In-depth accident causation study of young drivers

Prepared for Road Safety Division, Department for Transport, Local Government and the Regions

D D Clarke, P Ward and W Truman (School of Psychology, University of Nottingham)
## CONTENTS

### Executive Summary

<table>
<thead>
<tr>
<th>Executive Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### 1 Introduction

1.1 Some specific problems of younger drivers

#### 1.1.1 Darkness

#### 1.1.2 Speed

#### 1.1.3 Single vehicle accidents and bends

#### 1.1.4 Rear end shunts

#### 1.1.5 Right turns

#### 1.1.6 Age vs. experience

1.2 Methods of studying road accidents

<table>
<thead>
<tr>
<th>1 Introduction</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Some specific problems of younger drivers</td>
<td>3</td>
</tr>
<tr>
<td>1.1.1 Darkness</td>
<td>3</td>
</tr>
<tr>
<td>1.1.2 Speed</td>
<td>3</td>
</tr>
<tr>
<td>1.1.3 Single vehicle accidents and bends</td>
<td>4</td>
</tr>
<tr>
<td>1.1.4 Rear end shunts</td>
<td>4</td>
</tr>
<tr>
<td>1.1.5 Right turns</td>
<td>4</td>
</tr>
<tr>
<td>1.1.6 Age vs. experience</td>
<td>4</td>
</tr>
<tr>
<td>1.2 Methods of studying road accidents</td>
<td>4</td>
</tr>
</tbody>
</table>

### 2 Method

2.1 Initial sampling and data quality

2.2 Interpretation of cases

2.3 The database

<table>
<thead>
<tr>
<th>2 Method</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Initial sampling and data quality</td>
<td>5</td>
</tr>
<tr>
<td>2.2 Interpretation of cases</td>
<td>6</td>
</tr>
<tr>
<td>2.3 The database</td>
<td>6</td>
</tr>
</tbody>
</table>

### 3 Analysis and results

3.1 Experience

3.2 Contributory factors age and gender differences

<table>
<thead>
<tr>
<th>3 Analysis and results</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Experience</td>
<td>9</td>
</tr>
<tr>
<td>3.2 Contributory factors age and gender differences</td>
<td>11</td>
</tr>
</tbody>
</table>

### 4 Qualitative analysis and discussion

4.1 Attitude vs. skill deficits

#### 4.1.1 Attitude vs. skill deficits; young drivers of ‘performance’ cars

#### 4.1.2 Attitude vs. skill deficits; young driver accidents by time of day

#### 4.1.3 Skill factors: an analysis of observational failure

4.2 Blameworthiness and time of day

4.3 Time of day and ‘performance’ cars

4.4 Vehicle ownership and driver age

4.5 Unlicenced drivers

#### 4.5.1 Accident severity

#### 4.5.2 Attitude vs. skill factors

4.6 Countermeasures

4.7 Cluster analysis

<table>
<thead>
<tr>
<th>4 Qualitative analysis and discussion</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Attitude vs. skill deficits</td>
<td>13</td>
</tr>
<tr>
<td>4.1.1 Attitude vs. skill deficits; young drivers of ‘performance’ cars</td>
<td>16</td>
</tr>
<tr>
<td>4.1.2 Attitude vs. skill deficits; young driver accidents by time of day</td>
<td>16</td>
</tr>
<tr>
<td>4.1.3 Skill factors: an analysis of observational failure</td>
<td>19</td>
</tr>
<tr>
<td>4.2 Blameworthiness and time of day</td>
<td>19</td>
</tr>
<tr>
<td>4.3 Time of day and ‘performance’ cars</td>
<td>21</td>
</tr>
<tr>
<td>4.4 Vehicle ownership and driver age</td>
<td>21</td>
</tr>
<tr>
<td>4.5 Unlicenced drivers</td>
<td>21</td>
</tr>
<tr>
<td>4.5.1 Accident severity</td>
<td>23</td>
</tr>
<tr>
<td>4.5.2 Attitude vs. skill factors</td>
<td>23</td>
</tr>
<tr>
<td>4.6 Countermeasures</td>
<td>24</td>
</tr>
<tr>
<td>4.7 Cluster analysis</td>
<td>24</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>5 Concluding remarks</td>
<td>24</td>
</tr>
<tr>
<td>6 References</td>
<td>31</td>
</tr>
<tr>
<td>Appendix A: Primary and defensive countermeasures</td>
<td>33</td>
</tr>
<tr>
<td>Appendix B: Explanatory factors</td>
<td>34</td>
</tr>
<tr>
<td>Abstract</td>
<td>35</td>
</tr>
<tr>
<td>Related publications</td>
<td>35</td>
</tr>
</tbody>
</table>
Young drivers, especially young males, have relatively more accidents than other drivers. In absolute terms, young drivers have three to four times as many accidents per year as older drivers and even allowing for their relative numbers in the population, their accident involvement is about 2.5 times higher than older drivers. Young driver accidents also have somewhat different characteristics. They include in particular single vehicle accidents involving loss of control, excess speed for conditions, accidents during the hours of darkness, accidents on all-purpose single carriageway rural roads, and accidents while making right turns. Their accident liability drops rapidly, however, in the post-test period, falling by around 30% in the first year, and a further 28% over the next two years.

A sample of 3437 accident cases was considered, including 1296 in detail, from midland police forces, involving drivers aged 17 – 25, and covering the years 1994-1996 inclusive. Each case was summarized on a database including the main objective features (such as time and place) and a summary narrative, a sketch plan and a list of explanatory factors. The summary narrative, in particular, included judgements by the researchers that emphasised the sequence of events leading up to the accident.

Four types of accident were analysed: right-turns; rear-end shunts; loss of control on bends; and accidents in darkness.

Loss of control on bends and accidents in the hours of darkness were found to be a particular problem for the younger drivers within the group studied (17-19 year olds), while the older group studied (23-25 years) had more problems with rear end shunt accidents. Right turn accidents seem to peak in relative frequency in the middle age range of the sample (20-22 years). When experience was studied separately, it was found that right turn accidents showed the quickest improvement with increasing driver experience, whereas accidents occurring in the hours of darkness and with no street lighting showed the slowest rate of improvement.

Simple behavioural countermeasures that might apply within each category were examined, and it was discovered that a small number of simple countermeasures would be applicable to a large number of the cases examined, meaning that findings might be easily communicated in a concise and comprehensible form. Significant differences were also observed concerning age and gender differences in contributory factors within accidents of various types. An examination of driver attitudes as revealed in police interviews also gave an insight into some of the motivational factors underlying young driver behaviour. The overall sequence of events in particular accidents was also placed within a detailed structure of proximal and distal accident causation, showing differences in prototypical sequences within accidents of the four types.

A central theme that was developed from our unique blend of qualitative with quantitative methods was the extent to which young driver accidents of all types could be said to be the result of ‘attitudinal’ factors as opposed to ‘skill deficit’ factors. It has previously been thought that one of the main problems that young drivers have is in the area of specific skills needed in the driving task. However, it appears that a large percentage of their accidents are purely the result of two or three ‘failures of attitude’, rather than skill deficits per se. Our analyses show that specific groups of young drivers, such as those who drive ‘performance’ cars, can even be considered as above average in driving skills, but simultaneously have a higher accident involvement due to attitudinal faults such as deliberate speeding and recklessness.
1 Introduction

The high accident rate for younger drivers has been of concern to such diverse official bodies as insurance companies, driving standards agencies and governments for many years. Road accidents are the most common cause of death among those aged under 25 in the USA, Canada and the European Union. Research conducted in these areas has shown that drivers aged 17-20, particularly males, have an accident rate per km/mile driven that is disproportionately high when compared with other groups. Forsyth (1992) quotes figures from the UK in 1987 that show male drivers between the ages of 17 and 20 having an average of 440 injury accidents per 100 million km driven. The average for all male drivers was 106 injury accidents. Comparable figures for female drivers in this age bracket were 240 vs. 125 injury accidents per 100 million km driven.

Accident rates appear to drop rapidly above this age bracket. Figures for male drivers in the age range 20-24 years, for example, show a drop to 180 injury accidents per 100 million km driven. While this is a massive drop, it still represents an injury accident rate that is nearly 70% higher than the baseline for all male drivers.

Recently, the Select Committee on Environment, Transport and Regional Affairs 19th report (1999) contained evidence from the UK showing that, although the 17-24 year old age group hold only 11% of driving licences, they are involved in 25% of fatal/serious injury accidents each year. Additionally, fatality rates for male drivers aged 17-20 are ten times those of male drivers aged 35-54.

1.1 Specific problems of younger drivers

1.1.1 Darkness

Accidents for all drivers per unit distance travelled are much higher during the hours of darkness than during the daylight. One of the possible reasons for the elevated accident rate seen in young drivers during the hours of darkness is tiredness. Always assumed to be more of a problem for older drivers, researchers such as Corfitsen (1994) have shown that tiredness is a common affliction among young male night-time drivers, which leads to reaction times that can be three times slower than a driver who is ‘rested’. Similarly, Pack et al. (1995), in the USA, found that accidents that could be attributed to the driver having fallen asleep at the wheel had a peak of occurrence at age 20 years. Pack also points out that this is not only a problem at night. ‘Sleepiness’ accidents can also reach a peak during the early afternoon, described as ‘siesta time’ in certain cultures. Laapotti and Keskinen (1998) found that fatal loss of control accidents involving young male drivers typically took place during evenings and nights. The high numbers of accidents occurring in the early hours of the morning are also associated with the high numbers of single vehicle accidents for this age range.

Internationally, the high accident rate of young drivers during the hours of darkness has led to the introduction of a driving curfew in certain areas as part of a graduated driver licensing scheme (GDLS), e.g., in Canada (Doherty et al., 1998), and New Zealand (Langley et al., 1996). The introduction of such a scheme in New Zealand was closely followed by substantial reductions in car crash injuries, though Langley points out that caution should be exercised due to research suggesting that one of the principle effects of the GDLS on crashes may have been indirect through a reduction in overall exposure. Nevertheless, researchers in the United States, e.g. Miller et al. (1998) have pointed out, using cost-benefit analysis, that crash costs of younger drivers are high enough to justify limiting them to not driving after midnight.

1.1.2 Speed

Youth drivers have long been associated with offences and accidents involving speeding. An early comprehensive work in the USA by Harrington (1972), for example, showed that in a sample of over 13000 driver records, speeding was the most common violation, and also the violation most frequently involved with fatal and injury accidents. STATS19 data for 1995 in the UK shows that the importance of speeding as a contributory factor in injury accidents declines steadily with age.

Speeding was by far the most common offence for young male and female drivers in the UK Cohort study by Forsyth et al. (1995) and there also appeared to be an increase in the number of speeding violations as a whole over the first three years of driving. Forsyth et al. suggest that this is a result of increasing driver confidence as initial driving experience is gained after passing the test. This is similar to a finding by Quenault and Parker (1973), where newly qualified drivers were assessed at 1, 13, 26, 39 and 52 weeks after passing the driving test. They found that average speeds in 30mph and de-restricted zones tended to become higher with increasing driver experience.

Jonah (1986) reviews evidence that young drivers are less likely than older drivers to cite speeding as a major cause of accidents, and when asked to rank a number of driving situations in order of risk, young drivers ranked speeding significantly lower in risk than did older drivers. It has been suggested e.g., by Brown (1982), that one of the reasons young drivers attach less importance to the risk of speeding is they are overconfident in their control and recovery skills. Brown concludes that ‘... relatively naive drivers tend to create accident opportunities for themselves because they often overestimate their ability to recover from error.’ It has also been pointed out by Deery (1999) that psychological research separate from the road safety area suggests that people are generally overconfident about their skilled performance, and that in addition, speeding can result from young males especially having a higher degree of risk acceptance while driving than that found in older drivers.

The work of both Parker (1991) and Tuohy et al. (1992) showed the importance of driver attitudes in an understanding of the young driver problem. Parker (1991) found that speeding in younger drivers was often mediated by the effects of peer groups and significant others, resulting in the young driver having a perceived lack of control over violations such as speeding. Similarly, Tuohy et al. (1992) surveyed the knowledge and beliefs of both
young drivers and ‘pre-drivers’ and concluded that both groups had a good knowledge of basic roadcraft: Young drivers knew what was the correct behaviour, but attitudes, opinions and beliefs usually stopped them practising it.

1.1.3 Single vehicle accidents and bends
The proportion of single vehicle accidents is much higher for younger drivers than for older drivers. STATS19 (UK) data for 1995 reveals that over 1 in 5 (22%) of injury accidents for males aged 17-19 involved no other vehicle but the driver’s own. These data are backed up by the self report study of drivers by Maycock et al. (1991); for the youngest group, single vehicle accidents represent about 20% of total accidents.

When the type of manoeuvre in aggregate records such as STATS19 (UK) is examined, it can be seen that younger drivers (17-19) are involved in twice the proportion of accidents while negotiating a bend that older drivers are (in this example, those aged 30-39). This is a feature associated with the over-representation of younger drivers in single vehicle accidents. Clarke, Ward and Jones (1998), in their study of overtaking accidents, found that the second most common overtaking injury accident for drivers under the age of 21 occurred as a result of overtaking into a bend with little visibility ahead.

Laapotti and Keskinen (1998), in their study of young driver fatal loss-of-control accidents, found that there were differences in the causation of such accidents according to the driver’s gender. Risky driving habits such as driving too fast and consuming alcohol played a bigger role in male drivers’ loss of control accidents than in any kind of female drivers’ accidents. Female drivers’ loss of control accidents tended to be associated with slippery road conditions rather than risky driving habits.

1.1.4 Rear end shunts
Rear end shunts have been found to be amongst the most common types of accidents for all drivers. West (1993) estimated that at least 30% of all accidents on UK roads were shunts. While many of these accidents are seemingly trivial, whiplash injuries that can result from them are a significant problem. West, in his analysis of different types of shunt, found that ‘active involvement in shunts was a function of being young and male.’ (‘Young’, in West’s terms, being under 23 years old, with a sample deliberately selected to contain 50% 17 and 18 year olds.)

1.1.5 Right turns
In a previous study at Nottingham, Clarke, Forsyth and Wright (1998) discovered that young drivers (under the age of 25) were more than three times more likely to be involved in right turning accidents (either onto or off a more major road) than typical mileage travelled each year by this age group would lead one to expect. West (1993) discovered that young drivers were at greater risk of ‘passive’ right of way violations. He reported that ‘younger drivers [are] more at risk of an accident where another driver pulls out in front of them’. West says that this is most likely to occur due to a combination of such factors as speeding, slow perception of potential hazards, and a ‘[determination] to assert their own right of way.’

1.1.6 Age vs. experience
Methodologically, it has always been difficult to separate the effect on accident frequencies of simple age compared with the experience of the driver concerned. Does a 24 year old with 6 months driving experience have the same risk of an injury accident as a 17 year old with equivalent experience, for example? If this were true, the effect would not show up in accident statistics because there are many more 17 year olds with only 6 months driving experience than there are 24 year olds with 6 months experience. The most common measure of experience is, nevertheless, time in years since passing a driving test. Waller et al. (2000), for example, looked at the decline in offences and crash incidents over seven years from the date of full licence attainment. The odds of any driving offence committed being serious decreased by approximately 8% per year of licensure, independent of gender. Similarly, the odds of an at-fault crash occurring decreased overall around 6% per year of licensure, but the decline was more than twice as fast for women as for men. However, in any given sample of drivers, age and experience when measured in this way are very highly correlated, and this makes any separate effects very hard to determine. In the end, as Jonah (1986) observed, ‘the attempt to separate the two concepts may well prove fruitless’.

Attempts have been made to define experience as the distance in miles/km driven since the test pass date, but not only is this difficult to determine, it also complicates the issue owing to the exposure effect. The driver in question may be more experienced as a result of driving a greater distance, but the greater the distance travelled, the more likely it is that he/she will have an accident. However, in Jonah’s (1986) review of Canadian research on the subject, he concludes ‘...even when one controls for the quantity and quality of exposure to risk, young drivers are still at the greatest risk of casualty accident involvement, particularly those aged [under] 19.’

1.2 Methods of studying road accidents
The causality of real road accidents can be a difficult phenomenon to study. One possible solution to this is the use of methodology that investigates road accidents after they have occurred, rather than the more familiar psychological research that relies for its method on examination of driver behaviour in controlled environments.

One such well known approach involves the use of multi-disciplinary accident investigation teams (MDAI) that travel to the site of accidents soon after they occur to collect data. Research such as that of Sabey and Taylor (1980) is based on the work of MDAI teams. Findings were concerned with the proportional contributions to road accidents of the user, environment and vehicle. It is from this work that the much quoted figure of 95% was identified as the proportion of road accidents involving human error. Sabey quoted research carried out in the United States that produced much the same figure. She went on to assess driver errors behind
this figure by examining the contribution of perceptual errors, lack of skill, manner of execution and various forms of impairment such as alcohol.

However, in a review of the work of multi-disciplinary team research world-wide, Grayson and Hakkert (1987) pointed out several disadvantages to such a method. Operational costs are very high, and only a small number of accidents can be studied. Although Sabey did study over 2000 accidents, such a figure is the exception rather than the rule. There is a bias towards injury accidents due to the notification procedure. The accidents sampled are bound to be of a heterogeneous nature, which works against any approach that aims to study a specific problem.

A further criticism concerns the conclusions reached. Despite the vast amount of information collected in such work, ‘definitive conclusions are very limited’ and have been applied mainly to vehicle design and engineering efforts rather than human behaviour and road design. According to Grayson and Hakkert, these limitations tend to disappear ‘if an in-depth but not immediate response on-the-spot approach is taken.’ They comment that it is also important that any in-depth technique is only really of use if applied to specific areas rather than a large heterogeneous sample of information.

Many studies have used in-depth techniques applied to secondary data sources such as police reports, interviews and questionnaires. Fell (1976) was amongst the first to claim that an ‘accident causal schema’ could be constructed from such sources. Fell was of the opinion that in-depth work using police reports, while still having some limitations, could be used to improve the ‘state of the art’ in understanding accident causation.

More recently, Malaterre (1990) used police reports to break down and analyse accidents. Malaterre constructed four stages in his analysis - driving, accident, emergency and collision. Factors identified in his analysis stage were next used in synthesis; the building of prototype cases. Such an approach, Malaterre claimed, focused effectively on functions not correctly carried out by the driver, which are sometimes difficult to locate. Malaterre’s sample was, however, quite small (115 cases) and was also heterogeneous. He ended by concluding that more precise analysis needed to be carried out by referring to complete police accident reports, with all their varieties of information.

It is often overlooked that local council initiatives into examining accident causation at specific locations (‘blackspots’) make much use of police reports to present a full picture of what happened. England (1981) describes the approach as very cost effective when targeting engineering countermeasures, and points out that it has the additional benefit of checking the accuracy of summary statistical information that is held on accidents.

The in-depth technique itself has been used in areas outside accident causation for some time. Examination of in-depth case study techniques by Yin (1984) shows how they are primarily of use in producing analytic generalisations rather than more traditional statistical generalisations. They concentrate on an iterative type of explanation building that often features chronologies, sequences and contingent event analysis.

Case study methods were used by Clarke, Forsyth and Wright (1998) in the analysis of police road accident files in right-turn accidents, a key feature of this work being that it treated accidents as a ‘clinical’ problem, rather than just an ‘epidemiological’ one as in many traditional approaches. For the first time sequence analysis was used in conjunction with rule-finding computer software. This approach concentrated on the relatively homogeneous class of right turn accidents to produce new findings. It was however felt that much of the information from the original police reports was being lost. The rich nature of an accident report that made it understandable to a human observer had to be lost out when the data were being prepared for computer analysis. Subsequent work investigating overtaking accidents, by Clarke, Ward and Jones (1998), placed more emphasis on the interpretation of causal patterns by the human coders, but retained the powers of a computer database for the later stages of storing, sifting and aggregating explanatory models of individual cases. This later approach was continued in the present study.

2 Method

Our method largely relies on the human interpretation of road accident case reports. Furthermore, the construction of interpretations, typologies and models has not been driven by theory in the main, but generated primarily from the data itself, although theoretical models are acknowledged. The most attention is given to full sequential nature of the accident story in each individual case, which is where the technique of qualitative human judgment methodology proves more useful than more traditional statistical methods applied to aggregated data. Full details of our method can be found in previous reports and papers, (e.g. Clarke et al., 1998).

2.1 Initial sampling and data quality

The first step was to draw a heterogeneous sample of police road accident files involving young drivers. These were used to gain an initial impression of the quality of data available, to pilot methods of analysis and to assist in choosing the type of accident best suited for the main study. This required liaison with Nottinghamshire and Derbyshire County Councils and Constabularies to determine methods of referencing and selecting the relevant accident cases. A random selection of 285 accidents was made from the year 1994 and the original files obtained from Nottinghamshire and Derbyshire Constabularies. The files were found to contain varying amounts of information depending on the circumstances of the accident and any subsequent legal proceedings.

The minimum contained in each file is a report sheet/card which is a summary of information about the accident such as date, time, location, weather conditions, junction type and many other items. The sheet also includes a brief accident story as interpreted by the attending police officer. This is constructed by the officer a short time after the accident by reference to his or her pocket book. It
contains the actions, and in some cases the reported intentions and behaviours of drivers and witnesses. The report is completed and sent to the County Council Accident Investigation Unit (AIU) in the first instance to enable collection of STATS 19 information.

In addition to the report sheet/card, the most detailed files contain a range of further items which help to fill out the often complex circumstances of the accident. These include maps, photographs, statements of vehicle examiners and, perhaps most importantly, interview and witness statements which are rich in information. These are often built up over a period of time in the pursuance of a court case. The files, having been examined by the AIU, are stored with all relevant materials in the abstract department of the Police headquarters.

The most detailed files drawn from this source were very dense, requiring some time to read and interpret; these were designated as ‘A’ grade cases. Others contained little beyond the information on the report sheet/card, usually because the accident was minor, there were no independent witnesses and no charges made; these were designated as ‘B’ grade cases.

2.2 Interpretation of cases

The interpretation consisted of the reconstruction of an entire accident story from the information available in the police file. Clearly some files did not contain the detailed level of material suitable for the main part of the study and the initial sample was useful in estimating the period over which the main sample would have to be drawn in order to obtain the target of about 1200 detailed files.

2.3 The database

The data was entered into a FileMaker Pro database customised to handle the information and search parameters required for this project. Figure 1 shows the standard data entry set-up.

Data are entered describing the relatively objective facts of each case: time of day, speed limit, class of road etc. The database includes some fields configured as check boxes or ‘radio buttons’; these provide quick access to selected cases during further analysis. Summary fields are also used to calculate things such as mean age of involved drivers. Any combination of fields in the database can be used to search for cases matching a variety of criteria. A variety of layouts are also used to present and analyse the data, in addition to the data entry layout in Figure 1.

A ‘prose account’ is also entered for each case giving a step-by-step description of the accident. The causal story is always written from the viewpoint of the young driver, who is labelled as ‘driver 1’, though much consideration is also given to other drivers’ actions and intentions. An interest is taken in all accidents involving the young driver, whether, to use West’s (1993) terminology, they are ‘actively’ or ‘passively’ involved. The prose accounts give a detailed summary of the available facts, including information from witnesses that appears to be sufficiently reliable. Discrepancies can occur between the interviews of drivers and the statements of independent witnesses, but these can usually be resolved by considering all statements together with various other reported facts. These can include measurement of skid marks by police, vehicle damage reports etc. Figure 1, it should be noted, only shows part of a typical prose account because the text is held in an ‘expandable field’ in the database.

Next, a sketch plan of each accident is made from sources in the file. The orientations of the sketch plan and the icons contained in it are standardised for speed of entry and to allow direct comparisons between example or prototype cases. A minimum set of possible explanations for each accident is recorded from a standard checklist adapted and developed from a previous study (Clarke, Ward and Jones, 1998). The list has subsections for the road environment, vehicle and driver characteristics, and specific driver actions. The emphasis throughout is on giving the finest grain description possible of each accident, not for use as a formal coding scheme, but rather to provide search and selection aids to identify homogeneous groups of cases for further qualitative analysis. In addition, we entered data for a version of a national ‘contributory factors in accidents’ form developed at TRL, which involves the identification of one major precipitating factor (PF) from a possible list of fifteen, and a further coding of up to four contributory factors (CFs), together with a confidence rating in the CFs identified. Finally, entries are made in additional fields for comments and quotes from involved drivers.

The ultimate aim of entering facts and figures, prose accounts, standardised graphics and explanatory factors in the database was to build a library of analysed cases stored as a series of case studies. In this sense, the database is used to find groups and recurring patterns, rather than being considered as ‘raw’ data awaiting analysis. In this way it was possible to find patterns, sequences and processes within each group of accident. Statistical examinations were not the primary focus of the study, even though simple statistics were used to characterise the sample.

The reliability of this technique has already been assessed in two previous studies (Clarke, Forsyth and Wright, 1998; Clarke, Ward and Jones, 1998), and will not be further examined in this study.

It should also be noted that some of the fields in the database were, in the end, not used in the analysis. It had been initially thought that factors such as whether the car involved was ABS equipped, and what type of drive it had (i.e. FWD, RWD, 4WD) might have been a fruitful area of investigation. However, the cases examined were from a few years ago, and most of the young drivers appeared to be driving front-wheel drive older vehicles that tended to only have ‘standard’ braking equipment.

3 Analysis and results

Following the pilot analysis of 285 cases, the following types of accident were selected for further study in the main body of the project:

- Accidents occurring on rural roads involving loss of control on a bend.
It was early in the morning on a damp day in late Autumn. It was still dark and streetlamps were lit. The road was wet, but it wasn't raining. The driver (F,21) of a Peugeot 105 (1) was travelling along an urban A road towards a crossroads junction with a more major urban A road dual carriageway with a 40mph limit. The junction was controlled by traffic lights and she wished to make a right hand turn. She stopped at the lights, which were showing red in her direction. She wasn't really paying much attention, and she said she saw a light change and thought it was her signal. She pulled off and turned right in front of an articulated HGV (2), driven by (M,59), who had been coming through the traffic lights from her right which were showing green in...

**Prose Account**

It was early in the morning on a damp day in late Autumn. It was still dark and streetlamps were lit. The road was wet, but it wasn't raining. The driver (F,21) of a Peugeot 105 (1) was travelling along an urban A road towards a crossroads junction with a more major urban A road dual carriageway with a 40mph limit. The junction was controlled by traffic lights and she wished to make a right hand turn. She stopped at the lights, which were showing red in her direction. She wasn't really paying much attention, and she said she saw a light change and thought it was her signal. She pulled off and turned right in front of an articulated HGV (2), driven by (M,59), who had been coming through the traffic lights from her right which were showing green in...
- Right turns either onto or off a more major road.
- Rear end shunts.
- Accidents occurring in darkness, with or without street lighting.

It was found that these (overlapping) types covered nearly 90% of the pilot sample. 3437 cases were coded during the main phase of the project. These comprise 1296 A grade cases and 2141 B grade cases (A grades account for 37.7% of the total sample). The four types of accident were selected without any particular design bias and can therefore be compared across factors such as age, gender, or others. Accidents can also belong to more than one type in certain situations, for example, right turn accidents happening during the hours of darkness.

A basic statistical overview of the sample reveals that accidents occurring in the hours of darkness are notably high in 17-19 year old drivers. In addition, this appears to be a problem for young males in particular (Figure 2).

By contrast, rural bend accidents involving young females are relatively rare. Although young females have a higher percentage of shunts in their total accidents, when these cases are examined in a 2x2 \( \chi^2 \) analysis, significant differences are seen. Across a 2x2 matrix of male/female and active/passive rear end shunts, males are significantly more likely to be actively involved in rear end shunts, while females are significantly more likely to be passively involved (‘active’ and ‘passive’ being used according to the definitions of West, 1993).

The overall aim was to examine the four main divisions of accident for consistent features such as the type of driver involved, location, time, and ultimately the types of errors made by drivers in these different scenarios. In examining these questions it is necessary to account for exposure effects within the sample as a whole.

An induced exposure measure was provided by breaking the age range in the sample (17-25 years) up into 3 equally spaced bands and calculating standard normal residuals for each band. This measure, based on the \( \chi^2 \) statistic, finds combinations of a ‘row’ feature and ‘column’ feature which are considerably over-represented in the data, even when mere coincidences have been allowed for (Colgan and Smith, 1978). For each cell, \( O-E/E \) is calculated and the resulting figure is evaluated against the square root of the upper 5 percent point of the appropriate \( \chi^2 \) distribution divided by the number of cells in the table. Here, a figure exceeding +/- 1.27 is approximately equivalent to a significance level of \( p < 0.05 \), and the null hypothesis is that there is no interaction, i.e. Differences between manoeuvre are unaffected by age and gender, and vice versa. Table 1 shows standard normal residuals for the three age bands of male drivers across six different accident conditions (two of the accident types, right turns and darkness accidents, having been further subdivided to reveal any differences within the types). Table 2 shows the same information for female drivers in the sample.

Figures exceeding +/- 1.27 are approximately equivalent to a significance level of \( p < 0.05 \). Plots of these standard normal residuals are shown below for these categories of accident where significant differences are revealed (Figures 3 and 4). In all figures, the significance level of +/- 1.27 is represented as a threshold line. It can be seen that the younger male age group in particular are over-represented in the sample with respect to accidents occurring on bends in rural areas and accidents occurring at night with or without streetlamps lit (Figure 3). The younger female drivers are similarly over-represented with respect to accidents occurring on bends in rural areas, and the older age band of females (23-25 years) are significantly over-represented with respect to rear end shunt accidents (Figure 4).

![Figure 2](image-url) Percentage of the four accident types in each gender group, as a percentage of total accidents for each gender
Table 1 Male Drivers: Standard normal residuals for six types of accident and 3 age bands of young driver; for cases where young drivers have been judged fully or partially to blame for the accident

<table>
<thead>
<tr>
<th>Age band</th>
<th>Right turns 'on'</th>
<th>Right turns 'off'</th>
<th>Rear end shunts</th>
<th>Rural bends</th>
<th>Darkness (street lights lit)</th>
<th>Darkness (no lighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-19</td>
<td>-0.43</td>
<td>-0.62</td>
<td>-0.28</td>
<td>2.98</td>
<td>2.39</td>
<td>1.62</td>
</tr>
<tr>
<td>20-22</td>
<td>1.07</td>
<td>0.79</td>
<td>0.10</td>
<td>-0.67</td>
<td>1.51</td>
<td>-0.75</td>
</tr>
<tr>
<td>23-25</td>
<td>-1.03</td>
<td>-0.15</td>
<td>0.18</td>
<td>-2.30</td>
<td>-3.89</td>
<td>-0.86</td>
</tr>
</tbody>
</table>

Table 2 Female Drivers: Standard normal residuals for six types of accident and 3 age bands of young driver; for cases where young drivers have been judged fully or partially to blame for the accident

<table>
<thead>
<tr>
<th>Age band</th>
<th>Right turns 'on'</th>
<th>Right turns 'off'</th>
<th>Rear end shunts</th>
<th>Rural bends</th>
<th>Darkness (street lights lit)</th>
<th>Darkness (no lighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-19</td>
<td>-0.93</td>
<td>-0.66</td>
<td>-3.09</td>
<td>1.27</td>
<td>0.53</td>
<td>0.25</td>
</tr>
<tr>
<td>20-22</td>
<td>0.25</td>
<td>0.14</td>
<td>1.11</td>
<td>-0.55</td>
<td>-0.09</td>
<td>0.25</td>
</tr>
<tr>
<td>23-25</td>
<td>0.54</td>
<td>0.54</td>
<td>1.98</td>
<td>-0.72</td>
<td>-0.46</td>
<td>-0.50</td>
</tr>
</tbody>
</table>

Figure 3 Young Male Drivers’ Accidents: Prevalence of three types of accident across three age groups shown as standard normal residuals

It would appear that the propensity for rural bend and darkness accidents starts high for the younger age group of drivers in both sexes and then declines in relative terms, whereas the propensity for rear end shunt accident involvement starts low and increases with driver age, for female drivers. Young males in the first two age groups (17-19 years and 20-22 years) show a propensity for darkness accident of both types, which then declines relatively for the older age band of males. In general, therefore, every change in accident propensity that is significant shows an improvement over time, with the exception of rear end shunts involving female drivers, which show an increase in propensity.

3.1 Experience

Data on driver experience were collected by examining records for information regarding the length of time young drivers in the sample had held a full driving licence for cars (young motorcyclists being beyond the remit of this study). 906 records that contain such information have been entered.
in the database. This represents 26.3% of the total number of cases. Figure 5 shows a simple distribution of the experience information in these records.

It must be noted that prevalence figures alone would produce a triangular distribution as the sample can contain (at one end) all drivers of 17-25 years of age who have been driving for one year at the time of their accident (nine cohorts of drivers); but at the other end it contains only drivers aged 25 years who have been driving for eight years at the time of their accident (one cohort of drivers). However, it can be seen in Figure 5 that the proportion of young drivers considered to be at fault or partially at fault (‘active’ in accident causation as opposed to ‘passive’, using West’s (1993) definitions) does decrease with experience when it is defined as years a full car licence has been held. The proportional fall is illustrated for all cases, and accidents of different types (Figure 6). It can be seen that the proportional drop is not the same for all kinds of accident. (Proportional data gathered from the sample is represented by a ‘curve fit’ second-order polynomial function that tracks the distribution of proportion percentages in each type.)

The general point is that curves could be expected to asymptote at just below 50%; the different curves represent (to some degree) the ‘learnability’ regarding young drivers’ avoidance of accidents of differing types.

Figure 4 Young Female Drivers’ Accidents: Prevalence of two types of accident across three age groups shown as standard normal residuals

Figure 5 Distribution of driver experience in the sample, expressed as years full licence held (for all cases where records are available, n=906)
It should be noted that in the case of rural bend accidents (the top line in Figure 6), the proportion of young drivers of all levels of experience considered to be active in these cases appears not to fall at all because these are largely single vehicle accidents. In fact, 393 of the 584 (67.3%) accidents on rural bends in the sample involve no other car but the young driver’s own. In all the other types of accident apart from rural bends, the falling curve functions could represent differing degrees of experience-based improvement in susceptibility to causing accidents in these separate ways.

An attempt has been made to correct this single vehicle problem in the case of rural bend accidents using the triangular nature of the distribution, multiplying the observed frequencies of all year groups following the 0-1 year group by a factor that has been calculated to correct the under-representation; i.e. 1-2 year figures being multiplied by 8/7 (1.14), 2-3 year figures by 8/6 (1.33) etc. Figure 7 shows this corrected distribution, where a large drop in the frequency of rural bend accidents occurs over the first three years of increased driver experience. Thereafter, the trend shows an apparent rise; however, it is possible that the frequency and resulting trendline is becoming increasingly ‘overcorrected’ towards the right of the distribution.

3.2 Contributory factors age and gender differences

Contributory factors were examined, firstly from the standard checklist adapted and developed from a previous study (Clarke, Ward and Jones, 1998), and secondly from a version of a national ‘contributory factors in accidents’ form developed at TRL by Broughton et al. (1998), which involves the identification of one major precipitating factor (PF) from a possible list of fifteen, and a further coding of up to four contributory factors (CFs). Table 3 shows the percentage of accidents involving specified factors for different driver groups from the first set of contributory factors, for just those cases where the young driver was judged primarily at fault. (Note: factors in either scheme are not mutually exclusive, and so their percentages can sum to more than one hundred).

Table 4 shows the percentage of total accidents in the sample involving specified contributory factors (cfn) (from the Broughton et al., 1998) for different driver groups, for just those cases where the young driver was judged primarily at fault. (In both Tables 3 and 4, figures show percentage of cases where the factor was considered in some way responsible/contributory to the accident.) Though the two coding schemes are not exactly equivalent, certain similarities can be observed. The percentage of cases involving alcohol impairment in the male driver group is over four times the percentage of similar cases involving female drivers; this occurs across
both coding schemes. The percentage of cases involving alcohol impairment also rises across the age groups in both schemes. Male drivers also show over twice the percentage of excess speed involvement.

The situation regarding reckless behaviour is somewhat more confused, as this is a separate category in the first coding scheme, and is included as a blanket category in the second, where it is grouped with ‘careless/thoughtless’ behaviour. Nevertheless, a distinct gender difference in the percentages is observed.

Gender differences are also apparent in the close-following factor, with females showing more percentage involvement than males. This factor also seems (like alcohol impairment) to show a rise across age groups. This perhaps explains the results shown earlier (Figure 2 and Table 2), which suggest that females and the older age groups have a higher percentage of their accident involvement as rear end shunts.

The apparently high incidence of wet roads as a contributory factor in both schemes is perhaps a result of the way the sample has been deliberately selected to contain accidents occurring on rural bends, where a high number of accidents occurring in slippery conditions would be expected in any case.

It should be noted that Tables 3 and 4 show results from coding schemes that operate quite differently in some ways, which explains why some percentages can seem markedly different across the two schemes. However, the pattern of percentages relating to similar factors across the schemes seems to tell the same story.

The sum of percentages in the second coding scheme is somewhat revealing. This suggests that males are involved in more ‘multi-factor’ accidents than females, and that the number of such accidents increases with age, suggesting either the existence of a ‘hard-core’ of persistent driving offenders in the older age groups who have more multi-factorial accidents, or perhaps that simple single-fault accidents are those which drivers learn to avoid more quickly.

### 4 Qualitative analysis and discussion

So far, we have given a statistical overview of the database as it was at the completion of data entry. We now turn to the more detailed qualitative work that followed.

An analytical schema was needed that might more fully investigate the sequential nature of accidents in the sample. There are, to start with, factors involving young drivers that can be of long standing. These include, firstly, putting oneself repeatedly in a situation of danger, e.g. by driving consistently over the speed limit, close following of other vehicles etc. These can interact with other background risks, such as number of passengers, inexperience of driving etc. All these risk factors can exist for an indefinite length of time, or ‘lag’ without an accident ever occurring.

But certain factors can then act as a trigger to precipitate an accident. These triggers can be active, passive, or more importantly, ‘invisible’. An example of a ‘non’ or ‘invisible’ trigger factor is the situation in rural bend accidents where, up until the point where the tyres lose

<table>
<thead>
<tr>
<th>Factor (% in each group)</th>
<th>Male drivers (n=1756)</th>
<th>Female drivers (n=542)</th>
<th>All 17-19 year olds (n=829)</th>
<th>All 20-22 year olds (n=785)</th>
<th>All 23-25 year olds (n=685)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet road</td>
<td>26.0</td>
<td>23.4</td>
<td>28.0</td>
<td>24.2</td>
<td>23.6</td>
</tr>
<tr>
<td>Excess alcohol</td>
<td>9.5</td>
<td>2.2</td>
<td>6.3</td>
<td>7.1</td>
<td>10.4</td>
</tr>
<tr>
<td>Poor observation (all categories)</td>
<td>32.5</td>
<td>42.8</td>
<td>32.7</td>
<td>36.9</td>
<td>35.2</td>
</tr>
<tr>
<td>Misjudged speed/distance of other vehicle</td>
<td>4.2</td>
<td>7.4</td>
<td>5.4</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Overbraking / oversteering</td>
<td>4.5</td>
<td>4.8</td>
<td>6.2</td>
<td>4.1</td>
<td>3.2</td>
</tr>
<tr>
<td>Excess speed (limit &amp; conditions)</td>
<td>43.2</td>
<td>20.3</td>
<td>41.3</td>
<td>37.7</td>
<td>33.7</td>
</tr>
<tr>
<td>Close following</td>
<td>10.1</td>
<td>13.1</td>
<td>8.7</td>
<td>10.7</td>
<td>13.4</td>
</tr>
<tr>
<td>Aggressive recklessness</td>
<td>7.7</td>
<td>0.7</td>
<td>7.2</td>
<td>5.6</td>
<td>5.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor (% in each group)</th>
<th>Male drivers (n=1079)</th>
<th>Female drivers (n=312)</th>
<th>All 17-19 year olds (n=496)</th>
<th>All 20-22 year olds (n=496)</th>
<th>All 23-25 year olds (n=426)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slippery road (cf41)</td>
<td>27.4</td>
<td>26.3</td>
<td>27.6</td>
<td>27.5</td>
<td>26.3</td>
</tr>
<tr>
<td>Impairment, alcohol (cf1)</td>
<td>9.2</td>
<td>1.6</td>
<td>5.4</td>
<td>7.7</td>
<td>9.6</td>
</tr>
<tr>
<td>Failure to judge other’s path or speed (cf12)</td>
<td>7.7</td>
<td>8.7</td>
<td>7.5</td>
<td>7.9</td>
<td>8.5</td>
</tr>
<tr>
<td>Excessive speed (cf21)</td>
<td>53.8</td>
<td>24.0</td>
<td>48.0</td>
<td>48.0</td>
<td>44.6</td>
</tr>
<tr>
<td>Close following (cf22)</td>
<td>13.3</td>
<td>21.2</td>
<td>10.7</td>
<td>14.1</td>
<td>21.4</td>
</tr>
<tr>
<td>Careless / thoughtless / reckless behaviour (cf9)</td>
<td>36.5</td>
<td>16.7</td>
<td>37.7</td>
<td>30.3</td>
<td>32.6</td>
</tr>
<tr>
<td>Sum</td>
<td>147.9</td>
<td>98.5</td>
<td>131.9</td>
<td>135.5</td>
<td>143.0</td>
</tr>
</tbody>
</table>
adhesion on the road, there is virtually no feedback to the
driver indicating that something is about to go wrong.

The nature of the indefinite lag between the initial factors
has implications according to learning theory. Behaviour that
is learned under indefinite lag conditions shows
characteristics similar to those of a variable ratio
reinforcement regime, in that typically, the behaviour is very
hard to extinguish; such a lag is ‘uninformative’ and de-
motivating for the driver. To again use the example of a rural
bend accident, the driver may have driven round bends of the
same severity a great many times under similar conditions,
each time never knowing how close he/she actually is to
sending the car out of control. On the one occasion that things
go wrong, and an accident is precipitated as a result, the driver
typically cannot understand how the accident has occurred.
They have learned in the past that their behaviour is ‘safe’,
and cannot now recognise that it was not. Comments from
police interviews that reveal this attitude include:

Driver A: ‘I had reduced my speed to a speed slightly faster
than the speed limit, but one which normally I
would expect to be able to take the corner
without difficulty at... Even though I drifted a bit,
I am sure that I never reached a point when I was
totally out of control.’

Driver B: ‘I wasn’t doing anything wrong, it just went.’

Driver C: ‘I wasn’t going too fast, it just went.’

Driver D: ‘Well, it was alright yesterday when my friend
drove round it.’

Driver E: ‘I feel it was because of the road surface.’

The various factors in the analytical schema are
summarised in Figure 8.

‘Putting of self in a situation of danger’, and
‘background’ risks are distinguished by being respectively
the relatively avoidable and unavoidable risk factors. One or
other or both can be the scene setters for a later trigger event
that precipitates an accident. For example, in Figure 9 the
following ‘putting of self in a situation of danger’ and the
‘background’ factors were found to be commonly associated
with a young driver deliberately breaking the speed limit,
giving rise to the outcome of a fatal accident. Figure 10
gives the same information for serious accidents.

Similarly, other linkages between initial conditions,
triggers and outcomes were explored for leads to use in the
later stages of the analysis.

4.1 Attitude vs. skill deficits

In addition to looking at the sequential nature of young
driver accidents, one of the key themes of the work was a
division between causal factors that were primarily about
driver attitude, and those that were apparently concerned
with skill deficits. It has often been assumed that the
problem of young drivers is primarily one of skill deficits,
whether in high or low level skills. However, our results
indicate that a fair percentage of young driver accidents
result from driver attitudes, rather than any particular
failure of skill.

\[
\text{INITIAL CONDITIONS} \\
\text{Put Self in Situation of Danger} \\
\begin{itemize}
  \item Speed
  \item Close Following
  \item Poor Maintenance
  \item Showing Off
  \item Peer Pressure
  \item etc
\end{itemize}
\text{Background Risks} \\
\begin{itemize}
  \item Nature & No. of Passengers
  \item Unfamiliar Vehicle
  \item Unfamiliar Road
  \item Powerful Car
  \item Inexperience
  \item Weather
  \item etc
\end{itemize}
\text{None}
\]

\[
\text{TRIGGER} \quad \rightarrow \quad \text{RESPONSE} \quad \rightarrow \quad \text{OUTCOME}
\]

\[
\begin{align*}
\text{ACTIVE} \\
\text{Brake}
\end{align*}
\]

\[
\begin{align*}
\text{PASSIVE} \\
\text{Swerve}
\end{align*}
\]

\[
\begin{align*}
\text{NONE} \\
\text{Signal}
\end{align*}
\]

\[
\begin{align*}
\text{Problem resolved} \\
\text{Conflict} \\
\text{Collision}
\end{align*}
\]

\[
\begin{align*}
\text{Damage only} \\
\text{Slight injury} \\
\text{Serious injury} \\
\text{Fatality}
\end{align*}
\]

**Figure 8** Factors in the analytical schema
Figure 9 Dangerous/background factors associated with fatal accidents where the young driver deliberately broke the speed limit.

Figure 10 Dangerous/background factors associated with serious accidents where the young driver deliberately broke the speed limit.
This stage of the analysis therefore attempted to separate attitudinal and skill factors. Figure 11 shows that, for all ‘to blame’ accidents, once deliberate attitudinal factors have been removed, nearly 50% of the accident involvement is accounted for. This occurs no matter which of the four types of accident is examined, but the fall occurs more rapidly for Darkness and Rural bend accidents, a large proportion of which are dealt with by removing the attitudinal factors of alcohol, recklessness and deliberate speeding. A large percentage of the remainder (after attitude problems are removed) can be accounted for by various skill deficits, for example, failure to take account of a restricted view. The ordering of these factors is intuitive; the pattern would look different if the rankings were changed, but the overall conclusions would be similar. Figure 12 shows a histogram of the raw proportions of these factors.

**Figure 11** Fall in percentage of all accidents where the young driver is to blame, removing attitudinal and skill factors cumulatively. (Factors are explained below)

**Figure 12** Raw proportions of attitude and skill factors in the sample
**Factors:**

**Alcohol**
All cases where the driver has been discovered to be over the legal limit for alcohol as measured in blood or breath sample. (80mg/100ml of blood, equivalent to 35µg/100ml in the breath).

**Recklessness**
All cases where there appears to be elements of deliberate recklessness, for instance racing another vehicle, speed of more than twice the posted limit, and so on.

**Speed**
All cases where the driver exceeded the posted speed limit.

**Risky o/ts**
Risky overtakes; cases involving overtaking against Highway Code guidelines, for instance, at junction, hillcrests, corners etc.

**Close follow**
Deliberate close following of another vehicle.

**Light jump or crossing**
All cases involving crossing a red light, either at traffic light controlled junctions, or pedestrian crossings.

**Twoe**
All cases involving a vehicle taken without the owner’s consent.

**Looked but did not see**
All cases involving a lack in continuity of observation on the part of the driver.

**Ignorant of correct speed**
All cases where the driver appeared to be ignorant of the correct speed for conditions; inside the speed limit, but still too fast for wet road conditions, bends, and so on.

**Close follow in ignorance**
All cases where the driver appears ignorant of the correct stopping distance when following a vehicle, for instance the increased following distance needed on a wet or icy road.

**Restricted view**
All cases where the driver has failed to take into account of a restricted view before making a turning manoeuvre.

**Not looked in relevant direction**
All cases where the driver has not looked in the relevant direction at all.

**Distracted**
All cases where the driver has become distracted by something inside or outside the vehicle.

It is important to note, when splitting any given group of accidents by attitudinal or skill factors, such as removing all speed accidents, it does not necessarily mean that the same proportion of accidents would ‘disappear’ if the manipulation were to happen in the real-world environment. The removal of one factor may simply reveal the influence of another, in the same way that eradicating a disease ‘x’ entirely in a population might result in a greater mortality from disease ‘y’.

### 4.1.1 Attitude vs. skill deficits; young drivers of ‘performance’ cars

A search of the database was performed to identify all young drivers that were accident involved in ‘performance’ cars. This was done by using the indexing function of the database and searching on all manufacturer suffixes found in the ‘vehicles’ field that appeared to denote cars of above average performance, e.g. ‘16v’ to denote a 16 valve engine. (Note that, in the years of accidents studied, this would not have been a widespread option on most cars.) 221 cases were discovered in total, which represents 8.6% of all accidents where the young driver has been considered as fully/partly to blame.

A series of 2x2 analyses were performed using the Chi-square test, in order to find which attitude or skill factors young drivers of performance vehicles might be over-represented in.

Accident involved young drivers of performance cars are more likely to be male, and are more likely than other young drivers to be driving at excessive speed deliberately, or driving recklessly. They are more likely to have taken the car without the owner’s consent, but are no more likely than other young drivers to have drunk excessive amounts of alcohol prior to their accident, or run across red traffic lights. There appear to be no significant differences in the number of accidents involving performance cars across the three age bands studied (in a 2x3 Chi-square analysis), but perhaps this is not surprising as this age group as a whole (17-25 years) could be assumed to have a higher than average degree of interest in such cars.

Young drivers of performance cars are no more likely than other young drivers to exhibit any skills deficits in their accident involvement, and indeed, indications are that, on two of the skill factors examined (‘looked but did not see’ and ‘close follow in ignorance’), they are less likely to be represented. They can therefore perhaps be considered as drivers with, if anything, above average skills, but whose attitude deficits more than make up for that apparent advantage.

### 4.1.2 Attitude vs. skill deficits; young driver accidents by time of day

Of all the accidents where they are fully or partly to blame, young drivers have 50.4% of their accidents during the hours of darkness in this sample. Table 5 shows the percentage of total accidents involving specified factors for different driver groups from the set of contributory factors detailed earlier. Figures show percentage of accidents involving the specified factor where the young driver was judged primarily at fault, for all accidents occurring during the hours of darkness.

Table 6 shows the same thing for the hours of daylight. Perhaps surprisingly, observational failures, taken as a global group, are more common in daylight accidents. This suggests that visibility problems caused by darkness itself
are not having much effect on these accidents, and that the problem is, again, not so much a matter of skill deficits in young drivers, as with attitudinal factors found in this group. Aggressive recklessness peaks during the hours of darkness, particularly for male drivers, and the younger driver group (17-19 years). Accidents involving driving while over the alcohol limit are also more likely to occur at night; they are more likely to involve male drivers, and the older driver age group (23-25 years). Accidents involving inappropriate or illegal speeding show an increase in the hours of darkness, particularly for male drivers. Accidents caused by close following decline markedly at night, perhaps due to lower traffic volumes. The high incidence of wet roads as a factor in accidents occurring under both lighting conditions is almost certainly due to the set of accidents being studied, i.e. rear end shunts and ‘loss of control on bend’ accidents are more likely to occur in slippery conditions.

If we examine the proportion of accidents involving the ‘attitudinal factors’ identified earlier (Figure 11) by time of day, the following diagram is produced:

Most ‘attitudinal’ factors in Figure 13 peak during the hours of darkness. A similar plot (Figure 14), showing the proportion of the remaining ‘skill’ factors from Figure 11 reveals that the proportions either peak during the day instead, or remain more or less constant independent of the time.

The evidence seems to point to the fact that the problem of increased young driver accident involvement during the hours of darkness is not caused by darkness per se, but rather the purposes for which young drivers are on the road during these hours. These include driving for social purposes and ‘driving for pleasure’, both of which younger drivers do more than other groups of drivers (Stradling and Meadows, 2000). Driving is viewed as an expressive activity by many young drivers, and is often a significant leisure activity for many. Attitudes as revealed in interview transcripts seem to bear this out:

**Driver 1:**

‘..... there was lots of people and everything and my car was clean and like and my mate used to pose a bit like and so instead of doing what I usually do ... I did a circle round ... ‘cos there was a lot of people around so we just drove back down and ... I’m roughly doing about 30 mile an hour or something round about 33 something like that just you know not taking very much notice of my speedo okay , but I was doing about 30 and I’m in about 2nd or 3rd gear so that, you know, my exhaust is sounding nice and everything, and I’m going down the street all the way and I get to about where the pizza shop is ... I see this Sierra ... and it seemed to be pulling into the causeway, so I just didn’t think no more of it and I just went to proceed round him as you do, and all of a sudden he just popped out on me, no indicators or anything and I just went to swerve to miss him and me, me front end of me car just caught him’.

(Driver 1’s front seat passenger was killed in this collision.)
Figure 13 Proportion of Young Drivers ‘to blame’ (n=2851) accidents involving ‘attitudinal factors’ by time of day

Figure 14 Proportion of Young Drivers ‘to blame’ (n=2851) accidents involving skill factors by time of day
Darkness seems, therefore, not to be especially dangerous in itself; rather it is the young drivers’ reasons and attitudes towards driving in the evening that put them at an increased risk of having an accident. Deliberate speeding, recklessness, and excessive alcohol consumption seem to be the main problems for young drivers travelling during the hours of darkness.

Driver fatigue seems not to be a significant problem in these cases: Though accidents verifiably involving tiredness are four times more likely to happen during the hours of darkness than they are during daylight, they form less than 1% of this sample. The majority of fatigue accidents in darkness occur between twelve midnight and six in the morning, as might be expected. It should be noted, however, that the contribution of fatigue to any given accident is hard to quantify unless there is absolute evidence of the driver having lost consciousness. This may not be apparent, even to the driver involved. Horne and Reyner (2001) have pointed out, for example, that in the first stages of sleep in fatigued drivers, subjects are actually not aware that they have lost consciousness. Clearly fatigue can play a part in young driver accidents, but this is very difficult to investigate in a study of this type.

4.1.3 Skill factors: an analysis of observational failure
It was decided to look at a select group of cases in one particular skill failure category, failure of continuity of observation. It had been noted by researchers that, in a certain proportion of observation failure cases of this type, the vehicle that the young driver had failed to see was so close to the junction that they had been negotiating that there appeared to be no explanation as to why they had not seen it, even when looking in that direction. This is commonly referred to as ‘Looked But Did Not See’, for example in the police co-factors used in this study, and in a review of work by Brown (in press). Two ‘prototypical’ cases with this particular failure of observation are outlined as follows:

**Case 1:**

It was early in the evening on a fine Autumn day. The driver (F,18) of a Renault 5 (1) was travelling along a rural A road with a 40mph limit as it went through a small village. She intended making a right turn ahead into a garage. She slowed down and indicated right, stopping opposite the junction to allow a car coming in the opposite direction to proceed. After the car had gone past, she made her turn directly into the path of a motorcycle (2), ridden by (M,27) that had been following the car at a speed of about 30mph. The rider was knocked from the machine and received serious injuries. Both the bike and the car received heavy damage. The driver was charged with driving without due care and attention. She said that she hadn’t even seen the motorbike until she’d hit it.

**Case 2:**

It was early in the evening on a fine day in Spring. The driver (M,19) of a Metro (1) was travelling along an unclassified rural road with a 60mph limit when he came to a T junction at a rural A road that was controlled by give way lines. He pulled up at the give way lines, intending to turn right. He had to wait to let two or three vehicles go past. He then edged forwards a couple of feet to get a better view to the right. He saw a car approaching from the right, but it looked far enough away for him to pull out. He started to pull out, then suddenly saw a black Ford Sierra (2), driven by (M,33) that was approaching from the right at about 60mph, and which was closer than the car he had already seen. He accelerated to make his car turn faster in an effort to get out of the Sierra’s way, but at that point the Sierra driver was braking and steering towards the offside of the road in an effort to avoid the turning car. The Sierra went into a full skid and hit the emerging Metro hard on the offside front wing, spinning it round in the road. Both vehicles were written off, but injuries were minor. Driver 1 could not explain how he had seen an approaching car at a distance, but had missed the Sierra travelling in front of it, even though it had headlights on. He was charged with driving without due care and attention.

It seems that the only explanation for accidents such as this is that young drivers in these circumstances ‘overlook’ the foreground while concentrating on the more distant view beyond the junction mouth. Unfortunately, it is quite difficult to quantify the distances involved, or the angle of gaze required, from the information available. Nevertheless, in cases where a vehicle in the foreground was obviously overlooked, countermeasure analysis took account of this (e.g. Table 14). Indeed, it was found that proper checking of foreground and distance was in the top five countermeasures applicable all groups of accidents with the exception of rural bends.

4.2 Blameworthiness and time of day
Another approach to highlighting differences in young driver accidents that occur at different times of day was an examination of the ratios of blameworthiness of various young driver groups. This is the number of cases where the young driver is to blame, divided by the number of
equivalent cases where the young driver was not to blame. This was chosen as the most accurate way of producing figures that took account of the exposure effects of the number of drivers of various ages on the road at different times of the day. In Figures 15-20, differences of the ratio of blameworthiness are plotted by time of day for various groups of drivers split into different age/gender groupings. The ‘average curves’ are smoothed by taking the average over three adjacent time intervals.

**Figure 15** Ratios of all young drivers to blame/not to blame by time of day (24hrs), n=3443

**Figure 16** Ratios of male drivers to blame/not to blame by time of day (24hrs), n=2545

**Figure 17** Ratios of female drivers to blame/not to blame by time of day (24hrs), n=893

**Figure 18** Ratios of 17-19 year old drivers to blame/not to blame by time of day (24hrs), n=1101
These plots of the proportional ratios by time of day reveal differences between accidents occurring at specific time periods. Particularly interesting are the two marked peaks that occur in the ratios of males to blame/not to blame. These peaks in the ratio of blameworthiness for males in accidents between occur at the time periods 04:00 – 06:00 and 14:00 – 15:00 (Figure 16). When the specific accident cases for these time periods are examined, the following significant differences in causal factors were found (Tables 7 and 8). (Significance was measured using a statistical test of the difference between two proportions, and significant differences are shown in bold).

It appears, therefore, that the early hours are associated with alcohol and speed, and early afternoons with poor observation and close following.

4.3 Time of day and ‘performance’ cars

Having separated ‘performance’ vehicles from within the database earlier, it was decided to run another time of day analysis focussing on these (Figure 21).

These accidents seem to peak mainly in the evening hours. Young drivers of performance cars have already been shown to be more involved in deliberate speeding and recklessness, which also peak in the hours of darkness, than their numbers in the sample as a whole would lead one to expect, so it is no surprise that the number of accidents involving performance cars also rises at this time. This would also be the prime time for ‘recreational’ and leisure driving, indicating perhaps that performance cars are more likely to be driven in dangerous ways during these hours while pursuing these driving goals. The apparent slight peak at 9 o’clock in the morning also contains a subset of cases where excessive speed plays a major part in accident causation.

4.4 Vehicle ownership and driver age

It was also decided to examine the relationship between age and ownership of the vehicle in young accident involved drivers in the sample. Tables 9 and 10 show the figures and percentage breakdowns for the whole sample, and for young drivers of performance cars in particular:

With all drivers in the sample, there appears to be a slight increase in vehicle ownership, and a decrease in driving cars owned by parent(s) with age, as might be expected. Driving of cars owned by a business similarly increases with age. Driving of a friend’s car is relatively rare.

Young drivers of performance cars show an increase in vehicle ownership across age bands greater than that for the whole sample. The two younger age groups also appear to be less likely to be driving a car belong to parent(s). Business use remains low in comparison to the whole sample, and the two younger age groups appear to show a greater use of friends’ vehicles, with this peaking in the 20-22 year old age band.

It should be noted, however, that the validity of these figures could be called into some doubt. Police files occasionally seem to indicate an owner driver by default in some of the initial documentation, but more detailed work when the case is followed up shows that the vehicle was owned by someone else. Providing a theft or insurance offence has not occurred, the ownership of the vehicle is not usually crucial to a traffic investigations.

4.5 Unlicenced drivers

There are 135 unlicenced drivers in the sample, which means that they form 3.9% of the total. Of these:

- 55 young drivers (40.7% of the total unlicenced) are provisional licence holders driving unaccompanied.
- 45 young drivers (33.3% of the total unlicenced) have no licence of any kind.
- 35 young drivers (25.9% of the total unlicenced) are driving while disqualified.

- 26 are involved in Right turn accidents; 19.3%, compared with 27.7% of the overall sample. 23 are involved in Rural Bend accidents; 17.9%, the same
Table 7 Significant differences in explanatory factors for young male driver accidents at ‘peak’ blameworthiness times

<table>
<thead>
<tr>
<th>Factors (% in each column/group)</th>
<th>Total number of accidents (to blame) (n=3443)</th>
<th>Accidents between 04:00-06:00 (to blame) (n=44)</th>
<th>Accidents between 14:00-15:00 (to blame) (n=153)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet road</td>
<td>17.8%</td>
<td>31.7%</td>
<td>24.3%</td>
</tr>
<tr>
<td>Excess alcohol</td>
<td>5.3%</td>
<td>9.8%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Poor observation* (all categories)</td>
<td>25.5%</td>
<td>9.8%</td>
<td>34.8%</td>
</tr>
<tr>
<td>Misjudged speed / distance of other vehicle</td>
<td>4.4%</td>
<td>2.4%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Overbraking / oversteering</td>
<td>3.2%</td>
<td>4.9%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Excess speed* (limit+conditions)</td>
<td>19.4%</td>
<td>36.6%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Close following*</td>
<td>6.9%</td>
<td>2.4%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Aggressive recklessness</td>
<td>4.2%</td>
<td>9.8%</td>
<td>6.1%</td>
</tr>
</tbody>
</table>

Table 8 Significant differences in police contributory factors for young male driver accidents at ‘peak’ blameworthiness times

<table>
<thead>
<tr>
<th>Factors (% in each column/group)</th>
<th>Total number of accidents (to blame) (n=3443)</th>
<th>Accidents between 04:00-06:00 (to blame) (n=44)</th>
<th>Accidents between 14:00-15:00 (to blame) (n=153)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slippery road (cf41)*</td>
<td>15.4%</td>
<td>24.4%</td>
<td>21.7%</td>
</tr>
<tr>
<td>Impairment, alcohol (cf1)*</td>
<td>5.3%</td>
<td>12.2%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Failure to judge other’s path or speed (cf12)</td>
<td>5.6%</td>
<td>2.4%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Excessive speed* (cf21)</td>
<td>28.6%</td>
<td>48.8%</td>
<td>28.7%</td>
</tr>
<tr>
<td>Close following* (cf22)</td>
<td>9.1%</td>
<td>2.4%</td>
<td>21.7%</td>
</tr>
<tr>
<td>Careless / thoughtless / reckless behaviour (cf9)</td>
<td>25.6%</td>
<td>31.7%</td>
<td>27.8%</td>
</tr>
</tbody>
</table>

Table 9 Vehicle ownership according to driver age, all drivers

<table>
<thead>
<tr>
<th>Ownership</th>
<th>17-19 year olds</th>
<th>% of 17-19 year olds</th>
<th>20-22 year olds</th>
<th>% of 20-22 year olds</th>
<th>23-25 year olds</th>
<th>% of 23-25 year olds</th>
<th>17-19 year olds</th>
<th>% of 17-19 year olds</th>
<th>20-22 year olds</th>
<th>% of 20-22 year olds</th>
<th>23-25 year olds</th>
<th>% of 23-25 year olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner driver</td>
<td>593</td>
<td>65.8</td>
<td>631</td>
<td>71.1</td>
<td>552</td>
<td>69.6</td>
<td>593</td>
<td>65.8</td>
<td>631</td>
<td>71.1</td>
<td>552</td>
<td>69.6</td>
</tr>
<tr>
<td>Parent(s)</td>
<td>185</td>
<td>20.5</td>
<td>95</td>
<td>10.7</td>
<td>41</td>
<td>5.2</td>
<td>185</td>
<td>20.5</td>
<td>95</td>
<td>10.7</td>
<td>41</td>
<td>5.2</td>
</tr>
<tr>
<td>Business</td>
<td>37</td>
<td>4.1</td>
<td>62</td>
<td>6.9</td>
<td>120</td>
<td>15.1</td>
<td>37</td>
<td>4.1</td>
<td>62</td>
<td>6.9</td>
<td>120</td>
<td>15.1</td>
</tr>
<tr>
<td>Friend</td>
<td>23</td>
<td>2.6</td>
<td>42</td>
<td>4.7</td>
<td>38</td>
<td>4.8</td>
<td>23</td>
<td>2.6</td>
<td>42</td>
<td>4.7</td>
<td>38</td>
<td>4.8</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
<td>2.9</td>
<td>27</td>
<td>3.0</td>
<td>30</td>
<td>3.8</td>
<td>26</td>
<td>2.9</td>
<td>27</td>
<td>3.0</td>
<td>30</td>
<td>3.8</td>
</tr>
<tr>
<td>Not known</td>
<td>37</td>
<td>4.1</td>
<td>41</td>
<td>4.7</td>
<td>38</td>
<td>4.8</td>
<td>37</td>
<td>4.1</td>
<td>41</td>
<td>4.7</td>
<td>38</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Table 10 Vehicle ownership according to driver age, drivers of performance cars

<table>
<thead>
<tr>
<th>Ownership</th>
<th>17-19 year olds</th>
<th>% of 17-19 year olds</th>
<th>20-22 year olds</th>
<th>% of 20-22 year olds</th>
<th>23-25 year olds</th>
<th>% of 23-25 year olds</th>
<th>17-19 year olds</th>
<th>% of 17-19 year olds</th>
<th>20-22 year olds</th>
<th>% of 20-22 year olds</th>
<th>23-25 year olds</th>
<th>% of 23-25 year olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner driver</td>
<td>51</td>
<td>65.4</td>
<td>49</td>
<td>68.1</td>
<td>56</td>
<td>78.9</td>
<td>51</td>
<td>65.4</td>
<td>49</td>
<td>68.1</td>
<td>56</td>
<td>78.9</td>
</tr>
<tr>
<td>Parent(s)</td>
<td>11</td>
<td>14.1</td>
<td>6</td>
<td>8.3</td>
<td>4</td>
<td>5.6</td>
<td>11</td>
<td>14.1</td>
<td>6</td>
<td>8.3</td>
<td>4</td>
<td>5.6</td>
</tr>
<tr>
<td>Business</td>
<td>4</td>
<td>5.1</td>
<td>1</td>
<td>1.4</td>
<td>4</td>
<td>5.6</td>
<td>4</td>
<td>5.1</td>
<td>1</td>
<td>1.4</td>
<td>4</td>
<td>5.6</td>
</tr>
<tr>
<td>Friend</td>
<td>7</td>
<td>8.9</td>
<td>11</td>
<td>15.3</td>
<td>3</td>
<td>4.2</td>
<td>7</td>
<td>8.9</td>
<td>11</td>
<td>15.3</td>
<td>3</td>
<td>4.2</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>5.1</td>
<td>4</td>
<td>5.6</td>
<td>2</td>
<td>2.8</td>
<td>4</td>
<td>5.1</td>
<td>4</td>
<td>5.6</td>
<td>2</td>
<td>2.8</td>
</tr>
<tr>
<td>Not known</td>
<td>1</td>
<td>1.3</td>
<td>1</td>
<td>1.4</td>
<td>2</td>
<td>2.8</td>
<td>1</td>
<td>1.3</td>
<td>1</td>
<td>1.4</td>
<td>2</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Figure 21 Accidents involving ‘Performance’ cars, frequency and percentage by time of day, n=221
figure as in the overall sample. 31 are involved in Rear End Shunt Accidents; 23.0%, compared with 28.7% of the overall sample. 82 are involved in Darkness accidents; 60.7%, compared with 50.4% of the overall sample.

In the whole sample, the young drivers are to blame, or at least partly to blame, in 75.1% of the accidents they are involved in. Unlicenced young drivers are to blame, or at least partly to blame, in 93.3% of all accidents they are involved in.

89% of unlicenced drivers at fault are male, compared with 76% of young drivers at fault, in general.

The mean age of unlicenced drivers is virtually the same as the mean age of all drivers in the sample (20.5 years). The figures for an age breakdown of all unlicenced drivers in the sample are:

- 17-19 years: 55
- 20-22 years: 44
- 23-25 years: 36

If anything, therefore, unlicenced driving appears to decrease with age.

### 4.5.1 Accident severity

Young unlicenced drivers are approximately twice as likely to be involved in a fatal accidents when compared with the sample of young drivers as a whole. They are also more likely to be involved in a serious accident. Table 11 shows the equivalent percentages in each category (fatal, serious and slight) for the two groups.

<table>
<thead>
<tr>
<th>Severity</th>
<th>All young drivers at fault (n=2580)</th>
<th>Unlicenced drivers at fault (n=126)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal</td>
<td>1.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Serious</td>
<td>13.0</td>
<td>20.6</td>
</tr>
<tr>
<td>Slight</td>
<td>85.3</td>
<td>76.2</td>
</tr>
</tbody>
</table>

### 4.5.2 Attitude vs. skill factors

Table 12 shows the percentage of total unlicenced driver accidents involving specified factors for different driver groups from our set of contributory factors. Figures show percentage of accidents involving the specified factor where the unlicenced driver was judged primarily at fault, and differences in attitude/skill factors are highlighted/emboldened.

Table 13 shows the percentage of total accidents involving specified factors for different driver groups from our set of contributory factors, for comparison purposes. Figures show percentage of accidents involving the specified factor where the young driver was judged primarily at fault. (Column totals in Tables 12 and 13 do not have to equal 100%, as there can be more than one factor per accident. The higher the column total, the greater

### Table 12 Contributory factors in the accidents of young unlicenced drivers

<table>
<thead>
<tr>
<th>Factor (% in each group)</th>
<th>Male drivers (n=112)</th>
<th>Female drivers (n=14)</th>
<th>All 17-19 year olds (n=50)</th>
<th>All 20-22 year olds (n=42)</th>
<th>All 23-25 year olds (n=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet road</td>
<td>14.3</td>
<td>14.3</td>
<td>14.0</td>
<td>14.3</td>
<td>14.7</td>
</tr>
<tr>
<td>Excess alcohol</td>
<td>29.5</td>
<td>14.3</td>
<td>22.0</td>
<td>35.7</td>
<td>26.5</td>
</tr>
<tr>
<td>Poor observation (all categories)</td>
<td>19.6</td>
<td>71.0</td>
<td>22.0</td>
<td>21.4</td>
<td>26.5</td>
</tr>
<tr>
<td>Misjudged speed / distance of other vehicle</td>
<td>0.9</td>
<td>7.1</td>
<td>0.0</td>
<td>2.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Overbraking / oversteering</td>
<td>3.6</td>
<td>7.1</td>
<td>6.0</td>
<td>4.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Excess speed (limit+conditions)</td>
<td>61.6</td>
<td>21.4</td>
<td>61.0</td>
<td>59.5</td>
<td>47.1</td>
</tr>
<tr>
<td>Close following</td>
<td>5.4</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Aggressive recklessness</td>
<td>33.9</td>
<td>7.1</td>
<td>42.0</td>
<td>21.4</td>
<td>26.5</td>
</tr>
</tbody>
</table>

(Column total, as example) 168.8

### Table 13 Contributory factors, all accidents in our sample with young driver mainly at fault

<table>
<thead>
<tr>
<th>Factor (% in each group)</th>
<th>Male drivers (n=1756)</th>
<th>Female drivers (n=542)</th>
<th>All 17-19 year olds (n=829)</th>
<th>All 20-22 year olds (n=785)</th>
<th>All 23-25 year olds (n=685)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet road</td>
<td>26.0</td>
<td>23.4</td>
<td>28.0</td>
<td>24.2</td>
<td>23.6</td>
</tr>
<tr>
<td>Excess alcohol</td>
<td>9.5</td>
<td>2.2</td>
<td>6.3</td>
<td>7.1</td>
<td>10.4</td>
</tr>
<tr>
<td>Poor observation (all categories)</td>
<td>32.5</td>
<td>42.8</td>
<td>32.7</td>
<td>36.9</td>
<td>35.2</td>
</tr>
<tr>
<td>Misjudged speed / distance of other vehicle</td>
<td>4.2</td>
<td>7.4</td>
<td>5.4</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Overbraking / oversteering</td>
<td>4.5</td>
<td>4.8</td>
<td>6.2</td>
<td>4.1</td>
<td>3.2</td>
</tr>
<tr>
<td>Excess speed (limit+conditions)</td>
<td>43.2</td>
<td>20.3</td>
<td>41.3</td>
<td>37.7</td>
<td>33.7</td>
</tr>
<tr>
<td>Close following</td>
<td>10.1</td>
<td>13.1</td>
<td>8.7</td>
<td>10.7</td>
<td>13.4</td>
</tr>
<tr>
<td>Aggressive recklessness</td>
<td>7.7</td>
<td>0.7</td>
<td>7.2</td>
<td>5.6</td>
<td>5.3</td>
</tr>
</tbody>
</table>

(Column total, as example) 137.7
the incidence of multi-faulting in that category. The totals
for male (young) unlicenced drivers, and all male (young)
drivers respectively (169% and 138%) suggest the
unlicenced drivers are averaging about 1.7 of these fault
categories per accident, while the young males in general
are averaging about 1.4.)

Although the numbers of unlicenced drivers are relatively
small, they are still over-represented in the attitudinal factors
of alcohol, speed and recklessness when compared to the
sample as a whole. What we are perhaps seeing here is the
influence of a sub-group of drivers who have no interest in
obeying any road traffic laws. This conclusion is borne out
by the high percentage of unlicenced driver accidents that
involve a vehicle that has been taken without the owner’s
consent (TWOC) (14.8%, compared with only 1.4% of
accidents in the sample as a whole).

Unlicenced drivers have a tendency to be involved in
accidents at night, and that involve a proportionally greater
than normal proportion of attitudinal failures such excess
consumption of alcohol, speeding and general
recklessness. They are, perhaps as a result of these
attitudinal failures, also more likely to be involved in fatal
and serious accidents. There are therefore grounds for
considering unlicenced drivers a multiple-offending group
whose primary problems are attitudinal in nature.

4.6 Countermeasures
Taking just the A cases, the next step was to consider any
simple behavioural countermeasure which could have
made a substantial difference to the outcome of each
accident in turn, either by preventing it or reducing its
severity. A list of 30 possible behavioural strategies for
avoiding typical young driver accidents was drawn up
using established texts such as ‘Roadcraft’ and ‘The
Highway Code’, together with prior knowledge of the data.
The countermeasures were concerned solely with simple
driver behaviours and did not extend to road/vehicle
engineering factors which were outside the scope of this
study. Each case was coded for the countermeasures that
might have either prevented the accident (or reduced the
severity of it). Countermeasures were not meant to be
either exotic or counter-intuitive, and dealt with mainly
obvious measures that would be understood by most
competent drivers. At the same time, they were meant to
be of ‘medium grain size’, so as to apply across accident
types to a certain extent, while at the same time not
appearing too banal. Rules that can be applied across
accident types also mean that accidents can be compared
on their countermeasure profile and that the message to
drivers is non-contingent. Tables 14-17 show the top five
countermeasures for each of the four accident categories,
except with rural bend cases (Table 16), where only three
main countermeasures were felt to apply to the majority of
cases. The over-riding message in rural bend accidents is
simply that drivers must slow down, preferably before
entering a corner.

Figures 22-25 below Tables 14-17 show how these
countermeasures, considered cumulatively, could prevent
accidents in each of the four types. In most cases, it can be
seen that the top two or three countermeasures can affect a
large proportion of the accidents under consideration. This
appears to happen to a differing degree depending on
accident type. For example, right turn accidents appear to
have a much more even spread of countermeasures than
rural bend accidents, where little benefit is added after the
first, when considered cumulatively.

4.7 Cluster analysis
In order to produce an economical summary of the great
range of accident types and mechanisms a first-order
cluster analysis was performed on a random selection of
twenty cases from each of the four accident types. Cases
were sorted by perceived similarity within each of the
types by five researchers working independently. The
following dendrograms (Figures 26-29) were produced for
the four accident types, detailing the clustering of
accidents that was found to occur:

Again, it can be seen, especially in the case of Rural
Bend and Darkness accidents, that there seems to be a split
in the major causal factors between those that involve
attitudinal problems of the driver, and those that involve
failures of skill. These clusters were verified by repeating
the analysis on a further set of twenty cases for each type
of accident.

5 Concluding remarks

1 Some of the accidents of young drivers are due to
actions and mistakes that are typical of young drivers in
particular. Others happen for reasons that apply to all
drivers. Both sets of causes should be included. (We
want young drivers to be on their guard against all the
causes of accidents that might affect them, not just those
which are peculiar to them.) But the two sets of causes
should also be distinguished. (An understanding of the
processes that give young drivers their exceptional
accident liability requires us to pick out the accidents
that are especially associated with youth and
inexperience.) It seems that the central difference is
between accidents that are caused by attitudinal factors
rather than skill deficits. In particular sub-groups of
young drivers, e.g. drivers of performance cars, this
difference is especially marked. Such drivers have, if
anything, higher than average control skills, but this is
more than offset by their attitudinal failures.

2 Accidents in the dark might be expected to arise from
problems of visibility. We find this not to be generally
true. The hours of darkness are not only a time of
reduced visibility and artificial lighting, they are also a
time quite unlike mornings and afternoons, when
different groups of road-users are about, travelling for
different reasons, and in different ways. To a striking
degree, the problems of accidents in the dark are not a
matter of visibility, but rather a matter of who uses the
roads at night, and why, and how. There appears to be a
high number of accidents associated with ‘recreational’
driving, or driving in relation to the social life typically
engaged in by people of this age group.
Table 14 Right Turning Accidents: Top five countermeasures for drivers most at fault

<table>
<thead>
<tr>
<th>Measure</th>
<th>Frequency</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure foreground to distance is checked properly with a sweeping gaze.</td>
<td>101</td>
<td>24.2</td>
</tr>
<tr>
<td>Come to a stop at junctions especially if the view is in doubt.</td>
<td>78</td>
<td>18.7</td>
</tr>
<tr>
<td>Re-check to the right (first point of danger) before pulling out.</td>
<td>65</td>
<td>15.6</td>
</tr>
<tr>
<td>Give yourself enough time to be sure of the speed of approaching traffic.</td>
<td>59</td>
<td>14.1</td>
</tr>
<tr>
<td>On approaching junctions, check your speed and look for emerging traffic.</td>
<td>56</td>
<td>13.4</td>
</tr>
</tbody>
</table>

Figure 22 Right Turn Accidents (n=314): Histogram showing the top five measures (described in Table 14, above) that could be taken by young drivers to alter the outcome or likelihood of an accident as a cumulative percentage of their total accidents of that type
Table 15 Rear End Shunt Accidents: Top five countermeasures for drivers most at fault

<table>
<thead>
<tr>
<th>Measure</th>
<th>Frequency</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep a safe stopping distance from the vehicle in front.</td>
<td>81</td>
<td>27.0</td>
</tr>
<tr>
<td>Don’t allow yourself to become distracted by anything (either inside or outside the vehicle) while driving.</td>
<td>72</td>
<td>24.0</td>
</tr>
<tr>
<td>Look ahead of the vehicle in front for any hazards that might cause it to slow/stop.</td>
<td>60</td>
<td>20.0</td>
</tr>
<tr>
<td>Ensure appropriate speed/distance in adverse weather conditions.</td>
<td>27</td>
<td>9.0</td>
</tr>
<tr>
<td>Ensure foreground to distance is checked properly with a sweeping gaze.</td>
<td>22</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Figure 23 Rear End Shunt Accidents (n=213): Histogram showing the top five measures (described in Table 15, above) that could be taken by young drivers to alter the outcome or likelihood of an accident as a cumulative percentage of their total accidents of that type.
Table 16 Rural Bend Accidents: Top three countermeasures for drivers most at fault

<table>
<thead>
<tr>
<th>Measure</th>
<th>Frequency</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure appropriate speed for bend severity: if in doubt slow down.</td>
<td>160</td>
<td>73.1</td>
</tr>
<tr>
<td>Ensure appropriate speed/distance in adverse weather conditions.</td>
<td>96</td>
<td>43.8</td>
</tr>
<tr>
<td>Avoid braking while travelling around a bend; finish braking before entry.</td>
<td>47</td>
<td>21.4</td>
</tr>
</tbody>
</table>

Figure 24 Rural Bend Accidents (n=214): Histogram showing the top three measures (described in Table 16, above) that could be taken by young drivers to alter the outcome or likelihood of an accident as a cumulative percentage of their total accidents of that type.
Table 17 Darkness Accidents: Top five countermeasures for drivers most at fault

<table>
<thead>
<tr>
<th>Measure</th>
<th>Frequency</th>
<th>% of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure appropriate speed for bend severity: if in doubt slow down.</td>
<td>153</td>
<td>23.5</td>
</tr>
<tr>
<td>Ensure appropriate speed/distance in adverse weather conditions.</td>
<td>120</td>
<td>18.5</td>
</tr>
<tr>
<td>Ensure foreground to distance is checked properly with a sweeping gaze.</td>
<td>55</td>
<td>8.5</td>
</tr>
<tr>
<td>Don’t allow yourself to become distracted by anything (either inside or outside the vehicle) while driving.</td>
<td>52</td>
<td>8.0</td>
</tr>
<tr>
<td>Come to a stop at junctions, especially if the view is in doubt.</td>
<td>47</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Figure 25 Darkness Accidents (n=535): Histogram showing the top five measures (described in Table 17, above) that could be taken by young drivers to alter the outcome or likelihood of an accident as a cumulative percentage of their total accidents of that type
Right turns

- Other vehicle not seen
- Signalling or overtaking error
  - Misjudges approach or intention of other driver
    - Believes other driver is turning left
    - Misjudges other driver's speed
- Obscured view from junction
- No rechecking of view from junction
  - Didn’t stop at junction line
  - Stopped at junction line
- Signalled late
- Signalled in error
- Signalling absent
- Overtaking at a junction

- Misjudges

Reckless/Misc

Figure 26 Right Turn Accidents: Dendrogram from cluster analysis of twenty random cases

Rear End Shunts

- In-car Distraction e.g. stero/cigarettes
- Dual Carriageway accidents
  - Not seeing slowed/stopped traffic ahead in time
  - Misjudged other’s speed ahead
- Deliberate speeding
- Lack of attention to road ahead
- Speeding & Lack of attention to road ahead

Reckless/misc.

Figure 27 Rear End Shunt Accidents: Dendrogram from cluster analysis of twenty random cases
For many young drivers, especially males - to judge from those who end up in accident case files at least - driving is fun, challenging, exciting, a way of testing themselves, and a way of showing off. This seems especially the case with young drivers of ‘performance’ models of car, who, if anything, could be considered as somewhat more skilful than their contemporaries, but who ‘lose’ any advantage this might give them due to their propensity for deliberate risk-taking. Of course there are limits. Speed, road conditions, weather, traffic, and vehicle performance all combine to produce a ‘space’ - a part of the multi-dimensional graph describing vehicle, driver, and environment, in which one can move about safely. The safe region has edges. (Test pilots call them ‘the envelope’, and their job is to find and to ‘push back’ that envelope when flying new kinds of plane.) Some young drivers think they are test pilots too. Their interest is to find and explore the envelope, or else to assume they know where it is and to operate on its edges. They talk and behave as if this envelope - the dividing line between accident-free driving and collision - is visible, precise and stable. If that were true, they would get away with what they do, to the extent they were as skilful as they thought. But they are prancing on a crumbling cliff, not a hard edge. If it gives way, it will do so without warning, without apparent cause, and without the chance of recovery. No-one can tell exactly where the danger zone begins. There is no clear line between safety and catastrophe. And what division there is, is constantly changing. Given that ‘the envelope’ works like that, the only skill is to keep well away from the edge. This is the essential message that we must put across to young drivers. They think that the driving styles that have been accident-free in the past will be accident-free in the future, unless they do something noticeably different - but they are wrong. They think that unsafe driving will soon reveal its dangers, and they can learn - but they are wrong. The normal conditions of successful learning do not apply. While some improvements can doubtless be made to young driver accident involvement by focussing on issues of skill-based learning and hazard perception, a way to address the attitudinal problems of a significant number of young drivers must also be found, if the greatest improvements are to be made.
There is a change of attitude that needs to occur in young drivers, who typically do not understand what the nature of the danger is. They seem to think that behaviour that has not caused an accident in the past will not cause one in the future, and that is quite wrong. The game of Russian roulette is not proved safe, if you hear three clicks and no bang. The game of Russian roulette is only safe for those with the sense not to play it.

6 References


Brown I D (1982). Exposure and experience are a confounded nuisance in research on driver behaviour. Accident Analysis and Prevention, 14 (5), 345-352.


www.publications.parliament.uk


Appendix A: Primary and defensive countermeasures

1 Come to a stop at junctions, especially if the view is in doubt.
2 Re-check to the right (1st point of danger) before pulling out.
3 Ensure that foreground to distance is checked properly with a sweeping gaze.
4 Ensure a vehicle indicating left is turning, and is also not masking close following traffic.
5 When turning, check beyond the first vehicle(s) in vision; are they about to be overtaken?
6 Take account of restricted vision caused by road layout e.g. hillcrests and corners
7 Take account of restricted vision caused by buildings, vegetation, parked cars, fences etc.
8 Give yourself enough time to be sure of the speed of approaching traffic.
9 On approaching junctions, check your speed and look for emerging traffic
10 Beware of emerging vehicles when passing vehicles that are turning into junctions.
11 When close to the junction, check that any waiting driver appears to be aware of your vehicle.
12 Look for road signs that warn of junctions and other hazards ahead, and check your speed.
13 Check for pedestrians crossing the road when turning into a junction.
14 Check both rear view mirrors and signal in good time before turning.
15 Check for green/filter light before turning right at traffic lights; opposing traffic may still have priority.
16 Before turning across queuing traffic, ensure stationary vehicles are not masking other road users.
17 Before overtaking slower moving vehicles, ensure none are about to turn.
18 Ensure appropriate speed/distance in adverse weather conditions.
19 Avoid braking while travelling round a bend; finish braking before entry.
20 Ensure appropriate speed for bend severity; if in doubt, slow down.
21 Keep a safe stopping distance from the vehicle in front.
22 Look ahead of the vehicle in front for any hazards that might cause it to slow/stopped.
23 Don’t allow yourself to become distracted by anything (either inside or outside the vehicle) while driving.
24 Check ahead before looking right when moving off from roundabouts/junctions.
25 If stopping your vehicle, do so in a safe location.
26 Check condition of your vehicle regularly, e.g. tyres, brakes, lights etc.
27 If fatigued, delay your journey; and take a breaks on long journeys.
28 Reduce speed in urban areas at night to take account of pedestrians.
29 Don’t drink and drive
Appendix B: Explanatory factors

Road Environment (RE)
1 Wet / icy road.
2 Darkness.
3 Fog / rain / snow / other weather reduces visibility.
4 High winds.
5 Reduced visibility from road layout / parked vehicle / other.
6 Obstruction by / Collision with vehicle breakdown / other.
7 Poor road surface / camber.
8 Faulty traffic lights.
9 Signs or markings misleading / absent.

Vehicle Characteristics (VC)
1 Defective brakes / tyres / steering.
2 Defective lights / signals.
3 Poor conspicuity of 2 wheeler ; lack of bright clothing / headlights.
4 Unusual handling e.g: L/H drive, very large, under / over powered.
5 Insecure / overhanging load.

Driver Characteristics
1 Excess alcohol.*
2 Illness / Infirmity.*
3 Tired.*
4 In a hurry, pressed for time etc.
5 Vision impaired by sun / headlights / other.*
6 TWOC.

Road User Behaviours
A Misinterpretation of layout *
1 Driver unaware of need to give way.
2 Misread signs or road markings.

B Ignorance
1 Wrong positioning.
2 Close following.
3 Excess speed for conditions.

C Carelessness
1 Poor tracking.
2 Poor observation (specify direction).*
   2.1 Didn’t look in relevant direction.
   2.2 Didn’t take account of restricted view (specify, e.g. HGV, vegetation).

2.3 No continuity of observation.
2.4 Didn’t notice other driver’s signal.
2.5 Didn’t notice warning road sign (junction, bridge etc.).
2.6 Distracted.
3 Failure to signal.
4 Opened door in path of other road user.

D Misjudgement
1 Misjudged speed / distance of other vehicle.*
   1.1 When entering a gap in moving traffic.
   1.2 When traffic ahead slows or stops.
   1.3 Oncoming vehicle when overtaking.
2 Misjudged speed / handling of own vehicle.
   2.1 Insufficient power for overtake.
   2.2 Overbraking / oversteering leading to loss of control.
3 Misjudged correct speed for conditions.
4 Misjudged time needed to complete overtake.
5 Misinterpreted other driver’s signal / intention.
6 Overtake in inadvisable position (Highway Code definitions).
7 Hesitation / insufficient acceleration.

E Deliberate risk taking
1 Excess speed.
   1.1 Above speed limit.
   1.2 Too fast for conditions.
2 Close following.
   2.1 Deliberate by one driver.
   2.2 Convoy conformity.
3 Disobeying lights or pedestrian crossing.*
   3.1 Going over stop line on red.
   3.2 Not stopping on pedestrian crossing.
4 Risky overtaking.
   4.1 Inadvisable (Highway Code).
   4.2 Illegal; e.g. over double white line system.
5 Wilful aggressive recklessness (WAR).*

NB: Certain factors (*) can be used to describe pedestrian actions.
Abstract

Young drivers, especially young males, have relatively more accidents than other drivers, even allowing for their relative numbers in the population. Their accident involvement is over two times higher than that of older drivers and young driver accidents also have somewhat different characteristics than those of older drivers.

Over 3000 accident cases involving drivers aged 17-25 were considered, all from midland UK police forces, and covering the years 1994-1996 inclusive. Each case was analysed in depth and summarized on a database that contained important features to be used in subsequent analyses.

Four types of accident were analysed: right-turns; rear-end shunts; loss of control on bends; and accidents in darkness.

Loss of control on bends and accidents in the hours of darkness were found to be a particular problem for the younger drivers within the group studied (17-19 year olds), while the older group studied (23-25 years) had more problems with rear end shunt accidents. Right turn accidents seem to peak in relative frequency in the middle age range of the sample (20-22 years).

Further work revealed important differences in the accident classes studied with regard to such factors as driver experience, gender, and the incidence of speeding and other reckless behaviours. An examination of driver attitudes as revealed in police interviews also gave an insight into some of the motivational factors underlying young driver behaviour. It is shown that attitudinal factors are at least as important as skill factors when the causation of young driver accidents is being considered.

Related publications

TRL323  A new system for recording contributory factors in road accidents by J Broughton, K A Markey and D Rowe. 1998 (price £25, code E)
PR111  Cohort study of learner and novice drivers: Part 3 Accidents, offences and driving experience in the first three years of driving by E Forsyth, G Maycock and B Sexton.
SR567  The known risks we run: the highway by B E Sabey and H Taylor. 1980 (price £20)
LR567  Driver behaviour - newly qualified drivers by S W Quenault and P M Parker. 1973 (price £20)

Prices current at July 2002

For further details of these and all other TRL publications, telephone Publication Sales on 01344 770783, or visit TRL on the Internet at www.trl.co.uk.