

**Road Safety Research Report No. 75**

**Fatal Vehicle-occupant  
Collisions: An In-depth Study**

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## EXECUTIVE SUMMARY

Road traffic accidents are responsible for over 3,000 deaths per year in the UK, according to Department for Transport (2004a) figures. Although progress is being made in a number of areas, vehicle occupant fatalities are not falling in line with casualty reduction targets for the year 2010 (DETR, 2000).

A sample of 1,185 fatal vehicle occupant cases was considered, from 10 UK police forces, for the years 1994 to 2005 inclusive. Each case was summarised on a database, including the main objective features (such as time and place), 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.

The main findings were as follows:

- Over 65% of the accidents examined involved driving at excessive speed, a driver in excess of the legal alcohol limit, or the failure to wear a seat belt by a fatality, or some combination of these.
- Young drivers have the great majority of their accidents by losing control on bends or curves, typically at night in rural areas and/or while driving for 'leisure' purposes. These accidents show high levels of deliberate speeding, alcohol involvement and recklessness.
- Older drivers had fewer accidents, but the fatalities they were involved in tended to involve misjudgement and perceptual errors in 'right of way' collisions, typically in the daytime on rural rather than urban roads. Blameworthy right of way errors were notably high for drivers aged over 65 years, as a proportion of total fatal accidents in that age group.

# 1 INTRODUCTION

According to research conducted by the Transport Research Laboratory (TRL) (Broughton, 2005), there has been a lack of progress with the reduction of the UK fatality total. This is impacting negatively with the long-term aim of reducing the number of killed and seriously injured (KSI) in accordance with 10-year casualty reduction targets set to be achieved by 2010 (DETR, 2000). Although the serious injury component of KSI totals has continued to fall year on year, the fatality total has showed very little improvement since 1998. This has occurred despite improvements in vehicle design in the last decade, and also despite improvements in some fatal accident totals, such as those of pedestrians and cyclists, for example. The number of deaths of car occupants, which has risen since 2000, has been revealed to be one of the main problem areas.

Car occupant fatalities were found to have occurred predominantly among the young, the passenger fatalities tending to be even younger than the driver fatalities. Contributing significantly to these totals were weekend peaks in fatalities of both car drivers and passengers, occurring between 9 pm and midnight. Such accidents show a high level of alcohol involvement. Previous research at Nottingham University (Clarke *et al.*, 2002) has shown similar increases in alcohol-related accidents at such times. Alcohol-related accidents, however, may not be the exclusive preserve of the young; Abdel-Aty and Abdelwahab (2000), using US state data, found that ‘the 25–34 age group experience the highest rate of alcohol/drug involvement in accidents’.

There is also evidence that young male drivers take more risks when driving with passengers, particularly other male passengers. Preusser *et al.* (1998) found that the presence of passengers was associated with more at-fault fatal crashes for drivers aged under 25 years; this effect was particularly marked where teenaged drivers were carrying two or more teenage passengers. Simons-Morton *et al.* (2005), using an observational study, found that ‘the observed rate of high risk driving (defined as speed  $\geq 15$  mph or more above the posted speed limit and/or headway of  $\leq 1.0$  s) for the teen male driver/male passenger condition was about double that of general traffic’.

Speeding as a factor in fatalities has been well-researched. Bédard *et al.* (2002) found that ‘travelling at a speed of 112 kph (70 mph) or more was independently associated with a 164% increase in the odds of a fatality compared with speeds of less than 56 kph (35 mph)’. Bédard *et al.* also pointed out that larger decelerations (i.e. larger impact velocities) were associated with more post-injury medical complications, independent of age and injury severity. Quimby (2005) found that UK drivers recognised that driving too fast was ‘a major contributory factor in accidents compared to drivers in most other [EU] countries’ but also that they ‘do not necessarily associate driving “faster” (than other drivers) with driving more “dangerously” – where their own driving is concerned’.

Clarke *et al.* (2002) found that the problem of increased young driver accident involvement during the hours of darkness was not caused by darkness *per se*, but rather by the purposes for which young drivers were on the road during these hours and the manner in which they drove while there. These included driving for social purposes and 'driving for pleasure', both of which younger drivers did more than other groups of drivers (Stradling and Meadows, 2000). Researchers such as Rimmö and Åberg (2000) have found 'potential relations between sensation seeking and aberrant behaviour on the road'; this sensation seeking could be considered a component of the type of 'driving for pleasure' identified by Stradling and Meadows (2000). In their report on night-time accidents, Ward *et al.* (2004) found that, for young male drivers in particular, 'taking risks, pushing the car to the limit, is something that some young men do as part of the "growing up" process. The car is clearly seen as an extension of either/both the ego or the body, it is something that needs to be mastered, and pushing it to the limit is the way a number of young men see of doing it'.

Authors such as Jonah (1997) have linked sensation seeking with other risky driving behaviours, such as the failure to use a seat belt. Begg and Langley (2000), in a review of the literature, stated that 'failure to use seat belts is most common among young adults, and particularly males. There is also evidence that those who do not use seat belts . . . engage in other risky driving behaviors such as speeding and alcohol-impaired driving'. It has been noted (e.g. by Salzberg *et al.*, 2002) that there can be a discrepancy between an observed level of seat-belt use in the driving population and that seen in vehicle occupant fatal cases. Salzberg *et al.* (2002) comment that the 'unbelted segment of the population is overrepresented among occupants killed in . . . collisions for two reasons: (a) because of a greater chance of involvement in potentially fatal collisions in the first place, and (b) because they do not have the protection of seat belts when a collision does occur'.

To sum up, driving can often be viewed as an expressive activity by many young drivers, and is also often a significant leisure activity for many. Darkness seems 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.

This conclusion was also reached in the TRL study, whose author (Broughton, 2005) commented: 'at a time when improving car technology had been expected to reduce the number of car occupant fatalities, this trend has been offset by a decline in the driving standards of some car drivers'. This was most evident in the high proportion of fatal accidents involving 'loss of control', 'behaviour – careless/thoughtless/reckless' and 'aggressive driving' as police-listed co-factors. The loss of control on bends, particularly in rural areas, was similarly also a particular problem area identified in the young driver accidents studied by Clarke *et al.* (2002). A key factor

in young driver accidents is likely to be the acceptance of risk by the driver; Deery (1999) comments that ‘young drivers underestimate the risk of an accident in a variety of hazardous situations. At the same time, they overestimate their own driving skill. Young drivers are also more willing to accept risk while driving than experienced drivers’.

Older drivers and passengers are also more at risk of fatality as car occupants. A review of European research on older drivers by Hakamies-Blomqvist and Peters (2000) quoted Maycock (1997), who estimated that ‘half of the increased fatality risk of drivers aged 75 years or more, compared to drivers aged 30 years, might be due to the enhanced susceptibility of the older drivers to be killed in the accidents in which they are involved, rather than to their higher accident rates’.

Older drivers, according to Hakamies-Blomqvist and Peters (2000), also have specific problems with visual attention. Studies quoted in their review showed that a simulated driving task combined with a secondary task of visual analysis in experimental conditions found significant performance decrements in older drivers. Another study on ‘merging decisions’ at intersections, quoted in the review, found no age differences in accuracy, but that the elderly needed about 50% more time to decide whether to merge in a given traffic situation. Rabbitt *et al.* (1996) compared driving instructors’ observations of older drivers’ behaviour with the experiences of the older drivers in the study. The instructors found some skills to be intrinsically difficult for older people, such as vigilance, speed and distance judgements, and co-ordination. The older drivers in question appeared to be unaware of these deficits, although Rabbitt *et al.* (1996) believed that this may have resulted from lack of feedback.

Brouwer *et al.* (1991) found that older drivers were over-represented in crashes when turning at intersections, usually by failing to yield the correct right of way. Brouwer *et al.* suggested that divided attention could be a problem for older drivers; they ‘misperceive or do not adequately react to other traffic . . . particularly in complex acts such as turns at intersections’. Åberg and Rimmö (1998), in their update of work by Reason *et al.* (1990), found that inattention errors increased with age. They reported that increased scores on this factor possibly resulted from the ‘automatization of driver behaviour’ that occurs with increased driver age and experience. Parker *et al.* (2000), using a questionnaire approach, similarly found that accident involvement in drivers aged over 50 years was associated with higher levels of errors and lapses of attention. This was in contrast to young drivers who had shown higher levels of driving violations in previous work by the same author (Parker *et al.*, 1995).

Fatalities involving older females in particular, using US data, were examined by Baker *et al.* (2003), who found that ‘senior women are primarily overrepresented in crashes that occur under the “safest” conditions, in daylight, when traffic is low (not at rush hour), when the weather is good, and when the roads are dry’. Though the

authors point out that elderly drivers may perform most of their driving under such conditions, they point out that ‘interventions to encourage self-adjusting their exposure to unsafe conditions are not likely to be sufficient to protect this driver population’. They also point out that fatal crashes in this driver group are more likely at intersections in built-up areas. Similarly, older drivers have been shown to be over-represented in junction accidents in many other studies over the last two decades (e.g. Moore *et al.*, 1982; Viano *et al.*, 1990; Verhaegen, 1995). With an ageing population which has greater susceptibility from side impacts (Viano *et al.*, 1990), and an increased risk of fatality from side impacts as opposed to frontal impacts (Bédard *et al.*, 2002), it seems likely that the human and financial cost of this type of accident will increase with time.

## 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 has been generated primarily from the data themselves, although theoretical models are acknowledged. The most attention is given to the full sequential nature of the accident story in each individual case, which is where the technique of qualitative human judgement methodology proves more useful than more traditional statistical methods applied to aggregated data.

The first step was to draw a heterogeneous sample of police road accident files involving fatalities of car and light commercial vehicle occupants (fatal accidents involving motorcyclists or large goods/public transport vehicles were excluded). The files were found to contain varying amounts of information depending on the circumstances of the accident and any subsequent legal proceedings, but were generally of a very detailed nature. Each file contained 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 the drivers and witnesses.

In addition to the report sheet/card, nearly all the files contained 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. The interpretation consists of the reconstruction of an entire accident story from the information available in the police file.

### 2.1 The accident database

The data were entered into a FileMaker Pro database customised to handle the information and search parameters required for this project. Figure 2.1 shows the standard data entry layout.

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 the mean age of the 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 above.

Figure 2.1: A standard data entry sheet on the database

<b>RECORD NUMBER</b>	<input type="text" value="983276/05"/>																																																														
<b>Driver 1 Age</b>	<input type="text" value="75"/>	<input checked="" type="radio"/> M <input type="radio"/> F	<b>Fatality type</b>																																																												
<b>Driver 2 Age</b>	<input type="text"/>	<input type="radio"/> M <input type="radio"/> F	<input checked="" type="checkbox"/> Driver																																																												
<b>Council Ward Code</b>	<input type="text" value="NG190QE"/>		<input type="checkbox"/> Front passenger																																																												
<b>Vehicle 1 Owner</b>	<input type="text" value="Own vehicle"/>		<input type="checkbox"/> Rear o/s passenger																																																												
<b>Primary blame</b>	<input checked="" type="radio"/> Driver 1		<input type="checkbox"/> Rear n/s passenger																																																												
<b>Date</b>	<input type="text" value="26/3/05"/>		<input type="checkbox"/> Other																																																												
<b>Day</b>	<input type="text" value="Saturday"/>		<b>Injury Body Parts</b>																																																												
<b>Time 24hrs</b>	<input type="text" value="14:46"/>		<input checked="" type="checkbox"/> Head & Neck																																																												
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<b>Passengers?</b>	<input type="text" value="None"/>		<input type="checkbox"/> General trauma to head and chest; no further details																																																												
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<b>Avoiding Action Attempted</b>	<input type="text" value="none"/>		<input type="checkbox"/> Roundabout																																																												
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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 driver of the car in which the fatality occurred, who is labelled as 'driver 1', though much consideration is also given to the actions and intentions of other road users. If two vehicles contained fatalities, 'driver 1' is taken to be the most blameworthy driver in the multiple-fatality accident. 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 the measurement of skid marks by police, vehicle damage reports, etc. Figure 2.1, 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 in a series of previous studies (Clarke *et al.* 1998; 2002; 2004). 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, originally developed at TRL, which involves the identification of one major precipitating factor (PF) from a possible list of 15, 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 and others.

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 in cases, after each has been analysed individually, 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 accidents. Statistical examinations were not the primary focus of the study, but simple statistics were used to characterise the sample.

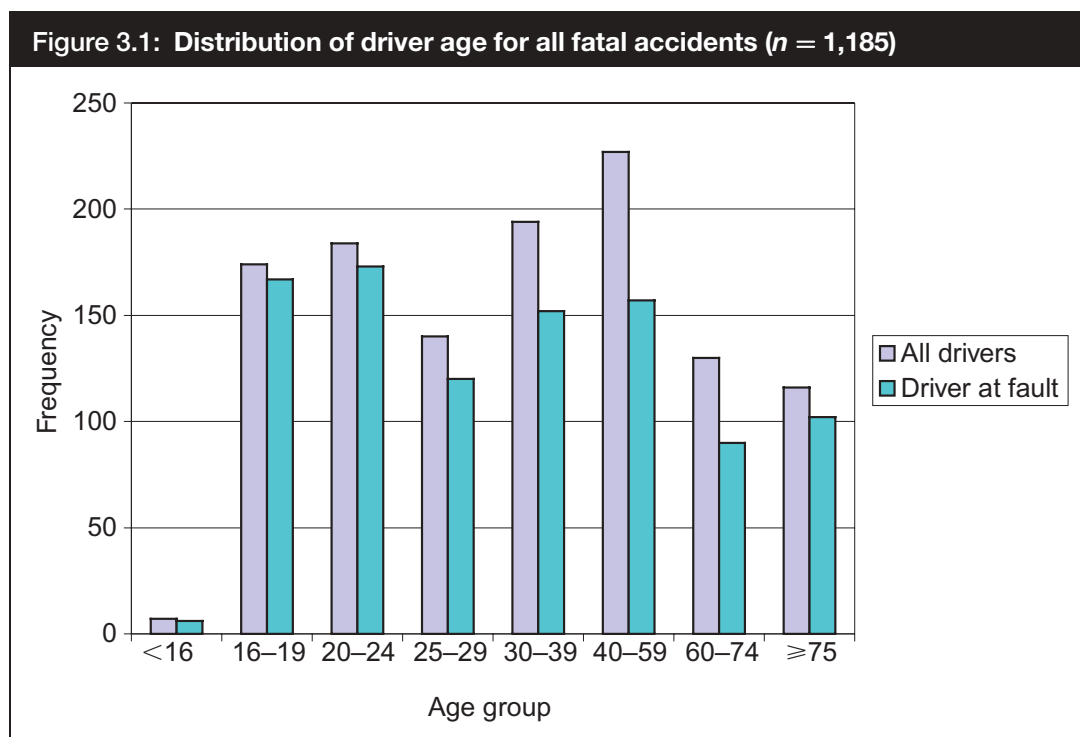
### 3 RESULTS

#### 3.1 General overview/summary

In total, 1,185 fatal cases were entered into the database. Of these, 931 (79%) involved the driver of the car, in which the fatality occurred, being primarily at fault. Male drivers at fault in any fatal accident outnumbered female at-fault drivers by a ratio of over four to one.

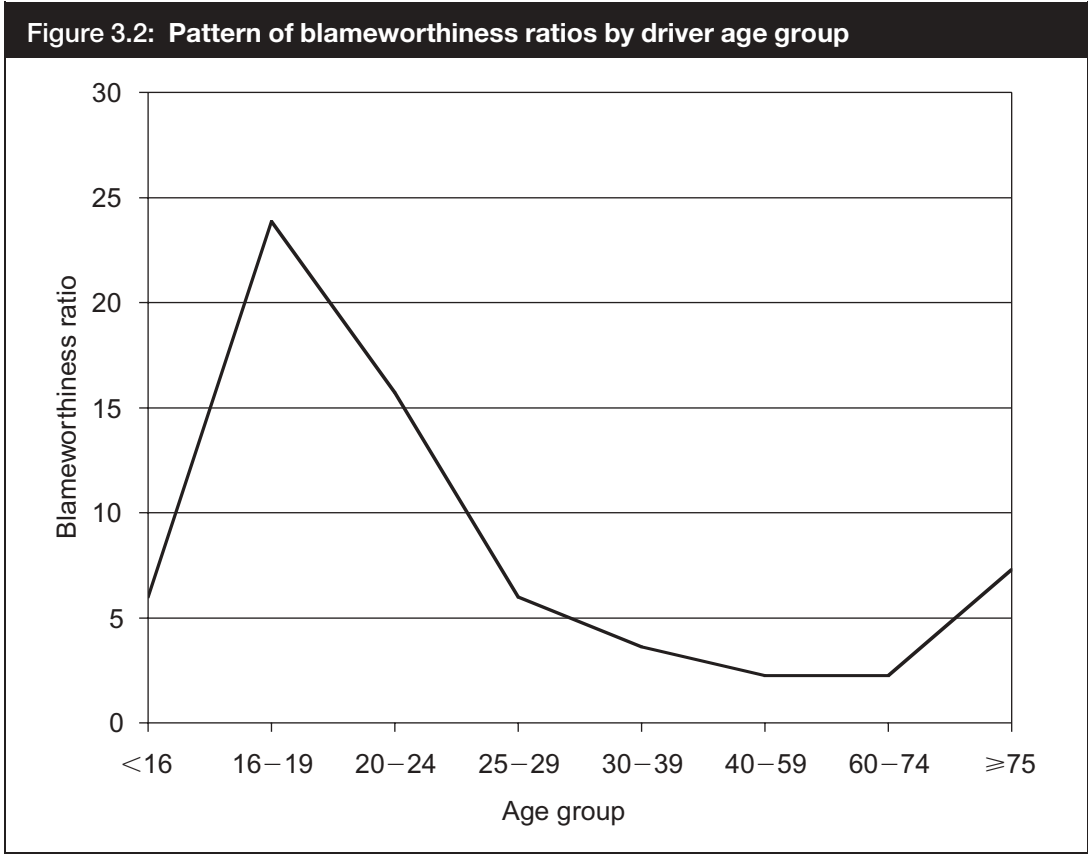
#### 3.2 Driver age in fatal accidents

Figure 3.1 shows the distribution of driver ages, in eight age-bands, for all drivers in the sample, and for only those drivers considered to have been at fault.



#### 3.3 Blameworthiness ratios

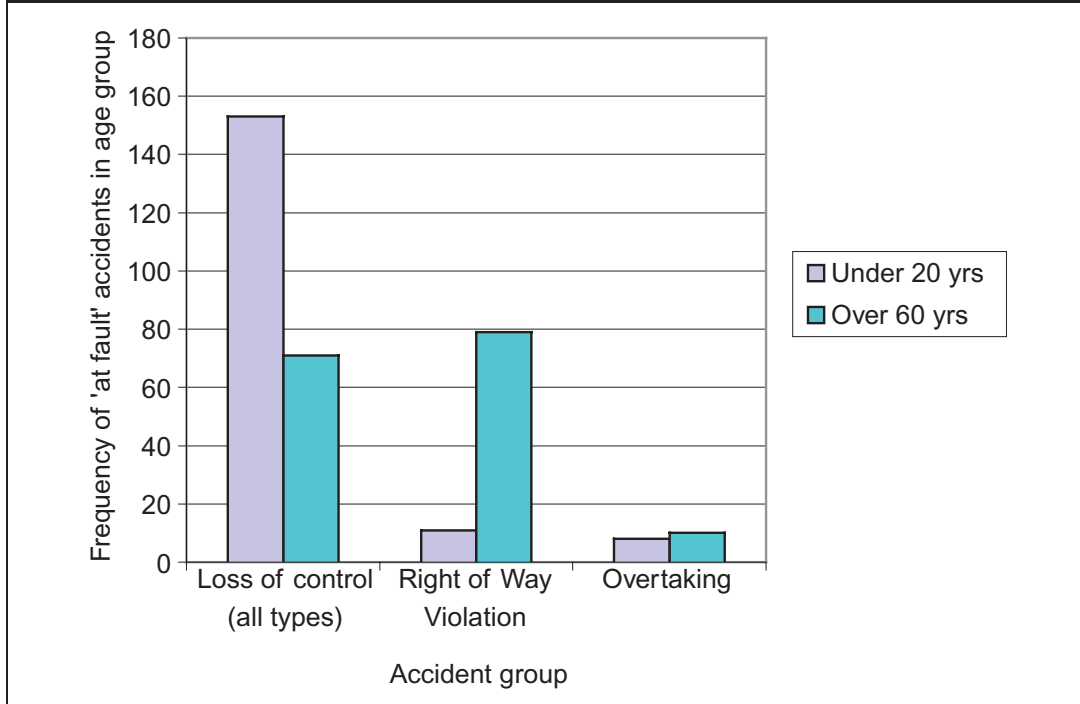
All cases were assessed by coders as to the blameworthiness of any participants in the incident. Drivers could be rated as either ‘to blame’, ‘at least partly to blame’ or ‘not to blame’ in any given accident, and there were also codings for unforeseen mechanical failure and miscellaneous others. Figure 3.2 shows the pattern of blameworthiness ratios across drivers in each age band, i.e. the number of accidents where the driver is rated as at least partly or fully to blame, divided by the number of accidents caused by all other factors, most usually another road user/driver.



It can be seen that those drivers aged 16 to 19 years old appeared to be over 20 times more likely to have caused a fatal accident than they were to have been innocently involved in such an accident. This effect decreased dramatically with increasing driver age, only rising again beyond the age of 60.

Younger drivers showed factors such as speeding and deliberate recklessness in causing fatalities to themselves and others. They ‘specialised’ particularly in loss of control accidents, typically on bends. Older drivers seemed to make more observational and misjudgement errors, and had a higher proportion of right of way violation accidents compared with other accident types that this older group became involved in, as shown in Figure 3.3.

**Figure 3.3: Three groups of accident – drivers aged 20 and under compared with drivers aged 60 and over**



The examination of yearly percentages of younger (under 20 years) and older (over 60 years) drivers for 1994 to 2001 inclusive failed to show any noticeable pattern of change in the proportion of fatalities in these age groups. There were insufficient cases available for the years 2002–05 to reach any meaningful conclusions.

### 3.4 Speed and fatal accidents

Speeding accidents were examined, and divided into separate types, based predominantly on the levels of risk-taking by drivers:

- **Type 1** – deliberate risk-taking involving speed in excess of the limit.
- **Type 2** – deliberate risk-taking involving driving too fast for road conditions, for example cornering deliberately fast.
- **Type 3** – ignorance of speed, for example failing to realise that wet road conditions increase the likelihood of skidding.
- **Type 4** – misjudgement of the correct speed for the conditions, for example misjudging the sharpness of a bend.

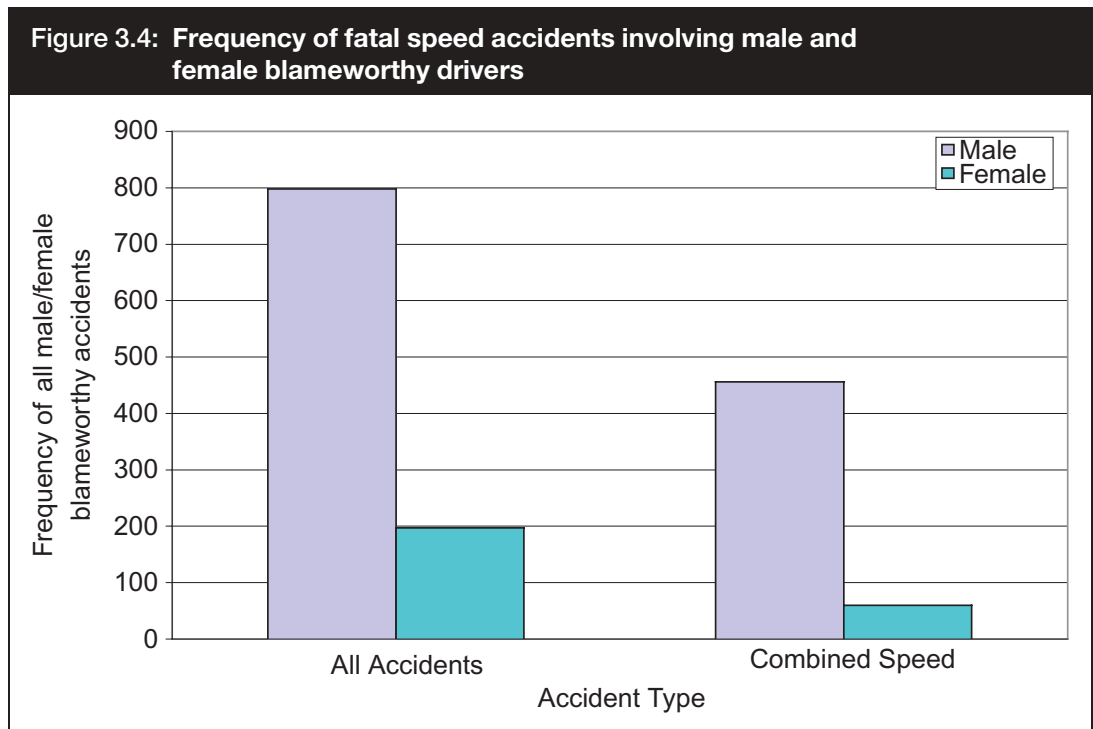
Judgements were made by individual researchers, using all the available data. Primary sources included, for example, witness statements from surviving passengers as to the vehicle speed/driver behaviour and accident reconstruction reports using critical speed marks left by a car to calculate a likely velocity range at

the point of loss of control (usually compiled by a specially trained police traffic officer).

These four types of speed accident were examined by driver gender, age group, time of day, day of week and year.

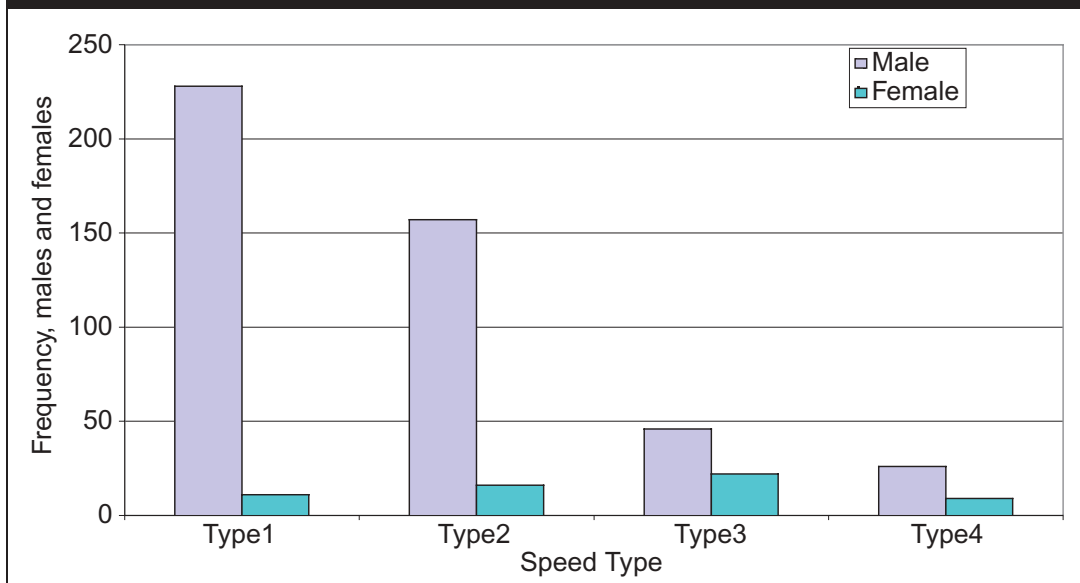
### 3.4.1 Speed and gender

Figure 3.4 shows that male drivers were found to be involved in a far greater number of ‘to blame’ speed-related accidents than female drivers: 57% of all male, at-fault accidents involved speed as a cause. This compares to 31% of all females at fault.



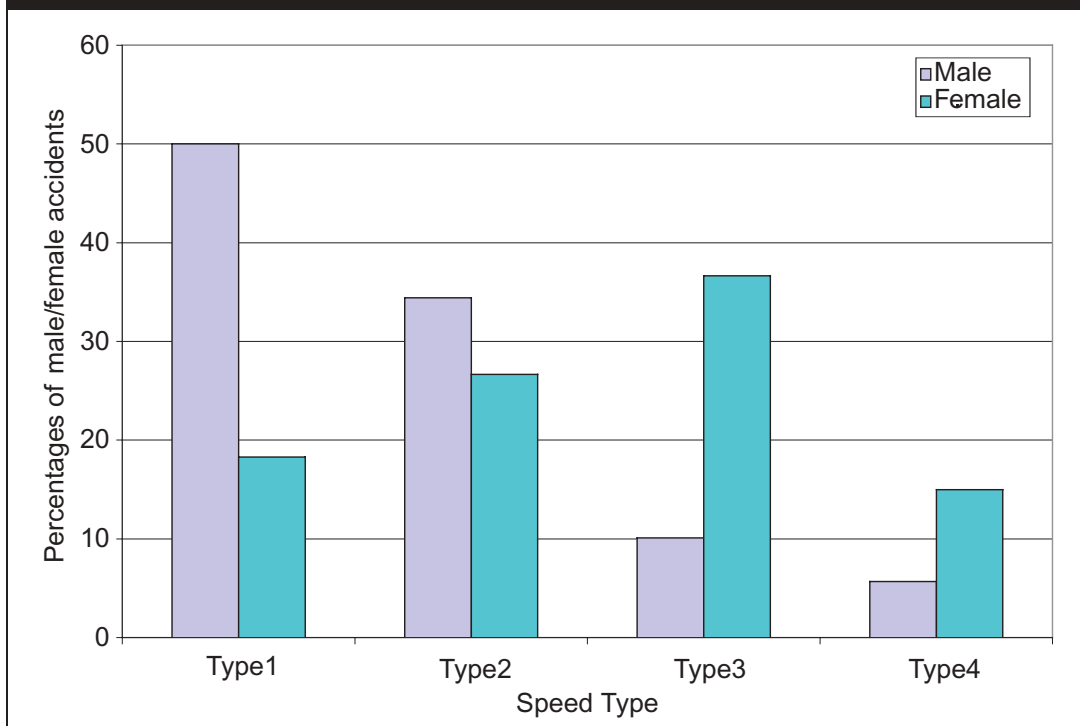
When the four speed categories were examined, it was seen that males at fault were much more likely to commit deliberate risk-taking types of accident than females (see Figure 3.5). Of the males involved in excess speed accidents, 50% of the cases were found to be of type 1 (risk-taking by travelling in excess of the legal speed limit) and 34% were found to be of type 2 (deliberately travelling too fast for the road conditions). Only 6% of the males were involved in accidents where the driver misjudged the correct speed.

**Figure 3.5: Frequency of types of speed – differences between male and female drivers**



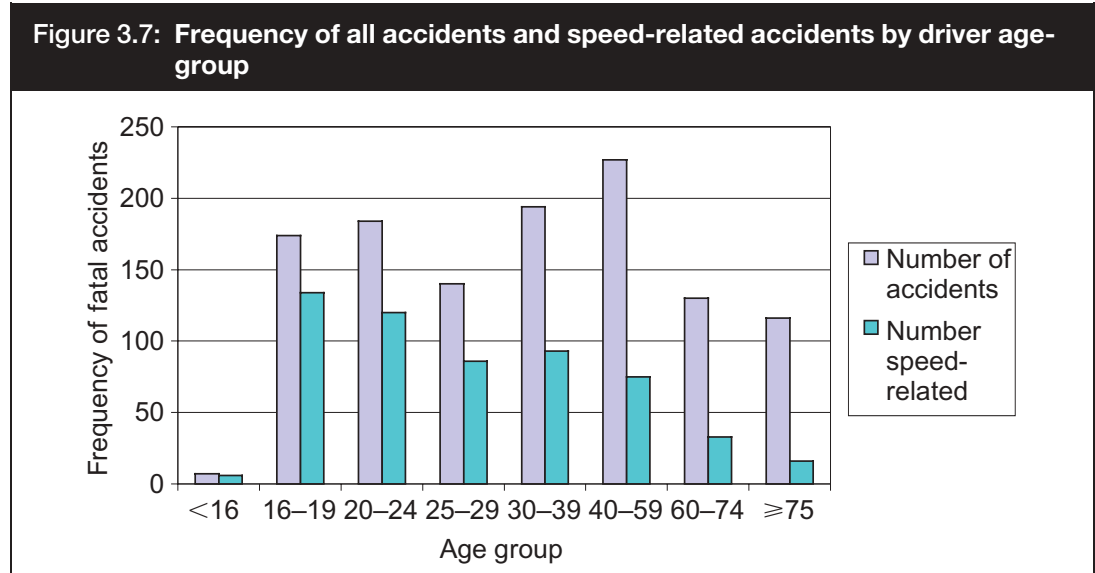
For female drivers, a far greater proportion of their speed-related collisions were of type 3 (ignorance of the correct speed, almost 37%) than for males. Where females were involved in deliberate risk-taking, they were more likely to be travelling too fast for the conditions (type 2, 27%) rather than above the speed limit (type 1, 18%), as shown in Figure 3.6.

**Figure 3.6: Percentages of total speed accidents in male and female blameworthy accidents**

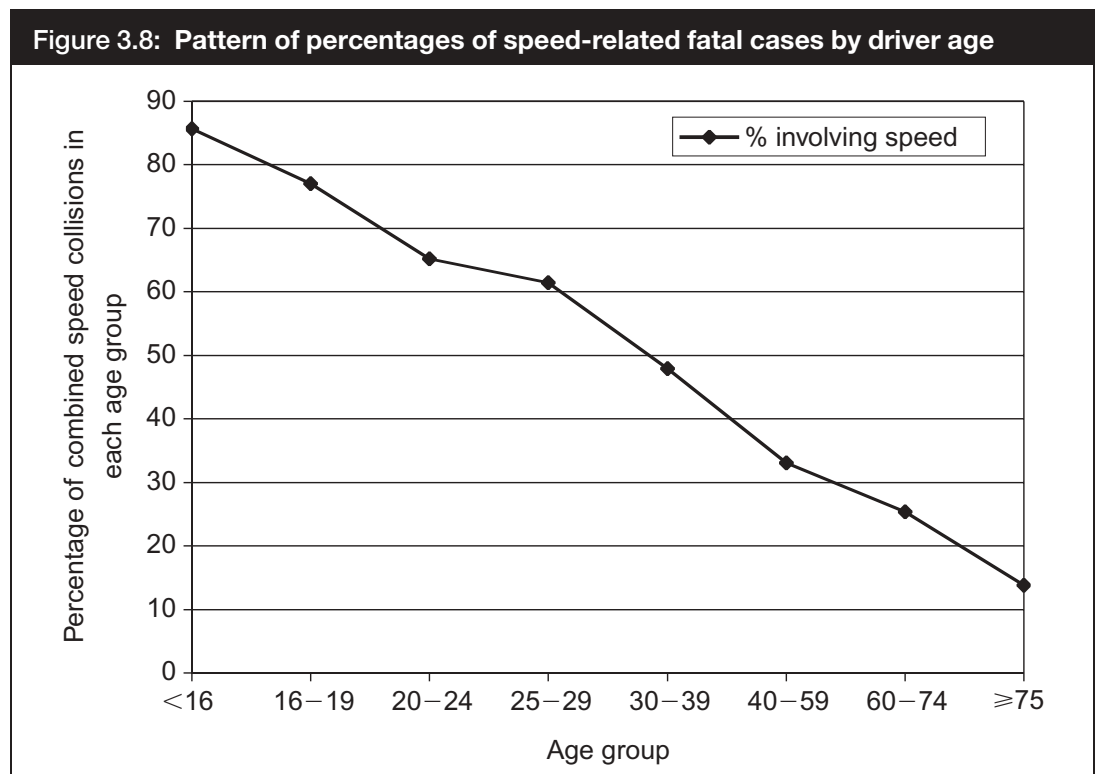


### 3.4.2 Driver age and speed

Drivers under the age of 25 years were at fault in the greatest number of speed-related accidents. Speed-related collisions declined considerably in drivers over the age of 60 years. This is shown in Figure 3.7.

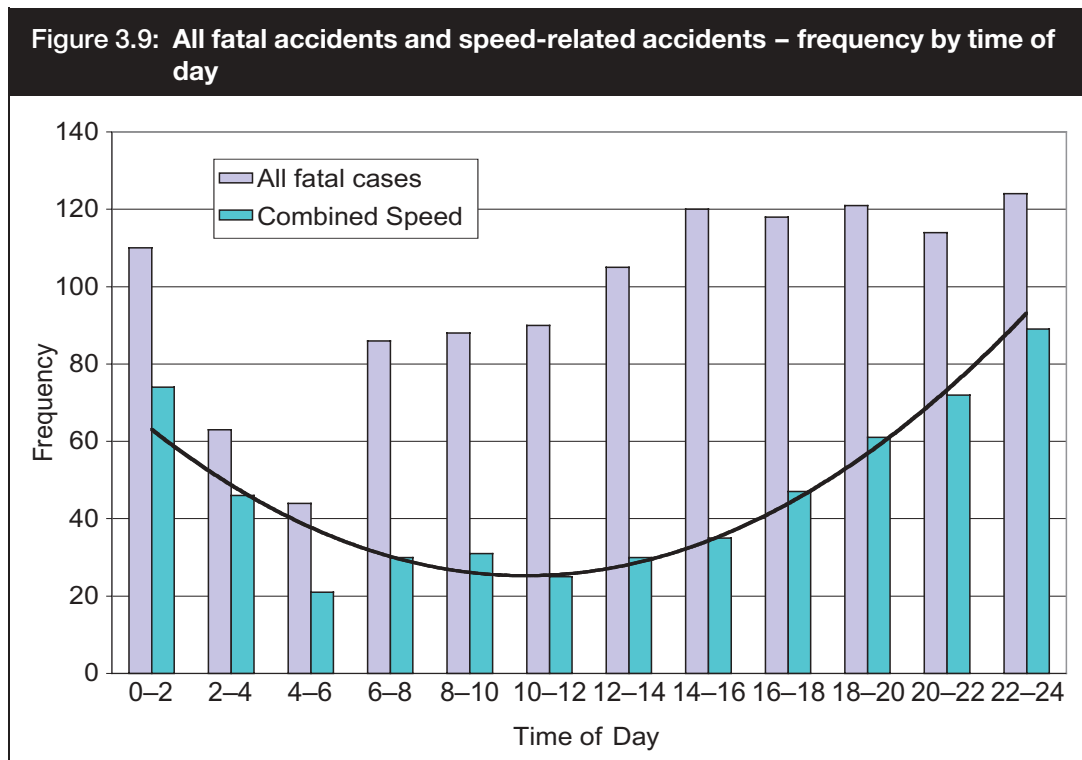


Speed accident types 1 and 2, involving deliberate risk-taking, were by far the most common type of speed accident that drivers under 25 years old were involved in. Figure 3.8 shows that it was only after the age band of 30–39 that the percentage of drivers in each age group showing speed as a causal factor in their accidents began to fall below 50% (percentage figures are for all four types of speed factor combined).



### 3.4.3 Speed and time of day

The cases were split into two-hour intervals over a 24-hour period and it was found that most of the fatal collisions occurred throughout the daytime. Frequency seemed relatively constant between 06:00 and midday, after which the frequency began a steady increase, peaking at midnight. The frequency then began to fall quite rapidly, with the least number of fatalities between the hours of 02:00 and 06.00 (see Figure 3.9). The majority of fatal collisions occurred between 22:00 and 23:59; these accounted for 124 accidents, of which 72% were caused, at least partly, by the ‘at-fault’ driver travelling at an inappropriate speed.



A second order polynomial curve has been added to Figure 3.9 to demonstrate the U-shaped distribution of the combined speed component in fatal crashes compared with the distribution of all fatal cases. It can be seen that speed as a component factor in fatal crashes peaked throughout the hours of darkness. The majority of speed-related accidents occurred between 22:00 and midnight and are of types 1 and 2, involving deliberate risk-taking. More than 50% of fatal accidents between the hours of 18:00 and 05:00 involved a driver taking deliberate risks involving speed. In contrast, types 3 and 4 speeding accident, involving ignorance and misjudgement, were fairly consistent throughout the 24-hour period.

### 3.4.4 Speed and day of the week/yearly totals

Around 60% of the fatal collisions that occurred on a weekend had some form of speed as a cause. On weekends the greater number of speed collisions were of types

1 and 2, deliberate speeding. As with the time of day analysis above, types 3 and 4 speeding accident, involving ignorance and misjudgement, were fairly consistent throughout the week.

The examination of yearly percentages of speed-related cases for the years 1994 to 2001 inclusive failed to show any significant change in the proportion of fatalities in speed-related accidents. There were insufficient cases available for the years 2002–05 to draw any meaningful conclusions. Particular types of speed factor (types 1–4) did not seem to differ significantly on a year-by-year basis.

Overall, the greatest frequencies of speed-related fatal accidents were found to have involved male drivers under the age of 21, who were travelling between 22:00 and midnight, on a Saturday night, and who were deliberately travelling at above the speed limit.

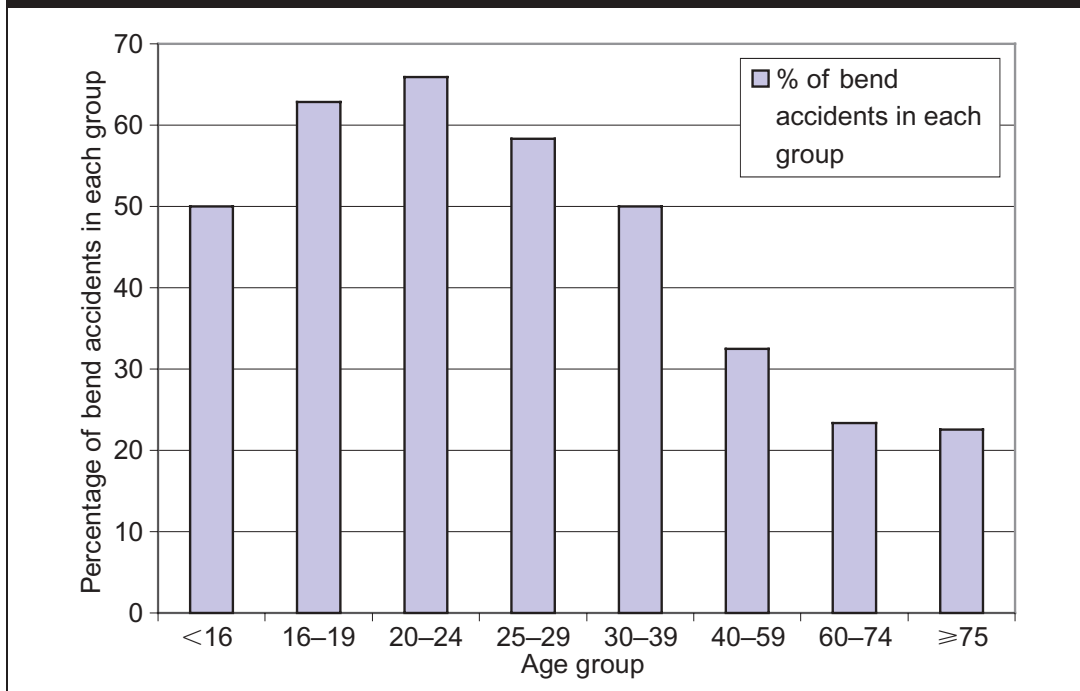
### 3.4.5 *Speed – accidents involving loss of control on bends*

Forty-four per cent of the fatal accidents sampled involved a vehicle going out of control on a bend or curve. The mean age of drivers at fault in these bend accidents was significantly younger than the mean age of drivers in all other accidents in the sample (mean age 33 years versus mean age 45 years, unpaired  $t = 10.45$ ,  $p < 0.01$ ). Fifty-four per cent of these accidents were single vehicle accidents (SVAs). There were approximately five times as many male drivers at fault in this fatality class as there were female drivers at fault.

The majority of loss of control on bend accidents (74%) were, unsurprisingly, characterised by excessive speed for the bend in question, contributing to the loss of control by the driver. The age distribution of ‘at-fault’ drivers in bend accidents is shown in Figure 3.10. The figure shows the percentage of bend accidents in the total ‘at-fault’ accidents for each age band.

Figure 3.10 clearly shows that, for drivers under the age of 30, over half of the fatal accidents were caused by loss of control on a bend or curve. As a whole, these fatal accidents occurred over four times as often on rural roads as they did on urban roads. Over half (57%) occurred during the hours of darkness.

**Figure 3.10: Percentage of bend accidents by driver age band for all at-fault drivers**



There were two general patterns of bend control loss. The first, occurring in approximately 70% of such cases, seemed to occur where a driver approached a bend at excess speed and was unable to make the bend at all. This usually resulted in the car leaving the road to either side, sometimes hitting oncoming traffic before doing so in the case of left bends on single carriageway roads (in the case of right bends, failing to take the bend meant that the car left the road to the nearside rather than entering the opposing carriageway).

In the second type (approximately 27% of such cases), the pre-accident sequence was somewhat more complex. The driver appeared to have made attempts to steer out of a skid and regain control, but ended up typically contributing to the loss of control by overcorrecting and inducing a yawing skid, as the path taken in correction exceeded the available grip on the road surface. The vehicle could then spin off to either side of the road or into opposing traffic.

The average age of the drivers involved in either of these two types of loss of control bend accidents was not significantly different from one another. The ratio of male/female drivers at fault was also the same in either case, and was no different from loss of control bend accidents considered as a whole. There was no evidence that slippery road conditions were playing a major part in either type of loss of control accident.

In both of the two causation patterns identified above, there appeared to have been a high number of side or non-frontal impacts to the car, although this was found to be

more common in the second type (67% side/non-frontal impacts versus 45% in the first type). Side impacts have been found to cause twice as many fatalities as frontal impacts (e.g. by Bédard *et al.*, 2002)

### 3.5 Alcohol and drugs

Nearly 20% of all fatalities involved a driver over the drink-drive limit. The average blood alcohol level (where this could be measured) was 176 mg/dl (i.e. over twice the UK legal driving limit of 80 mg/dl). The highest blood alcohol level recorded was 384 mg/dl, i.e. nearly five times the legal limit. Drivers found to be above the alcohol limit had an average age lower than that found in the sample of drivers where alcohol was not a factor (mean age 31 years versus 42 years, unpaired  $t = 7.29$ ,  $p < 0.01$ ).

Four per cent of cases involved drugs. Cannabis was the most widely found drug, but also evident in these cases were amphetamines, MDMA (ecstasy), cocaine and heroin. The level of drug use is, unfortunately, likely to be an underestimate, as toxicology reports were not always performed and/or the results were not always made available in the police reports. Drivers found to have used drugs had an average age lower than that found in the sample of non-drug-using drivers (mean age 28 years versus 40 years,  $p < 0.01$ ). Of the cases where drivers were identified as driving while under the influence of drink and/or drugs, only 18 drivers (8%) were found to have been under the influence of drugs and not alcohol, with a further 13 (6%) testing positive for both alcohol and drug intake.

Males were more likely to be driving under the influence of drink and/or drugs when involved in an accident than females. Where male drivers are to blame, 23% of accidents involved a driver impaired by drink and/or drugs compared with only 13% of females.

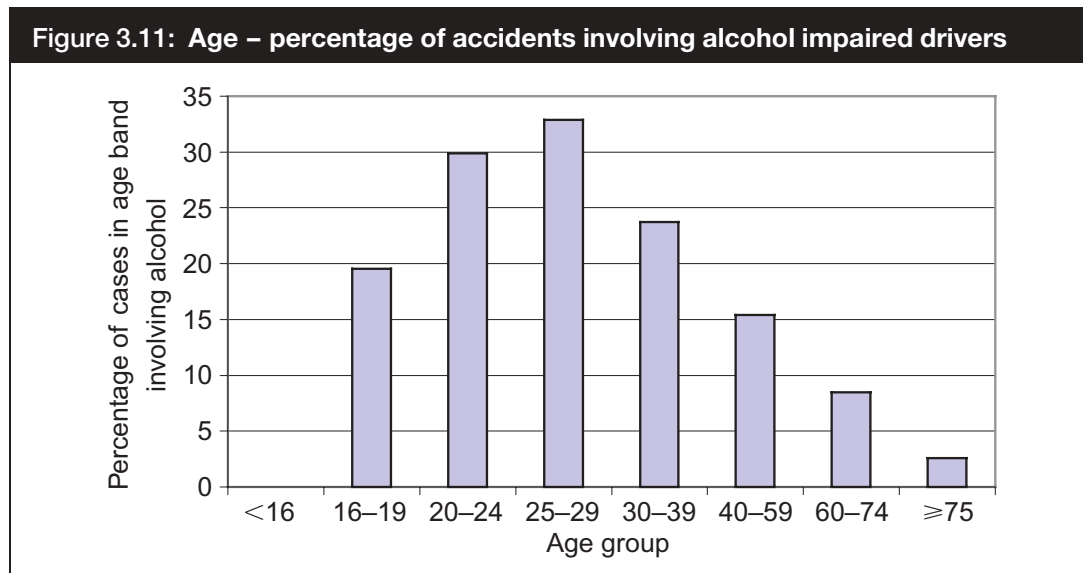
There were also very clear types of accident in which impaired drivers were likely to be involved. A major group was 'loss of control' accidents, especially when attempting to negotiate a left- or right-hand bend. Two-thirds of all the accidents examined were attributed directly to a loss of control. Of these, nearly a quarter involved drivers who were under the influence of drink and/or drugs. There were fewer impaired drivers in other accident types, which could be broken down into three main categories:

- 10% of right of way violation (ROWV) accidents involved an impaired driver;
- 10% of overtaking accidents involved an impaired driver; and
- 9% of rear-end shunt (RES) accidents involved an impaired driver.

Of all the accidents involving an impaired driver, 68% were SVAs and these were nearly all (97%) 'lose control' accidents.

### 3.5.1 Driver age and drink/drug impairment

An examination of four age-groups covered by the sample showed the general downward trend of the fatal accidents involving drink/drug impairment with driver age (Figure 3.11). Age bands have been grouped together in large sets to remove apparent variations caused by small numbers of accidents in individual bands, particularly in the older age groups.



Over a quarter of the accidents where drivers were aged under 30 years involved the driver being impaired by drink or drugs. This factor fell in drivers aged over 30 years. In the drivers aged 40–59 years, 15% of accidents involved drink/drug impairment. The proportion fell very dramatically with more elderly drivers – less than 3% of the accidents where the driver was aged 75 or over involved impairment by drink or drugs.

Younger drivers were, therefore, the group most likely to be causing fatal accidents while driving when unfit through drink or drugs. The attitude of some younger drivers was demonstrated by comments made by drivers in two cases. Both accidents involved a 19-year-old male who was to blame for the accident and found to be over the legal limit. In both cases their front seat passenger died as a result of the driver losing control on a right-hand bend. One of the drivers clearly knew he had done wrong, as he stated:

‘I know I shouldn’t have been in the car and I had no licence and I’d had too much to drink but I still did it. It’s just one of those stupid things that you do.’

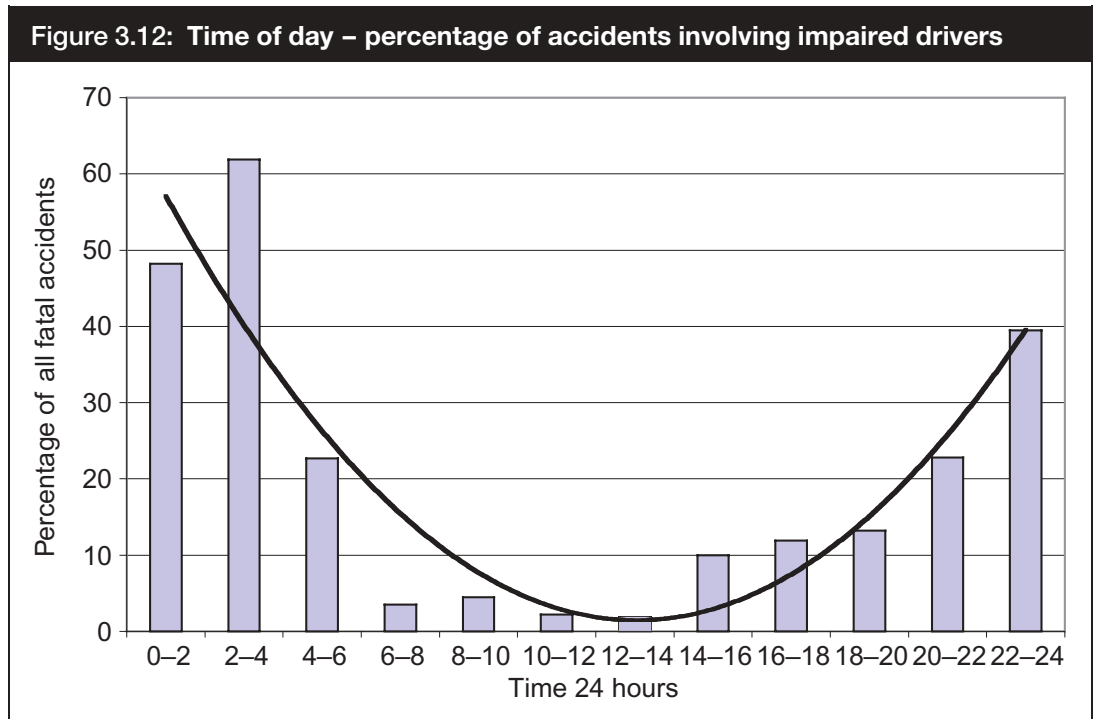
The other case involved a driver who appeared to have no concept of what a ‘safe’ amount of alcohol was, and claimed he had:

‘Only had three pints . . . and a couple of lines.’

Both drivers were charged with causing death by dangerous driving, jailed for approximately five years and banned from driving until they undertook an extended re-test.

### 3.5.2 Alcohol and time of day

A round-the-clock examination of accident involvement was also undertaken. Figure 3.12 shows a breakdown by time into two hourly bands starting and ending at midnight, and includes a second-order polynomial curve to demonstrate the general trend of the data.



The percentage of drink/drug impaired drivers within each time band increased with time during the hours of darkness, reaching a peak in the 02:00 to 04:00 time band. There were also very noticeable increases after 20:00. Between the hours of 20:00 and 04:00, accidents involving drink/drug impaired drivers accounted for over 40% of the total number of fatal accidents. There was a significant drop in the number of accidents involving drink/drug impaired drivers within the remaining time bands between 04:00 and 20:00. Of these accidents, only 8% involved a driver under the influence of drink or drugs.

### 3.5.3 Alcohol and day of the week/yearly totals

Figure 3.13 shows the percentage of accidents on each day of the week involving a drink/drug impaired driver.

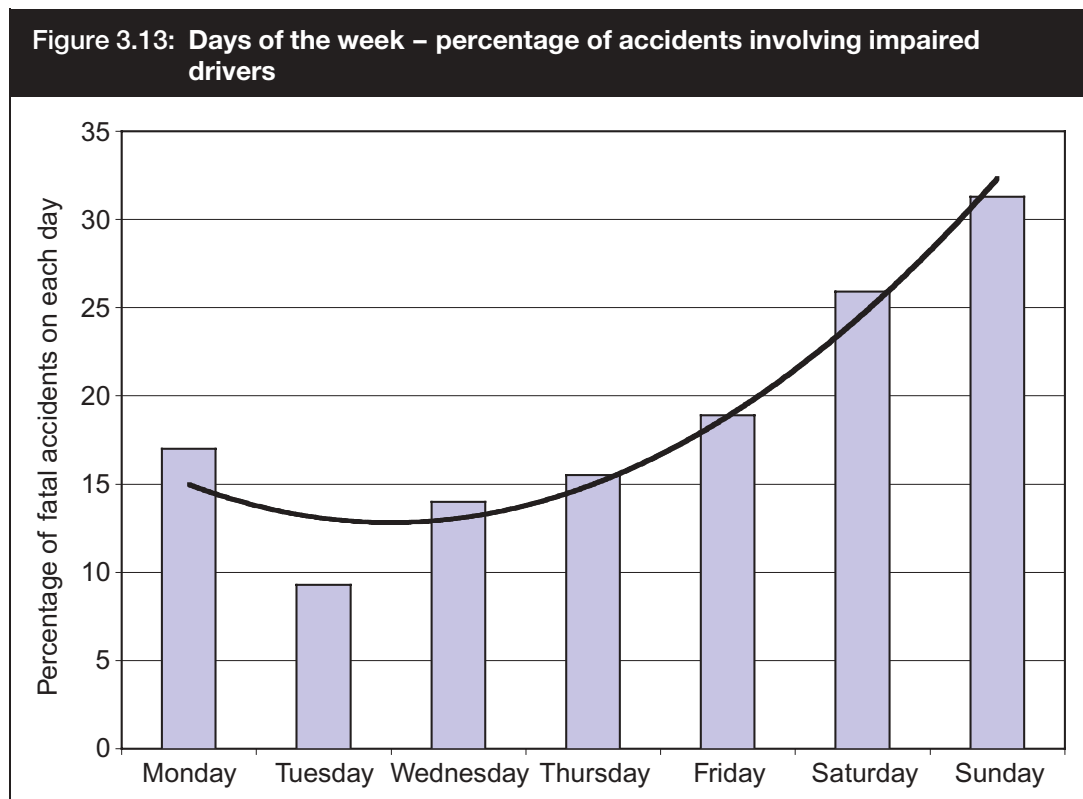


Figure 3.13 shows a steady rise in the proportion of accidents occurring on any given day that involve a drink/drug impaired driver as the week progresses towards the weekend. A second-order polynomial curve has been added to the chart to demonstrate this increase. Comparing the lowest and highest results clearly demonstrates the increase. On Tuesdays only 9% of fatal crashes involved drivers that were found to be driving under the influence of drink and/or drugs. In contrast, almost a third (31%) of fatal crashes that occurred on a Sunday involved impaired drivers. The weekend is the most likely time that people will socialise and drink, and this was reflected in the fatal accident sample.

As the time of day analysis previously showed (Figure 3.12), many alcohol- or drug-related accidents occurred, somewhat unsurprisingly, late at night or in the early hours of the morning. For this reason there appeared to be more accidents on a Monday, as many of these accidents had occurred as a result of drivers drinking on a Sunday evening and then crashing in the early hours of Monday morning.

A yearly analysis covering 1994 to 2001 failed to show any significant differences from year to year. The lowest percentage of fatal traffic accidents involving drink/drug impaired drivers occurred in 1996 when 15% of the accidents involved drivers

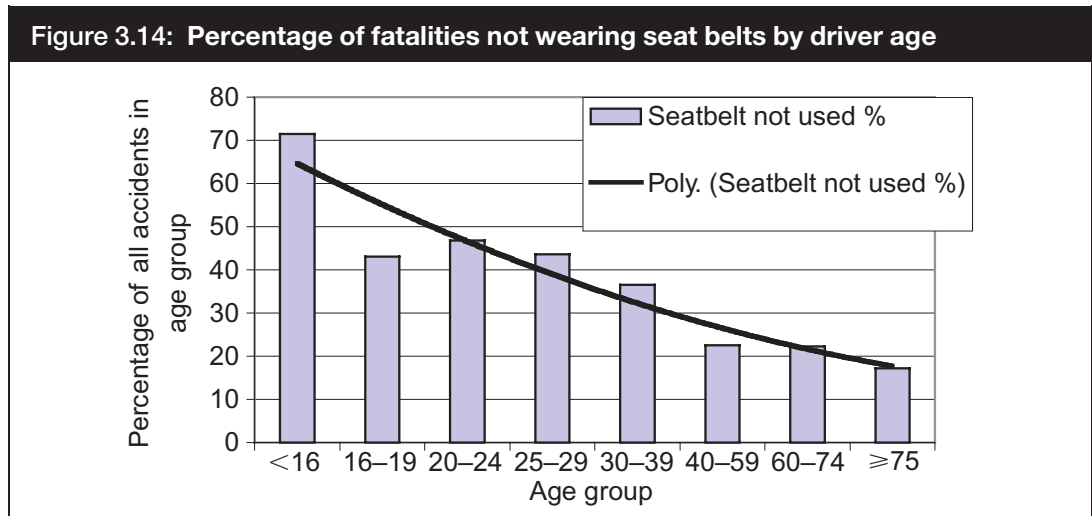
who tested positive for alcohol or drugs. The highest number occurred in 1995 when 23% of the accidents examined were alcohol or drug related. There were insufficient cases available from the sample provided by TRL for the years 2002–05 to draw any meaningful conclusions.

### 3.6 Seat belts

Three hundred and ninety-nine (34%) cases involved a fatality **not** wearing a seatbelt. Five hundred and eighty-eight (50%) cases involved a fatality wearing a seat belt. The remaining 16% of cases occurred where seat-belt use was either ‘unknown/unrecorded’ or ‘not applicable’ (e.g. rear seats in pre-1987 cars).

Eighty-five per cent of fatalities not wearing a seat belt were either driving or travelling in the front passenger seat; fatalities were not wearing seat belts in 58% of accidents involving a rear-seat death.

Figure 3.14 shows the percentage of accidents where the fatality was not wearing a seat belt falls with the age of the car driver, but still remained quite high throughout all age ranges. A second-order polynomial curve has been added to Figure 3.14 to show the pattern of the drop from the peak of over 70% of fatalities in the youngest (illegal) driver age-group who were not wearing a seat belt.

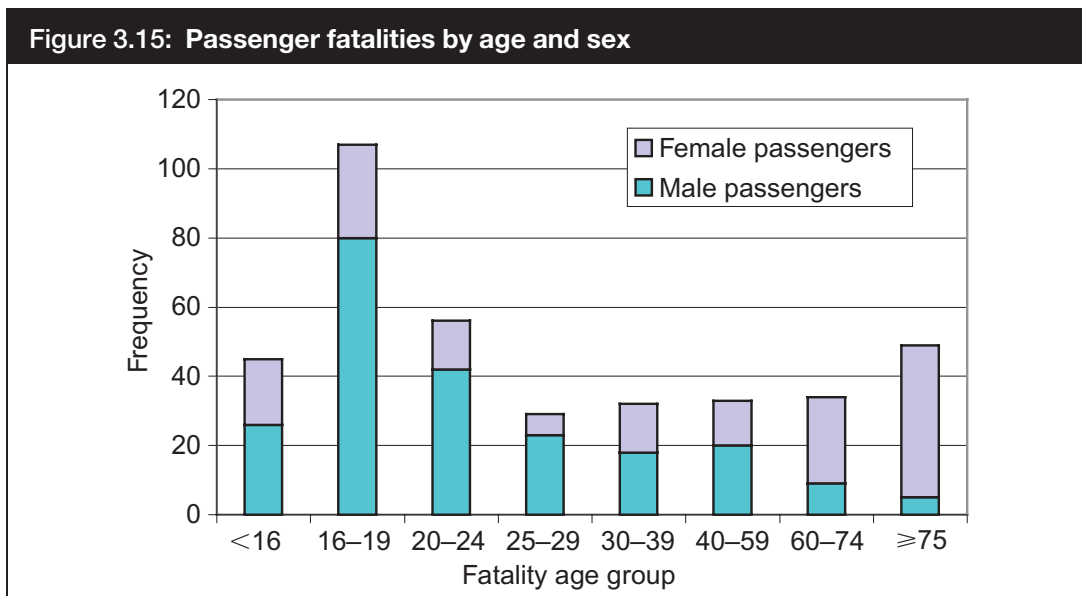


The examination of yearly percentages of non-seat-belt wearing for the years 1994 to 2001 inclusive failed to show any fall in the proportion of fatalities failing to wear a seat belt. There were insufficient cases available from the sample provided by TRL for the years 2002–05 to draw any meaningful conclusions.

### 3.7 Passenger fatalities

- 75% of all cases involved the death of a driver.
- 33% of all cases involved the death of a passenger
- 23% involved the death of a front-seat passenger.
- 12% involved the death of a rear passenger.
- 10% involved more than one fatality.
- In 26% of cases involving the death of any passenger, the driver of the same vehicle was also killed.

Figure 3.15 shows the distribution of passenger fatalities in the sample by age and sex.



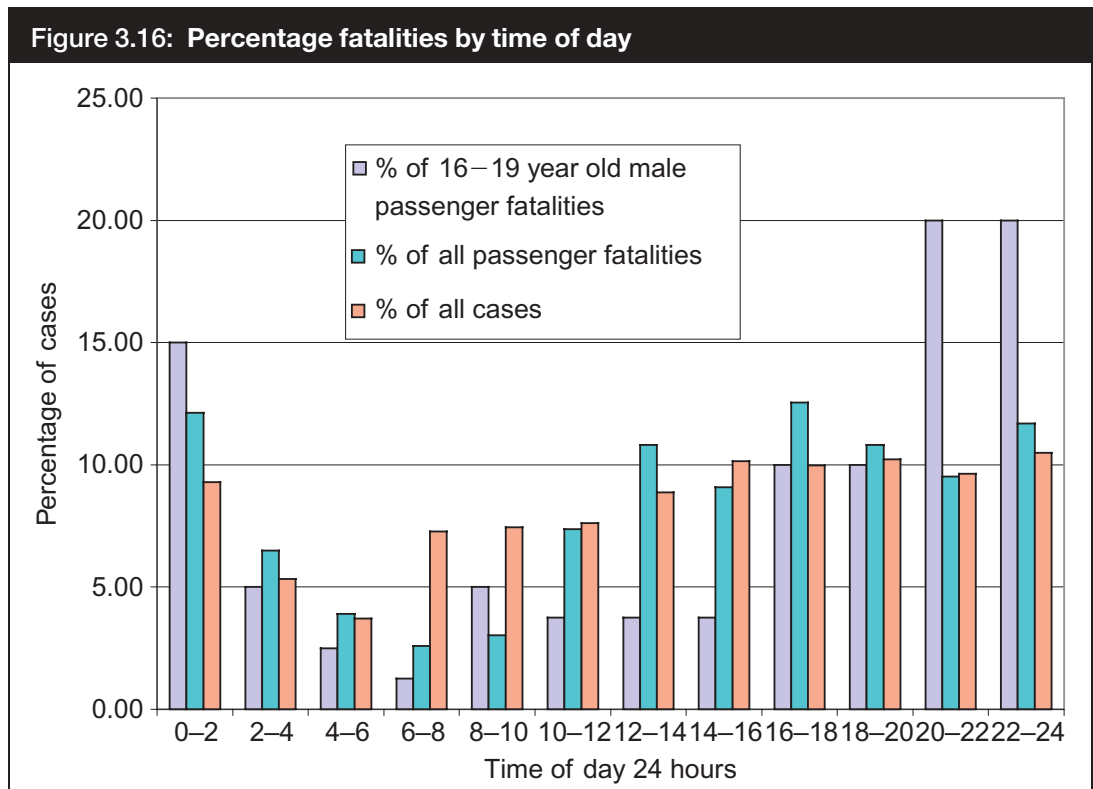
The peak age/sex for passenger fatalities was shown to have been 16–19-year-old males. Of these casualties, 58% were not wearing seat belts. Most were usually travelling with a slightly older driver (mean driver age for this subset was 20 years versus mean passenger age of 18). The majority (73%) of this subset involved deliberate excessive speed by the driver concerned, and 39% involved deliberate recklessness, such as racing.

The drivers in this subset were almost always assessed as fully to blame for the accident; the driver was regarded as fully to blame in 94% of this subset versus 79% in the sample as a whole.

There was some evidence of a ‘commonality of behaviour’ between drivers and passengers, i.e. if a driver had been drinking/taking drugs/not wearing a seat belt, it

was likely that the passenger(s) had also been drinking/taking drugs/not wearing a seat belt. More than half of the group where the passenger was not wearing a seat belt also involved a driver not wearing one. The extent of this phenomenon is hard to quantify for actual levels of drink/drugs consumed, however, as it is rare to see a toxicology report on a passenger, but reasonably common for a driver.

The 16–19-year-old male passenger group had a peak in their accident involvement late in the evening, with the highest percentage of accidents occurring between 22:00 and 02:00; this four-hour period accounted for 35% of all 16–19-year-old passenger fatalities. This is shown in Figure 3.16.



It seems that the 16–19-year-old male subset of passenger fatalities were essentially ‘younger versions’ of the drivers with whom they were involved in the accidents. Two-thirds of cases in this subset appeared to involve driving for what might be described as ‘recreational’ purposes, and over half involved a car that might be described as a ‘performance’ model (usually denoted by a variety of suffixes such as GTi/GTE/Turbo, etc.) To an extent, this group of 16–19-year-old male passenger casualties appeared to be travelling with drivers who were strikingly similar to a sub-group of drivers identified in the University of Nottingham’s previous ‘young driver’ study (Clarke *et al.*, 2002).

### 3.8 Child fatalities

Five per cent of cases in the sample involved the fatality of persons aged 15 years or under. Over half of these fatalities were not wearing seat belts or appropriate restraints. Passenger fatalities aged between 12 and 15 years tended to be travelling with young drivers who were friends of theirs; there was evidence of excess speed and recklessness in the drivers, similar to that observed in cases with 16–19-year-old passengers described above. Child fatalities under 12 years of age, by contrast, tended to be travelling with their parents, and in 46% of such cases, the parent driving was not considered to blame for the accident. Of those cases where the adult driving was to blame, the most common problems were with distraction, observational errors and misjudgement, rather than deliberate speeding and recklessness. Nearly half (46%) of the child fatalities aged under 12 were not wearing seat belts. Two fatalities of very young children occurred as a result of incorrectly fitted/fastened child safety seats.

### 3.9 Elderly fatalities

Ten per cent of cases in the sample involved a driver aged 75 or over. These drivers were considered to be primarily at fault in 84% of the accidents that they became involved in. Poor observation, misjudgement of another vehicle's speed/distance and distraction were the major explanatory factors found in this group. Only 14% of accidents involving drivers aged 75 years or over were SVAs. A small group of accidents involved loss of control and showed the hallmarks of illness or fatigue, but it proved hard to determine this to any degree of certainty where problems failed to be reported at post-mortem and no prior medical history was known to have been affecting the driver.

Only 49 cases (approximately 4% of the sample) involved the death of a passenger aged 75 years or over. In nearly 40% of these cases, the driver of the car in which they were travelling was not considered to be to blame for the accident in any way. In the remainder where the driver was considered to blame, approximately 80% were caused by a driver aged over 75 years, with contributory factors as outlined in the previous paragraph.

### 3.10 Accidents involving right of way violations

Fatalities resulting from drivers engaging in right of way violations (ROWVs) formed approximately 16% of the total sample. The mean age of drivers at fault in these ROWV accidents was significantly older than the mean age of drivers in all other accidents in the sample (mean age 57 years versus mean age 37 years,  $p < 0.01$ ). Seventy per cent of fatal ROWV accidents occurred in rural areas, which was perhaps a reflection of the higher speeds that can be typically attained/are legally allowed on rural roads when compared with urban roads.

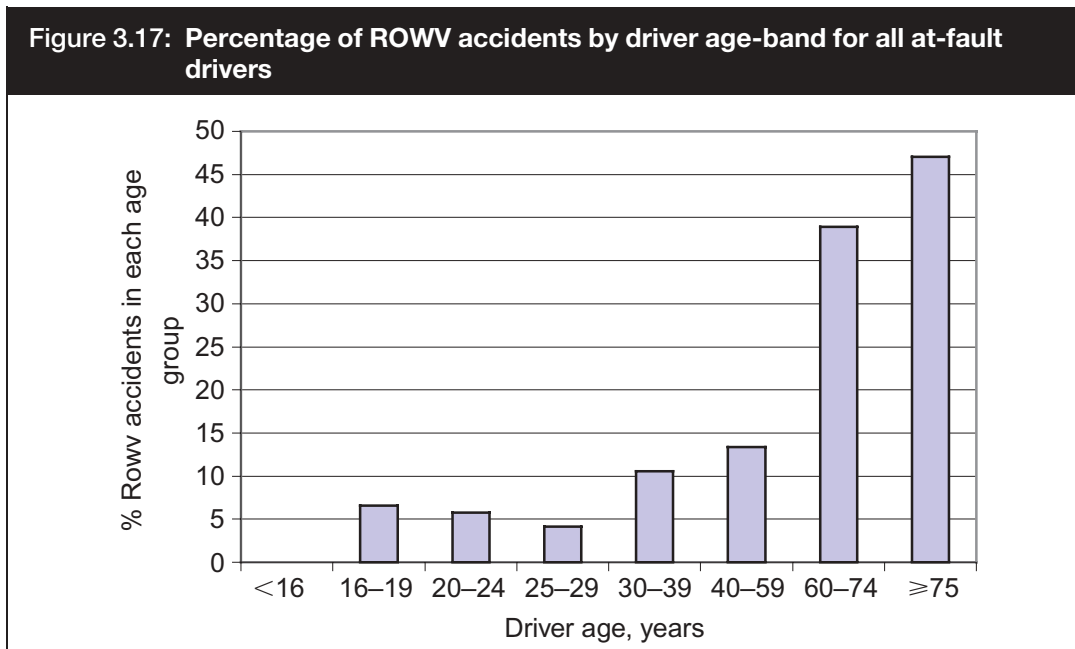


Figure 3.17 clearly shows a rise in the proportion of ROWV accidents with driver age; the greater part of this rise occurred after the age of 60 years. When fatal ROWV accidents caused by drivers aged 60 years and over are examined, 44% of them involved a driver that ‘looked but did not see’ (LBDNS) and a further 21% involved drivers who seemed not to have looked in the relevant direction at all before the crash.

Fatal ROWV accidents considered as a whole appeared to be more frequent during daylight (68% in daylight conditions) – ‘at-fault’ drivers aged 60 years and over had 77% of their ROWV accidents during the hours of daylight. The most common manoeuvre in the older group was a right turn onto another road, typically on a rural road; this commonly put the first point of impact at the driver’s door, which is a relatively weak part of the car when compared to the crumple zone that typically protects drivers in a frontal collision. As with the bend accidents discussed above, side impacts have been found to cause twice as many fatalities as frontal impacts (e.g. by Bédard *et al.*, 2002).

The examination of yearly percentages of ROWV accidents involving drivers aged over 60 years for the years 1994 to 2001 inclusive failed to show any pattern in the proportion of fatalities in this group on a year-by-year basis. There were insufficient cases available for the years 2002–05 to draw any meaningful conclusions.

### 3.11 Single vehicle accidents

Nearly 40% of the sample as a whole were SVAs. Thirty-six per cent of all accidents where a driver was killed were SVAs. Of all the cases where the driver of the car in which the fatality occurred was considered primarily at fault, 47% were SVAs. Fifty-

eight per cent of fatal accidents that involved male drivers aged between 17 and 20 years were SVAs.

The majority (94%) of SVAs, not surprisingly, involved some kind of loss of control. Loss of control on a bend accounted for 65% of SVAs. The remaining 35% were categorised as 'other'; these included loss of control accidents for which there was no immediate contribution from the road environment. Drivers in this 'other' loss of control SVA class were significantly older than drivers who lost control on bends (mean age 34 years versus mean age 29 years,  $p < 0.01$ ). Although the proportion of drink/drug involvement was similar to that found in SVAs on bends, the 'other' SVA loss of control class showed over two and a half times the frequency of fatigue as a factor compared with loss of control SVAs on a bend, and over three times the frequency of fatigue found in non-SVA accidents. The 'other' SVA class also showed over four times the frequency of illness compared with loss of control SVAs on a bend, and over three times the frequency of illness as a factor in non-SVA accidents.

The majority of SVAs, however, involved a vehicle going out of control on a bend. These accidents were discussed previously and more fully in the section on bend accidents. The examination of yearly percentages of SVAs for the years 1994 to 2001 inclusive failed to show any change in the proportions of SVAs year on year. There were insufficient cases available for the years 2002–05 to draw any meaningful conclusions.

### **3.12 Licence and insurance violations**

Seven per cent of all cases involved a driver without a full driving licence (either through having no licence at all, driving illegally on a provisional licence, or driving while already disqualified). Over 70% of these cases were SVAs versus 39% in the sample as a whole. Factors such as excess alcohol, drugs and excess speed were found to be common in this group. Less than 1% of the sample was found to involve under-aged drivers, i.e. less than 17 years of age. Most of these cases involved taking a vehicle without consent, but there are also cases on record of under-aged drivers 'having a go' in their friend's cars with the owner's consent, and even of a group of under-aged friends 'clubbing together' to buy a cheap car for them all to drive as they saw fit.

Seven per cent of all cases involved an uninsured driver. This is probably an underestimate, as this information was not always recorded if police could convict for another serious offence; there was also considerable 'overlap' with the group of 'no-licence' offenders detailed above.

### 3.13 Fatigue and illness

Fifteen per cent of all fatal cases involved either fatigue or illness as a factor. There were more than one and a half times as many accidents involving fatigue as there were accidents involving illness. These results should, however, be treated with some caution, as often illness or fatigue had to be assumed rather than confirmed. The two factors were often considered to be the only likely explanations for otherwise inexplicable loss of control SVAs, for example.

The mean age of drivers affected by illness was significantly higher than those affected by fatigue (57 years versus 44 years,  $p < 0.01$ ), and both groups were significantly older than drivers in accidents that did not have illness or fatigue listed as a possible factor.

Figure 3.18 shows the percentage of total fatigue and illness accidents that occurred by time of day. The percentage of ‘other’ accidents (i.e. those not showing fatigue or illness as a factor) that occurred in the same time bands is shown for comparison purposes. A second order polynomial curve has been added to illustrate the trend in ‘other’ accidents over 24 hours.

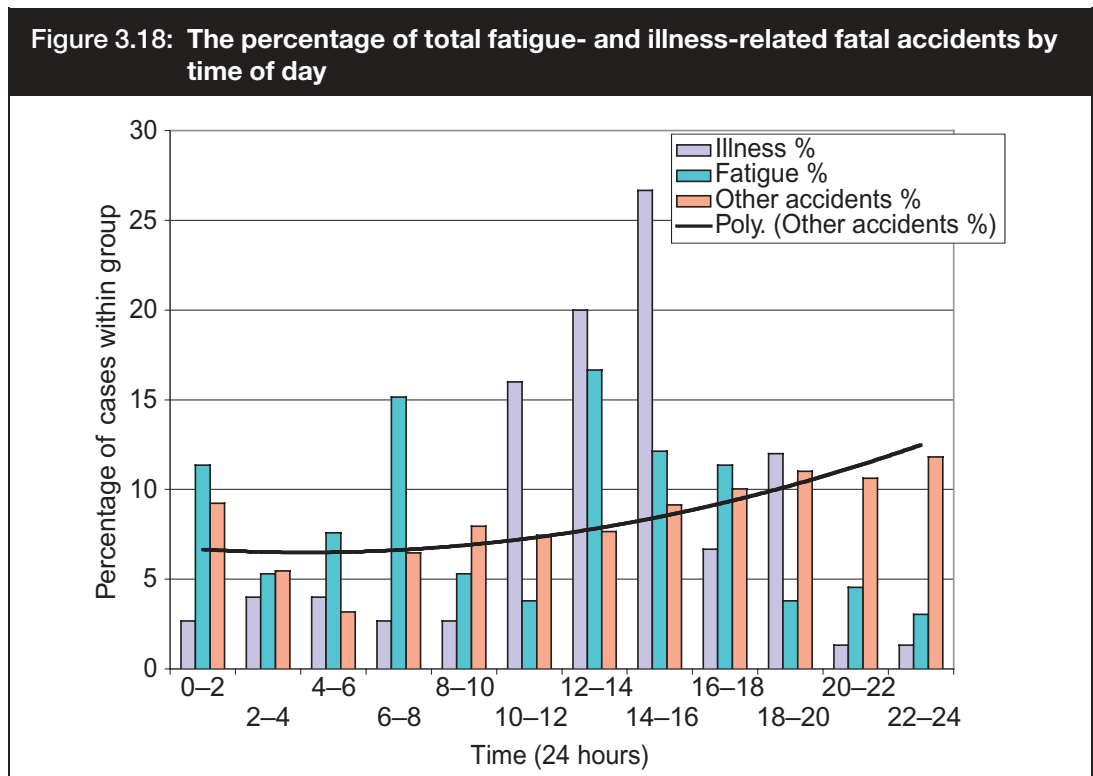


Figure 3.18 shows that fatal accidents involving illness peaked from between 10:00 and 16:00. As might be expected, the mean age of accident-involved drivers in this six-hour time period was high (60 years). It proved difficult to be specific about conditions affecting the drivers in this group; where information was available, there was evidence of such conditions as coronary heart disease, clinical depression,

diabetes, various cancers and epilepsy contributing to accident causation. However, in nearly half of the cases, illness had been assumed to be a likely cause, but the precise condition proved unidentifiable at post-mortem. It should be noted that all accidents in the 'illness' group had a verdict of 'accidental death', i.e. the crash was given as the primary cause of injury and death. Accidents resulting from illness causing death pre-crash were deliberately excluded from the sample. Road deaths where a verdict of 'suicide' had been given were similarly excluded.

Fatigue accidents appeared to peak between midday and 16:00, and also showed a peak between 06:00 and 08:00. The peak between 06:00 and 08:00 appeared to have involved drivers who were significantly younger than the drivers involved in afternoon fatigue accidents (mean age 41 years versus 57 years,  $p < 0.01$ ). The 'early morning' fatigued drivers tended to be night-shift workers or otherwise sleep-deprived individuals (for example, a driver with a full daytime job plus another position as a club DJ). There are cases on record of drivers falling asleep at the wheel after being awake for over 20 hours, and even one of a man who worked two shifts at two different companies and only ever had 3–4 hour breaks between finishing one shift and starting another somewhere else (neither of his employers were apparently aware he was doing this).

### 3.14 Unsurvivable crashes

The Transport Research Laboratory has performed analyses suggesting common factors in accidents deemed as 'unsurvivable', i.e. 'collisions or roll-overs that would be expected to result in fatal injuries to correctly restrained occupants of a passenger car'. These factors included high values of velocity change ( $\Delta v$ ), high degrees of intrusion/penetration to the vehicle body/roof, and collision with a 'high-impacting structure', for example a vehicle of greater mass, such as an SUV (Sports Utility Vehicle), or an immovable part of the road environment, such as a concrete bridge support (TRL progress note, delivered to DfT contractor meeting in September 2005).

At least 27% of the sample cases involved a casualty who was declared dead at the scene. Around half of these cases involved excess speed on behalf of at least one driver in the incident; this could be assumed to have increased the change in velocity ( $\Delta v$ ) factor. Thirty-two per cent of these cases involved a vehicle hitting a tree, wall or bridge; usually at speed, which may have resulted in high  $\Delta v$ s and severe impact/penetrative damage. Thirty-seven per cent of casualties in this group were not wearing seat belts, and were therefore assumed to have further contributed to the unsurvivability of the crashes that they were involved in, to an extent beyond that predicted by the common factors listed above. 'Death-at-scene' accidents were found to have involved drivers who were somewhat younger when compared with drivers in 'death elsewhere/not recorded' cases (37 years versus 40 years,  $p < 0.05$ ).

### 3.15 Clusters and prototypes

Research at TRL also identified clusters of five different types of fatal accident (Sexton, 2005). The main characteristics for each of the five clusters were as follows:

1. Mainly built-up roads, with a mixture of frontal and side impacts.
2. Mainly non-built-up roads, all the rear impacts and most offside impacts.
3. Non-built-up roads, only nearside impacts.
4. Non-built-up roads, only frontal impacts and front or rear passengers.
5. Non-built-up roads, only frontal impacts and drivers.

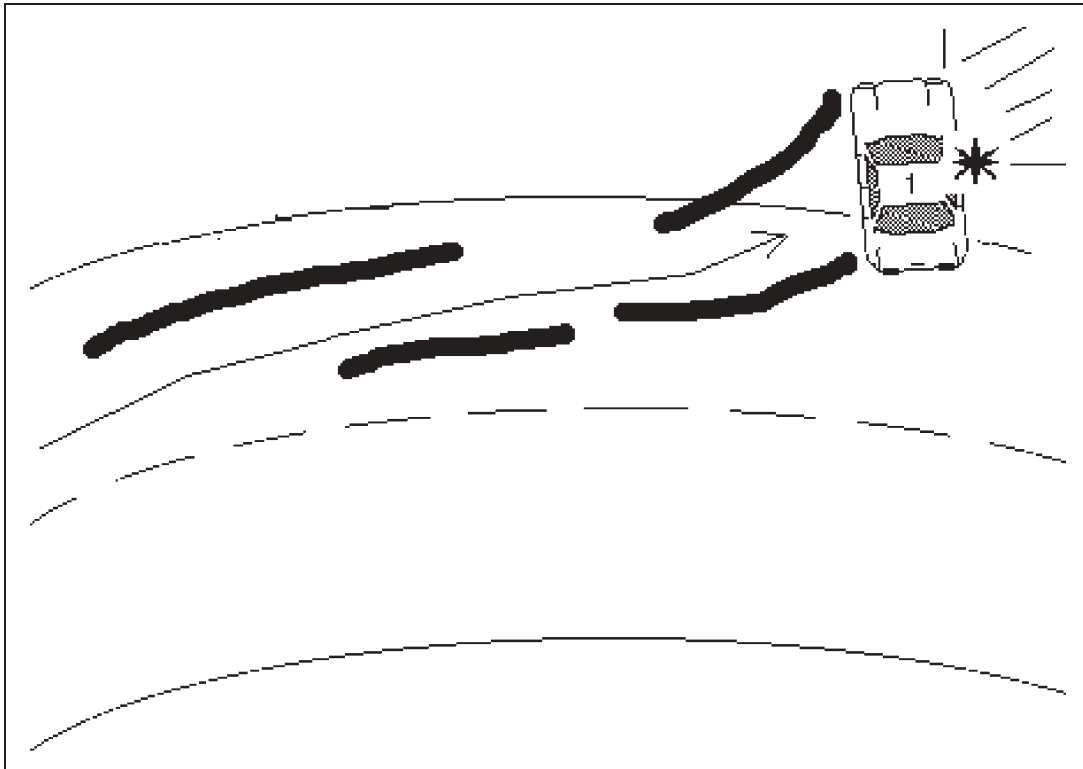
The average age for the different clusters varied, with a mean of about 37 years for clusters 1, 3 and 4 and a mean of about 41 years for clusters 2 and 5. TRL has suggested that cluster 1 has been increasing since 1999, which is due to the increase in built-up accidents during this period. A prototype case from our database which falls into this category is reproduced below.

Accident story:

*It was early in the evening on a cold damp night in winter. It was dark, the street lights were lit, and the road was wet from previous rain. The driver (M, 18) of a Ford Fiesta (1) was travelling along an urban A road with a 30 mph limit. He was seen by witnesses to be driving at a speed of between 50 and 60 mph on the approach to a right-hand bend in the road ahead. Two of the witnesses also made mention of very loud music coming from the car; one became concerned because she knew from personal experience that the corner was fairly sharp, and couldn't be taken at more than the 30 mph limit, in her opinion.*

*The driver tried to round the corner still travelling at well above the speed limit and lost control of the car. It skidded off the road to the nearside, leaving striated tyre marks for over 34 metres before it mounted the nearside pavement and crashed into the corner of a building. The building was badly damaged and the car was severely distorted by the force of the collision. Both the driver and passenger were wearing their seat belts, and the driver's airbag had deployed. Nevertheless, the force and angle of the collision inflicted serious injuries on both. The driver died at the scene, and the front-seat passenger died around a month after the accident of a massive head injury he had received, having never properly regained consciousness. The cause of the accident was put down entirely to the driver's excess speed entering the bend.*

Diagram:



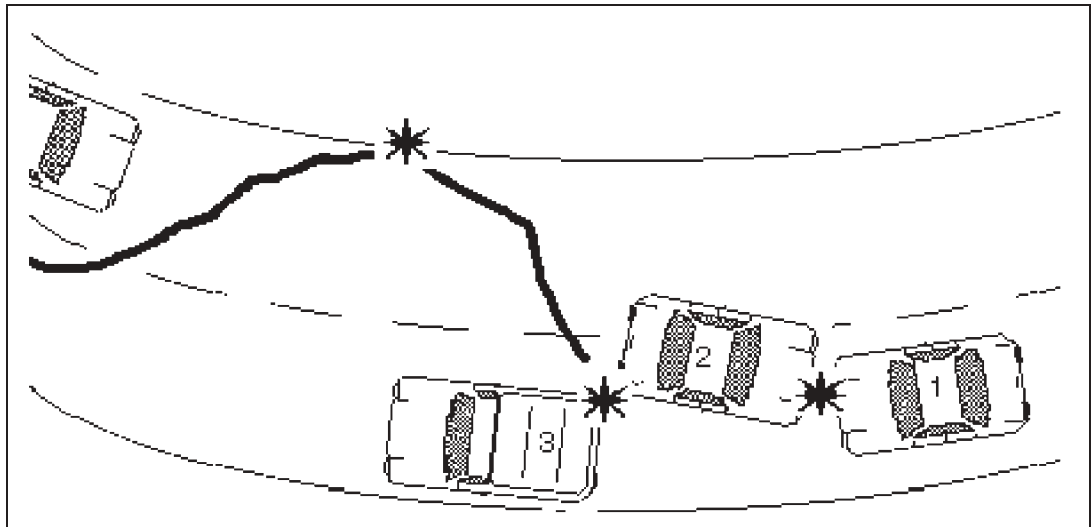
TRL also found cluster 5 to have shown an increase for the past two years, this possibly due to the increase in driver fatal casualties on non-built-up roads. A prototype case of this type from our database is reproduced below.

Accident story:

*It was a dry and fine Thursday afternoon in December. Visibility was good and the road conditions were excellent. The driver (M, 44) of a Ford Mondeo car (2) was travelling at speed along an A class, single carriageway road with a 60 mph limit. There were no passengers with him. As the driver approached a left-hand bend he pulled out to pass two vehicles travelling ahead of him. It was calculated that the driver was travelling at approximately 80 mph at this time. Due to the driver's speed he lost control of his car as he attempted to return to the correct side of the road after passing the two vehicles ahead and mounted the nearside kerb, which sent him out of control and across into the opposite carriageway where he clipped the back end of a Mitsubishi pick-up before hitting the driver (F, 24) of a Fiat Punto (1) head on. Driver 1 was trapped in the vehicle as a result of the accident and sustained multiple injuries from which she subsequently died. Driver 2 escaped without serious injury and the driver of vehicle 3 escaped unharmed.*

*There were no road or vehicle defects that the police thought would have contributed to the accident and conditions at the time of the accident were good. The accident was clearly the fault of driver 2. There were many witnesses to the accident who all said that driver 2 was travelling excessively fast and there is no doubt that the driver attempted to overtake two cars at once at a very inadvisable position. It was also discovered that driver 2 was on medication that may have hindered his ability to drive at the time of the accident. For these reasons it was decided to charge driver 2 with causing death by dangerous driving.*

Diagram:



### 3.16 Night-time accidents

Ward *et al.* (2004) reported on night-time accidents to the AA Motoring Trust, and identified problems and attitudes of younger and older drivers.

Slightly under half (46%) of the fatal accident cases examined to date occurred during the hours of darkness. Drivers involved in night-time fatal collisions were significantly younger than drivers involved in daytime fatal collisions (mean driver age for daytime accidents was 47 years versus 31 years for night-time accidents,  $p < 0.01$ ). As might be expected, over half (54%) of night-time fatalities occurred in SVAs. The examination of yearly percentages of night-time accidents for the years 1994 to 2001 inclusive failed to show any change in the proportion of in-vehicle fatalities at night-time year-on-year. There were insufficient cases available for the years 2002–05 to draw any meaningful conclusions.

Turning, in particular, to the dangers of rural roads at night, Ward *et al.* (2004) reported that ‘The rural lanes hold a particular attraction for some young men to drive along as they consider them a good test of their skills. They are often in

smaller, older cars that are carrying the maximum number of passengers, sometimes more, which affects the handling' (p. 48).

When accidents on rural unclassified roads at night were examined, over 70% were SVAs, and the mean age of the drivers was low (28 years) compared with the rest of the sample. Over half of these single vehicle cases involved drivers in excess of the legal alcohol limit for driving; over 70% involved excess speed. Over half were carrying passengers, most usually friends, and in the majority of cases that involved friends as passengers, one or more of the passengers was killed. The average age of the cars in these cases was nine years, and nearly all were small hatchback-type cars with limited safety features (there was typically no evidence of airbag deployment, for example).

Approximately 5% of the fatal night-time accidents in the sample involved drivers aged 65 years or over (compared with 27% of daylight accidents that involved drivers of this age group). This is perhaps due to the attitudes shown by older drivers in the report by Ward *et al.* (2004), where respondents claimed that they were less likely to travel at night due to perceived problems with eyesight, tiredness and concentration, as well as attitudes concerning other drivers on the roads at night.

## 4 DISCUSSION

The use of deliberate excessive speed was a clear factor in many of the fatal accidents in this sample. Young male drivers were a particular problem group – they were responsible for a high proportion of fatal collisions that occurred during the hours of darkness, on rural roads, and they ‘specialised’ in loss of control accidents on bends. Young male passengers showed the highest numbers of fatalities, typically while travelling with drivers of a similar age to themselves. The young drivers in the fatal accidents examined here appeared to show the same characteristics as young drivers in previous studies, for example Clarke *et al.* (2002) and Ward *et al.* (2004). They viewed driving as an expressive activity, and found risk-taking to be an exciting challenge to their abilities. They were behaving like make-believe ‘rally drivers’, but without the skills, the cars or the proper courses and safety equipment available to real rally drivers.

Fatalities involving driving with excess alcohol were also a major problem area. The number of fatal accidents involving drink/drug impaired drivers followed fairly predictable patterns, with the most accidents in the late evening and early morning, particularly at weekends. The average level of blood alcohol found in impaired drivers causing fatal accidents was over twice the current legal limit. This suggested that these drivers were not simply miscalculating their level of intoxication and ability to drive, having erroneously assumed that they were under the limit. It appeared far more likely that they took a deliberate decision to drive while they knew themselves to be intoxicated. This was shown most graphically by the quote from a driver responsible for the death of his front-seat passenger through losing control of a car he had borrowed from a friend, given previously in section 3.5.1.

It was clear that many fatalities in the cases examined were not wearing seat belts. This seemed to be a particular problem with in-car fatalities where the driver was under 35 years of age, but there remained a high level of non-belt wearing by fatalities throughout all age-groups of driver. The Department for Transport put a figure of over 90% for drivers’ and front-seat passengers’ seat-belt usage, and 66% for rear-seat passengers (DfT, 2004b). It seemed that non-belt wearing was much more prevalent in the fatal accidents examined than in levels observed in the general driving population. This discrepancy was similar to that noted in research by Salzberg *et al.* (2002).

‘Looked but did not see’ (LBDNS) fatal accidents appeared to show a similar pattern of accident causation to that found in previous research into accidents of all severities that involved older drivers pulling out in front of motorcyclists (Clarke *et al.*, 2004). There appeared to be little or no explanation as to why a driver had failed to see another vehicle that should have been in plain view. The increased proportion of ROWV accidents found with age occurred at too great an age (65 years plus) to be related purely to driver skill factors, and suggested an age-related deficit.

There are many reasons for an increase in global visual failings with age. Isler *et al.* (1997) studied the effect of reduced head movement and other deteriorations in the visual system on the useful field of view for drivers aged 60 years plus. They found that there was an evident restriction on the distances at which approaching traffic could be brought into the central, stationary field. Even at maximum head rotation plus one saccadic eye movement, approaching vehicles would not be perceived clearly beyond a distance of 50 metres. They also pointed out the large number of visual deficits, such as scotoma, that occur naturally with aging, and which may not be appreciated by the driver owing to their gradual onset. This is an area of potential concern because of aging population demographics throughout the UK and the greater European Union.

## 5 CONCLUSIONS

The sample of fatal cases examined seemed to show there were two main problem areas. The first, and apparently greater one, concerns the behaviours engaged in by younger drivers and their passengers, who take the most risks and travel at the highest speeds. They show a particular propensity for loss of control accidents of all types, and are also over-represented in night-time accidents, particularly in rural areas. It would seem that younger drivers in fatal accidents are ‘violators’, as described in the work of Reason *et al.* (1990), and Åberg and Rimmö (1998). The young driver problem is an area of particular concern not just in the UK, but in all OECD (Organization for Economic Cooperation and Development) countries. The OECD/ECMT Transport Research Centre (2006) claimed that, ‘Traffic crashes are the single greatest killer of 15–24 year-olds in OECD countries.’

The second, somewhat smaller problem area, concerns misjudgements and mistakes made by elderly drivers that can lead to fatalities. Older drivers appear more likely to be involved in fatal ‘right of way’ collisions, and have the bulk of their accidents in the daytime. It would seem that these drivers are more prone to the errors (as opposed to violations) described by Reason *et al.* (1990).

Although not a primary focus of this study owing to the relatively small number of accidents available for examination from each year, where trends by year were examined, no real pattern was evident. If anything, the factors identified were ‘flat-lining’, and so failing to show any decrease across the years 1994 to 2001 inclusive. The fact that major factors such as speed, alcohol involvement and the lack of safety restraint use failed to show any reduction over this period lends credence to the view that these may be primary factors behind the stubborn refusal of the total fatality rate for vehicle occupants to fall in line with the reduction target for 2010 (DETR, 2000).

The OECD/ECMT Transport Research Centre (2006) have argued that campaigns focusing on the three areas of speed, intoxication and seat-belt use should be carried out on a regular basis, and must be combined with effective education and enforcement measures. It will be recalled that Begg and Langley (2000) stated that there was a link between all three areas of risk taking, i.e. that drivers who failed to wear a seat belt were more likely to drive at speed and/or while intoxicated. This suggests that it is general driver attitudes regarding risks to themselves and others that are the problem, rather than attitudes towards discrete risk-taking behaviours considered in isolation. Similar links regarding networks or patterns of aberrant behaviour have been found in other studies:

- Broughton (1999) established a link between unlicensed driving and other types of car crime;
- Chenery *et al.* (1999) found that drivers who violated the law relating to parking

in disabled parking areas were far more likely than others to have criminal records for serious traffic offences; and

- Wellsmith and Guille (2005) showed a link between individuals issued with fixed-penalty notices and ‘concurrent criminality’.

Such observations have led authors such as Corbett (2003) to argue that emphasis in enforcement should be put on ‘intelligence-led offender targeting and intelligence gathering’ in police vehicle-stop scenarios.

One or more of the ‘unholy trinity’ of speed, alcohol and lack of safety restraint were factors in nearly two-thirds of the fatal accidents examined here. These are all factors that have been subject to both legal sanctions and extensive campaigns in the past (e.g. Department for Transport ‘THINK!’ campaigns on seat belts, drink-driving, and speeding in current and recent years). It would seem that, in the case of fatal accidents at least, certain groups of driver cannot be told often enough of the dangers to which they can expose themselves and their passengers, or perhaps that additional measures need to be added to the provision of safety information.

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