9 hours by the last survey). This may be associated with the fact that the pass mark for the hazard perception component was increased during the first year after its introduction.

• The majority of respondents studied at home for the theory test, both before and after the introduction of hazard perception. With the expanded test, fewer studied with friends or with an ADI.

• Both before and after the introduction of the hazard perception component of the theory test, the majority of respondents reported using written material to study for the multiple-choice component of the test. After the introduction of the hazard perception component of the theory test, there was a marked increase in the use of CDs and DVDs, primarily for the hazard perception component but also for the multiple-choice part, reflecting a fundamental change in media use.

• Although more theory test respondents said that they had practised driving with friends or relations after the hazard perception component was introduced, there was little overall change in the amount of driving experience gained before the theory test.
APPENDIX 3
Further discussion of the effects of hazard perception

Analysis of the mean hours of professional tuition was somewhat misleading. It indicated that respondents whose first or only theory test included hazard perception took fewer hours of professional instruction than respondents who took a theory test without hazard perception (Figure A3.1). This apparent reduction in hours of tuition after the introduction of hazard perception testing was evident across gender and all age groups, the size of the difference increasing with age. The average difference overall was 9.7 hours (10.5 hours for females and 6.7 hours for males). Female and male respondents aged 17 to 19 years appeared to take an average of three hours less professional tuition if their theory test included hazard perception than if it did not (see Volume 2: Appendix D, Table D14).
Any effect of hazard perception experience on the amount of professional tuition taken was considered most appropriately assessed by comparing respondents who knew that their first theory test would include hazard perception against those who knew it would not. This was based upon the assumption that if the learning process was influenced by the theory test, the greatest effect would be based upon the type of theory test that was initially expected. It is acknowledged that some respondents may have taken a theory test with hazard perception after initially failing one without hazard perception, and therefore may have also adjusted how much professional tuition they took to account for this. Further analysis confirmed a similar difference in hours of professional tuition for respondents whose most recent theory test did, or did not, include hazard perception.

A further consideration was that the sample responding to the survey with only experience of hazard perception was very likely to have learnt to drive within three years, whereas some respondents who commenced learning prior to the introduction of hazard perception may have taken much longer. To establish the association between learning duration and hours of professional tuition, mean hours of professional tuition were also calculated for different numbers of months taken from starting to learn to drive to taking the most recent practical test (see Volume 2: Appendix D, Table D15). These findings also indicated that respondents who learnt to drive within similar time periods generally reported slightly fewer hours of professional tuition if they had only experience of a theory test with hazard perception when compared with those who did not (Figure A3.2). Hours of tuition increased systematically with the time between starting to learn to drive and the practical test, but the mean number of tuition hours was still fewer if the theory test included hazard perception than if it did not.

36 Note that the sample size when splitting the sample based on learning duration was reduced because of some missing data needed to determine the length of time between starting to learn to drive and taking a practical test.
Figures A3.1 and A3.2 are evidence of the mean number of hours of professional tuition varying substantially as a function of respondent age and the amount of time taken to learn to drive. There was concern that age and learning duration were distorting the relationship between hours of professional tuition and the introduction of hazard perception testing. To clarify the relationship, mean hours of professional tuition for males and females with and without hazard perception experience were plotted for each of the 16 cohorts (Figure A3.3).

Hours of professional tuition were clearly increasing throughout the four years of the study and again males were shown to have taken substantially fewer hours of professional tuition. There was also evidence to support the earlier findings that respondents who took a hazard perception theory test amassed fewer hours of professional tuition when compared with those who did not. However, there were other factors likely to contribute to this latter difference – factors related to the type of respondents who took a theory test with hazard perception and then presented for practical test soon after. For example, respondents in Cohorts F, G, H and I would have taken the practical test within three, six, nine and twelve months of passing a hazard perception theory test, respectively. These early takers of the hazard perception theory test all came to the practical test relatively soon after taking the theory test, especially when compared with the much wider range of learning durations captured by respondents who did not have experience of a hazard.
perception theory test within corresponding cohorts. Similarly, it was notable that respondents who took the hazard perception theory test were, on average, younger than those who did not. As hours of tuition were positively correlated with both age and learning duration, this may have accounted for some respondents with experience of the hazard perception theory test coming to the practical test with substantially fewer hours of professional tuition than respondents within the same cohort without experience of the hazard perception test.

The amount of variability in hours of tuition accounted for by age and learning duration was investigated further. Positive linear relationships were found between age and hours of professional tuition (accounting for 23% of the variability in hours of tuition) and between learning duration and hours of professional tuition (accounting for 11% of the variability). The mean residual values from a regression of hours of tuition on age and learning duration were plotted for each of the 16 cohorts to remove the effects of these two influential variables. The resultant plot (Figure A3.4) indicates that the relationship between hours of professional tuition and male and female respondents with and without hazard perception experience was still comparable with earlier findings (Figure A3.3). After accounting for the

37 The residuals are distributed around zero because the adjusted values not only take into account the age and time to learn influences but are also computed relative to the overall average.
effects of age and learning duration, hours of tuition were still fewer among males than among females, and fewer if respondents’ first or only theory test included hazard perception. Hours of tuition for all respondents were generally increasing with each cohort. However, between Cohorts I and P, the reported hours of tuition for respondents whose first or only theory test excluded hazard perception were unstable. Respondents in these later cohorts, whose first theory test was without hazard perception, defined a certain type of respondent who took at least a year to prepare for the practical test after taking their first theory test (without hazard perception). Ever decreasing sample sizes account for some instability in the residual data, but there is also the possibility that hours of professional tuition were influenced by a multitude of other, uncontrolled factors.

The data presented thus far have indicated that any relationship between hours of professional tuition and experience of hazard perception testing is far from simple to determine. Indeed, even when accounting for age and learning duration, there is unexplained variability in hours of tuition, particularly among respondents in Cohorts I to P who did not experience a hazard perception theory test. Logically, with a longer learning duration, such respondents would accrue more hours of tuition than comparable respondents with hazard perception experience who came to practical test at the same time. Nevertheless, even accounting for learning...
duration and age in Figure A3.4, respondents without experience of hazard perception who took a long time to learn still accrued more hours than respondents with hazard perception experience in similar cohorts. Such respondents must therefore have differed from respondents with hazard perception experience for other reasons.

Cohorts A to D and M to P (representing Years 1 and 4 of the study) provided a more appropriate comparison of similar hazard perception takers and non-hazard perception takers. In Year 1 of the study, all respondents’ first or only theory tests were multiple-choice only (without hazard perception as it had not yet been introduced), whereas in Year 4 of the study, the vast majority of respondents’ first or only theory test included hazard perception (with very few respondents without experience of a hazard perception theory test remaining in the sample). The residual mean hours of tuition for respondents in Cohorts A to D who had not taken a theory test with hazard perception was remarkably similar to the residual values for respondents in Cohorts M to P who had taken a theory test with hazard perception. This suggests that once a more comparable sample of respondents was established, both with and without experience of a theory test with hazard perception, hours of tuition were restored to a similar level. These criteria were used in the final analysis model to determine the association between taking a hazard perception theory test and hours of tuition.
APPENDIX 4

Further discussion of learning duration

The simple relationship between learning duration (measured as months to practical test from starting to learn to drive) and the introduction of hazard perception to the theory test was much the same as for hours of professional tuition; the introduction of hazard perception appeared to coincide with a general reduction in learning durations. The overall mean reduction was 3.7 months. The learning duration for females who did take a theory test with hazard perception was, on average, 4.1 months shorter than for females who did not take a theory test with hazard perception. For males, the mean reduction was 2.7 months (see Volume 2: Appendix D, Table D16).

This apparent reduction in learning duration can be understood partly by plotting the mean learning duration for males and females who did/did not take a first or only theory test with hazard perception for each of the 16 cohorts (Figure A4.1). After the introduction of hazard perception testing in Cohort F, the mean learning duration for respondents who were taking a practical test with hazard perception experience clearly deviated from that for respondents who were taking a practical test without having taken a hazard perception theory test. This deviation was because respondents who had not taken a theory test with hazard perception were those who took an increasingly long time to reach practical test, especially when compared directly with respondents who had taken a hazard perception theory test and had initially come to the practical test in very little time (although in later cohorts, such respondents increasingly became more representative of a range of learning durations). In order to explore the relationship between hazard perception testing and learning duration, appropriate sub-samples were used that better represented the range of respondents and the range of learning durations. In this respect, as when investigating hours of professional tuition, respondents who had taken a hazard perception theory test were most appropriately described by the sample in Cohorts M to P (Year 4), while respondents who had not taken a hazard perception theory test were best described by the sample in Cohorts A to D (Year 1).
Two measurable variables also had positive linear relationships with learning duration: hours of professional tuition (accounting for 11% of the variability in learning duration) and respondent age (accounting for 10% of the variability). To account for these variables, and to ensure they were not responsible for the relationship observed in Figure A4.1, a regression of learning duration on hours of tuition and age was conducted. The mean residual values from this analysis (Figure A4.2) produced a similar plot to Figure A4.1. This supported the assumption that comparing the experience of respondents who had and had not taken a hazard perception theory test was better represented by restricting further analysis to Years 1 and 4.

38 The residuals are distributed around zero because the adjusted values not only take into account the age and hours of tuition influences but are also computed relative to the overall mean.
It was noted from both plots (Figures A4.1 and A4.2) that respondents in Year 4 who had taken a hazard perception theory test appeared to learn to drive in slightly less time than respondents in Year 1 who had not taken a hazard perception theory test. This observation was formally tested to confirm that a reduction in learning duration was related to respondents having taken their first or only theory test with the hazard perception component.

The relationship between experience of hazard perception and learning duration was formally tested using an analysis of covariance, with candidate age and hours of professional tuition as covariates in the model. The sample for analysis was restricted to respondents in Years 1 and 4 of the study to represent respondents without hazard perception experience and with hazard perception experience, respectively.
### APPENDIX 5

**Background information for accident modelling**

#### A5.1 Model variables and data files

Table A5.1 shows the variables of interest in the modelling, and provides a key to the variable names used within this appendix.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of public road accidents</td>
<td>PRACC</td>
</tr>
<tr>
<td>Number of ‘active’ public road accidents</td>
<td>ACACC</td>
</tr>
<tr>
<td>Annualised mileage, i.e. miles per year, taken as double that stated for six-month reporting periods</td>
<td>MILES</td>
</tr>
<tr>
<td>Overall frequency of driving (number of days in the year, recoded from Q–A1, on average, how often did you drive in the last n months?)</td>
<td>FREQ</td>
</tr>
<tr>
<td>Exposure measure (= MILES + 10 × FREQ)</td>
<td>exposure</td>
</tr>
<tr>
<td>Length of the accident reporting period</td>
<td>PERIOD</td>
</tr>
<tr>
<td>How do you compare your driving with that of other drivers generally? (1 = much better than average to 5 = much worse than average)</td>
<td>D2 – your driving compared with others</td>
</tr>
<tr>
<td>In general, how confident are you in your driving ability? (1 = very confident to 4 = not very confident)</td>
<td>D3 – confidence in driving</td>
</tr>
<tr>
<td>How often do you exceed speed limits? (1 = never to 6 = always)</td>
<td>D5 – frequency of speeding</td>
</tr>
<tr>
<td>Driving Style scales (scale of 1 to 7):*</td>
<td></td>
</tr>
<tr>
<td>Scale 1: Attentive/inattentive, careful/careless, responsible/irresponsible, safe/risky – high scorers are attentive, careful, etc.</td>
<td>DS1 – attentive, careful, …</td>
</tr>
<tr>
<td>Scale 2: Placid/irritable, patient/impatient, considerate/selfish, tolerant/intolerant – high scorers are placid, patient, etc.</td>
<td>DS2 – placid, patient, …</td>
</tr>
<tr>
<td>Scale 3: Decisive/indecisive, experienced/inexperienced, confident/nervous, fast/slow – high scorers are decisive, experienced, etc.</td>
<td>DS3 – decisive, experienced, …</td>
</tr>
<tr>
<td>Scale on: Awareness, observation and anticipation of possible hazards (1 = very aware to 6 = very unaware)</td>
<td>Awareness of hazards</td>
</tr>
<tr>
<td>Scales from the Driver Behaviour Questionnaire† – (high scorers make more):</td>
<td></td>
</tr>
<tr>
<td>Slips</td>
<td>SLIPS</td>
</tr>
<tr>
<td>Errors</td>
<td>ERROR</td>
</tr>
<tr>
<td>Inexperience errors</td>
<td>INEXP</td>
</tr>
<tr>
<td>Violations</td>
<td>VIOL</td>
</tr>
<tr>
<td>Aggressive violations</td>
<td>AGGR</td>
</tr>
<tr>
<td>Number of near-accidents (1 = none and] 5 = 10 or more)</td>
<td>B1 – near-accidents</td>
</tr>
<tr>
<td>Received a warning by police on a motoring offence (yes/no)</td>
<td>WARNED</td>
</tr>
</tbody>
</table>

(continued)
The data file used in the development of the accident models was assembled as follows:

1. By comparing the dates and times of accidents submitted by the same drivers in response to the sequential Driving Experience Questionnaires, accidents reported more than once were eliminated. A few drivers who failed to provide information about accidents were excluded. The accidents resulting from this process can be described as an ‘all accident’ dataset. The number of ‘public road accidents’ (PRACC) was then derived as a sub-set of this ‘all accident data’ using the question in the Driving Experience Questionnaire, ‘Did the accident happen on a public road?’.

2. The mileage estimate was regarded as the primary measure of the driver’s exposure to the risk of being involved in an accident. For this reason, drivers who had not provided an estimate of the mileage driven during the accident period were removed from the file. Any drivers who had not driven at least 100 miles in the reporting period, or who had an exposure of more than 25,000 units, were also eliminated since they were considered as unrepresentative ‘outliers’. In the analysis, ‘annualised’ estimates of mileage were used – i.e. the responses to the question ‘About how many miles have you driven in the last six months?’ were doubled.

3. The ‘how often’ variables (FREQ – see Table A5.1) were recoded into a numerical ‘times per year’ equivalent. Thus ‘every day’ becomes 365, once a month becomes 12, and so on. This variable was treated as independent of the accident period; that is to say, in the case of a driver who reported driving ‘every

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**Table A5.1.** (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received a fixed penalty notice or summons from police for a motoring</td>
<td>FPNS</td>
</tr>
<tr>
<td>offence (yes/no)</td>
<td>A4-A</td>
</tr>
<tr>
<td>How often did you drive (1 = never and 6 = daily):</td>
<td>A4-B</td>
</tr>
<tr>
<td>In a busy town or city centre</td>
<td>A4-C</td>
</tr>
<tr>
<td>In quiet parts of towns or cities</td>
<td>A4-D</td>
</tr>
<tr>
<td>On country roads</td>
<td>A4-E</td>
</tr>
<tr>
<td>On fast dual-carriageways</td>
<td>A4-F</td>
</tr>
<tr>
<td>On motorways</td>
<td>A4-G</td>
</tr>
<tr>
<td>In the dark</td>
<td>A4-H</td>
</tr>
<tr>
<td>In the rain</td>
<td>A4-I</td>
</tr>
<tr>
<td>In fog</td>
<td>A4-J</td>
</tr>
<tr>
<td>In snow and ice</td>
<td>A4-K</td>
</tr>
<tr>
<td>To and from your place of work or study</td>
<td></td>
</tr>
<tr>
<td>On your employer’s business</td>
<td></td>
</tr>
</tbody>
</table>

* Source: Reason et al. (1990).
† Source: Guppy et al. (1990).

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40 The exposure measure combines mileage and driving frequency. It is defined as the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven.
day’, the FREQ variable was assigned the value 365 whether the response was made in the first six-month period, the second six-month period or in the following years.

4. The Learning to Drive Questionnaire asked drivers for information on a range of aspects relating to their experience when learning to drive. The variables which have been included in the statistical modelling are listed in Table A5.2.

<table>
<thead>
<tr>
<th>Table A5.2: The learning to drive variables used in the accident modelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Number of hours of tuition with an Approved Driving Instructor</td>
</tr>
<tr>
<td>Number of hours of practice with friends and relations</td>
</tr>
<tr>
<td>Having a motorcycle licence prior to learning to drive a car (Question A5 in the Learning to Drive Questionnaire – Before you started learning to drive a car did you regularly ride a motorcycle, moped or scooter?; 1 = yes and 2 = no)</td>
</tr>
<tr>
<td>Attitudes to driving violations (as measured by the West ADVS(^{41}) scale – questions D3(a) to D3(h) in the Learning to Drive Questionnaire (1 = strongly agree to 5 = strongly disagree with speed restriction issues))</td>
</tr>
<tr>
<td>Confidence having just taken and passed the practical driving test (question D1(d) in the Learning to Drive Questionnaire – How confident are you in your driving ability now?; 1 = very confident to 4 = not at all confident)</td>
</tr>
<tr>
<td>An indicator variable relating to taking hazard perception (did not take = 0, took hazard perception = 1)</td>
</tr>
<tr>
<td>A grouped hazard perception score variable (none, 38–45, 46–50, 51–55, 56–60, 61+)</td>
</tr>
</tbody>
</table>

**A5.2 The modelling method**

The modelling reported in Section 9 used a multivariate regression method known as Generalised Linear Modelling (GLM). The Poisson distribution has traditionally been used to model accidents. In the present analysis, however, a more sophisticated approach has been used – it has been assumed that accident variables follow a Negative Binomial Distribution. The Negative Binomial Distribution provides a more flexible approach to the modelling because of the restrictive requirement of a Poisson model that the residual variance about the model predictions should equal the mean. This requirement is rarely fulfilled in practice because, even when all the explanatory effects have been removed from the data by the modelling process, the residual dispersion is usually larger than the mean values predicted by the model. Accordingly, in Poisson modelling, a separate scaling parameter has to be invoked to cater for this over-dispersion.

\(^{41}\) The Attitudes to Driving Violations Scale (West, 1997). This is an eight-item scale which looks at, among other things, attitudes to speed.
The Negative Binomial Distribution, however, does not need such a ‘fix’. It already includes a parameter which can deal with ‘over-dispersion’ by virtue of the fact that the variance of the Negative Binomial Distribution is not constrained and can be estimated independently of the mean. The T1 statistic is calculated to test if there is significant over-dispersion (Dean and Lawless, 1989). This statistic is approximately a standard Normal variable. Thus, if it has a value greater than 1.64 then there is over-dispersion in the data and one can be 95% sure that a Poisson model would be over-dispersed (one-sided test).

The actual model resulting from either a Poisson or a Negative Binomial fit will be very similar because the link function required for this class of generalised linear models is the same for both distributions – a natural log link. These models may be conveniently fitted using the GLM methodology available in the ‘R’ statistical package.42

The variables included in all the ‘base’ models were:
• the duration of the accident period (half a year or one year);
• the driver’s age (when the test was passed);
• the sex of the driver; and
• a measure of his or her driving exposure (in terms of annual mileage and frequency of driving).

The models for each of the four reporting periods also need to include a variable which represents the fact that the accident data relate to four stages in the development of the drivers’ skills – their experience after the first six months of driving, after a further six months of driving and after a further year or two years of driving. This driving experience variable has been defined as the average number of years of driving experience the drivers have accumulated since passing the test (taken as time zero) at the mid-point of the four reporting periods. Thus, this variable becomes 0.25 (years) for the first six-month period, 0.75 (years) for the second six-month period, 1.5 (years) for the second year of driving and 2.5 (years) for the third year of driving.

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A5.2.1 The general form of the accident model

The form of the model used for each reporting period (i.e. 1–6 months, 7–12 months, 13–24 months or 25–36 months) is:

$$\text{loge}(\text{ACCR}) = \text{intercept} + b_1(\text{sex}) \cdot \text{loge}(\text{exposure}) + b_2(\text{sex}) / \text{AGE}$$

$$+ b_3(\text{period}) / \text{AGE} + c_n \cdot V_n$$

(1)

which is equivalent to:

$$\text{ACCR} = \exp(\text{intercept}) \cdot \text{exposure}^{b_1(\text{sex})} \cdot \exp\{b_2(\text{sex}) / \text{AGE}$$

$$+ b_3(\text{period}) / \text{AGE} + c_n \cdot V_n\}$$

(2)

where:

- ACCR is the predicted annualised accident rate in the reporting period as estimated by the model – that is, the predicted number of accidents in the survey reporting period being analysed, divided by the duration of the period in years or fractions of a year. ACCR is also known as accident liability. For most of the modelling work, ACCR was based on either public road accidents (PRACCR) or active public road accidents (ACACCR);

- exposure is the annualised number of miles driven plus 10 times the annualised number of days on which the driver has driven. This composite measure of driving exposure proved to provide the best statistical explanation of the variation in the data. The natural logarithm of exposure is used in the model;

- sex is a category variable;

- AGE is the respondent’s age when he or she passed the test. Based on previous work, the model uses $1/\text{AGE}$ as the most appropriate functional form for this term. The goodness of fit of the functional form for age was checked against a simple negative exponential and against a term of the form $1/(\text{AGE} + k)$. The simple reciprocal form gave a result which could not be significantly improved on by these alternative functions. The ‘all periods’ model recognises that a different age coefficient is required for the first six months of driving from that for the later periods;

- $V_n$ are variables of interest added to the ‘base’ model in order to determine the strength of their association with accidents;

- $b_n$ are parameter coefficients estimated by the modelling process. A parameter of the form $b_1(\text{sex})$ implies that different coefficients (for exposure and age) are to be estimated for females and males. $b_3(\text{period})$ implies that different coefficients are to be estimated which allow different age effects in different accident reporting periods; and

- $c_n$ are the parameter coefficients estimated by the modelling process when the additional variables are added to the ‘base’ model. The size and statistical significance of these coefficients are a measure of the influence of the added variable.
Equation (1), but without the $c_n V_n$ term, is the ‘base’ accident model fitted to the various accident datasets.

### A5.3 Models for all public road accidents

#### A5.3.1 ‘Base’ models

Table A5.3 gives the coefficients of the best fitting ‘base’ models fitted to public road accidents (PRACC) for the four individual reporting periods. Those coefficients which are statistically significant (i.e. those one can be 95% confident are not zero), have been emboldened; it will be seen that not all of the coefficient estimates in all the models are statistically significant.

<table>
<thead>
<tr>
<th>Table A5.3: Coefficients for models of reported public road accidents, in logged form, for each of the four reporting periods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>‘Null’ intercept</td>
</tr>
<tr>
<td>average accidents p.a.</td>
</tr>
<tr>
<td>$T_1$ test statistic on Null-model for over-dispersion, $\sim$ Normal (0,1)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>$1/\text{AGE}$</td>
</tr>
<tr>
<td>Sex ($f = 0$ and $m = 1$)</td>
</tr>
<tr>
<td>$\log_e(\text{exposure})$</td>
</tr>
<tr>
<td>$\text{sex.iage}$</td>
</tr>
<tr>
<td>$\text{sex.lmiles}$</td>
</tr>
<tr>
<td>Female accident liability**</td>
</tr>
<tr>
<td>$1/\text{AGE}$</td>
</tr>
<tr>
<td>$\log_e(\text{exposure})$</td>
</tr>
<tr>
<td>Male accident liability**</td>
</tr>
<tr>
<td>$1/\text{AGE}$</td>
</tr>
<tr>
<td>$\log_e(\text{exposure})$</td>
</tr>
<tr>
<td>Sample size</td>
</tr>
<tr>
<td>Ratio of estimated male to female accidents†</td>
</tr>
</tbody>
</table>

* Coefficient estimates in ‘bold’ are statistically significant from zero at the 5% level or better.
† The accident liabilities for female and male drivers were computed for a mid-range age of 18.9 years and an annual exposure of 7,646 units (exposure measures always include the annualised miles driven plus an adjustment for the frequency of driving).
The ‘null’ model (rows 1 and 2) is a model which has no added explanatory variables and consists, therefore, of a constant term only. This constant term will be equal to the mean of the data. Row 1 is therefore the logged mean and row 2 the exponentiated equivalent – simply the average accident rate for each sample in accidents per year. It will be seen that the mean accident rate for the first six months of driving was 0.275 accidents per year, and that this declined to 0.132 in the second year, rising slightly in the third year to 0.148 accidents per year.

The $T_1$ over-dispersion test statistic described earlier (row 3) shows that there is evidence of some over-dispersion in the data for all but the fourth reporting period.

The model labelled ‘base’ in Table A5.3 (rows 4 to 9) is a model which includes terms representing the driver age (when the test was passed) in reciprocal form, the sex of the driver and the exposure term described earlier, which includes both annual mileage and frequency of driving. The model also includes two interaction terms – one in which driver sex interacts with the reciprocal age term and the other in which driver sex interacts with the exposure term. These interaction terms represent the differences in the relevant coefficients (reciprocal age or lmiles) between females and males. It will be seen that of these, the only interaction term which is statistically significant is the age interaction in the first six months of driving.

For convenience, the female and male versions of this model are written out in the lower part of Table A5.3, the coefficients shown in these models being derived from the ‘base’ model. Thus for example, the lmiles coefficient for females is simply 0.375 – the same as the ‘base’ version (since ‘female’ is the reference category in the ‘base’ model). The corresponding coefficient for males is the same 0.375 plus the interaction component (sex.lmiles) of 0.148, making a total of 0.523. The fact that the sex interaction terms for the three later periods (7–12 months, 13–24 months and 25–36 months are not statistically significant (row 8)) means that the apparent differences in the age coefficients for females (row 12) and males (row 16) for these periods are not statistically different either. In the case of the sex.lmiles interaction (row 9), none of the interaction terms are statistically significant, so that within each model (reporting period) none of the apparent differences in the lmiles coefficients for females (row 13) and males (row 17) are statistically significant at the 5% level.

Table A5.4 shows the ‘base’ model coefficients for total reported public road accidents for all periods combined.

Again, the ‘null’ model provides an estimate of the mean of the data only. The overall mean of the whole of the accident data in this study (all four reporting periods) is therefore 0.191 accidents per year.
As before, it can be seen from the $T_1$ statistic that there is evidence of some over-dispersion. An indication of how well the model fits can be obtained by assuming the data follows a Poisson distribution. Under this assumption, the fitted model in Table A5.4 would explain about 68% of the non-Poisson variance.

The various explanatory variables in the above model are considered individually below:

1. Exposure\(^{44}\) – in the modified mileage term (mileage + 10 $\times$ FREQ), the multiplier (10) was chosen so as to optimise the fit of the public road accident model to the PRACC dataset. As in previous modelling work, the addition of

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### Table A5.4: Coefficients and standard errors for the model of reported public road accidents for all reporting periods combined, in logged form\(^{43}\)

| Model | Variable                                                                 | Coefficient | SE  | $|z|$ | $p(>|z|)$ |
|-------|---------------------------------------------------------------------------|-------------|-----|-----|---------|
| Null  | intercept                                                                | $-1.656$    | 0.191 | 78.76 | <0.001  |
|       | average accidents p.a.                                                   |             |      |      |         |
| $T_1$ test statistic on Null-model for over-dispersion, $\sim$ Normal (0,1) |                         | $5.10$     |      |      | ($p < 0.001$) |
| Base  | intercept                                                                | $-5.777$    | 0.288 | 20.05 | <0.001  |
|       | iage = $1/AGE$                                                           | $9.087$     | 2.678 | 3.39  | <0.001  |
|       | sex ($f = 0$ and $m = 1$)                                                | $-0.330$    | 0.215 | 1.53  | ns      |
|       | lmiles = log$_e$(exposure)                                               | $0.413$     | 0.030 | 13.91 | <0.001  |
|       | experience                                                                | $-0.209$    | 0.055 | 3.77  | <0.01   |
|       | sex.iage                                                                 | $8.527$     | 4.205 | 2.03  | <0.05   |
|       | iage. $\delta$                                                          | $4.881$     | 1.741 | 2.80  | <0.01   |
| Female| intercept                                                                | $-5.777$    | 0.288 | 20.05 | <0.001  |
|       | iage $< 6$ months ($\delta = 1$)                                         | $13.968$    | 3.195 | 4.37  | <0.001  |
|       | iage $> 6$ months ($\delta = 0$)                                         | $9.087$     | 2.678 | 3.39  | <0.001  |
|       | lmiles = log$_e$(exposure)                                               | $0.413$     | 0.030 | 13.91 | <0.001  |
|       | experience                                                                | $-0.209$    | 0.055 | 3.77  | <0.001  |
| Male  | Intercept                                                                | $-6.107$    | 0.360 | 16.98 | <0.001  |
|       | iage $< 6$ months ($\delta = 1$)                                         | $22.494$    | 5.281 | 4.26  | <0.001  |
|       | iage $> 6$ months ($\delta = 0$)                                         | $17.614$    | 4.985 | 3.53  | <0.001  |
|       | lmiles = log$_e$(exposure)                                               | $0.413$     | 0.030 | 13.91 | <0.001  |
|       | experience                                                                | $-0.209$    | 0.055 | 3.77  | <0.001  |
| Sample size |                                                                 | $21.072$   |      |      |         |

Note, coefficient estimates in ‘bold’ are statistically significant from zero at the 5% level or better.

As before, it can be seen from the $T_1$ statistic that there is evidence of some over-dispersion. An indication of how well the model fits can be obtained by assuming the data follows a Poisson distribution. Under this assumption, the fitted model in Table A5.4 would explain about 68% of the non-Poisson variance.

The various explanatory variables in the above model are considered individually below:

1. Exposure\(^{44}\) – in the modified mileage term (mileage + 10 $\times$ FREQ), the multiplier (10) was chosen so as to optimise the fit of the public road accident model to the PRACC dataset. As in previous modelling work, the addition of

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\(^{43}\) The final three columns of the table provide some statistics which enable the fit of the model to be assessed. SE is the standard error of the coefficient estimates. $|z|$ is the ratio of the coefficient value to the standard error, and $p(>|z|)$ is the probability that the value as large as $|z|$ could occur by chance. A low value of this probability means that it is very unlikely that the result occurred by chance – in these terms the usual 5% significance level (or better) corresponds to $p(>|z|) < 0.05$.

\(^{44}\) Wherever exposure is mentioned, it is always this measure of the annualised mileage plus a factor for the frequency of driving.
FREQ in this functional form significantly improves the fit of the model; moreover, this particular form for FREQ proved to be significantly better than fitting the variable as a simple (positive) exponential. The exponent of this term (0.413) is similar to that obtained in earlier studies, and implies that accident liability is not linearly related to annual mileage. The exposure coefficient is the same for females and males since no statistically significant interaction effects were found between sex and exposure.

2. Age – the effect of age is again represented by a reciprocal function $\frac{1}{\text{AGE}}$ in which AGE is the driver’s age at the time the test was passed. However, the model requires an age parameter adjustment factor ($\delta$) to allow for an age effect which is larger in the first six months of driving than in the later periods. In addition to this, an interaction between the sex of the driver and the age term is required because the overall age effect is considerably larger for males than for females. These effects are reflections of the results seen in the individual period models (Table A5.3) where the age coefficient for males was higher than that for females and the effect of age fell dramatically after the initial six-month driving period.

3. Driver sex – in assessing the effects of the sex of the driver in the ‘all periods’ model of Table A5.4, it is necessary to take into account both the sex main effect ($-0.33$) and the sex-age interaction. Putting these two effects together, it turns out that the ratio of male accident rates to female rates is $(8.527/\text{Age} – 0.33)$ at all values of exposure. Thus, at age 17, a male driver is predicted to have an accident liability which is 18.7% higher than a female’s – a figure which falls to 2.5% at age 24.

4. Experience – experience in the model has been represented by the combination of two components: a negative exponential term (coefficient $-0.209$, SE 0.055) covering the whole three-year period, and effectively different model constants for the first six months of driving and the remaining 30 months, arising from the interaction terms. The size of these components is such that ‘public road accident’ liability falls by 30% between the first six months and the second six months, by 15% between the second six months and the second year of driving, and by 19% between the second year and third year of driving. However, since age in this model is age when the test was passed, it needs to be remembered that this ‘experience’ reduction will be due to the combined increase in age and experience.

Although it was possible to fit a statistical model to the full dataset for the key variables (driver age, sex, experience and exposure), a full dataset was not, in general, available for most of the other variables listed in Tables A5.1 and A5.2. Thus, the size of the dataset used for evaluating the effect of the variables on accidents varied depending on the number of data values missing for each variable. A check was made on records where there was a significant proportion of missing or not applicable values; it was found that young males tended not to respond as often
as others. In a ‘worst case’ situation, with over 20% of missing data for the months taken between obtaining a provisional licence and taking the test, it was found that those not responding to this question were about eight months younger than those responding and about 59% were female compared with 66% of females for those with a valid response. The number of miles driven was very similar for those with and those without a valid response on this ‘worst case’ variable.

### A5.3.2 Driver experience variables

Tables A5.5 and A5.6 show the results of the modelling for the driver experience variables. Here, each variable was added on its own to the ‘base’ model.

The magnitude of the effect of adding each term is represented by its coefficient – the value of $c_n$ in equation (1). Whether or not this addition to the model produces a

<table>
<thead>
<tr>
<th>‘Free-fit’ model</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional variable</td>
<td>1–6 months</td>
</tr>
<tr>
<td>D2 – compared to others</td>
<td>0.136</td>
</tr>
<tr>
<td>D3 – confident</td>
<td>0.266</td>
</tr>
<tr>
<td>DS1 – attentive, careful, ...</td>
<td>-0.308</td>
</tr>
<tr>
<td>DS2 – placid, patient, ...</td>
<td>-0.121</td>
</tr>
<tr>
<td>DS3 – decisive, experienced, ...</td>
<td>-0.110</td>
</tr>
<tr>
<td>DBQ – violations</td>
<td>0.323</td>
</tr>
<tr>
<td>DBQ – errors</td>
<td>0.598</td>
</tr>
<tr>
<td>DBQ – aggressive</td>
<td>0.370</td>
</tr>
<tr>
<td>DBQ – inexperienced</td>
<td>0.122</td>
</tr>
<tr>
<td>DBQ – slaps</td>
<td>0.361</td>
</tr>
<tr>
<td>Awareness</td>
<td>0.490</td>
</tr>
<tr>
<td>WARNED – for motoring offence</td>
<td>-0.410</td>
</tr>
<tr>
<td>FPNS – fixed penalty or summons for offence</td>
<td>-0.267</td>
</tr>
<tr>
<td>A4a – busy town or city</td>
<td>0.051</td>
</tr>
<tr>
<td>A4b – quiet part of town or city</td>
<td>0.051</td>
</tr>
<tr>
<td>A4c – country roads</td>
<td>0.011</td>
</tr>
<tr>
<td>A4d – fast dual-carriageways</td>
<td>0.032</td>
</tr>
<tr>
<td>A4e – motorways</td>
<td>0.020</td>
</tr>
<tr>
<td>A4f – in dark</td>
<td>0.048</td>
</tr>
<tr>
<td>A4g – in rain</td>
<td>-0.066</td>
</tr>
<tr>
<td>A4h – in fog</td>
<td>-0.025</td>
</tr>
<tr>
<td>A4i – in snow/ice</td>
<td>0.045</td>
</tr>
<tr>
<td>A4j – to/from work</td>
<td>0.054</td>
</tr>
<tr>
<td>A4k – on business</td>
<td>0.006</td>
</tr>
<tr>
<td>B1 – near-accidents</td>
<td>0.535</td>
</tr>
<tr>
<td>D5 – exceed speed limit</td>
<td>0.105</td>
</tr>
</tbody>
</table>

Note, the emboldened deviance indicates a statistically significant variable at the 5% level or better.
A statistically significant improvement is assessed by the magnitude of the change in a statistic termed ‘deviance’, which is computed by the statistical routine when the new variable is added to the model.

‘Deviance’ is a likelihood ratio statistic which measures the amount of residual scatter of the data about the model predictions; it is a $\chi^2$ statistic. A deviance difference therefore of 3.841 or more is required to demonstrate significance at the 5% level, and a deviance difference of 6.635 is required to demonstrate significance at the 1% level.

Those coefficient estimates which are significant at the 5% level or better are emboldened in Tables A5.5 and A5.6.

<table>
<thead>
<tr>
<th>‘Constrained-fit’ model</th>
<th>Reporting period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–6 months</td>
</tr>
<tr>
<td>D2 – compared to others</td>
<td>0.127</td>
</tr>
<tr>
<td>D3 – confident</td>
<td>0.239</td>
</tr>
<tr>
<td>DS1 – attentive, careful, ...</td>
<td>-0.294</td>
</tr>
<tr>
<td>DS2 – placid, patient, ...</td>
<td>-0.112</td>
</tr>
<tr>
<td>DS3 – decisive, experienced, ...</td>
<td>0.076</td>
</tr>
<tr>
<td>DBQ – violations</td>
<td>0.295</td>
</tr>
<tr>
<td>DBQ – errors</td>
<td>0.579</td>
</tr>
<tr>
<td>DBQ – aggressive</td>
<td>0.329</td>
</tr>
<tr>
<td>DBQ – inexperienced</td>
<td>0.116</td>
</tr>
<tr>
<td>DBQ – slips</td>
<td>0.351</td>
</tr>
<tr>
<td>Awareness</td>
<td>0.479</td>
</tr>
<tr>
<td>WARNED – for motoring offence</td>
<td>-0.645</td>
</tr>
<tr>
<td>FPNS – fixed penalty or summons for offence</td>
<td>-0.503</td>
</tr>
<tr>
<td>A4a – busy town or city</td>
<td>0.046</td>
</tr>
<tr>
<td>A4b – quiet part of town or city</td>
<td>0.045</td>
</tr>
<tr>
<td>A4c – country roads</td>
<td>0.009</td>
</tr>
<tr>
<td>A4d – fast dual-carriageways</td>
<td>0.028</td>
</tr>
<tr>
<td>A4e – motorways</td>
<td>0.018</td>
</tr>
<tr>
<td>A4f – in dark</td>
<td>0.038</td>
</tr>
<tr>
<td>A4g – in rain</td>
<td>-0.060</td>
</tr>
<tr>
<td>A4h – in fog</td>
<td>-0.024</td>
</tr>
<tr>
<td>A4i – in snow/ice</td>
<td>0.043</td>
</tr>
<tr>
<td>A4j – to/from work</td>
<td>0.042</td>
</tr>
<tr>
<td>A4k – on business</td>
<td>0.006</td>
</tr>
<tr>
<td>B1 – near accidents</td>
<td>0.519</td>
</tr>
<tr>
<td>D5 – exceed speed limit</td>
<td>0.094</td>
</tr>
</tbody>
</table>

Note, the emboldened deviance indicates a statistically significant variable at the 5% level or better.
For each ‘base’ model, two analyses were conducted: Table A5.5 shows ‘free-fit’ results in which the coefficients of the variables included in the ‘base’ model are allowed to vary when the new variable is entered, and Table A5.6 shows the ‘constrained-fit’ results in which the coefficients of the ‘base’ model are fixed and therefore remain unchanged when the new variable is added. Free fitting generates a ‘best fit’ model, which minimises the overall deviance; if there are correlations between the added term and the terms already included in the ‘base’ model, then, in free fitting, the coefficients of the ‘base’ model will be adjusted so as to maximise the fit of the new model. However, because showing the coefficients for each fitting model would be impractical (and not very helpful), these coefficients are not included. It should also be noted that the ‘near-accident’ variable is included as a potential ‘explanatory variable’ in the tables which follow. This variable measures the number of times a driver has had the impression of just avoiding an accident. The implication of ‘near-accidents’ will be discussed in the next sub-section.

A comparison of the two versions of the model (the ‘free-fit’ model shown in Table A5.5 and the ‘constrained-fit’ model in Table A5.6) gives an indication of the magnitude of correlations within the data. A strong correlation between an added variable and the terms already included in the ‘base’ model will generate lower coefficients for $c_n$ and lower deviance differences in the case of the ‘constrained-fit’ model than in the case of the ‘free-fit’ model. In practice, there were very few practically important differences in the coefficient estimates using either modelling approach.

The relative significance of an extra variable for the prediction of accident liability can be judged by the size of the deviance difference resulting from adding the variable to the model – the larger the deviance, the more significant the relationship between the added variable and accidents. The deviance differences generated by the ‘constrained-fit’ model, listed in descending order of deviance difference, are given in Table A5.7.
A5.3.3 Learning to drive variables

The effect on accident liability of the learning to drive variables (see Table A5.8) was explored in a similar way to that for the variables derived from the Driving Experience Questionnaire (with some adjustment for the type of variable involved) by adding each variable individually to a ‘base’ model which includes sex, age, exposure and, for the ‘all periods’ model, experience. In this analysis the accident data from all periods was modelled as before (the ‘all periods’ model), but the only single period model used in the learning to drive analysis was that for the first six months of driving. As before, both modelling approaches produced similar rank orders in the significance of these variables as predictors of accidents.

Again, the relative significance of an extra variable fitted to the ‘base’ model can be judged by the size of the deviance associated with adding the variable to the model.
The deviance associated with the hours of professional tuition suggests a statistically significant finding and indicates that the more tuition, the higher the public road accident liability. This is almost certainly a reflection of the fact that those drivers who find it difficult to reach a suitable driving standard to pass the test are also likely to have a higher accident liability in their early years of driving. The statistically significant result for all driving tuition plus practice with friends and relations is highly influenced by the hours of professional tuition. The magnitude of the effect size of the learning to drive variables for the ‘first year’ model is discussed in Section 9.

A5.4 Effect of hazard perception testing

The approach used to model accidents in this study has been explained earlier. An identical approach has been used in order to determine the impact on accident liability of having taken the hazard perception test. A two-level dichotomous variable (takeHP) which indicates whether or not the driver had taken (and necessarily passed) the hazard perception test was added to the ‘all periods’ base models for different types of reported public road accidents. For this variable, level 1 = not taken the test and level 2 = taken the test. The effect size of this variable in the model (i.e. its effect on estimated accident liability) provides a measure of the consequential validity of having introduced hazard perception testing into the licensing system.

Table A5.9 shows fitted ‘all periods’ models for all reported public road accidents, reported non-low-speed public road accidents, reported non-low-speed public road
accidents with some blame and reported ‘active’ public road accidents. The structure of the model is similar to ones presented earlier. The individual coefficient estimates are given in bold where they are statistically significant. The emboldened estimates for taking hazard perception or not (‘takeHP’) are statistically significant for the non-low-speed public road accidents and the non-low-speed public road accidents where there is some blame.

The coefficient estimates for both the hazard perception variables (‘takeHP’ and ‘HPTg’) added individually to the ‘base’ models for each of the different time periods are summarised in Table A5.10. The statistical significance of these coefficients has been judged by a one-sided ‘t’-test and the statistically significant estimates are indicated by the use of bold.

It is noteworthy that the sign of all statistically significant coefficients (and, in fact, virtually all the coefficient values) is negative. This indicates that drivers who took (and passed) the hazard perception test tended, on average, to have a lower accident liability than those who had not taken the test, other differences between these two groups of drivers in terms of age, sex, exposure and experience being controlled for statistically. Similarly, drivers who scored higher in the hazard perception test tended, on average, to have a lower accident liability than those who scored lower, again allowing for other differences between the two groups. The size of the first effect can be judged by the factors shown in Table A5.11, which have been calculated for the ‘takeHP’ variable (level 1 = not taken, and level 2 = taken) for the ‘all periods’ model for each of the different accident types.

Table A5.11 shows, for the ‘all periods’ models, the coefficient estimates for the ‘takeHP’ two-level variable, together with the equivalent percentage reductions in
accident liability. In each case the 95% confidence values are also given – i.e. one can be 95% confident that the true values are at least as great as these. For example, one can be confident of at least a 1.5% reduction in reported non-low-speed public road accidents associated with the introduction of the hazard perception test. The

<table>
<thead>
<tr>
<th>Accident type</th>
<th>Coefficient</th>
<th>1–6 months</th>
<th>7–12 months</th>
<th>First year (1–12 months)</th>
<th>13–24 months</th>
<th>25–36 months</th>
<th>All periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>All public road</td>
<td>takeHP HPTg</td>
<td>0.034</td>
<td>-0.116</td>
<td>-0.014</td>
<td>-0.040</td>
<td>-0.090</td>
<td>-0.025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.001</td>
<td>-0.003</td>
<td>-0.001</td>
<td>-0.002</td>
<td>-0.006</td>
<td>-0.001</td>
</tr>
<tr>
<td>Non-low-speed public road</td>
<td>takeHP HPTg</td>
<td>-0.082</td>
<td>-0.199</td>
<td>-0.120</td>
<td>-0.025</td>
<td>-0.358</td>
<td>-0.116</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.003</td>
<td>-0.007</td>
<td>-0.005</td>
<td>-0.002</td>
<td>-0.018</td>
<td>-0.005</td>
</tr>
<tr>
<td>Non-low-speed public road, some blame</td>
<td>takeHP HPTg</td>
<td>-0.172</td>
<td>-0.237</td>
<td>-0.191</td>
<td>-0.016</td>
<td>-0.195</td>
<td>-0.157</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.007</td>
<td>-0.010</td>
<td>-0.008</td>
<td>-0.002</td>
<td>-0.016</td>
<td>-0.007</td>
</tr>
<tr>
<td>‘Active’ public road</td>
<td>takeHP HPTg</td>
<td>-0.050</td>
<td>-0.119</td>
<td>-0.071</td>
<td>-0.052</td>
<td>-0.181</td>
<td>-0.075</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.003</td>
<td>-0.005</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.010</td>
<td>-0.004</td>
</tr>
<tr>
<td>Sample size</td>
<td></td>
<td>7,963</td>
<td>5,946</td>
<td>13,909</td>
<td>3,425</td>
<td>2,289</td>
<td>19,623</td>
</tr>
</tbody>
</table>

Note, the emboldened entries indicate a statistically significant estimate at the 5% level or better (one-sided test).

<table>
<thead>
<tr>
<th>‘All periods’ model – estimates for ‘takeHP’ variable</th>
<th>All public road accidents</th>
<th>Non-low-speed public road accidents</th>
<th>Non-low-speed public road accidents where some blame</th>
<th>‘Active’ public road accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>Central estimate</td>
<td>-0.025</td>
<td>-0.116</td>
<td>-0.157</td>
</tr>
<tr>
<td></td>
<td>95% confidence value*</td>
<td>0.048</td>
<td>-0.015</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.025</td>
</tr>
<tr>
<td>% reduction</td>
<td>Central estimate</td>
<td>2.4%</td>
<td>10.9%</td>
<td>14.5%</td>
</tr>
<tr>
<td></td>
<td>95% confidence value*</td>
<td>-5.0%</td>
<td>1.5%</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.5%</td>
</tr>
</tbody>
</table>

* One can be 95% confident that the true values are at least as great as this.

Table A5.10: Coefficients for hazard perception variables in models of different accident types for different reporting periods

Table A5.11: Coefficients and estimated effects of introducing the hazard perception component of the theory test for the ‘all periods’ models for different accident types.
coefficients were very similar for the free-fit and constrained-fit model parameters, suggesting that there was no strong correlation between the parameters already in the model and the added hazard perception variable, so only the constrained-fit values are shown in the table.