AA

Foundation for Road Safety Research

Urban accidents: why do they happen?

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Report of a study on
CONTRIBUTORY FACTORS IN URBAN ROAD TRAFFIC ACCIDENTS

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INSTITUTE FOR TRANSPORT STUDIES
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Contents

The AA Foundation for Road Safety Research

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> To carry out, or procure, research into all factors affecting the safe use of public roads;
>
> To promote and encourage the safe use of public roads by all classes of users through the circulation of advice, information and knowledge gained from research; and
>
> To conceive, develop and implement programmes and courses of action designed to improve road safety, these to include the carrying out of projects or programmes intended to educate young children or others in the safe use of public roads.

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Executive summary

Introduction

Accidents do not just happen. They have causes, and sometimes several causes, not just one, contribute to an accident. Determining what these causes are can reduce the chance of a similar occurrence, by indicating to those in authority what appropriate policies could be introduced for accident prevention, and by informing those at risk about the nature of the danger and the practical steps that can be taken to reduce it.

The aim of this research, which was undertaken by the Institute for Transport Studies, University of Leeds in collaboration with the Departments of Civil Engineering and Psychology, was to provide a better understanding of urban road accident causation. Hence the work comprised a comprehensive 'in-depth' study of the contributory factors in urban road accidents, with particular emphasis on the role of human factors. It was the first urban accident study of its kind to be undertaken in the UK and incorporated a number of unique features.

Size and scope of the study

The intention was to examine 1000 accidents which occurred in an urban environment. An area in North Leeds comprising five police sub-divisions was chosen and the sample of accidents was restricted to those injury accidents reported to the police occurring outside the central business district and on roads with a speed limit of 40 mph or less.

The main stages of the study consisted of:

collecting basic accident and background information,
interviewing participants,
visiting the accident sites,
assessing contributory factors,
linking all the data sources,
analysing all the information obtained and generated,
interpreting the results and outlining policy implications.

In the event, between 1 January 1988 and 31 December 1988, 1254 injury accidents were sampled involving 2454 participants. Almost 70% of these accidents occurred at junctions. They comprised 1863 drivers/riders, 128 cyclists and 463 pedestrians. Interviews were attempted with as many of these participants as possible (with a postal questionnaire for those not living near enough), resulting in a 50% response rate overall.

Methods employed in the study

Information was collected from the police in the first instance and included the accident report form RT7, together with other relevant information recorded in the police files. Questionnaires were then administered by interview or post, with a different questionnaire being prepared for each participant type (drivers/riders, adult pedestrians, child pedestrians and child cyclists).

The questionnaires were detailed, and inquired about the accident, the journey, the participants' health and state of mind, alcohol and other drug consumption, and their views of how the accident was caused. The participants' attitudes towards road safety were also probed.

When all the information relevant to a particular accident was available, a site visit, normally involving two members of the study team, was carried out and a case conference convened. The site visit was organised, in so far as it was practicable, to take place in conditions similar to those pertaining to the accident under investigation.

For each sampled accident, a case conference was convened at which the investigators studied all the information in order to determine the contributory factors for each participant involved in the accident.

In order to be able to carry out this last procedure a set of agreed rules and definitions was devised. A contributory factor was defined as 'a road user or traffic system failure without which the accident would not have happened'. The factors were defined at four levels as follows:

1 the immediate failure that precipitated the accident;

2 a failure that increased the likelihood of the accident happening;

3 the road user behaviour or lack of skill that led to those failures;

4 the explanation for the failure or behaviour.

This approach involved an innovative method of describing accident causation and is one of the unique elements of this Study. An example of this 'chain of factors' approach would be:

> 'failure to yield at a junction' (level 1) caused by 'failure to look' (level 3) caused by 'alcohol impairment' (level 4) and 'fatigue' (level 4).

In total the scheme comprises almost 150 items. The scheme is included in the Report, together with a Glossary that defines the terms.

Contributory factors were assigned to all accident participants, whether or not they responded to the questionnaires. A number of checks were carried out to investigate the nature and extent of any errors arising as a result of the 50% response rate. There was a small bias with distance due to the fact that those postal respondents who had a lower response rate tended to live further away from the study area. Only small differences were found between the age and sex characteristics of respondents and non respondents, and it was concluded that these differences were not important as far as the main purpose of the study was concerned.

Summary of the results

Contributory factors

The main strength of this study is that it has sought to identify human contributory factors in more detail than previous studies by means of a multi-level coding scheme. In particular the study has focused on the specific types of contributory factors which are associated with different groups of accident participants. It is considered that knowledge of this type is potentially much more useful as an aid to accident prevention than more general statements about the relative roles of human, environmental or vehicle factors which are a feature of many previous studies.

Of the immediate failures that precipitated an accident (the first level factors), 'failures to yield' accounted for 16% of the factors coded for adult drivers and riders. A further 10% of the factors coded for drivers and riders was 'failure to anticipate' (essentially a failure to perceive another road user in one's path in time to prevent an accident). Forty-four percent of the drivers and riders were deemed to be innocent victims of others' mistakes.

At the same (first) level, failure of a pedestrian to yield to traffic accounted for 66% of the factors coded for adult pedestrians and 78% of those coded for child pedestrians. Only 23% of adult pedestrians and 11% of child pedestrians were found to be innocent victims of others' mistakes.

Of the road user behaviours that explained the immediate failures (the third level factors), perceptual errors were the most common. These factors were more frequently coded for child pedestrians (61% of all the factors at this level for this group) than for adult pedestrians (54%) or for drivers and riders (16%). Judgement errors were more frequently coded for female drivers and riders (16% of factors coded for this group) than for male drivers and riders (12%). This was also true for pedestrians.

Of the factors explaining the failure or behaviour (the fourth level factors), vehicle defects were rarely coded. For drivers and riders, environmental factors accounted for 46% of the known factors at this level, and human factors for 53%, (with unknowns accounting for 34% of the total). It should be noted that human factors could be coded at other levels of the scheme, so these figures on their own do not indicate the extent to which human factors are present overall.

Examining the scheme as a whole, 46% of the top-level failures to yield for all types of road user were explained by a perceptual error, compared to only 14% being explained by judgement errors. Loss of control over the vehicle by drivers and riders (accounting for 7% of all first level driver and rider factors) was most commonly explained by driving too fast (27%) and impairment of various types (14%). Driving too fast was more common for males than for females and more common for younger drivers than older drivers. There was also some indication that young drivers lost control of their vehicles because of a skills error proportionately more often than other age groups.

Fault

On the basis of the contributory factors coded, each participant was assigned to an 'at-fault' category, a 'not-at-fault' category or an 'unknown' category. Adult pedestrians were considered to be more often at fault than adult drivers and riders, and children more frequently at fault than adults. Thus, 41% of adult drivers and riders were considered to be at fault compared to 71% of adult pedestrians and 81% of child pedestrians. (It is important to note that children were held up to the same standard of 'reasonable road user' as adults.)

Examining fault by age, the same U-shaped curve could be observed as has often been noted in the analysis of accident involvement. Fault decreased consistently with age from 88% at fault in the 0-4 age group to 39% in the 50-59 age group, and then rose to 55% among those aged 60 and over.

Motorcycle riders were, in spite of their public image, not found to be more often at fault than car drivers. Pedal cyclists were least often at fault, while light goods vehicle drivers were most often at fault.

Alcohol

Alcohol was only considered to be a definite or probable contributory factor for 4% of adults. However, this figure was substantially higher for adult pedestrians (11%) than for adult drivers and riders (3%). Information on alcohol consumption for pedestrians was largely self-reported, and was thus obtainable for only half the total number of adult pedestrians, whereas for drivers and riders other information (eg breath tests) was more generally available. This means that the actual figure for adult pedestrians may be higher than that reported here.

Other findings

When asked to identify a situation likely to increase the chances of an accident, both drivers and pedestrians indicated that 'driving too fast' and 'a pedestrian crossing without looking' were high on the list of their concerns. It is, therefore, relevant to note that 35% of drivers and riders admitted that they exceeded the urban speed limit quite often.

One third of child pedestrians said they did not stop at the kerb before crossing the road. In addition 37% (which includes many who also did not stop at the kerb) said they did not look to see whether the road was clear before crossing.

Only 10% of child pedestrians involved in accidents were accompanied by an adult and a sixth (17%) of those of school age reported that they had never received any road safety training in school.

Policy implications

The findings of this study are extremely useful as a guide to existing problems and indicate implications for future policy. However, the precise policies needed to correct those problems will require a more extensive review of the alternatives available. In terms of drivers and riders, the study showed that young male drivers or riders seem to be prone to inconsiderate behaviour (failure to yield, loss of control, lack of anticipation, and driving too fast for the situation), but it remains to be determined whether education or publicity would be of assistance here. It was also shown that perceptual problems for drivers and riders increase with age. This finding is a cause for concern in view of the predicted increase in the numbers of elderly drivers.

Since approximately 70% of the accidents in the study area occurred at junctions (a figure broadly in line with the national figures for urban roads), further analyses of the factors contributing to junction accidents may be particularly helpful.

One of the most overwhelming findings of the study is the large proportion of accident participants for whom a perceptual error was coded as part of the reason for their involvement in the accident. These types of factors were most frequently coded for pedestrians and in particular child pedestrians. This seems to indicate an inability on the part of these road users to cope with the present highly complex traffic system and hence underlines the need for changes to be made to the road environment to make it safer for such road users, or to make drivers and riders more aware and considerate of pedestrians.

This study has particularly highlighted the need for a reassessment of current policy in relation to the problem of pedestrian drunkenness. This problem needs to be urgently considered, but one possibility would be to extend some of the anti-drink driving publicity campaigns to include pedestrians as well.

Conclusion

This study has produced many new insights into the understanding of urban accident causation. The data base which has been built is a rich source for further research into factors affecting accidents, and consideration is being given to ways in which this can be made available for further study.

1 What is this study about?

Introduction

Accidents do not just happen. They have causes. Sometimes, not just one but several factors contribute to making the accident happen. Finding out what these contributory factors are can help reduce the risk of such accidents in the future. An understanding of these factors can guide local authorities and central government towards the most helpful policies.

In this report the main features of one such study of contributory factors are summarised. It is the first study of its kind in the UK for over a decade. It concentrates on accidents in urban areas because this is where most accidents occur. It was carried out by a team of four researchers at the Institute for Transport Studies, University of Leeds, with the assistance of nine survey staff, under the direction of the grantholders from the Institute for Transport Studies, Department of Civil Engineering, and Department of Psychology. They investigated over 1250 accidents that occurred in 1988 on urban roads in the Leeds area. As this is a Summary Report, further details of many aspects may be found by referring to one of the three volumes of the full Technical Report.

The theme of this report, ***Urban accidents: why do they happen?***, has a question-mark. Whilst the study aimed to provide some insights into this question, there will never be a complete answer. Perhaps the most enduring feature of a study of this kind is the question-mark, since the data inevitably raises additional questions to those posed at the beginning. It is hoped that these data, and the analyses reported here, will provide scope for continuing to probe the question from a number of different angles in the future.

The principal reasons for undertaking in-depth studies are outlined in Appendix A; the aims of the project are described below.

OUR AIMS

- to assess the role of behavioural factors in road traffic accident causation;
- to assess the relative role of road-vehicle, road-user and environmental factors in accident causation;
- to indicate broad policy conclusions and research needs emerging from these assessments.

How does this study relate to earlier ones?

Earlier studies had shown that human factors played the most significant role in accident causation. Consequently this study focussed particularly on that aspect. This enabled the costs to be substantially reduced. No longer was it necessary to visit the site at the time of the accident. Neither was it necessary to examine vehicles for defects or accident damage. Instead, it was possible to extend the nature of the in-depth discussions with the accident participants in order to explore the 'human factors' aspects in greater depth.

Where did the study take place?

The study was not designed as a national study, or even to be representative of urban areas in the north of England. However, the area chosen was considered to have similar conditions to those found in many urban areas. With the research team being based at the University of Leeds, it was decided to sample accidents on urban roads in Leeds. Five police sub-divisions in north Leeds were chosen, these being Weetwood, Chapeltown, Pudsey, Gipton and Horsforth (Fig 1.1 and 1.2). These areas had a high enough annual average number of accidents to ensure that the planned total of 1000 accidents would be attained. In the event 1254 accidents were investigated.

THE ROADS ON WHICH ACCIDENTS WERE INVESTIGATED

- in north Leeds, on
- urban roads (speed limit = 40 mile/h or less)
- outside the central business district

What did we do?

The main stages in this study consisted of:

- collecting basic accident and background information
- interviewing participants
- visiting sites
- assessing contributory factors
- linking all data sources
- analysing the above.

The basic data used is summarised in Section 2 and the methods of assessing the contributory factors discussed in Section 3. The results of the initial analyses are described in the subsequent Sections.

In carrying out the study, a number of protocols were observed in order to respect the rights and concerns of the various individuals and organisations involved. These are summarised in Appendix B.

Figure 1.1 – Leeds in the national context

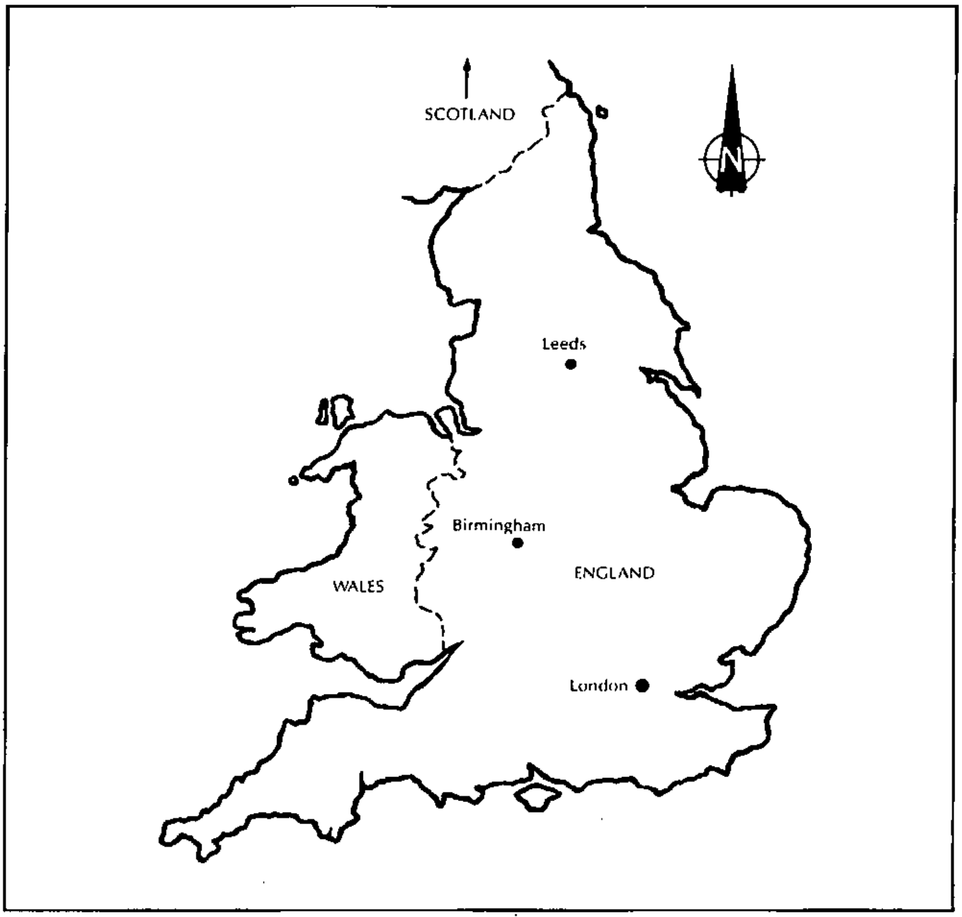
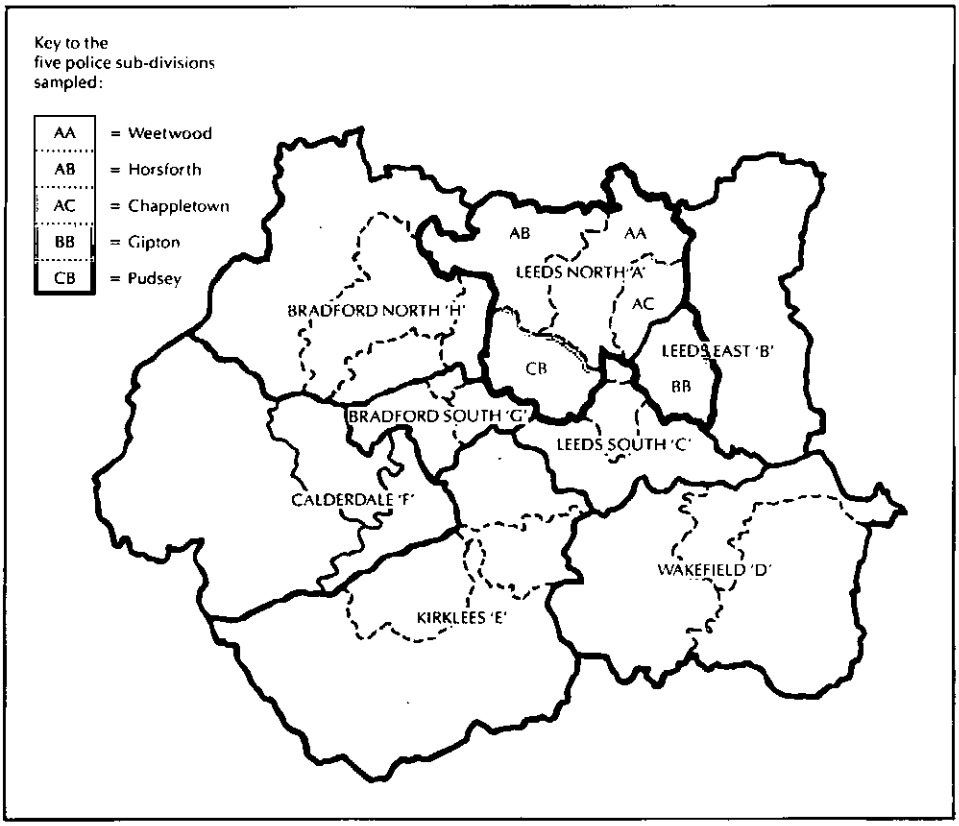


Figure 1.2 – West Yorkshire police divisions and sub-divisions



2 What were the basic data?

In this Section the main sources of data, and the amount of data collected are summarised. **Participants** in the accidents studied (defined below) are distinguished from **respondents** to the interviews and questionnaires.

PARTICIPANTS

Participants are defined as the drivers or riders of any vehicle involved in a road traffic accident, plus any injured pedestrian.

2.1 Sources of data

All injury accidents have to be reported to the police. The investigating officer records this on a standard form (known as the *RT7*). Their records also may have statements by witnesses and sometimes (for serious accidents) other documents such as photographs of the scene.

But such information is not enough for a study of this kind, where each accident participant can help by responding to a number of detailed questions. As the main focus of effort was the 'human factors' aspects, the main data collection effort concentrated on the in-depth interviews with the participants. In addition, it was necessary to visit the accident sites. Given the 'human factors' emphasis, an immediate site visit was not required and these site details were ascertained at a later date.

MAIN DATA SOURCES

- The police report on the case.
- Interviews with accident participants, for:
    - adult drivers or riders (including cyclists)
    - adult pedestrians
    - child pedestrians
    - child cyclists
- A site visit to the scene of the accident.

For summary details of the survey procedures used, see Appendix C.

The data from these various sources was contained in several datasets, covering:

- interview data
- site visit data
- contributory factors data (see Section 3)
- *Police Books* data
- *STATS 19* data.

The *STATS 19* data consisted of the coded portions of the official police record of the accident (the *RT7* form referred to above). This dataset is part of the official national statistics on road traffic accidents. For further explanations and details of these datasets, see Appendix D.

2.2 How much data became available?

2.2.1 All participants

From the five police sub-divisions in Leeds selected for the study, 9 in 10 accidents in 1988 were sampled as they occurred. This eventually produced substantially more than the target number of 1000 accidents. The total sample consisted of:

- 1254 accidents involving:
- 2454 participants, who were involved as:
    - 1963 adult drivers/riders (including 100 adult cyclists)
    - 297 adult pedestrians
    - 166 child pedestrians
    - 28 child cyclists.

Site visit and 'contributory factors' data were obtained for all of these and *STATS 19* data for virtually all.

2.2.2 Those interviewed

For the in-depth investigations, attempts were made to contact all participants. Interviews were sought with most, but postal questionnaires were sent to those who lived far away (or some households which could not be contacted for an interview). The overall response rate is shown in Table 2.1.

Table 2.1 – Response and non-response to the questionnaires

	Frequency	%
Respondents		
Interviewed	1143	46.6
Postal response	69	2.8
Sub-total:	1212	49.4
Non-respondents		
No contact	261	10.6
Unreturned	280	11.4
Refusal	461	18.8
Sub-total:	1002	40.8
Not approached		
Cut off	194	7.9
Fatal accident	46	1.9
Sub-total:	240	9.8
TOTAL	**2454**	**100.0**

Some participants were not approached. These were cases that were 'cut off' because they had not been cleared for interview by the police three months after the accident occurred, and those participants involved in a fatal accident. Of those approached, some (the 'no-contacts') could not be contacted at all (in a few cases no name was available, and addresses were often missing or wrong). Some of those contacted refused to be interviewed or returned the postal questionnaire uncompleted (the 'refusals'). 'Unreturned' refers to those participants to whom questionnaires were sent but not returned.

Since 240 participants were not approached, the 1212 replies obtained represented a 54.7% response rate.

Of the 1212 respondents, the numbers responding to each type of questionnaire (and expressed as a percentage of the total number of participants in each category) is shown in Table 2.2.

Table 2.2 – Response by questionnaire type

	Frequency		%
Driver/rider interview	848	=	51.8
Driver/rider postal	64	=	19.6
Adult pedestrian interview	161	=	58.8
Adult pedestrian postal	5	=	21.7
Child pedestrian interview	112	=	67.5
Child cyclist interview	22	=	78.6
TOTAL	**1212**	=	**49.4**

2.2.3 How did those interviewed differ from other participants?

Since only 54.7% of those approached responded to the interview/questionnaire it was important to assess how different the 1212 respondents were from the other participants in the study. This was possible because *STATS 19* data was available for accidents in the study area. Hence the characteristics of both respondents and non-respondents could be compared.

Non-respondents were compared with respondent participants by age, sex, participant type and accident date. Table 2.3 shows that there was a smaller proportion of children between 5-13 years in the non-respondent group than in the respondent group (3.7% and 10.0% respectively) and the same was true of participants over 60 years of age (8.1% and 10.7% respectively). The lower refusal rate of the 60 years and over participants may be explained by the fact that retired people have more time to give interviews, and are easier to find at home.

Among participants in their twenties there was a greater proportion in the non-interview than in the interview group, the greatest difference being in the 20-24 age group (19.4% and 14.2% respectively). The proportion of participants in the non-interview and interview groups were similar for participants aged 14-19, and 30-60+ years.

Table 2.3 – Comparison of non-respondent with respondent participants by age

Age	**Non-respondent**	**Respondent**	**TOTAL**
0-4	16	17	33
%	1.37	1.40	
5-9	25	63	88
%	2.14	5.20	
10-13	18	58	76
%	1.54	4.79	
14-19	137	156	293
%	11.73	12.87	
20-24	227	172	399
%	19.43	14.19	
25-29	174	136	310
%	14.90	11.22	
30-39	221	204	425
%	18.92	16.83	
40-49	171	169	340
%	14.64	13.94	
50-59	85	107	192
%	7.28	8.83	
60+	94	130	224
%	8.05	10.73	
TOTAL	**1168**	**1212**	**2380**
Age unknown	**74**	**0**	**74**

Table 2.4 – Comparison of non-respondent with respondent participants by sex

Sex	Non-respondent	Respondent	TOTAL
Male	906	861	1767
%	76.20	71.04	
Female	283	351	634
%	23.80	28.96	
TOTAL	**1189**	**1212**	**2401**
Sex unknown	**53**	**0**	**53**

Table 2.4 shows that there were 5.2% more men in the non-interview as compared to the interview group, with the reverse being the case among women.

Table 2.5 shows that the response rate was higher for those participants scheduled to be interviewed than for those to whom postal questionnaires were sent. Thus the data is biased against participants living 30 miles or more from Leeds, and who are more likely to be unfamiliar with the road system.

Table 2.5 – Comparison of non-respondent with respondent participants by questionnaire type

	Non-respondent	Respondent	TOTAL
Driver/rider	789	848	1637
(interview) %	63.53	69.97	
Adult pedestrian	113	161	274
(interview) %	9.10	13.28	
Child pedestrian	54	112	166
(interview) %	4.35	9.24	
Child cyclist	6	22	28
(interview) %	0.48	1.82	
Driver/rider	262	64	326
(postal) %	21.10	5.28	
Adult pedestrian	18	5	23
(postal cases) %	1.45	0.41	
TOTAL	**1242**	**1212**	**2454**

No appreciable difference was found between the respondent and the non-respondent groups for different months of the year.

While the interview response rate was only about 50%, those responding to the interviews or postal questionnaires showed only slight differences in their age and sex distribution compared with non-respondents, with a tendency for males to be slightly over-represented, and the 20-30 age group under-represented. The main difference shows up in the postal responses; those living far away from the study area tended not to respond. These possible sources of bias mean, of course, that some care needs to be exercised when interpreting any results based upon the questionnaire data alone.

However, the assessment of the contributory factors was not based solely on the questionnaire data, since information was available from the Police Reports on all accidents in the study. Hence, the 50% response rate, and the small differences in characteristics between respondents and non-respondents, was not important as far as the main purpose of the study was concerned. The main effect of any lack of interview information on the assessment of contributory factors was in the frequency of coding 'unknown' at any of the levels of the coding scheme. This is discussed further in Section 3.

2.2.4 How did the sample of participants differ from those in the study area generally?

The sample consisted of 90% of the 1988 injury accident cases which occurred on roads with a speed limit of 40 mph or less in the five police sub-divisions. Comparisons were made between the characteristics of participants in this sample, and the characteristics of the 100% population available in the *STATS 19* data. It was found that the sample contained similar proportions of injured participants as did the *STATS 19* data set, when grouped by age, sex, police sub-division, and type of participant.

3 How were contributory factors assessed?

The assessment of the factors that contribute to a particular accident is not an easy matter. It involves:

- reviewing all the material available about the accident
- having a recording scheme that allows relevant interactions to be explored
- ensuring that it is assessed in a consistent manner.

The methodology developed in this study has many innovative features and involves:

- case conferences on each accident
- a scheme for assigning contributory factors
- precise definitions of the factors and how they were applied.

In interpreting the results of the study in the following Sections, it is important to bear in mind the detailed explanations of these given here.

Because suitable data were available from the police files it was possible to assign contributory factors to **all** 2454 participants in the 1254 accidents studied, not just for the 50% of participants who responded to the interviews/questionnaires. As noted in 2.2.3, the main effect of a lack of interview information was on the frequency of coding 'unknown' as a contributory factor.

3.1 What is meant by a contributory factor?

The basic definition of a contributory factor is shown below:

CONTRIBUTORY FACTOR: DEFINITION

'A road user or traffic systems failure without which the accident would not have happened'.

The way in which the factors are defined and determined is discussed in Section 3.4.

3.2 The case conference

Case conferences, in which the investigators determined the contributory factors for each participant in the accident, were conducted as part of the site visit for most of the study. This enabled any questions about the exact accident location to be resolved on the spot, as well as ensuring that the general environment of the accident and the configuration of the scene was fed into the case conference. Case conferences involved two team members. Hence site visits were generally performed by two people, both of whom read the full file on the accident beforehand (interviews, *RT7* and other police material). Towards the end of the study, because of time constraints, it was only possible for one team member to visit the site. The case conference was carried out subsequently by this person and one other team member.

When coding the factors the team members attempted to reconcile any contradictions in the accounts of the various participants. If an interview had been refused or the *RT7* was unavailable, then site visits and case conferences were still performed. This was because the scheme for assigning 'contributory factors' provided for unknowns and levels of certainty. Any disagreements between the two team members were resolved by involving a third member of the team.

3.3 The contributory factors scheme

As the main focus of this study was on the human factors in accidents, a structure was devised that was suitable for in-depth examination of the links between different factors. This had two main features.

1 The structure had several levels. This was in order to incorporate different kinds of explanation. These ranged from the immediate failure(s) that precipitated the accident at the top level, to causes at the bottom level that provide an explanation of factors higher up.

2 The factors were participant-based. That is, **all** the contributory factors were coded for each participant, rather than for the accident as a whole. This provided the flexibility to code, for example, problems in understanding the layout of the accident site for one participant but not for another.

The scheme adopted in the study is shown in Figure 3.1 and had several advantages over those previously used. It made it clear to which participant a particular factor applied. It permitted site factors to be assessed relative to the behavioural factors associated with each participant. It enabled chains of factors to be investigated. An example of this is shown below (numbers in brackets refer to Figure 3.1).

EXAMPLE OF A CHAIN OF CONTRIBUTORY FACTORS

'failure to yield at a junction' (124)
    caused by: 'failure to look' (301)
        caused by: 'alcohol consumption' and 'fatigue' (404 and 406).

This capability increased both the flexibility and the power of the 'contributory factors' coding, and overcame some of the problems in earlier studies where no distinction had been made between different levels of causation.

There are, however, some limitations to investigating accident causation in this way. Overall, the approach covers causation on a case-by-case basis; it cannot therefore point the finger globally or indicate how severe

Figure 3.1 – Scheme for determining contributory factors in urban road accidents

198 No failure

199 Unknown

FAILURES

101 Braking suddenly reasonably
102 Braking suddenly unreasonably and sharply
103 Erratic course
104 Loss of control/falling over
105 Failure to avoid
106 Failure to stop – stop sign/line
107 – zebra crossing
108 – red light
109 – pelican flashing orange
110 – other control (e.g. school patrol/policeman)
111 Turn/manoeuvre from wrong lane
112 U-turn
113 Inappropriate overtaking
114 Poorly carried out manoeuvre – turning
115 – overtaking
116 Reversing
117 Opening door
118 Failure to anticipate
119 Unable to anticipate
120 In dangerous position
121 Driving wrong way
122 Failure to signal
123 Failure to put on lights
124 Failure to yield – minor into major
125 – no priority
126 Failure to yield – changing lane
127 – turning right
128 – turning left
129 – pulling in
130 – pulling out
131 – pedestrian to traffic poor crossing situation
132 – pedestrian to traffic reasonable crossing situation
133 Misleading signalling
134 Vehicle failure
135 Other

201 Situational problem
202 Following too close
203 Driving too fast for the situation

SKILLS

300 Didn't see – type unknown
301 Failed to look – at all
302 – partial
303 Looked but failed to see
304 Misinterpretation – other road users
305 – layout
306 Lack of judgement – path
307 – speed/distance
308 – other
309 Lack of motor skills – braking
310 – steering
311 – general

312 Unable to see

ATTITUDE

313 Foolhardy
314 Deliberate

AGONISTIC BEHAVIOUR

315 Aggressive behaviour

399 Unknown

REASONS

401 Inexperience – driving
402 – of vehicle
403 Panic
404 Impairment – alcohol
405 – drugs
406 – fatigue
407 – illness
408 – emotional state of mind
409 Disability – sight
410 – hearing
411 – other
412 Thoughtlessness
413 Bloodymindedness
414 Distraction – physical, external
415 – physical, internal
416 – physical, pedestrian
417 – mental
418 Overconfidence
419 Tyre – deflation before impact
420 – lack of tread
421 – wrong pressure
422 Brake defect
423 Steering defect
424 Lights – defects
425 – inadequate
426 – signal defect
427 Mechanical defects – motive power/drive train
428 Total electrical failure
429 Load defective
430 Windscreen defective
431 Wipers not working
432 Fire
433 Overall poor condition
Obstruction/obscuration
434 – snow/ice on window
435 – load
436 – misted up
437 – other interior
438 – pedestrian's clothing/equipment
439 – situation – vertical/horizontal curvature
440 – street furniture
– weather conditions
441 – snow/sleet/hail
Obstruction/Obscuration
– Situation – weather conditions
442 – rain
443 – fog/mist
444 – object in road
445 – parked vehicles
446 – stationary vehicles
447 – moving vehicles
448 – vegetation
449 – pedestrian
450 – buildings/fences/walls
451 – spray
452 Lack of preparedness
453 Poorly positioned street furniture
454 Inadequate crossing facilities for pedestrians
455 Inadequate traffic lights
456 Misleading visual layout
457 Lack of/faulty guardrail
458 Poor road/pavement surface
459 Slippery road – low skid resistance
460 – wet
461 – mud/gravel/loose stones/oil
462 Slippery road – ice
463 – snow
464 – flooding water
465 Poor conspicuity of other road users
466 Steep hills
467 'Phantom'
468 Dazzle – glare from sun
469 – glare from headlights
470 Poor/absent street lighting
471 In a hurry
472 Being chased/scared
473 Unfamiliar road environment
474 Playing "chicken"
475 Frustration
476 Showing off
477 Encouragement
478 Nervousness
479 Insufficient parental control
480 Poor banking/camber
481 Inadequate road signs/markings
482 Weather condition (general)
499 Unknown

the problem is. For example, without a parallel control or exposure study, it is virtually impossible to assess the increased risk of an accident due to inexperience or to fatigue, and even more difficult to estimate the increased risk from several factors in combination. In addition, because of the interview techniques used (ie straightforward and rather factual question and answer), the study could not go into psychological causes in depth. Finally, the study relied on the judgement of the team in deciding between conflicting statements by accident participants.

3.4 Defining the contributory factors

Given the definition adopted for a contributory factor (see Section 3.1), it is necessary to emphasise and clarify how it was interpreted and applied.

Did coding a particular factor for a participant mean they were to blame?

Not necessarily. Rather, it implied that there was some failure in the system as a whole that affected the participant concerned.

One particular factor which was commonly assigned to participants who were, in the team's judgement, not at fault in the accident was 'unable to anticipate'. This implies that the road user, while being aware that an accident was imminent, had insufficient time to avoid or prevent the accident through no fault of their own.

What was meant by a 'systems failure'?

In theory, a pedestrian accident could be blamed on vehicles being allowed to use the street concerned; or drunk driving on the availability of alcohol. An arbitrary but definite limit was therefore necessary: the existing traffic and social environment would be treated as given. Thus it would be possible to blame a pedestrian accident on the failure to provide adequate crossing facilities within existing guidelines, but not on the failure to limit urban traffic to a speed of 10 mph.

How was each road user judged?

Some standard was required against which to judge each road user. The standard used is defined below and was adapted from the definition of 'the reasonable driver' used in a previous study in Indiana (Treat 1980).

THE REASONABLE ROAD USER

'He/she should at all times be sober, alert, attentive to road use, and performing to high but not unusual standards of good defensive road use. If the road user has extra knowledge or experience acquired in some way, that will be taken into account in defining reasonable behaviour.'

Children were judged against the same standards as adults, since this permitted later analysis of where children failed to meet these adult standards. The 'reasonable' standard was implicit in the definitions of site and vehicle factors as well.

How can variation due to the subjective nature of the judgements be guarded against?

Obviously, there is an element of judgement in determining whether someone or something is up to the 'reasonable' standard, or indeed when assigning contributory factors to accidents. The team endeavoured as far as possible to reduce inter-member differences. This was done in five ways.

- Each factor was specifically defined in a glossary (See Section 3.4.2 and Appendix E).
- All team members participated in the discussion of each definition and in the field testing of the scheme.
- The pairing of team members was varied throughout the investigation.
- If the pair of investigators sent to a particular accident disagreed, another team member was brought in as a referee.

A consistency check was carried out by selecting a small number of accidents at random to be investigated a second time by a different team of investigators. Although differences were recorded in some cases, these tended to be mainly at the fourth level on the contributory factor scheme. Extensive discussions between team members followed, in order to increase subsequent consistency.

3.4.1 How were the factors compiled and structured?

The candidate list of factors was obtained by reviewing previous studies and several accident databases in order to compile as complete a list as possible. The studies and databases reviewed included the Indiana study, the *TRRL* studies, *STATS 19,* the West Yorkshire Highways Engineering and Technical Services *(HETS)* contributory factors scheme, and the US Fatal Accident Reporting System (US Department of Transportation, 1984). This process produced an extensive list of candidate factors. This list was reviewed for duplicates, omissions, and categories that could be amalgamated since they were considered to make distinctions that were more detailed than necessary.

The next and far more difficult stage consisted of imposing some kind of hierarchy on the list. This process required lengthy discussion and went through several major revisions as well as much minor tinkering. The final structure consisted of three main levels, and a fourth, 'mezzanine', level intermediate between the first two, as shown earlier in Figure 3.1. These levels are summarised on page 13.

HIERARCHY OF CONTRIBUTORY FACTORS

1 At the top, the immediate 'failures' that precipitated the accident.

2 At the 'mezzanine' level, any factors that were felt to be intermediate – neither precipitators of accidents, nor behavioural explanations.

3 In the middle, the road user behaviours or lack of skills that led to the top-level failures.

4 At the bottom, the explanations for the middle-level behaviours or for top-level failures.

The 'mezzanine' level contained factors that were neither immediate precipitators of accidents, nor behavioural explanations. An example is given below.

EXAMPLE OF A 'MEZZANINE' FACTOR

Suppose that, for some time before the accident, a motorist was driving too fast (or following another vehicle too closely).

Such behaviour was not the immediate precipitator of the accident, but it increased the likelihood of an accident occurring.

So this factor would be recorded at the 'mezzanine' (No 2) level.

Similarly, what has been termed a 'situational problem' would be coded at this level. This would be a site or environment that was defective in some way, does not immediately precipitate an accident (many road users pass through such sites without incident), but does increase the risk to reasonable road users, so that such a road user might experience difficulty.

The number of levels was kept low in the interests of keeping explanation simple, of making the results reproducible, and of limiting the complexity of the analysis. The design of the scheme took some time to evolve and the final version reflects considerable experience in the trial stages of the study. The final scheme has served the main study well, and has not indicated any need for significant change.

The final scheme: are there always four levels of explanation?

It is not a requirement of the structure that factors be coded at every level for each participant. Thus:

- When 'no failure' was coded for a road user, no explanation was required and therefore no factor was coded at a lower level.
- Factors at the 'mezzanine' level applied to less than half the participants.

- In general, the scheme allowed direct links to be coded between a factor at the bottom level and one at the top.

Thus a loss of control by a motorcyclist could be explained by tyre deflation before impact, or misleading signalling explained by panic.

3.4.2 Putting the scheme into effect

It was clearly necessary to ensure consistency of treatment before putting the scheme into use. For this, a glossary was developed and field trials undertaken. The latter led to the recognition that it was necessary to distinguish between different levels of certainty in the factors involved.

Glossary

A detailed glossary of the contributory factors was regarded as essential for consistency in coding. In effect, it provided a 'rule book' for use by the investigators, and was taken along on every site visit. Development of the glossary of contributory factors took a considerable amount of team time, and underwent extensive revision during the trials. The glossary is provided as Appendix E. It is important that it is referred to when interpreting the results given in this report.

Field testing

Both the 'contributory factors' scheme and the glossary were given extensive field trials, using accidents occurring in some of the chosen Police sub-divisions over the period September to December 1987. Some major alterations were made as a result of this testing, including the addition of the 'mezzanine' level. Thus 'driving too fast' was originally a top-level factor, but on consideration was felt to be an explanation for 'loss of control' or 'failure to anticipate'. Modifications continued after the initial phase of field testing, but were generally minor, mainly involving the addition of new categories to take account of unusual accidents.

Level of certainty

Some uncertainty was present for many of the factors coded. Even if it was known that a driver had consumed a considerable amount of alcohol, it was not possible to be certain that it was the cause of the driver's loss of control and subsequent crash. With this proviso, it was decided that it would be advantageous to distinguish between those failures and their causes that were, in the assessment of the team members, definite, and those that were probable. At the top level, these factors were defined as shown below.

FACTOR CERTAINTY

A definite contributory factor was defined as:

'a road user or traffic systems failure without which the accident definitely would not have happened'.

A probable contributory factor was defined as:

'a road user or traffic systems failure without which the accident probably would not have happened'.

Similarly, lower-level causes were coded as either definite or probable. Only definite contributory factors are considered in Section 5 of this report.

Some consideration was given to having a further level of certainty, namely 'possible'. It was noted, however, that although the Indiana study had such a degree of certainty, it had not been used much in the analysis. It was also considered that, in the light of the judgemental nature of the whole exercise, 'possible' causes were too uncertain and too prone to inter-investigator variation to be reliable. Hence they were not identified in the study.

Distribution of accidents by month and by day in the study area (1988)

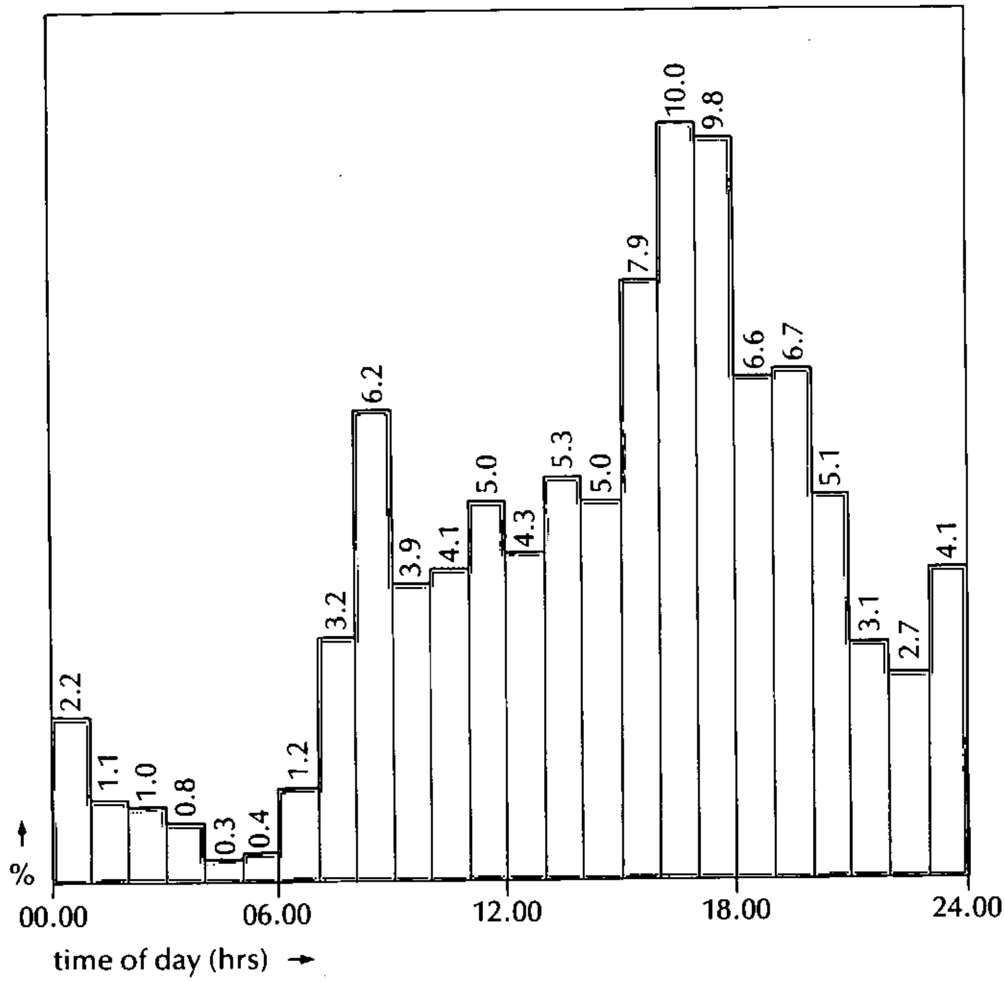
Monthly distribution
Highest: November (10.1%)
Lowest: March (6.5%)
(% of 1988 annual total)

Weekly distribution
Evenly spread apart from Fridays (19.5% of weekly total; half as much again as other days).

Time of day

The proportion of accidents occurring in specified time periods is shown in Figure 4.1. Over 30% of the accidents took place between 1500 and 1830 hrs.

Figure 4.1 – Hourly distribution of accidents



Flow levels

Subjective assessments of the pedestrian and vehicular traffic flow at each site were made. At most sites, neither pedestrian nor vehicle flow was very heavy; but it should be remembered that sites studied deliberately excluded areas such as the Leeds city centre.

4 What are the characteristics of the studied accidents?

4.1 Introduction

In this section some of the details relating to the accidents studied are set out. No attempt has been made to be completely comprehensive, and therefore attention has been concentrated on those aspects considered to be germane to the study's objectives which were identified in Section 1. It is not the purpose of this section to consider 'why' the accidents happened. Further summary tabulations are in the full Technical Report of the study, with fuller details given in Annex 2 to that report.

Characteristics are outlined under six headings, covering:

- Accidents and accident sites (Section 4.2).
- Participants (Section 4.3).
- Respondents: Drivers and riders (Section 4.4).
- Respondents: Adult pedestrians (Section 4.5).
- Respondents: Child pedestrians (Section 4.6).
- Respondents: Child cyclists (Section 4.7).

In interpreting the results, reference should be made to the sample sizes given alongside each sub-heading below.

4.2 Accidents and accident sites
(Total 1254)

Some of the main characteristics of the accidents investigated and the sites at which these occurred are highlighted in this Section.

1254 accidents were studied involving 2454 participants, broken down as follows:–

1963	adult drivers/riders, including 100 adult cyclists (912 respondents)
297	adult pedestrians (166 respondents)
166	child pedestrians (112 respondents)
28	child cyclists (22 respondents).

Of the 1254 accidents, 150 (12.0%) were single vehicle, 440 (35.1%) involved a single vehicle and at least one pedestrian, 599 (47.7%) were between two vehicles, and the remaining 65 (5.2%) involved three or more vehicles. Twenty-five (2%) of the accidents were fatal, 252 (20%) resulted in at least one serious injury, and the remaining 971 (78%) resulted in only slight injuries.

Location

Over 70% of the accidents in the study area occurred at junctions. Only 12% of the accident junction locations have positive traffic control in the form of traffic signals or a stop sign.

Table 4.1 – Location of accidents

Accident location	%
Not at junction	29
T or Y junction	48
Crossroads/multiple	17
Roundabout	5
Other	1

Table 4.2 – Type of junction control

Type of junction control	%
Traffic signals	11
Stop sign	1
Give-way sign	72
Uncontrolled	16

Weather and lighting conditions can profoundly influence the number of accidents

As exceptionally mild weather occurred during the winter of 1988, there are few accidents in snow and icy conditions.

Lighting conditions	*Weather conditions*	*Road conditions*
69% in daylight	81% fine 15% raining 4% other (eg fog)	Wet/damp 39%

4.3 Participants
(Total 2454)

The age and sex distribution of participants was given in section 2.2 for respondents and non-respondents separately and combined.

Means of transport

The number and proportion of participants travelling by different means of transport was obtained from the *STATS 19* data, and is summarised here in Table 4.3. (Note that this information was not recorded on the questionnaires.)

Table 4.3 – Means of travel by participants

Means of travel	Number	%
Pedal cycle	128	5.2
Moped	19	0.8
Motor scooter	11	0.5
Motorcycle	146	5.9
Other 3-wheeler	5	0.2
Car	1471	59.9
Minibus	2	0.1
Public service vehicle	37	1.5
Light goods vehicle	101	4.1
Heavy goods vehicle	48	2.0
Other motor vehicle	7	0.3
Pedestrian	463	18.9
Unknown vehicle type	16	0.6
Total	**2454**	**100**

4.4 Respondents: Drivers and riders (Total 912)

Of the 1963 driver-rider participants, a total of 912 responded to the questionnaire. Over 75% of the drivers and riders responding to the interview/questionnaire were male. Over 22% of the car drivers, and over 46% of the motor cycle/moped/motor scooter riders, had held a driving licence for less than 2 years.

Distance travelled before the accident

The percentage of respondents travelling a given distance **before** the accident occurred are summarised in Table 4.4. In over half the accidents studied the distance that had been travelled was less than 2 kms, and for over three-quarters of drivers and riders the distance was less than 5 kms. Whilst it appears that less than 2% of drivers and riders had travelled more than 50 kms prior to the accident, it should be recalled that the response rate was lower for postal questionnaires, and hence longer-distance journeys are under-represented. Some 93% of respondents indicated that they knew the road 'well' or 'quite well'.

Table 4.4 – Distance travelled before accident

Distance (kms)	%
0-2	52.4
3-5	22.7
6-10	12.6
11-15	4.2
16-20	3.3
21-30	1.8
31-50	1.2
>50	1.8
Total	**100**

Could you or the other person have done something to avoid the accident?

Around 80% of the drivers/riders who responded considered that the **other** person could have done something to avoid the accident and that the **other** person had behaved in a careless or inconsiderate manner. Only 5% considered that **they** had done anything that other road-users might have considered to be unexpected, in contrast to their opinion that 13% of other road-users had done unexpected things.

What might increase the chances of another accident occurring?

Drivers and riders were shown a list of 38 aspects of the road or driving situation that might increase the chances of an accident occurring. Those reported by more than 8% of the drivers/riders who responded are shown in Table 4.5. It should also be noted that 4% of drivers and riders were prepared to admit that their excessively fast driving may have contributed to the accident, and that 35% admitted to exceeding the speed limit quite often.

Table 4.5 – Aspects that drivers and riders state are likely to increase the chance of an accident

	%
Other people driving too fast	17
Pedestrian crosses without looking	16
Slippery road surface	14
Rain	14
Badly parked vehicle	13
Very heavy traffic flows	11
Aggressive driving by others	9

Did any medical condition have a bearing on the accident?

Two per cent of the drivers/riders who responded reported that they had not been wearing the spectacles/contact lenses they needed for long distance seeing at the time of the accident; but none considered that this was a factor leading to the accident. Of the range of medical conditions reported, by far the most common was hay fever and other allergies (11%). Only 4% of the 182 respondents reporting a medical condition thought that it contributed to the accident. Ten per cent of drivers/riders had taken medicine or tablets in the 24 hours prior to the accident, but no-one considered that this had had an influence on the accident.

Was any alcohol consumed and did it have an effect?

Only about 4.5% of the drivers/riders who responded reported consuming any alcohol in the 3 hour period before the accident. Of those who had been drinking, however, 6% considered that it could have been a contributory factor leading to the accident. The subject is discussed further in Section 7.

Feelings at the time of the accident

Respondents were asked to record whether one of eight possible conditions applied to them at the time of the accident.

Table 4.6 shows that the main adverse condition reported was fatigue (11%). This is important, bearing in mind the short distances travelled before the accident it suggests that the fatigue may be primarily a function of non-driving activities.

Table 4.6 – Mental/ psychological condition at time of accident

Mental/psychological condition	%
Relaxed	23
Particularly contented	15
Tired/fatigued	11
Other distractions (unspecified)	9
Problems on mind	3
Late for an appointment	3
Angry/annoyed	3
Difficulty in concentrating	2
Depressed	2
In-vehicle distractions	1

It should also be noted that virtually no drivers reported in-vehicle distractions at the time of the accident. But other (unspecified) distractions occurred frequently.

As a rider, were you wearing any clothing that helped you to be seen?

Over two-fifths (43%) of motor cycle/moped riders who responded indicated that they were **not** wearing clothing which would help them to be seen by other road-users.

Have you been involved in any other road accidents?

It was found that over one-third (36%) of the drivers/riders involved in the sampled study accidents had been involved in at least one further accident in the previous five years. Of these, 78% had been involved in only one previous accident; 17% in two accidents; and the remaining 5% in three or more accidents. One participant admitted having been in seven previous accidents in the 5 year time period.

Views

Asked to rank each of ten items in order of dangerousness, drivers/riders rated the three features that were most dangerous as:

- driving after drinking any alcohol
- driving too fast for the given conditions
- not giving way to vehicles/pedestrians having priority.

4.5 Respondents: adult pedestrians
(Total 166)

Of the 297 adult pedestrian participants, a total of 166 responded to the questionnaire. Adult pedestrians were defined as being 14 years of age or above. The numbers involved in accidents were greatest for the 14-19 year-olds (29% of the total) and for 60+ year-olds (29% of the total). Of those who responded, a slightly smaller proportion were females (46%) than males. Over 77% of all adult pedestrians were on non-work journeys. At the time of the accident, most adult pedestrians (80%) were in the process of crossing the road, with a further 15% on the footpath. Some 18% had not stopped at the kerb or the side of a parked vehicle before walking across the road.

Could they or others involved have done something to avoid the accident?

Nearly three-quarters (74%) of adult pedestrians who responded considered that the other person could have done something to avoid the accident, and 61% thought that the other person had behaved in a thoughtless or inconsiderate manner. However, almost 20% admitted that **they** had done something which other road-users might have considered to be unexpected.

Did they see the vehicle before it hit them?

When asked this question 65% of respondents replied 'no'. For these, the most dominant reason (given by 10%) was the presence of parked vehicles in the way.

What might increase the chances of an accident occurring?

Adult pedestrians were asked to indicate, in an identical manner to drivers/riders, those aspects of the accident site, driver behaviour, their behaviour, and traffic conditions which might increase the chances of an accident occurring. The results are shown in Table 4.7.

Table 4.7 – Aspects that adult pedestrians state are likely to increase the chance of an accident

Site situation	%
Sharp bend on road	13
Slippery road surface	9
No crossing facilities/pedestrian phase	9
Driver's behaviour	
Driver travelling too fast	43
Aggressive driving	12
Pedestrian's behaviour	
Crossed without looking	16
Traffic conditions	
Very heavy traffic	14
Badly parked vehicles	9

Weather conditions were not considered to have an adverse role so far as the adult pedestrian was concerned, even though 12% stated that it was raining at the time, and this would have reduced the ease with which they could be seen by an approaching driver.

Did any medical conditions have a bearing on the accident?

31% of adult pedestrian respondents indicated that they normally wore spectacles or contact lenses (other than for reading). Nearly a fifth of these (ie 6% of the respondents) were not wearing them at the time of the accident. A few admitted that this could have been a contributory factor in the accident.

Of the range of medical conditions reported, bronchitis/chest problems were reported most frequently (10%), with hay fever and other allergies also at 10%. A quarter of adult pedestrians who responded had taken medicine/tablets in the 24 hours prior to the accident, most of which had been prescribed by the doctor. These were not considered to have contributed to the accident. Generally, there was a higher incidence of medical problems than for the driver/rider group. However, only 4% considered that these were a contributory factor in the accident.

Was any alcohol consumed and did it have an effect?

Over 16% of adult pedestrians who responded had consumed alcohol in the three-hour period before the accident, a significantly higher figure, both in proportion and the amount consumed, than the 4.5% of drivers/riders. In addition, of those drinking, 24% considered that this could have been a contributory factor in the accident; again a higher figure than the 6% reported by drinking drivers/riders.

Feelings at the time of the accident

In a similar way to drivers, pedestrians involved in accidents were questioned about their mental/psychological condition at the time of the accident. The results are shown in Table 4.8.

Table 4.8 – Pedestrians' reported condition at time of accident

Mental/psychological condition	%
Particularly contented	19
Relaxed	17
Pre-occupied	9
Tired/fatigued	8

The main reported adverse factors were tiredness/fatigue, and being pre-occupied or distracted.

Views

Adult pedestrians were asked to comment on how dangerous different types of driver/rider behaviour were. The results obtained were similar to those obtained for drivers/riders, but with a higher proportion of adult pedestrians considering 'exceeding the urban speed limit' and 'drivers not signalling', to be very dangerous.

This broad similarity between the two sets of results is a little surprising, since only 29% of the adult pedestrians held a full or provisional driving licence.

4.6 Respondents: child pedestrians
(Total 112)

Of the 166 participants, a total of 112 responded to the questionnaire. Child pedestrians were defined as being 13 years of age or below. Of the total responding, 60% were male and 50% in the 5-9 age group.

Were they with someone?

When the accident occurred, 37% of the involved children were alone, 53% with other children, and only 10% with adults. In most cases (77%), when they were with other children, there were only 1 or 2 others.

Immediately prior to the accident, 9% of the children reported that they were holding hands.

What were they doing?

Only 14% of the child pedestrian respondents indicated that they were playing at the time of the accident, with the remaining 86% going somewhere. Of the latter, 39% were going home, 16% to school, and 11% were going to visit a friend or the park. Most of the children (88%) were familiar with the area where the accident occurred. Most of the accidents (96%) happened when the children were crossing or walking along the road.

How did they cross the road?

Importantly, 33% of the children indicated that they did not stop at the curb or alongside a parked vehicle before crossing the road. In addition, 37% (which includes a number who did not stop at the curb), did not look to see whether the road was clear before crossing, and a further 19% admitted that they had only looked in one direction.

Did they see the vehicle that hit them?

Nearly three-quarters (73%) of the children stated that they did not see the vehicle before it hit them. The main reason, stated by 18% of those responding, was a parked vehicle blocking the view.

Had they had an accident previously?

Some 5% of the children had been knocked down previously in a road accident.

How did they learn about road safety?

Three-quarters (77%) of the children reported that they had first learned how to cross the road at home, with 21% stating school. Teaching in schools was by the teachers (40%), the police (40%), and teachers and police together (20%). Over a quarter (27%) of the children reported that they received no road safety training in school at all but 12% of the respondents were not of school age.

4.7 Respondents: child cyclists (Total 22)

Data was obtained from only 22 child cyclists aged 13 years or below out of a total of 28 participants. This is too small a sample from which to draw many conclusions. Perhaps the most striking finding was that only 37% reported that they had been taught to ride their cycle safely, and that only 18% had taken a cycle proficiency test. A quarter (26%) indicated that they had never received any road safety training at school.

5 What do the contributory factors explain?

This section examines the contributory factors assigned by the team as definitely contributing to the accidents. Three different types of road user (drivers/riders, adult pedestrians and child pedestrians) are considered by age and sex. (Child cyclists were excluded because of their small sample size.) Data is presented for all participants in the study: those who did not respond to the questionnaires had their age and sex information determined from *STATS 19*.

Notes:

1 The number of factors coded at each of the four levels will not be the same. This is because:

- a failure at one level can be explained by more than one factor at a lower level;
- the lower level(s) of explanation need not be immediately below the higher level;
- where an 'unknown' is given at the first or third levels, no further factors are coded at lower levels;
- for certain other combinations of factors, no fourth level factors, including 'unknown', were coded.

For example, a participant coded at the first level as 'unable to anticipate', may have an explanation at the third level as 'misinterpretation – other road users'. This was deemed sufficient. Neither the second nor fourth levels would contribute to the explanation.

2 It will be necessary to refer to both the contributory factors scheme (Figure 3.1) and the glossary (Appendix E), in order to understand the nature of the contributory factors referred to.

3 The objectives of the study excluded provision of a separate control group against which the figures could be compared. For some of the factors, an awareness of the background levels is desirable before a definite interpretation can be made.

In all, excluding the factors coded for the twenty-eight child cyclists, there were 2434 definite factors (including 'no failure' and 'unknown' factors) coded at the first level of the scheme, 350 coded at the second level, 1700 coded at the third level, and 1040 coded at the fourth level.

5.1 What were the main differences between road users?

5.1.1 Top level of explanation

The main contributory factor for drivers and riders at the top level was 'unable to anticipate' (Table 5.1). That this occurs much more often than for any of the other types of road user is largely due to the design of the scheme, which was such that there should never be a situation where a pedestrian was coded as 'unable to anticipate'. The 'failure to yield' type factors which relate to driving are, of course, different from those 'failure to yield' type factors which relate specifically to pedestrians. The results for pedestrians are shown in Table 5.2. The most significant differences are as follows:

1 a higher proportion of adult pedestrians were coded as 'no failure' than any of the other road user groups;

2 a higher proportion of drivers and riders, when compared to pedestrians, could not be associated with any factor at all (ie coded 'unknown' due to lack of information).

3 child pedestrians were coded more often than adult pedestrians as 'failure to yield' in a reasonable crossing situation.

Table 5.1 – Driver/rider first level failures

	%
Unable to anticipate	29
Failure to yield	16
Failure to anticipate	10
Loss of control	7
Other	7
Manoeuvre problems	4
Failures to stop	2
No failure	14
Unknown	11
Level 1 factors	**1969**

Table 5.2 – Pedestrian first level failures

	Adult %	**Child** %
Failure to yield	66	78
Dangerous position	3	1
Unable to anticipate	1	2
Falling over	1	2
Other	2	5
No failure	21	10
Unknown	5	4
Level 1 factors	**296**	**169**

5.1.2 Third level of explanation

Very few factors were coded at the second, or mezzanine, level for pedestrians, so no comparison is made at the second level here. (The second level factors are discussed later in *How do factors vary for drivers and riders?*) For the third level, contributory factors are grouped as follows:

Perceptual factors – Level 3 includes	*Cognitive factors – Level 3* includes
failed to look (at all)	lack of judgement – path
failed to look (partial)	lack of judgement or distance – speed
looked but failed to see	lack of judgement – other.
did not see.	

Significant differences in the distribution of the factors are apparent, and these are highlighted in Tables 5.3 and 5.4. The main differences were:

- high proportion of perceptual (mainly 'failed to look') errors for pedestrians, especially children;
- 'misinterpretation – other road users' is almost always associated with drivers and riders;
- adult pedestrians are more susceptible to 'lack of judgement' factors.

Also worth noting is the rather low level for all road users of attitudinal error which includes aggressive behaviour. This is perhaps because, even though aggression might be *indicated* by the accident circumstances, the team only coded it as a definite factor when the road user virtually admitted to it in the interview or statement to the police.

Table 5.3 – Driver/rider third level factors

	%
Misinterpretation	25
Perceptual error	16
Cognitive error	12
Unable to see	12
Skills error	3
Attitudinal error	2
Unknown	30
Level 3 factors	**1384**

Table 5.4 – Pedestrian third level factors

	Adult %	Child %
Perceptual error	53	61
Cognitive error	17	8
Unable to see	2	2
Misinterpretation	1	2
Attitudinal error	2	–
Unknown	25	27
Level 3 factors	**184**	**132**

5.1.3 Fourth level of explanation

Several differences between the road user groups are shown at the fourth level. The main one, discussed further later, is that:

- 'impairment' is much higher for adult pedestrians than drivers/riders. (The main factor is alcohol – see Section 7).
- A second factor, 'in a hurry', is associated with much higher proportions of pedestrians than drivers and riders, with 'being chased/scared' an additional factor for child pedestrians in particular.

The 'other' factors in Tables 5.5 and 5.6 break down into a large number of distinct factors, each of which occurs only a small number of times.

Table 5.5 – Driver/rider fourth level factors

	%
Obscuration (vehicles)	16
Impairment	8
Distraction	6
Thoughtlessness	4
Overconfidence	3
In a hurry	2
Other	27
Unknown	34
Level 4 factors	**782**

Table 5.6 – Pedestrian fourth level factors

	Adult %	Child %
Impairment	18	–
Distraction	13	12
Insufficient parental control	–	13
In a hurry	10	10
Being chased/scared	–	9
Thoughtlessness	4	8
Other	6	5
Overconfidence	2	2
Obscuration (vehicles)	1	2
Unknown	46	39
Level 4 factors	**143**	**115**

5.1.4 Human, road environment and vehicle factors

An earlier in-depth study of contributory factors carried out by the Transport and Road Research Laboratory over the period 1978-81 concluded that contributory factors for rural road accidents could be allotted in the proportions 84% to human factors, 13% to road environment factors and 3% to vehicle factors (*Sabey*, 1983). Because the present study has a more complex, multi-level design for analysing contributory factors, it is difficult to provide a similar comparison. The reason for this is that the contributory factors are chained together; a human factor that occurs at level 3, say, may have an explanation at level 4 which is either a human factor or a vehicle factor or an environmental factor. At the lowest level of explanation provided by level 4, the number of factors that occur are as shown in Table 5.7.

Table 5.7 – Human, road environment, and vehicle fourth level factors

	Drivers/riders		**Pedestrians**			
	Number	**%**	**Adult**	**%**	**Child**	**%**
Human	274	53	69	91	66	94
Road environment	237	46	7	9	4	6
Vehicle	5	1	–	–	–	–
All known fourth level factors	**516**	**100**	**76**	**100**	**70**	**100**
Unknown fourth level factors	**266**		**65**		**45**	

The proportion of environmental factors is clearly higher for drivers and riders than for pedestrians.

5.2 How do factors vary for drivers and riders?

Analysing the first level factors for drivers/riders by age and sex shows that:

- 'loss-of-control' and 'manoeuvre problems' factors are more prevalent for younger driver/riders; and for males
- 'failures to stop' increase slightly for the oldest group; and are more common for males
- 'failure to anticipate' is highest for the 20-24 age-group; and for males
- 'unable to anticipate' – that is, where the reasonable driver would have been unable to anticipate – occurs with about the same frequency for each age group; and likewise for males and females
- 'failure to yield' increases in the 50+ age groups; and is more prevalent amongst females
- 'no failures' occur most amongst females.

At the second or 'mezzanine' level (not discussed in Section 5.1), nearly two-thirds of the driver/rider factors were described as a 'situational problem', with almost a third of the factors being 'driving too fast for the situation'. The variation of these with age is given in Table 5.8.

Table 5.8 – Driver/rider second level factors by age

	Age							Total No
	4-19	**20-24**	**25-29**	**30-39**	**40-49**	**50-59**	**60+**	
Situational problem	49	49	55	63	73	88	91	214 (63%)
Following too close	5	12	8	11	5	4	3	28 (8%)
Driving too fast for the situation	46	39	38	26	22	8	6	100 (29%)
Total	**41**	**65**	**53**	**62**	**59**	**24**	**33**	**337 (100%)**

Conclusions of second level driver/rider failures

- 'driving too fast for the situation' is more prevalent for younger drivers; and much more so for males
- 'following too close' is less prevalent for older drivers
- 'situational problems' is more prevalent for older drivers; and for females.

Taken in conjunction with similar analyses by sex, some clear conclusions emerge.

Analyses of the third level contributory factors by age and sex showed the results set out below.

Conclusions of third level explanations for drivers/riders

- 'perceptual error' was higher for the eldest age groups
- 'cognitive error' was more prevalent amongst females; and was highest for the oldest and youngest age groups
- 'skills error' was uniformly low except for the youngest (14-19) age group.

Investigations of the linkages between factors at different levels have been undertaken, with the following findings.

'**Failure to yield**' factors obtained at the first level were explained directly at the second level by:

- 'perceptual' factors (38%)
  - *– with fewer in the 30-39 and 40-49 groups*
  - *– and somewhat more females than males*
- 'cognitive' factors (17%)
  - *– with fewer in the 40-49 and 50-59 groups*
  - *– and substantially more females than males.*

However, as the proportion of 'unknown' factors at the third level was high (32% overall) and also varied with age and sex, the variations in age and sex noted above may not be significant.

'**Failure to anticipate**' factors obtained at the first level were explained directly at the second level by:

- 'driving too fast' (18%)
  - *with more in the 25-29 age group, and less for the 60+ age group*
  - *and substantially more for males*
- 'perceptual error' (17%)
  - *with more in the 14-24 age groups; and for females*
- 'cognitive error' (14%)
  - *with more in the 14-19 age group; and for males*
- 'following too close' (13%)
  - *with least in the 14-19 and 60+ age groups*
- 'situational problem' (8%)

with some 27% unexplained by other second level factors.

'**Loss of control**' factors obtained at the first level were explained at the second level by:

- 'driving too fast' (27%)
  - *which was here almost invariant with age*
  - *but more prevalent amongst males*
- 'situational problems' (19%)
  - *with more for females*
- 'impairment' (14%)
  - *which was greatest in the 25-29 age group*
  - *and was more prevalent for males*
- 'skills error' (9%)
  - *which was more prevalent for females*
- 'environment factor' (6%)

with some 18% unexplained by other second level factors.

The 'environment factor' means such fourth level factors as 'slippery road'.

'**Situational problems**' encountered at the second level were explained at the third level by:

- 'unable to see' (75%)
- 'environment factors' (19%)
- 'obstruction/obscuration' (4%)

There was very little variation with age; and it is likely that the 'unable to see' factors are explained at a lower level by further obscuration factors.

5.3 How do factors vary for pedestrians?

Due to the small number of pedestrians, only three age groups were considered, those for under 14 years (Child in the tables), 14-59 years (Younger Adult) and 60+ years (Older Adults).

The distribution of first level contributory factors by age of pedestrian is shown in Table 5.9. 'Failure to yield' dominates. The distribution of first level factors by sex shows that a higher proportion of male pedestrians compared to female pedestrians were coded as a 'failure to yield', while a higher proportion of females compared to males were coded 'no failure'.

The distribution of third level contributory factors by age of pedestrian is shown in Table 5.10. A particularly high proportion of children made a 'perceptual error' compared to adults. Combining this with the findings from Section 4.6 it appears that a large proportion of child pedestrians failed to yield at the kerb as a result of not looking properly before entering the road (either not looking in all directions, or looking but not seeing an approaching vehicle). To a lesser extent this accident type is common across all pedestrian age groups. A very much higher proportion of the 14-59 age group made a 'cognitive error' compared to other age groups. The distribution of third level contributory factors by sex shows that the pattern for the two sexes is remarkably similar.

Table 5.9 – Pedestrian first level failures by age

	Child %	Younger Adult %	Older Adult %
Failure to yield	78	66	67
Other	9	9	5
No failure	9	21	24
Unknown	4	4	4
Level 1 factors	**170**	**203**	**87**

Table 5.10 – Pedestrian third level failures by age

	Child %	Younger Adult %	Older Adult %
Perceptual error	61	53	55
Cognitive error	8	21	8
Other	5	6	4
Unknown	26	20	33
Level 3 factors	**134**	**129**	**51**

'Failure to yield' at the first level was investigated more fully by examining the second level factors explaining it. This showed that the main factors were:

- 'perceptual errors' (55%)
  - *– being slightly more for child pedestrians*
- 'cognitive error' (10%)
  - *– being much greater for the 14-59 group*
  - *– and for females*
- 'impairment' (3%)
  - *– mainly males (but the numbers are small)*

and 'unknown factors' amounting to 22%, but greater for the 60+ age group.

6 Are those at fault different?

In a study of this kind, there are two important questions:

- what are the inherent characteristics of those at fault?
- how do those at fault differ from the population of road users generally?

Answers to the first question help to assess suggestions for accident countermeasures. Answers to the second question help to identify those factors which are most important.

It is usually necessary to have an independent 'control group' in order to examine the second question. Typically, a control group, consisting of road users who have not been involved in accidents, would be separately sampled and interviewed. That, of course, would be costly. In this study it was realised that those participants in the study who are judged **not** at fault could be regarded as a control group. They just happened to be there at the time and place when the at-fault road users undertook those actions that resulted in the accident. Thus the not-at-fault road users ought to be similar in make-up (age, sex etc) to a control group drawn from all road users using the roads at such times. (This would not, of course, necessarily represent the road-user population generally. For example, some cautious motorists may avoid travel at what they consider to be dangerous times, such as late on Friday and Saturday nights.)

CONTROL GROUP

Not-at-fault road users may be regarded as a sample of the road users who are out and about at the time of the accidents.

The case conferences enabled the team to assess whether each participant in an accident could be deemed to be 'at fault' or 'not at fault'.

6.1 How were those at fault identified?

The definition of 'at fault' and 'not at fault' was based on the contributory factors assigned at the case conferences (see Figure 3.1). This was done in two stages:

1 determining which contributory factors indicated fault;
2 assessing whether participants were at fault.

6.1.1 Determining 'at fault' factors

In the first instance only the top (first) level factors were assigned to 'at fault', 'not at fault' and 'fault unknown' groups. But not all factors could be immediately assigned to one of these groups. Labelling these 'fault uncertain' for the moment, the first level factors in this group were re-assigned to one of the basic groups by reference to factors at the second, third and fourth levels of the scheme.

The grouping was done by considering whether the particular contributory factor was one that was applicable to the 'reasonable road user'. For example, 'braking suddenly reasonably' was placed in the 'not at fault' category, while 'braking suddenly unreasonably and sharply' was placed in the 'at fault' category. Only definite factors were included when determining fault. Details are in the main Technical Report.

6.1.2 Determining 'at fault' participants

Many factors could be coded for one accident participant; some might indicate fault, some not. To decide whether the participant was at fault, precedence between the factors had to be established. The rules for this are shown below.

HOW 'FAULT' WAS ASSESSED FOR PARTICIPANTS

A participant was declared:
At fault if **any** 'at fault' factor was coded;
Unknown in fault if one or more 'not at fault' factors and one or more unknown fault factors were coded;
Not at fault if **only** 'not at fault' factors alone were recorded for that participant.

All the Tables in this Section are presented at the participant level. Where age and sex were not available from the interview data, the information was obtained from the *STATS 19* database.

6.2 Are drivers/ riders more at fault than other road users?

The proportions of each class of road user that are judged 'at fault' or 'not at fault' are shown in Table 6.1. Adult pedestrians and children were more commonly judged to be at fault than drivers and riders. In a sense, therefore, a higher proportion of drivers and riders were the innocent victims of the mistakes of other road users.

Table 6.1 – Road user type by fault

Road user type	At fault %	Not at fault %	Unknown %
Driver/rider (1963)	41	44	15
Adult pedestrian (297)	71	23	7
Child pedestrian (166)	80	11	8
Child cyclist (28)	75	14	11

6.3 Are men more at fault than women?

For road users as a whole, males and females were found to be at fault in approximately equal proportions. At first sight this seems surprising. The kinds of faults differ between the sexes: males are more associated with the 'culpable' faults such as driving too fast, and females with 'mistake' type faults such as lack of judgement. Table 6.2 shows that female drivers and riders were somewhat less at fault than male drivers and riders. A similar finding occurs for adult pedestrians.

Among child pedestrians, there was no observable difference by sex.

Table 6.2 – Drivers/riders: sex by fault

Sex	At fault %	Not at fault %	Unknown %
Male (1482)	42	44	14
Female (433)	36	50	14

6.4 How does fault vary with age?

There are some substantial differences between age groups. Children (aged 13 or below) have the highest proportions of 'at fault', declining slightly with age, as shown in Table 6.3. However, it must be remembered that children were judged against the same standard of 'reasonable road users' as adults (Section 3.4). It was only by applying the same standard across the board that differences in meeting the standard could be discovered. There was no implication in this that children could be expected to behave in the same way as adults, and it is clear from the results that they cannot.

Table 6.3 – Child pedestrians: age by fault

Age	At fault %	Not at fault %	Unknown %
0-4	90	10	0
5-9	84	9	7
10-13	74	14	12

As shown in Table 6.4, fault shows a consistent pattern of decreasing with age up to, and including, the 50-59 age group. Beyond that, fault again increases. The 14-19 age group has the highest proportion of 'at fault' factors, indicating problems for young drivers and riders.

Table 6.4 – Adult road users: age by fault

Age	Drivers/riders %	Pedestrians %
14-19	48	80
20-24	40	69
25-29	39	73
30-39	39	78
40-49	38	74
50-59	36	52
60+	47	69

This gives the percentage of participants that are 'at fault' for road users in each age group.

6.5 When do most faults occur?

The distributions by day of week show little variation for drivers and riders, but with a slight tendency for adult pedestrians to be more often at fault on Thursdays and Fridays.

The distributions by time of day are more interesting. Drivers and riders were least often at fault in mid afternoon from 15.00-16.29 hours. This may be attributable to the high involvement in accidents of child pedestrians on their way home from school at this time. Adult pedestrians were more often at fault at lunchtime, in the evening and late at night (between 22.00 and 03.00 hours); this may be connected with drink.

6.6 How does fault vary with type of vehicle?

A comparison is also made, in Table 6.5, between the propensity to be 'at fault' and the vehicle used. Using vehicle types from the *STATS 19* data, this shows that pedal cyclists were least often at fault, while LGV drivers were most often at fault. It is interesting to note that the riders of two-wheeled motor vehicles had a similar or better 'at fault' record than car drivers.

Table 6.5 – Driver/riders: vehicle type by fault

Vehicle type	At-fault – yes %	At-fault – no %	Unknown %
Pedal cycle	27	65	8
Motorcycle	36	41	23
Car	42	44	14
Public Service Vehicle (PSV)	41	46	13
Light Goods Vehicle (LGV)	48	35	18
Heavy Goods Vehicle (HGV)	44	39	17
Other motor vehicle	43	50	7

6.7 Are non-respondents more at fault?

The final table (Table 6.6), which is for all accident participants, separates those who refused to be interviewed, from those who did not. It shows that those refusing were a little more likely to be at fault, and also to have a higher proportion of unknown fault. This latter finding is not surprising since the interview information was an important piece of evidence in the determination of contributory factors and hence of fault.

This pattern was similar for both adult pedestrians and drivers/riders.

Table 6.6 – Response by fault

Response	At-fault – yes %	At-fault – no %	Unknown %
Refusal	50	33	17
Non-refusal	47	41	12

7 How serious is alcohol impairment in urban accidents?

7.1 What data was available on alcohol levels?

Information on alcohol levels among participants in road traffic accidents was gathered from three sources: self reports from interviews, *STATS 19* data, and the police.

In cases where drivers and riders involved in road accidents were prosecuted for having positive breath or blood alcohol levels, police files were made available, thus supplementing the information already obtained. However, the actual breath and blood alcohol levels were often not recorded, only *OPL* (over the prescribed limit). Pedestrians involved in road accidents were not tested by the police for breath or blood alcohol levels. Therefore information on breath and blood alcohol levels was often not complete.

DRINK DRIVERS AND RIDERS

Those drivers and riders who were prosecuted for driving under the influence of alcohol and/or who were recorded in *STATS 19* as *OPL* and/or who stated in the questionnaires that they had consumed some alcohol in the 24 hours prior to the accident.

DRINKING PEDESTRIANS

Those pedestrians who stated in the questionnaires that they had consumed some alcohol in the 24 hours prior to the accident.

7.2 What were drivers' and riders' drinking characteristics?

Out of the 912 drivers/riders interviewed, 141 (15.5%) reported that they had consumed some alcohol in the 24 hour period before the accident.

7.2.1 Self-reported alcohol consumption up to 3 hours before the accident

Forty-one drivers and riders reported drinking some alcohol within 3 hours of their accident, and nine of them were prosecuted for driving over the prescribed limit. Seven, who were not prosecuted, claimed to have consumed 4 or more units of alcohol within 3 hours of their accident, and might have been positive had they been tested. One participant, who was successfully prosecuted, claimed to have drunk only 2 units, and presumably under-reported his alcohol intake.

7.2.2 Self-reported alcohol consumption more than 3 hours before the accident

Three drivers/riders were prosecuted for driving over the prescribed limit, two of whom claimed to have drunk 6 units of alcohol more than 6 hours before their accidents, while the third reported drinking 18 units in that period. Among others, who were not prosecuted, two claimed to have consumed 16 units 12-24 hours before their accidents, and the third, 20 units in the same period. It is possible that these drivers/riders were *OPL* at the time of their accidents.

Those drivers and riders reporting that they had drunk some alcohol 3-24 hours before the accident, were asked how often they drove after drinking **any** alcohol. Table 7.1 shows that nearly half of those drivers and riders whose accidents occurred in the period 12-24 hours after their last drink reported that they did not drive at all after drinking, and the same was true of drivers/riders whose accident occurred in the period 6-12 hours afterwards.

Table 7.1 – Response to the question 'How often do you drive after drinking ANY alcohol?' from those drivers and riders who reported drinking 3-24 hours before their accident

Last drink before accident	Not at all	Rarely	Not very often	Quite often
3-6 hrs	2	4	2	0
6-12 hrs	6	3	1	1
12-24 hrs	37	23	9	11
Total	**45**	**30**	**12**	**12**

7.3 What were the drinking characteristics of adult pedestrians?

Of the 166 adult pedestrians who responded, 37 reported that they had drunk some alcohol in the 24 hour period before their accidents (22.4%), twenty five reported drinking 4 units or more in the 3 hours prior to their accident, and an additional one of drinking 8 units between 3-6 hours beforehand. Thus, these 26 adult pedestrians may have been over the limit when their accidents took place.

7.4 Is alcohol impairment a contributory factor in urban accidents?

Table 7.2 shows that alcohol impairment was not judged to be a definite or probable contributory factor in many accidents. Only 82 of the 2260 adult accident participants were so coded (3.6%). However, there were differences between pedestrians and drivers/riders: 50 of the 1963 drivers/riders (2.5%) and 32 of the 297 adult pedestrians (10.8%) were judged to be impaired by alcohol.

The above indicates that alcohol impairment was a contributory factor in about 8% of the accidents studied.

Table 7.2 – Alcohol impairment as a contributory factor by participant type

	Definite	Probable	Total	% of Adult participants
Drivers/Riders	38	12	50	2.5
Pedestrians	20	12	32	10.8
Total	**58**	**24**	**82**	**3.6**

7.5 Conclusions

From the results obtained, alcohol impairment was considered to be a definite contributory factor in 38 cases, and probably a contributory factor in 12 cases, a total of 2.5% of all drivers and riders sampled.

For adult pedestrians alcohol impairment was considered to be a definite contributory factor in 20 cases, and a probable contributory factor in a further 12 cases, in total 10.8% of all adult pedestrians sampled. However, since only approximately half of the pedestrians involved in accidents during the year agreed to be interviewed or completed postal questionnaires, the true figure for drinking pedestrians may be considerably higher than that reported (perhaps nearer 20% of the total number of adult pedestrians involved in accidents). Another way of looking at the same data is that, of the fourth-level factors that are known, 25% are due to alcohol impairment.

8 What are the main conclusions?

The study assessed the effect of behavioural factors in urban road traffic accident causation, and to indicate the broad policy conclusions and emergent research needs emerging from these assessments. This was undertaken by directly interviewing accident participants, visiting the accident sites, obtaining *STATS 19* data and relevant police reports, and carrying out case conferences on every accident in order to determine the contributory factors. Accidents were studied on non-central area urban roads in north Leeds having a speed limit of 40 mile/h or less in 1988.

8.1 What was the context?

1 1254 urban accidents were studied involving 2454 participants, broken down as follows:

1963 adult drivers/riders (including 100 adult cyclists)
297 adult pedestrians
166 child pedestrians
28 child cyclists.

2 A total of 1212 participants were interviewed or contacted by postal questionnaire, broken down as follows:

912 adult drivers/riders
166 adult pedestrians
112 child pedestrians
22 child cyclists.

3 Of the 1254 accidents studied, 150 (12.0%) were single vehicle, 440 (35.1%) involved a single vehicle and at least one pedestrian, 599 (47.7%) were between two vehicles, and the remaining 65 (5.2%) were multi-vehicle involving three or more vehicles.

4 Twenty-six (2%) of the accidents were fatal, 253 (20%) resulted in at least one serious injury, and the remaining 975 (78%) resulted in only slight injuries. The accidents were fairly evenly distributed by day of the week, with Friday being the most prominent day at 19% and Sunday the lowest day at 12% of the weekly total.

8.2 What were the main accident characteristics?

5 Almost 70% of the accidents occurred at junctions. Of the latter 12% were controlled by traffic signals or a Stop sign, 72% by a Give Way sign, and the remaining 16% were uncontrolled.

6 In over half the accidents, the distance travelled by responding drivers and riders **before** the accident occurred was less than 2 kms; and for over three-quarters of drivers and riders the distance travelled was less than 5 kms. Nearly all respondents (93%) knew the road where the accident occurred 'well' or 'quite well'.

7 Drivers and riders were asked to indicate, from a list of 38, those aspects of the road or driving situation most likely to increase the chances of an accident occurring. The main ones noted, together with the percentage of respondents reporting them, were:

Other people driving too fast	17%
Pedestrians crossing without looking	16%
Slippery road surface	14%
Rain	14%
Badly parked vehicles	13%
Very heavy traffic flows	11%
Aggressive driving by others	9%

8 Over one-third (35%) of drivers and riders who responded admitted that they exceeded the urban speed limit quite often, and 4% admitted that their excessively fast driving may have contributed to the accident.

9 Over two-fifths (43%) of motor cycle/moped riders who responded indicated that they were **not** wearing clothing that would help them to be seen by other road users.

10 Over one-third of drivers and riders who responded had been involved in at least one accident in the previous five years. Of these 78% had been involved in only one; 17% in two; and the remaining 5% in three or more.

11 Drivers and riders considered the following three driving situations to be the most dangerous, and hence most likely to lead to an accident:

a) driving after drinking any alcohol
b) driving too fast for the given conditions
c) not giving way to vehicles/pedestrians having priority.

12 One-fifth (20%) of adult pedestrians who responded admitted that they had done something which other road users might have considered to be unexpected and hence contribute to an accident.

13 Adult pedestrians were asked to indicate those aspects of the road or driving situation most likely to increase the chances of an accident. The main ones noted, together with the percentage of respondents noting them, were:

Driver travelling too fast	43%
Pedestrian crossing without looking	16%
Very heavy traffic	14%
Sharp bend on road	13%
Aggressive driving	12%
No crossing facilities/pedestrian phase	9%
Slippery road surface	9%
Badly parked vehicles	9%

14 Over 16% of adult pedestrians who responded had consumed alcohol in the 3 hour period before the accident, a significantly

higher figure than the 4.5% of drivers and riders. Almost one-quarter (24%) of these considered that this could have been a contributory factor in the accident; again a higher figure than the 6% reported by drinking drivers/riders.

15 Only 10% of child pedestrians who responded were accompanied by an adult.

16 One-third of child pedestrians did not stop at the kerb before crossing the road. In addition 37% (which includes many who did not stop at the kerb) did not look to see whether the road was clear before crossing, and a further 19% only looked in one direction.

17 Of the child pedestrians of school age, 17% reported that they never received any road safety training in school.

8.3 What were the contributory factors?

18 A formal scheme was devised in order to undertake the in-depth examination of the contributory factors in accidents. This was detailed in Figure 3.1 and had two main features:

a) It was multi-level, thus enabling immediate failure(s) that precipitated the accident at the top level to be explained by causes at a lower level.

b) It was participant-based, thus enabling different behavioural factors to be associated with each accident participant.

The scheme was found to work well in practice.

19 The contributory factors at the different levels were:

	Definite known	**No failure or unknown**	**Total**
First level failure	1846	588	2434
Second level failure	350	–	350
Third level behaviour or action	1214	486	1700
Fourth level reason	664	376	1040
Total	**4074**	**1450**	**5524**

20 Substantial differences were found between different age, sex and road user groups in the types of contributory factors coded at each of the four levels of the scheme.

21 At the top-level, major driver/rider factors were 'failure to anticipate' (10%), or unable to anticipate (29%), and 'failure to yield at junctions' (16%). A large difference was found between child and adult pedestrians. 21% of the top-level factors for adult pedestrians were 'no failure', compared to 10% of top-level factors for child pedestrians. Conversely, only 66% of the top-level factors for adult pedestrians were 'failures to yield to traffic', compared to 78% for child pedestrians.

22 At the second level, the most notable findings were that 62% of the factors were situational problems, representing site or environment

factors which did present problems. Also, of the factors coded for drivers and riders, 'driving too fast for the situation' accounted for 29% of the total and 'following too close' accounted for a further 8%. This implies that, for approximately 5% of drivers and riders involved in accidents, 'driving too fast for the situation' was definitely considered to have been a factor in the accident, and for a further 1%, following too close, was definitely considered to have been a factor. Both of these factors may have been under-represented, since there was often little information on driver or rider speed prior to the accident. It should be noted that second level factors were coded for only a small proportion of the accidents.

23 Some of the more important differences occurred at the third level of the scheme, in terms of the behaviours used to explain the first level failures of participants. Of particular note were the high proportions of perceptual errors coded for child pedestrians (61%) compared to adult pedestrians (54%) and adult drivers and riders (16%). In addition, there was a difference at this level by sex: a higher proportion of factors for females, as compared to males, were cognitive errors. Sixteen per cent of the third-level factors for female drivers and riders were cognitive (lack of judgement), in contrast to 12% for male drivers and riders. Similar differences can be discerned in the case of adult pedestrians: 15% compared to 12%.

24 At the fourth level, 53% of reasons for drivers/riders were human factors (impairment by alcohol and distraction being the most frequent): 46% were road environment factors, 19% being obstruction or obscuration mainly due to parked or stopped vehicles. For pedestrians, the reasons were overwhelmingly human ones: adults being impaired, distracted or thoughtless. Lack of parental control was a major factor in child accidents.

25 Important findings were also apparent from the analysis of the links between factors. Almost 50% of the top-level failures to yield for all types of road user were explained by a perceptual error. Such explanations for failure to yield were more common in the case of pedestrians than in the case of drivers and riders. About 14% of the failures to yield were explained by cognitive error. This type of explanation was more prevalent amongst drivers and riders than pedestrians. Finally, about 27% of the top level failures to yield could not be explained from the available information.

26 Loss of control by drivers and riders was commonly explained directly by driving too fast (27%) and impairment of various types (14%).

27 Variations in the pattern of links were found by age and sex. Top-level factors explained by 'driving too fast for the situation' were more common for males than females and more common for younger drivers than for older drivers. This supports the generally perceived belief that young male drivers are more prone to take risks. There is some indication that 'loss of control' of their vehicles occurred because of a skills error, proportionately more often for younger drivers than for other age groups. Higher proportions of

females compared to males lost control of their vehicle due to cognitive and skills errors.

8.4 Who was at fault?

28 Adult pedestrians were considered to be more often 'at fault' than adult drivers and riders, and children to be 'at fault' much more frequently than adults. Thus 41% of adult drivers and riders were considered to be 'at fault', compared to 71% of adult pedestrians. An overwhelming 75% of child cyclists and 81% of child pedestrians were found to be 'at fault'. It is important to remember here that children were held up to the same standard of 'reasonable road user' as adults.

29 Males and females were found to be 'at fault' in approximately equal proportions. However, the kinds of fault differed between the sexes: males were more associated with the 'culpable' faults such as 'driving too fast for the situation', while females were more associated with 'mistake' type faults.

30 Examining fault by age, a U-shaped curve was observed; this is similar to ones noted in other analyses of accident involvement. Fault decreased consistently with age, from 88% 'at fault' in the 0-40 age group to 39% in the 50-59 age group, and then rose to 55% among those aged 60 and over. There are thus indications of problems both for the very young and for the old.

31 In spite of their public image, motorcycle riders were not found to be more often 'at fault' than car drivers. Pedal cyclists were least often 'at fault', while light goods vehicle drivers were most often 'at fault'.

8.5 How important was alcohol?

32 Alcohol was only considered to be a definite or probable contributory factor for 4% of adult participants. However, this figure was substantially higher for adult pedestrians (11%) than for adult drivers and riders (3%). Information on alcohol consumption for pedestrians was self-reported, and was thus obtainable for only half the total number of adult pedestrians, whereas for drivers and riders other information (eg, breath tests) was more generally available. There is evidence that the true extent of alcohol involvement as a contributory factor among adult pedestrians may be substantially more than the observed rate.

33 There was some evidence that, despite considerable publicity, drivers still have little idea of the effect of drinking on their performance; in particular the length of time it takes for the human body to shake off completely the effects of a heavy drinking session.

8.6 What are the policy implications?

The findings of this study are extremely useful as a guide to existing problems and indicate implications for future policy. The exact policies needed to remedy those problems will require further review and evaluation of the options available. Some issues relevant to particular target groups of the population are suggested here.

Road user issues

For drivers and riders, failure to yield to other road users at junctions, loss of control and lack of anticipation are the main problems precipitating an accident; and driving too fast for the traffic situation an important underlying reason. These failures are particularly apparent for the young male driver, and suggest that this group should be a focus for appropriate action. Most of these failures are explained by perceptual and cognitive factors; hence these offer some guidance on how to make drivers and riders more aware of the accident potential and consequences of such actions. For example, of the known factors, 9% were due to a 'failure to look', 14% due to a 'failure to see', and 17% due to an 'inability to see'. It was also shown that perceptual problems for drivers and riders increase with age. This finding is a cause for concern in view of the predicted increase in the numbers of elderly drivers. The problems of obstruction and obscuration that parked vehicles cause to pedestrians suggests that drivers should be made more aware of the potential dangers of overtaking parked vehicles, and of the need to adjust their speed accordingly.

For adult pedestrians, the dominant pattern of 'failure to yield to traffic' is explained in a very high proportion of cases by failures to look (44% of known factors), and failures to see (26%), with a further 22% being due to errors of judgement. The need to find ways of helping pedestrians cope with an environment that is clearly hostile to them is evident, and might include measures designed to make drivers and riders more aware and considerate of pedestrians. Of the known fourth level factors contributing to the explanation, a high proportion (25%) was due to alcohol impairment. The extent of pedestrian alcohol impairment suggests the need to consider practical action directed towards this class of road user.

For child pedestrians, the dominant pattern of 'failure to yield to traffic' is explained to an alarming extent by failures to look properly (67% of known factors), with a further 15% looking but failing to see. Over 50% of the children responding to the questionnaire admitted taking insufficient care before starting to cross the road. It appears that more attention may need to be paid to the extent and effectiveness of road safety training and education, including that provided through the schools. The role of adults in accompanying children may also be worth examination; only 10% of child pedestrian respondents were accompanied by an adult, and insufficient parental control was the highest single fourth level factor (21% of known factors) explaining the child's failure at a higher level.

For motor cyclists and moped riders, it is as important to improve the awareness of the car driver as it is to improve the awareness of the motorcyclist. (This conclusion arises from the finding that motor cyclists are not 'at fault' any more than car drivers.) Of issues specific to riders, there is a continuing need to increase the use of conspicuity aids (43% of rider respondents did not wear clothing that would help them to be seen).

Traffic management and engineering issues

Traffic management and environmental improvements are indicated that could help road users in general, and pedestrians in particular, to avoid the failures of the types which precipitated their road accidents. There may be a need to assess parking controls, and to assess how any changes might reduce the hazards to pedestrians caused by obstruction or obscuration of traffic.

Design improvements in urban areas are indicated as necessary to make the road environment easier for pedestrians of all ages to cope with, but particularly child pedestrians.

For the above, it is clear that a range of measures will need to be devised, involving improvements in education, training, publicity, traffic management, and road planning and engineering. It must, however, be emphasised that the effectiveness of particular remedial measures in improving road user behaviour, and in reducing accidents, cannot necessarily be taken for granted, and would have to be assessed as a separate exercise. Indeed further probing of the data-base will be desirable in formulating more precisely the policy responses suggested above.

8.7 Concluding remarks

This study has given new insight into the understanding of accident causation. The attribution of contributory factors in an innovative way, representing a causal chain, is a significant advance in this kind of research. The database resulting from the study now provides a new and important source of information on accidents in urban areas.

The analyses presented here represent only the start of the usefulness of the database. Its potential lies in providing more detailed understanding of the contributory factors and their interactions than has been possible hitherto, and in seeking answers to a variety of questions relating to practical and policy questions.

9 Acknowledgements

This study would not have been possible without the unstinting help and co-operation of many people and organisations. We thank particularly the West Yorkshire Metropolitan Police, both at Headquarters and local levels, without whose co-operation in the basic tasks of collecting data on accidents such research studies as these could not be contemplated; special thanks is due to the traffic officers and clerks at the subdivisions in Horsforth, Weetwood, Chapeltown, Pudsey and Gipton. We are grateful to the Highways and Engineering Technical Services at Leeds, for providing *STATS 19* data and advice. Other organisations such as the local hospitals and the Crown Prosecution Service also helped in various important ways. Especial thanks to Barbara Sabey, who in her role as the Technical Adviser to the AA Foundation for Road Safety Research provided helpful and insightful comment at many stages of the study. Particular mention must be made of those members of the research team or the Institute who are not mentioned as authors of this report, but whose willingness to contribute time over and above the norm at often unsocial hours made all the difference to achieving the targets of this large study: Joan Edwards, our survey supervisor, and her team of survey staff (Teresa Bickers, Maureen Currie, Anne Gibson, Judith Harvey, Jack Swift, Joan Tillotson, Christine Walker and Joyce Williams); Peter Tune, who joined us as Research Assistant in 1989 for just three months after Barry Plows had left; David Gaunt, our clerical assistant; Sarah Webster and Carolynne Priestley, the Institute's technical support staff; Judith Ellison, Suzanne Cummings and Helen Williams, who provided additional technical support at critical moments, and Gillian Hindle who provided the vital secretarial backup. Last but not least, our thanks are due to those members of the public who have contributed to the success of this study, by volunteering their time to impart information on such a traumatic event as an accident.

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11 Appendix A
Why carry out in-depth studies?

In-depth accident studies involve the collection of data which are not otherwise available as part of the standard accident data collection carried out in most developed countries. The standard data collection is usually carried out by the police who are required to record certain facts about each of the accidents they deal with. In Britain the outcome of such data collection is a database known as *STATS 19* which contains information concerning each accident and the participants and vehicles involved. Such routine data collection, although providing a basic database from which to analyse accident patterns, is limited in extent mainly by the constraints put upon police time, and the costs which would be incurred if the data collection effort was to be substantially increased. Because of the lack of information, in-depth studies have occasionally been undertaken in order to produce much of the necessary information vital to analyse effectively the various components involved in accident causation.

In-depth studies are of two main kinds: those that attempt to examine accident causation or primary safety; and those which attempt to identify means of injury alleviation or secondary safety. The study reported here is of the first kind, and is the first of its kind in the UK for over a decade.

Previous in-depth studies of accident causation, have included the following general aims:

- to provide a sound basis upon which the likely success of potential road safety measures can be evaluated and to suggest new remedial approaches;
- to gather data which can contribute to the safer design of roads, vehicles and traffic schemes;
- to obtain a relatively objective assessment of risk associated with different aspects of highway design, vehicle condition and road user behaviour;
- to provide a basis for the development of research methodologies and establish pointers for areas needing further research.

In-depth studies range from the very general, which seek to examine all aspects of accident causation, to more specific studies which investigate one or two aspects such as drinking and driving or speeding behaviour. A number of such studies were carried out in the 1960s and 1970s, and involved on-site investigations at the time of the accident. Being called out to accidents when they occurred proved to be very costly in terms of the staff resources involved.

In this new study, the traditional in-depth methodology was adapted so as to make it both cheaper and more focused. The earlier studies had identified human factors as the main component in accident causation. Hence the study was focused on these factors. This meant that costs could be reduced by dispensing with the need to visit the accident site immediately, and with the detailed examination of vehicles for defects and accident damage. As a result, the role of human factors could be investigated in more detail than was feasible in the earlier studies.

A short review of previous in-depth accident studies is included in the main Technical Report. These include 'on-the-spot, at-the-time' studies carried out in rural areas by the *Transport and Road Research Laboratory (TRRL)* in Britain in the 1970s (Staughton and Storie, 1977; Sabey and Taylor, 1980); and similar investigations for accidents on suburban roads in Indiana (Treat, 1980). Reference has also been made to the recent report concerned with on-site investigations of road accidents (OECD 1988). The main reason for immediate attendance at a site in these studies was to examine the site before the conditions there changed; to examine the participating vehicles, and to collect site data. In some cases the collision process was construed by an accident reconstruction study. The *TRRL* study examined 2,130 accidents and the Indiana study examined a total sample of 13,568 accidents, of which 2,258 were investigated at the scene by technicians and 420 examined in depth by a multi-disciplinary team.

12 Appendix B Protocols

The study proceeded with the co-operation of the Police, Local Authority, Hospital Authorities and the Crown Prosecution Service. It was nevertheless independent of these. Therefore certain protocols were applied throughout the study, in order to clarify the relative interests of the parties concerned, and to provide assurances about the confidential nature of the information obtained. The protocols were as follows:

1 No information on extra data obtained or the conclusions reached as to contributory factors on particular accidents would be passed to the police or to anyone else in any circumstances.

2 An interview would only be attempted after the police had taken any statements they required from an accident participant.

3 Any information about site factors that might help the Local Authority to reduce accident risks at or near these sites, would be conveyed to staff at the West Yorkshire Highways, Engineering and Technical Services (*HETS*).

4 As the project was concerned with the identification of contributory factors in road accidents as a whole, its remit did not overlap with the site-specific investigations carried out by *HETS*.

5 Names and addresses of participants in an accident, and the registration numbers of the vehicles involved, would not be recorded on the computer files of accident data, and would not be divulged to third parties.

6 Checks would be made to ensure that no contact was attempted with anyone involved in a fatal accident.

7 Information about individual accidents contributed by the cooperating organisations was regarded as the copyright of those organisations. Copies of any reports would be returned to them, or, with their approval, destroyed, at the conclusion of the study.

8 The sole right of the copyright in the results of the research, including any report made, and any data or other information collected specifically for the programme of research, vests (insofar as it is not already the copyright of any third party) in the *AA Foundation for Road Safety Research*.

13 Appendix C
Data collection procedures

13.1 Case selection

Cases for investigation were identified within one week of the accident, using the police accident registers maintained by each of the five police subdivisions. Only injury accidents were investigated. The decision to exclude non-injury accidents was made because of the huge under-reporting of damage only accidents, and the fact that those that are reported are unrepresentative of the whole (for example, dog-strike accidents).

The injury accident registers were photocopied and the 'not applicable' cases were eliminated from consideration. Those not applicable or 'non sample' cases consisted of:

- accidents occurring on roads where the speed limit was greater than 40 mile/h;
- injuries to bus passengers either as a result of slips or falls on the vehicle without any external collision occurring, or while getting on or off the vehicle.

The remaining cases were sampled at a rate of 90%, using a random number generator to determine inclusion or exclusion of the particular accident. The 90% level was chosen because of the sponsor's desire for coverage of at least 1000 accidents. In the event, that target was substantially exceeded.

13.2 Interview procedure

Interviews were sought with every participant in the sampled accidents. By 'participant', we mean the drivers of all involved vehicles, and any injured pedestrian. The name and addresses of the participants were obtained from the accident registers and the interviews were subsequently conducted by a special team of interviewers, using questionnaires that varied by participant type, as follows:

1 Driver/rider, for drivers, motorcyclists and adult cyclists (adult was defined as 14 or older).

2 Adult pedestrian.

3 Child pedestrian.

4 Child cyclist.

Each type of questionnaire consisted of an open-ended description of the accident by the respondent, followed by questions focusing on accident causation. Questions were asked about the journey the individual was on, the person's health and state of mind, alcohol consumption in the 24 hours prior to the accident, and about how the accident was caused and might have been avoided. Postal versions of the driver/rider and adult pedestrian questionnaires were also prepared (see next paragraph). A copy of each type of questionnaire is included in Annex 1 to the main Technical Report.

Naturally there were a number of practical limitations when attempting to interview all participants. Accident participants who lived beyond a thirty mile radius, and participants who lived within a thirty mile radius, but outside the Leeds and Bradford postal areas and for whom no phone number was obtainable, were contacted by post. Participants in fatal accidents were not approached for interview, because of the sensitive nature of the event, but details of these accidents were incorporated in the study.

The protocols established (see Appendix B) with the police and Crown Prosecution Service meant that no individual could be approached for interview until a police statement had been obtained from that individual, or until it had been determined that 'No Further Action' was to be taken on the case. In consequence, some considerable time often elapsed between the accident and the interview. Few were passed out to the interviewers in less than one month. If clearance was not obtained within three months of the accident, the case was 'cut off', and the site visit and case conference proceeded using whatever other information was available, including the interviews obtained from other participants in the accident and copies of the police file on the accident, if available.

13.3 The site visit

The site visit served two purposes: one was to collect basic information about site conditions, the other was to enable the team to conduct a case conference and to assess the contributory factors whilst at the scene. The procedures followed for the case conference are described in Section 3; here we describe the procedures for collecting the data.

The scheduling of visits to the accident site was arranged so that, as far as possible, the same general traffic conditions obtained as at the time of the accident. Accidents were divided into four categories, according to the day of the week on which they occurred: (1) Monday-Thursday, (2) Friday, (3) Saturday, and (4) Sunday. Within each category of day, the accident site was visited at the time of day at which the accident occurred, but not necessarily (for the Monday-Thursday group) on the same day of the week. If accidents occurred during the night, it was assumed that traffic and pedestrian flows were negligible. The site visit was therefore conducted at any time when light conditions were similar to those at the time of the accident in order to observe lighting and other visibility features. 'Night' was defined for site visit purposes as between 0000 and 0530 hours on Monday to Friday, between 0100 and 0630 hours on Saturday and between 0100 and 0830 hours on Sunday morning.

As part of the site visit, the team member or members coded information on the nature of the location, including environment type (whether residential, retail, industrial, etc.) and broad categories of pedestrian and vehicle flow using a standard form. More detailed locational and environmental information was subsequently obtained through matching cases with the police-reported injury accident database (*STATS 19*).

14 Appendix D
The Datasets

The data were contained in several datasets, as follows. They were all built using the *SAS* package (*SAS Institute,* 1985).

Interview dataset

This has six different versions depending on questionnaire type.

Site visit dataset

This contains information on the sites of all the 1254 accidents. Data includes the date and time of the site visit, a global assessment of pedestrian and vehicle flow at the site, a coding of the type of environment (whether residential, retail, etc), an indication of whether the site was on a hill, the brow of a hill or a bend, and an assessment of whether the site was a 'bad site', ie was below the current standard for a reasonable site.

Contributory factors dataset

This consists of all the 5870 factors that were coded as part of the case conferences on the 1254 accidents. The factors were coded at the participant level (see Section 3), and multiple factors could be coded for each participant. Each factor coded has the identifier (ID) of the relevant participant, and each factor coded below the top level has an 'explains' variable which indicates the factor number of the higher-level factor that it explains. There are thus only four variables in the factors dataset: participant ID, factor number, weight (definite, probable or none) and 'explains'.

Police Books dataset

This is essentially a cross reference between the accident number assigned by the team and the original police accident number. This cross reference was required for checking whether participants could be interviewed, for obtaining additional information such as the *RT7* from police files, and for the subsequent match with *STATS 19* (see below). The dataset also contains information on the results of blood and breath tests administered by the police.

STATS 19 dataset

This *STATS 19* data consists of the coded portions of the police record (the *RT7*s). The dataset used was that for the relevant five police subdivisions in 1988, as supplied by West Yorkshire Highways Engineering and Technical Services (*HETS*). It contained information at three levels: the accident level, the vehicle level (including driver or rider information), and the casualty level. Casualties were either linked to the vehicle in which they were passengers or in which they were riding, or, in the case of pedestrians, to the vehicle by which they were struck. The data tape had information on 1717 accidents, 2815 vehicles and 2178 casualties. After filtering out those accidents which occurred on roads with a speed limit greater than 40 mile/h the remaining data (1560 accidents) was matched with the accident data in the study sample. This was straightforward at the level of the accident, but complex at the level of the participant. Details are given in the main Technical Report. The matching process indicated some errors in the *STATS 19* data, the main type being an error in the age. Because of this, it was decided that in all the data analysis, interview information on age and sex should be used where it was available. *STATS 19* information on age and sex would only be used for those participants for whom interview data were not available.

The final number of *STATS 19* cases matched were 1980 vehicles and 453 pedestrians. This compares with the interview totals of 1991 drivers and riders and 463 pedestrians. In other words, virtually every participant in the sampled accidents was matched to a corresponding record in the *STATS 19* data. The shortfall can be explained by the omission of five accidents from *STATS 19* and by the occasional omission of a participant.

15 Appendix E
Glossary of contributory factors

Aggressive behaviour	Road user who maliciously attempts to impose his/her will on other road user(s), intending to force the other road user(s) to reduce the risks in the situation.
Being chased/scared	(other than panic). Includes chasing.
Bloodymindedness	
Brake defect	Fault or degradation in the braking system.
Braking suddenly reasonably	Where the reasonable road user would.
Braking suddenly unreasonably and sharply	Where the reasonable road user would not.
Dazzle/glare from sun	Sufficient to temporarily blind a road user.
Dazzle/glare from headlights	Sufficient to temporarily blind a road user.
Deliberate	Road user who attempts to precipitate an accident.
Did not see, type unknown	One of the following factors applied: – Failed to look, at all – Failed to look, partial – Looked but failed to see – Unable to see
Disability	
– hearing	Road user with partial or total, temporary or permanent, endogenous hearing problem.
– other	Road user with partial or total, temporary or permanent, endogenous problem, other than of sight or of hearing. (This would include a sudden cramp, for example.)
– sight	Road user with partial or total, temporary or permanent, endogenous sight problem.
Distraction	
– mental	Road user who is distracted from pertinent aspects of his/her situation, due to attention unduly focussed on other thoughts.
– physical, external	Driver/rider who is distracted from pertinent aspects of his/her situation or vehicle, due to attention unduly focussed on an aspect external to the vehicle.
– physical, internal	Driver/rider who is distracted from pertinent aspects of his/her situation or vehicle, due to attention unduly focussed on an aspect internal to, or of the vehicle. (This includes distraction due to passengers in/on vehicles.)

Distraction – physical, pedestrian	Pedestrian who is distracted from pertinent aspects of his/her situation, due to attention unduly focussed on any external cause.
Driving too fast for the situation	Exceeding the speed at which a reasonable driver/rider would have travelled given the circumstances.
Driving wrong way	Driving/riding on the wrong side of the road, or up a one-way carriageway the wrong way.
Encouragement	Receiving advice, support, or courage from another person (excluding playing 'chicken').
Erratic course	Any road user following an unpredictable course not resulting from loss of control. Does not include driving wrong way.
Failed to look, at all	Road user who fails to look in any directions in which the reasonable road user would have looked.
Failed to look, partial	Road user who fails to look in all directions in which the reasonable road user would have looked.
Failure to anticipate	Driver/rider or pedestrian who perceives a vehicle, person or object in their own carriageway or on the footpath too late to permit avoidance, and where the road user would normally have had right of way. The reasonable road user should have perceived it earlier (note this includes the situation where another vehicle turns into a major road in front of the vehicle concerned).
Failure to avoid	Insufficient or absent evading action once the likelihood of an accident occurring has been perceived (the reasonable driver should have been able to avoid).
Failure to put on lights	After dark or in poor visibility.
Failure to signal	Before undertaking any manoeuvre.
Failure to stop, pelican flashing orange	
Failure to stop, other control	(e.g. school crossing patrol or police person)
Failure to stop, red light	
Failure to stop, stop sign/line	
Failure to stop, zebra crossing	Not stopping for a pedestrian who has right of way on a zebra crossing. A pedestrian only has right of way when a reasonable driver could have stopped.
Failure to yield – changing lane	Whether marked, signed or not.
– minor into major	Whether marked, signed or not.

Failure to yield	
– no priority	At a junction where there are no marks or signs and there is no obvious priority.
– pedestrian to traffic poor crossing situation	Crossing at a place in the road where a reasonable pedestrian would be aware that it was dangerous. The reasonable pedestrian would choose to cross elsewhere.
– pedestrian to traffic reasonable crossing situation	Pedestrian stepping into path of vehicle and unreasonably obstructing it.
– pulling in	to the side of a road or into a driveway. Includes failure to yield to pedestrians on the footpath.
– pulling out	from the side of a road or from a driveway. Includes failure to yield to pedestrians on the footpath.
– turning left	Includes failing to yield to pedestrians crossing the road into which the vehicle is turning.
– turning right	Includes failing to yield to pedestrians crossing the road into which the vehicle is turning.
Fire	
Following too close	Road user following a vehicle with insufficient time to stop.
Foolhardy	Road user who, judging the situation correctly, attempts a risky action not believing an accident will occur.
Frustration	Only as a result of impatience with the traffic situation.
Impairment	
– alcohol	(Whether or not *OPL.)*
– drugs	Road user whose mental and/or motor abilities are adversely affected due to consumption of drugs (whether prescribed, illegal or other), or non-consumption of necessary drugs.
– emotional state of mind	(Includes mental illness.)
– fatigue	
– illness	(Excludes mental illness.)
In a hurry	A road user whose ability to use the road or pavement has been reduced by their motivation to get somewhere quickly.
In dangerous position	Pedestrian or stationary or barely moving vehicle at a location that endangers itself and/or other road users (does not apply to pedestrians crossing a road by a reasonably direct route). This category excludes manoeuvres defined elsewhere.

Inadequate crossing facilities for pedestrians	Crossing facilities for pedestrians which are absent, or, if present, are not working correctly or need to be upgraded. Crossing facilities include pedestrian refuges, zebra crossings, pelican crossings, pedestrian phase of traffic lights, police or school crossings, and subways or bridges over roads.
Inadequate road signs/ markings	A site where the signs and/or markings are faulty, non-existent, improper or wrongly placed.
Inadequate traffic lights	Traffic lights which are not working in part, or at all, or wrongly programmed signal settings (excluding pedestrian crossing facilities).
Inappropriate overtaking	Overtaking in a situation where the reasonable driver would not overtake.
Inexperience	
– driving	Road user who is unable to drive/ride reasonably due to lack of experience of driving/riding.
– of vehicle	Inexperience with the particular accident vehicle.
Insufficient parental control	A young road user whose guardian doesn't attempt to control the young road user to the degree expected of a reasonable guardian.
Lack of judgement	
– other	Road user who shows errors in judgement with regard to other aspects of the situation where the reasonable road user would not have done, and therefore fails to correctly assess the risks in the situation.
– path	Road user who shows errors in judgement with regard to the path of other road user(s) where the reasonable road user would not have done, and therefore fails to correctly assess the risks in the situation.
– speed/ distance	Road user who shows errors in judgement with regard to the speed or distance of other road user(s) where the reasonable road user would not have done, and therefore fails to correctly assess the risks in the situation.
Lack of motor skills	
– braking	Road user who shows lack of braking skills, where a reasonable road user would not.
– general	Road user who shows lack of general driving skills, where a reasonable road user would not.
– steering	Road user who shows lack of steering skills, where a reasonable road user would not.
Lack of preparedness	Road user who fails to adjust or clean their vehicle properly prior to or during driving/riding, or fails to ensure that their clothing is suitable for driving/riding.
Lack of/faulty guard rail	A faulty guard rail is either one that is damaged or one whose design makes it unsuitable.

Lights defect	One or more lights not in working order (other than lights too dim).
Lights inadequate	One or more lights too dim to be seen or too dim to light up the road (headlights).
Lights signal defect	One or more signals not in working order (other than signals too dim).
Load defective	Improperly secured or inappropriate load.
Looked but failed to see	Looked in one or more directions in which the reasonable road user would have looked, but having looked failed to see what the reasonable road user should have seen.
Loss of control/falling over	Sudden loss of adhesion, steering or stability.
Mechanical defects, motive power/drive train	Car does not respond properly to accelerator, clutch or gearbox.
Misinterpretation	
– layout	Misunderstood the true nature of the layout where the reasonable road user might be misled.
– other road users	Misunderstood the true intentions of other road users where the reasonable road user might be misled.
Misleading signalling	Doing something which the other road user would not expect you to do in the light of your signal (includes gestures, signs, signals, lights flashing, etc).
Misleading visual layout	A road layout with visual clues from the physical environment, excluding inadequate signs or markings, which might mislead the reasonable road user. This could include a deceptively sharp bend.
Nervousness	(related to the traffic situation.)
No Failure	A road user, for whom no factors are applicable – whether human, site or vehicle.
Obstruction/obscuration	
– load	Load such as to block vision of driver/rider.
– misted up	Interior of a window steamed up such that normal vision is obscured and which the reasonable driver would have cleared.
– moving vehicles	Moving vehicles such as to block vision of road user.
– other interior	Obstruction from some other person, object or animal in the interior such that normal vision is obscured and which the reasonable driver would have moved.
– pedestrian clothing/ equipment	Vision of pedestrian obscured by a piece of their own clothing or equipment.
– situation, building/ fence/wall	One or more buildings/fences/walls such as to block vision of road user.

Obstruction/obscuration	
– situation, moving vehicles	Moving vehicles such as to block vision of road user.
– situation, object in road	Object in road such as to block vision of road user.
– situation, parked vehicles	Parked vehicles such as to block vision or path of road user.
– situation, pedestrian	Pedestrian such as to block vision of road user.
– situation, spray	Road user vision hindered by spray.
– situation, stationary vehicles	Stationary vehicles such as to block vision of road user.
– situation, street furniture	Position of street furniture such as to block vision of road user.
– situation, vegetation	Vegetation such as to block vision of road user.
– situation, vertical/ horizontal curvature	Geometry of road surface such as to block vision of road user.
– situation, weather condition, fog/mist	Road user vision hindered by fog or mist.
– situation, weather condition, rain	Road user vision hindered by severe rain.
– situation, weather condition, snow/sleet/hail	Road user vision hindered by severe snow or sleet or hail.
– snow/ice on window	Sufficient snow or ice on a window such that normal vision is obscured and which the reasonable driver would have cleared.
Opening door	Opening a door where or when a reasonable person would not have.
Other	Top-level failure not otherwise specified.
Overall poor condition	Numerous faults such that vehicle required total overhaul to be put in safe condition or such that vehicle should have been scrapped.
Overconfidence	Road user who assesses the risk as lower than it really is.
Panic	Over- or under-reaction due to the fear of an apparently impending accident.
'Phantom'	A road user or object which, as a result of its presence or action, influences other road users to take an action which results in an accident. The 'phantom' is not directly involved in the accident.
Playing 'chicken'	A road user who challenges another road user to alter their path or speed by placing him/herself directly in their path, for reasons of gaming or amusement.
Poor banking/camber	Excessive camber or improper or inadequate banking.

Poor conspicuity of other road users	
Poor road/pavement surface	A road/pavement surface which is likely to deflect the paths of a driver/rider, or cause a pedestrian to stumble or fall.
Poor/absent street lighting	
Poorly carried out manoeuvre, turning	Turning in an inappropriate place or an appropriate place, but failing to carry it out properly (does not include failure to yield).
Poorly carried out manoeuvre, overtaking	Overtaking in an appropriate place, but failing to carry it out properly. Does not include failure to yield, changing lane.
Poorly positioned street furniture	Wrongly or dangerously positioned street furniture (excludes obscuration factors).
Reversing	Inappropriate or poorly executed.
Showing off	As a result of doing something meant to impress (excluding playing 'chicken').
Situational problem	Site where the reasonable road user would have difficulty.
Slippery road	
– flooding/water	Applies to road, pavement or verge.
– ice	Applies to road, pavement or verge.
– low skid resistance	Applies to road, pavement or verge.
– mud/gravel/loose stones/oil	Applies to road, pavement or verge.
– snow	Applies to road, pavement or verge.
– wet	Applies to road, pavement or verge.
Steep hills	(not including obscuration factors).
Steering defect	
Thoughtlessness	
Total electrical failure	If this results in a lighting, signal, braking, or motive power failure this also should be noted if relevant.
Turn/manoeuvre from Wrong Lane	Turning off a road from the wrong lane.
Tyre	
– lack of tread	
– wrong pressures	

Tyre deflation before impact	Sudden loss of air pressure that occurred prior to accident.
U-Turn	Inappropriate or poorly executed. Includes three-point turns.
Unable to anticipate	Driver/rider or pedestrian who perceives a vehicle, person or object in their own carriageway or on the footpath too late to permit avoidance, and where the driver/rider would normally have had right of way. The reasonable road user would also have been unable to anticipate (note this includes the situation where another vehicle turns into a major road in front of the vehicle concerned).
Unable to see	The reasonable road user would not have seen.
Unfamiliar road environment	A road user who encountered a road environment of which they have little or no experience and which prevents them from acting safely.
Unknown (top level)	Road user for whom we do not have enough information to code failures or no failure.
Unknown (3rd level)	Road user whose actions we are unable to explain.
Unknown (4th level)	Road user whose actions we are unable to explain.
Vehicle failure	Non-collision event, in which a vehicle failure such as a fire causes injury to an occupant or rider.
Weather condition (general)	(factors other than obscuration or road surface factors.)
Windscreen defective	Break or permanent mark on windscreen such that vision is obscured, or complete absence of windscreen.
Wipers not working	

£100.00

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