TRANSPORT RESEARCH LABORATORY

A new system for recording contributory factors in road accidents

Prepared for Road Safety Division, Department of the Environment, Transport and the Regions

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Executive Summary

The present national system for collecting information about road accidents was established in 1949, and is still known as the STATS19 system after the standard reporting form. The data collected have proved invaluable in monitoring accident trends and developing new measures to improve road safety. One important reason for this is that accident data are collected in a consistent way in all parts of Great Britain, so local data can be brought together in a national database.

In addition to objective factors such as time of day and speed limit, the original system also collected 'contributory factors', i.e. the factors which the reporting officer considered had contributed to the causation of the accident. Subsequent doubts over the reliability of the factors being collected meant that collection of these data ceased to be a national requirement in 1959. Nevertheless, in 1994 a TRL survey of the 43 police forces in England and Wales found that over one half were still recording contributory factors, but the systems being used had diverged over time so that patterns of accident causation in different areas could not be compared.

The contributory factors summarise the events and influences which led directly to an accident. The information is inevitably subjective as it depends upon the investigator's 'reconstruction' of the circumstances leading up to the accident from the available evidence. The information can suggest possible interventions and remedial measures which could have prevented the individual accident, and measures for improving road safety can be developed by studying the factors for large numbers of accidents. The fact that many police forces continue to record contributory factors so long after the national requirement ended provides one indication of the local value of this information at a time when road safety has assumed greater prominence.

The information has been mainly used by the Local Authorities, for example in developing remedial measures at accident blackspots and for road safety publicity. Its value would be greatly enhanced, however, if the factors could be recorded in a consistent way by all forces, and assembled into a database closely linked to the national STATS19 database. Accordingly, the then Department of Transport (now DETR) commissioned the Transport Research Laboratory to develop a prototype system. This report describes the development of a system that could be used by the police. It also describes the trial of the scheme that was carried out by eight police forces for three months in the summer of 1996, and presents analyses of the data collected.

There were various objectives in developing the new system. It had to be simple to use yet sufficiently comprehensive to accommodate the great majority of road accidents within a standard set of codes. Many police officers attend only one or two accidents per year, so it should be self-explanatory and not require extensive training or documentation. Equally importantly, its design should encourage the collection of high quality data.

The following approach to accident investigation was adopted in order to optimise the overall quality of the data collected:

1 ascertain the critical failure or manoeuvre which led up to the accident (referred to as the Precipitating Factor) and record it using the appropriate code,

2 from the evidence available, identify the factors which contributed to this failure or manoeuvre (there may be more than one of these Contributory Factors) and record them using the appropriate codes.

Two lists were drawn up, one consisting of 15 Precipitating Factors and the other of 54 Contributory Factors. As the identification of Contributory Factors in an accident tends to be relatively subjective, depending upon the experience of the investigator and the strength of the evidence, investigators were asked to code each factor as either Definite, Probable or Possible.

The eight police forces which cooperated in the trial represented all parts of Great Britain and all types of roads: two forces had not been recording contributory factors routinely. The trial thus provided a rigorous test of the new system. TRL staff made a single visit to each force to brief key personnel about the new system: these were then responsible for briefing the officers who would attend accidents during the trial. According to responses received from the participating police officers, few problems were encountered when using the new system. 2897 coding forms were returned to TRL, only 102 of these had not been completed satisfactorily.

The report presents various analyses of the contributory factors that had been recorded. In addition, the forms have been linked to the regular STATS19 reports for those accidents whose details had reached the national database by November 1996 (if in future a police force uses the system to record contributory factors routinely then the link would be made automatically in its accident database), and analyses of the linked data are also presented.

A system capable of recording contributory factors for every conceivable type of accident would be unmanageably large. In order to judge whether the new system provides a satisfactory compromise between completeness and ease-of use, investigating officers who were unable to choose an appropriate code were asked to enter 'other' and supply full details. Analysis of these details suggests that only a few minor adjustments to the factor lists are required. This 'other' facility also provided a means of recording valuable non-standard information, such as that two of the accidents resulted from suicide attempts, so the facility could be a useful feature of a future implementation of the new system.

The value of STATS19 accident information to Local Authorities and the Department of Transport (now DETR) in attempting to improve road safety has been widely recognised for many years, but its potential contribution to the effective management of traffic policing has received less attention. This report shows that the STATS19 information augmented by the contributory factors

collected with the new system can be entered and stored by the police using the MAAP5 software mounted on a PC, and that it can be analysed to guide deployment of police resources in support of the National Road Policing Strategy adopted by the Association of Chief Police Officers of England, Wales and Northern Ireland (ACPO). This approach was adopted by the Cleveland Constabulary in January 1997 and represents a further test of the new system for recording contributory factors, but it is too early to evaluate the results achieved. In addition to the benefits to the police, the enhanced data will be useful to the Local Authorities for developing remedial measures.

1 Introduction

The present national system for collecting information about road accidents was established in 1949. It has been reviewed and modernised periodically over the subsequent half century, but is still known as the STATS19 system after the original standard reporting form of 1949. The data collected have proved invaluable in monitoring accident trends and developing new measures to improve road safety. One important reason for this is that accident details are collected in a consistent way in all parts of Great Britain, so that data from individual forces can be brought together in a national database.

In addition to objective factors such as time of day and speed limit, the original system also collected 'contributory factors', i.e. the factors which the reporting officer considered had contributed to the causation of the accident. Such subjective information is valuable in deciding how to prevent further accidents, but in 1959 doubts over the reliability of the information being collected led to the termination of its collection on the national scale. Several forces subsequently ceased to record contributory factors, but in 1994 a TRL survey of the 43 police forces in England and Wales found that over one half were still collecting these data. The systems being used had diverged over time, however, so it was very difficult to compare directly the patterns of causation in different areas.

The fact that many forces still record contributory factors so long after the national requirement ended provides one indication of the local value of this information at a time when road safety has assumed greater prominence. Its value would be greatly enhanced, however, if the factors could be recorded in a consistent way by all forces, and assembled into a database closely linked to the national STATS19 database. Accordingly, the then Department of Transport (now DETR) commissioned the Transport Research Laboratory to develop a prototype system and test it 'in the field' with a number of police forces.

There were various objectives in developing the new system. It had to be sufficiently comprehensive to accommodate the great majority of road accidents within a standard set of codes, while being simple to use. Many police officers attend only one or two accidents per year, so it should be self-explanatory and not require extensive training or documentation. Equally importantly, its design should encourage the collection of high quality data.

This report describes the work that has been carried out. Section 2 describes the development of a system for recording contributory factors which could be used by police officers. Section 3 describes a test of the new system that was conducted with eight police forces over three months in the summer of 1996 to establish how well the objectives of the new system had been attained. The contributory factors recorded during the trial have been analysed and Section 4 presents a variety of results.

Section 5 presents a police perspective: it has been contributed by Superintendent David Rowe, who joined the Department of Transport in 1994 as its Police Liaison Officer, following a career with the Sussex Police Force during which he commanded their Traffic Division. It considers the role of contributory factor information in guiding police operations and summarises the views expressed by the police officers who used the new system. Finally, Section 6 brings together the main conclusions which can be drawn from this project.

2 Recording contributory factors in accidents

2.1 Accident causation

Road accidents are the visible tip of an 'iceberg' of failures in the enormous daily volume of interaction between the human beings who use the highway system and the environment in which they travel. Most failures have no serious outcome and consequently go unrecorded. When, for example, a pedestrian runs across a road without looking out for the traffic but an oncoming car is able to brake in time to avoid him, a failure has occurred but the consequences are trivial. If, however, the driver had not reacted in time, perhaps because of driving at an excessive speed, the same failure by the pedestrian would have led to him being injured or killed - the consequences of the pedestrian's actions depend in this example upon chance and the reactions of others. An accident is generally the result of a sequence of actions and events, and may well not have occurred if any of these had developed differently. The complexity of the interaction complicates the study of accident causation, for subtle changes can have major consequences - such as converting a trivial incident into a potentially fatal accident in the example of the pedestrian. Many accidents and most injury accidents have more than one cause.

Various other factors also complicate the design of a system for recording details of accident causation. The range of accident types is almost boundless because of the complexity of the highway environment and of road users' behaviour, and this makes it difficult to devise an efficient yet comprehensive system of classification. Virtually the only factor that road accidents have in common is that all would have been avoided if those involved had known with certainty, a few seconds in advance, that an accident was about to occur. Moreover, it is sometimes hard to obtain a reliable account of the events leading up to an accident from those who were involved.

In spite of these difficulties, the TRL survey in 1994 found that more than half of the police forces in England and Wales still had systems for recording contributory factors. Nevertheless, the survey also found that most systems had developed rather haphazardly from the national system which was used in the 1950's so that none offered a satisfactory model for a potential national system.

2.2 Developing the contributory factor list

2.2.1 Initial development of the system

Much of the preliminary development of the contributory factor list was carried out in 1995 in the course of a TRL research project entitled 'In-car equipment to help drivers

avoid accidents'. Extensive samples of accident reports were examined to identify the factors which commonly lead to car accidents, in order to specify the functionality required from novel driver support systems which might realistically have helped the drivers to avoid these accidents. The project report (Broughton and Markey, 1996) describes that development in detail, this section brings together the key aspects.

First, the systems used in previous studies of accident causation in Great Britain and other European countries were reviewed, together with the information from the TRL review already mentioned. The lists of factors from these sources were combined, merging items from different lists with the same apparent intention. Items which were likely to appear only infrequently in actual accidents were dropped because of the need for a compact system; moreover, their rarity meant that they could not have influenced the overall conclusions of the project. Instead, 'other' codes were provided to accommodate cases not covered by the final lists of factors.

The new lists were then revised iteratively. An important conclusion reached at an early stage was that, following the example of a study carried out at Leeds University (Carsten et al, 1989), a hierarchy of factors was needed so that *what* happened could be distinguished from *why* it happened. This provides a structure for the accident investigation:

1 ascertain the critical failures which led up to the accident (there may be more than one),

2 consider each failure in turn, and attempt to identify its causes (again, there may be more than one cause per failure).

The hierarchical approach allows the same factors to be recorded as the more traditional single tier approach, but was expected to impose a discipline upon the investigator which would lead to more reliable coding of causation factors. This was found to be the case when the list was piloted and, more importantly, when it was used in earnest in the course of the project.

Another advantage of the hierarchical approach over the single tier approach is that it is more logical, as the example of 'fatigue' demonstrates. Fatigue cannot of itself *cause* an accident, since every day many drivers are fatigued but manage to avoid becoming involved in accidents. However, fatigue can lead a driver to act mistakenly in situations where he would have acted correctly if he had been feeling fresh and alert, so it is important to link fatigue to the critical failure that appears to have been its result. The greater logic of the hierarchical approach should lead to more reliable coding, as the investigator can only enter fatigue as a causation factor if it can be linked to a specific failure; with a single tier approach, only a general suspicion that fatigue was somehow involved would be sufficient.

The four-level hierarchy used in the Leeds study was felt, however, to be unnecessarily complex, and a two-level hierarchy was developed, using the following terminology:

Precipitating Factors are the failures and manoeuvres that immediately led to the accident,

Contributory Factors are the causes for these failures and manoeuvres, so when a Contributory Factor is recorded, it relates to a Precipitating Factor that has already been recorded.

There could be up to three Precipitating Factors, and up to three Contributory Factors per Precipitating Factor. Factors were entered in decreasing order of importance.

Example

The following example should help to explain these terms. An accident occurs when car 1 pulls out of a minor road into the path of car 2 travelling on a major road, and is hit by car 2. The Precipitating Factor is 'Failed to give way': if driver 1 had acted properly the accident would not have occurred. When the reasons for driver 1's failure are examined, the Contributory Factors are found to be 'Impairment - Alcohol' (primary) and 'Disability' (secondary).

The coding system was used with considerable success in the actual study of accident reports. The work was carried out by a group of administrative staff who had no previous experience of coding accident data but, following a short briefing, they quickly grasped its principles. A sample of their codes were subsequently reviewed, and this confirmed that they were applying the system correctly.

2.2.2 Further development of the system

Although the system was developed for use in scientific research, it appeared to have the potential to be developed for use by the police. The first stage of this development consisted of collecting samples of police accident reports and checking to see whether a system which had been designed for studying car accidents was generally applicable. It was then developed further in consultation with police officers until a version was achieved in early 1996 that was suitable for large-scale trial.

The form used in the trial is shown in Figure 1. One form is completed *per accident*, so it relates to the main failure or manoeuvre which led to the accident, and the person responsible. The form is designed for use in conjunction with the STATS19 form, so it omits information that will be entered on the STATS19 form. Completed forms were returned directly to TRL when the new system was tested by the police, as described in Section 3, so the date and accident reference were needed to make the link subsequently with the corresponding STATS19 information; if a police force used the system to record contributory factors routinely then the link would be made automatically in its accident database. It will be seen in Section 4 that the full value of the contributory factors can only be derived through this link.

The changes made while developing the form were generally minor, but there were three more major changes:

i only one Precipitating Factor is entered per accident: very few of the accidents studied in the earlier project had more than one, and the form design is simplified by having only one

Accident Causation Coding Pilot

WHAT WENT WRONG? (Precipitating Factors)

FAILURES OF DRIVER or RIDER

1 Failed to stop (mandatory sign)
2 Failed to give way
3 Failed to avoid pedestrian (pedestrian not to blame
4 Failed to avoid vehicle or object in carriageway
5 Failure to signal/misleading signal
6 Loss of control of vehicle

FAILURES OF PEDESTRIAN or PASSENGER

7 Pedestrian entered carriageway without due care (driver/rider not to blame)
8 Passenger fell in or near PSV

MANOEUVRES

9 Swerved to avoid object in carriageway
10 Sudden braking
11 Poor turn/manoeuvre
12 Poor overtaking
13 Drove wrong way (e.g. 1-way street)
14 Opening door carelessly

15 OTHER (please supply details)

WHY? (Causation Factors)

PERSONAL DETAILS

1	Impairment	alcohol
2		drugs
3		fatigue
4		illness
5	Distraction	stress/emotional state of mind
6		physical in/on vehicle
7		physical outside vehicle
8	Behaviour	panic
9		careless/thoughtless/reckless
10		nervous/uncertain
11		in a hurry

12 Failure to judge other person's path or speed
13 Disability
14 Failed to look
15 Looked but did not see
16 Inattention
17 Person hit wore dark or inconspicuous clothing
18 OTHER (please supply details)

PEDESTRIAN DETAILS

19 Crossed from behind parked vehicle etc.
20 Ignored lights at crossing

DRIVER DETAILS

21 Excessive Speed
22 Following too close

23	Inexperience	of driving
24		of vehicle

25 Interaction or competition with other road users
26 Aggressive driving
27 Lack of judgement of own path

VEHICLE DEFECTS

28	Tyres	wrong pressure
29		deflation before impact
30		worn/insufficient tread

31 Defective lights or signals
32 Defective brakes
33 OTHER (please supply details)

LOCAL CONDITIONS

34	Site details	poor road surface
35		poor/no street lighting
36		inadequate signing
37		steep hill
38		narrow road
39		bend/winding road
40		roadworks

41 Slippery road
42 High winds
43 Earlier accident
44 OTHER (please supply details)

OBSCURATION

45	View	windows obscured
46		glare from sun
47		glare from headlights
48	Surroundings	bend/winding road
49		stationary or parked vehicle
50		moving vehicle
51		buildings, fences, vegetation etc.

52 Weather (e.g. mist or sleet)
53 Failed to see pedestrian or vehicle in blindspot

ANIMAL INVOLVEMENT

54 Animal out of control

Accident Ref | Date / / 1996

PF | V/C | Ref | CF1 | CF2 | CF3 | CF4

Notes: Only enter codes for the person who has a PF, with the Stats19 Vehicle Ref for a driver or rider
the Stats19 Casualty Ref for a pedestrian or passenger
PF is the Precipitating Factor, CF1 is the most important Causation Factor
Show confidence in CF codes by A=Definite, B=Probable, C=Possible

Enter details of any OTHER factors (PF 15, CF 18, 33, 44) here

PF or CF V/C | Ref | Details

PF or CF V/C | Ref | Details

Figure 1 Form tested in the Accident Causation pilot

ii a system for recording 'Other' details was introduced to check on the completeness of the coverage of the form and to allow emergent types of accident (e.g. accidents associated with mobile phones and other fairly new types of in-vehicle technology) to be entered

iii the quality of information available to the reporting officer varies from accident to accident, so he or she will have greater confidence in some codes than in others: this applies particularly with Contributory Factors and each is entered as Definite, Probable or Possible.

The main part of the form consists of the list of Precipitating and Contributory Factors. At present, some forces which record contributory factors include the full list of factors in their accident report form, while others supply the list via the supporting documentation, either approach would be appropriate for the new system. The minimum requirement when redesigning a current police accident report form to incorporate the new system would be to add the first line of boxes at the bottom of the form shown in Figure 1; the second and third lines would only be added if it was decided to record 'other' data on a regular basis.

The Introduction pointed out that the coding system represents a compromise between various competing objectives: in particular, it should be concise in order to be easy for the police to complete, yet comprehensive so that the information collected is of great value. Being a pragmatic compromise, the system does not depend upon any particular psychological theory: the critical test is whether it works in practice and yields useful information. The next section describes a practical application of the system by the police.

When the original system was developed, as described in Section 2.2.1, the term 'Causation Factor' was adopted for the causes identified for the Precipitating Factors. This term was used during the pilot, as shown in Figure 1, but when the experience of the pilot was reviewed it was decided that the term was too definite and failed to take account of the practical difficulties of establishing why these failures and manoeuvres occurred. Instead, the more neutral term 'Contributory Factor' was adopted, and is used throughout this report.

3 Trial of the new recording system

Eight police forces agreed to participate in a three month trial of the new recording system during the summer of 1996. The force areas encompass a full cross-section of road types, including motorways and urban and rural roads, and were drawn from all parts of Great Britain, so the new system was tested rigorously. The forces were:

North Wales	entire force
Essex	traffic division
Dorset	traffic division
Staffordshire	traffic division
Greater Manchester	all officers in Stockport division
Metropolitan Police	No. 2 Area North West traffic division
Durham	traffic division
Lothian & Borders	West Lothian division

Contributory factors were not collected routinely in North Wales and Essex. The other forces did record these factors, and continued to operate their existing systems in parallel with the new system during the trial.

Each force was visited by a member of the TRL project team and Supt. David Rowe during the Spring. The purpose of this visit was to identify a contact in each police force and to brief senior officers about the research and explain the new system.

Each force selected a group of officers to attend the briefings, ranging from the officers in charge of each traffic division in North Wales to the single officer responsible for coordinating the trial for the Metropolitan Police. Those officers attending the briefings had the responsibility of disseminating the information throughout that part of their force which was taking part in the trial. Guidance notes were available to them, some forces used these unaltered while others wrote their own briefing notes.

The method of completing the new coding form was explained by presenting various accident scenarios and then identifying which party was most at fault in the accident, what actually happened (the Precipitating Factor) and why it happened (the Contributory Factors). A glossary which explained some of the Factors and gave further examples of when they should be used was available if required.

Each force agreed that all injury accident report forms completed during the trial should be accompanied by a coding form, and that an accident report form would be returned to the investigating officer if no coding form was attached. Thus, provided that each coding form was completed satisfactorily with a correct accident reference number, it should eventually be possible to match all forms returned to TRL with STATS19 accident records received via the Department of the Environment, Transport and the Regions.

The operational methods in place within the Metropolitan Police Force meant that it would have been very difficult and time-consuming for them to identify the STATS19 accident reference number. It was decided that this force would add the time and grid reference of the accident instead, along with a text description of where the accident happened, e.g. the junction of Totteridge Lane with Longland Drive, N20.

The issue of quality control of the coding forms was left to each individual police force. The relatively small number of accidents in West Lothian meant that the officer directing the trial for that force was able to check that a form was filled in for each accident and to ensure that the information provided on the coding form agreed with the text description of the accident submitted by the officer attending. This level of checking was not feasible for forces with larger numbers of accidents.

At the end of the trial, 2897 accident causation coding forms had been returned to TRL, where they were entered into a database. Of these, less than four per cent (102) were

not completed to a standard that could be used for analysis purposes. The reasons for this varied from having no or more than one Precipitating Factor to Precipitating Factor 15 ('Other') being selected but no details of why it was chosen given. It was possible to obtain extra information about some accidents by contacting the police, but this was not usually feasible.

4 Statistical analysis of data collected

The contributory factor data are complex: there are Precipitating and Contributory Factors, the Contributory Factors are recorded as being of primary importance, secondary importance etc. with three levels of confidence in these factors. Further analyses become possible once these data have been matched with the corresponding STATS19 accident records. Of the wide range of potential analyses, those presented below will:

- provide an overview of the factors recorded during the trial (Section 4.1),
- investigate the consistency between forces in the factors recorded (Section 4.2),
- compare Contributory Factors according to the confidence levels (Section 4.3).
- compare Contributory Factors with results of previous TRL studies (Section 4.4).
- analyse the use of the 'Other' codes on the trial form to see whether any expansion of the lists of factors might be justified (Section 4.5).

These analyses are based on the full set of data collected during the trial. The contributory factor recording system is designed to complement the existing STATS19 system for accident reporting, however, and Section 4.6 presents analyses of the combined data sets.

4.1 Overview

Table 1 presents the reported Precipitating Factors in diminishing order, both by individual forces and collectively. There should be one factor per accident, so the final line also indicates the number of accidents investigated during the trial by each cooperating force. Two of the fifteen Precipitating Factors account for over 20 per cent of the factors recorded ('Loss of control of vehicle' and 'Failed to avoid vehicle/object in carriageway'). Another three accounted for 10-19 per cent ('Failed to give way', 'Pedestrian enters carriageway without due care' and 'Poor turn/manoeuvre'). Three others account for under 1 per cent.

Figure 2 presents percentages from the Table, including only the six commonest Precipitating Factors for clarity. The distributions show a reasonable degree of consistency between forces, but the different traffic conditions in the various force areas inevitably lead to differences between the distributions of factors. For example, the high level of bus patronage in London and Manchester is reflected in the relative level of factor 8 (passenger fell in or near PSV) in these areas, and the relatively low incidence of factor 6 (loss of control) is probably a consequence of lower speeds in congested urban areas.

Table 2 (on p9) now presents the recorded Contributory Factors in diminishing order. The first pair of columns of results relate to all factors, while the second relate to only those factors which were recorded as Definite. These confidence levels are considered in more detail in Section 4.3, but it is already clear that results may differ when only factors marked as Definite are included.

As there are 54 Contributory Factors, the long 'tail' of the distribution is to be expected: only 20 factors account for more than 1 per cent of the factors recorded. The six most frequent factors account together for 55 per cent of recorded factors.

Table 1 Incidence of Precipitating Factors, by police force

Code	*Description*	*N Wales*	*Essex*	*Dorset*	*Staffs*	*G Man*	*Met*	*Durham*	*L & B*	*Total*
6	Loss of control of vehicle	20.5	25.6	23.0	27.5	16.9	15.7	22.9	18.8	22.6
4	Failed to avoid vehicle/object in carriageway	21.7	21.6	18.7	25.0	28.5	27.5	17.8	16.8	22.0
2	Failed to give way	14.0	12.0	14.7	13.5	13.0	11.8	15.0	21.8	13.5
7	Pedestrian enters carriageway without due care	12.2	9.0	9.0	7.4	13.0	9.6	12.6	21.8	10.7
11	Poor turn/manoeuvre	8.1	12.9	11.0	7.8	8.7	14.6	11.2	10.9	10.7
12	Poor overtaking	6.2	3.4	7.3	7.0	1.9	1.7	4.7	2.0	4.6
10	Sudden braking	3.2	5.3	7.0	1.6	6.3	1.7	2.8	3.0	4.2
3	Failed to avoid pedestrian	4.6	2.5	1.0	0.4	2.9	3.9	1.4	1.0	2.6
15	OTHER	1.8	3.2	1.3	0.8	1.4	2.8	6.5	1.0	2.5
1	Failed to stop	3.0	1.5	2.7	4.5	3.9	3.4	1.4	0.0	2.5
9	Swerved to avoid object in carriageway	2.3	1.5	2.0	1.2	0.0	0.6	1.4	1.0	1.5
5	Failure to signal/misleading signal	0.8	0.2	1.0	2.0	2.4	2.8	0.9	0.0	1.0
13	Drove wrong way	0.5	0.6	0.3	0.8	0.0	0.0	0.0	2.0	0.5
14	Opened door carelessly	0.9	0.4	0.0	0.4	0.0	1.1	0.0	0.0	0.5
8	Passenger fell in or near PSV	0.3	0.2	0.3	0.0	1.0	2.8	0.0	0.0	0.4
n/k		0.0	0.2	0.7	0.0	0.0	0.0	1.4	0.0	0.3
Number of factors reported		658	893	300	244	207	178	214	101	2795

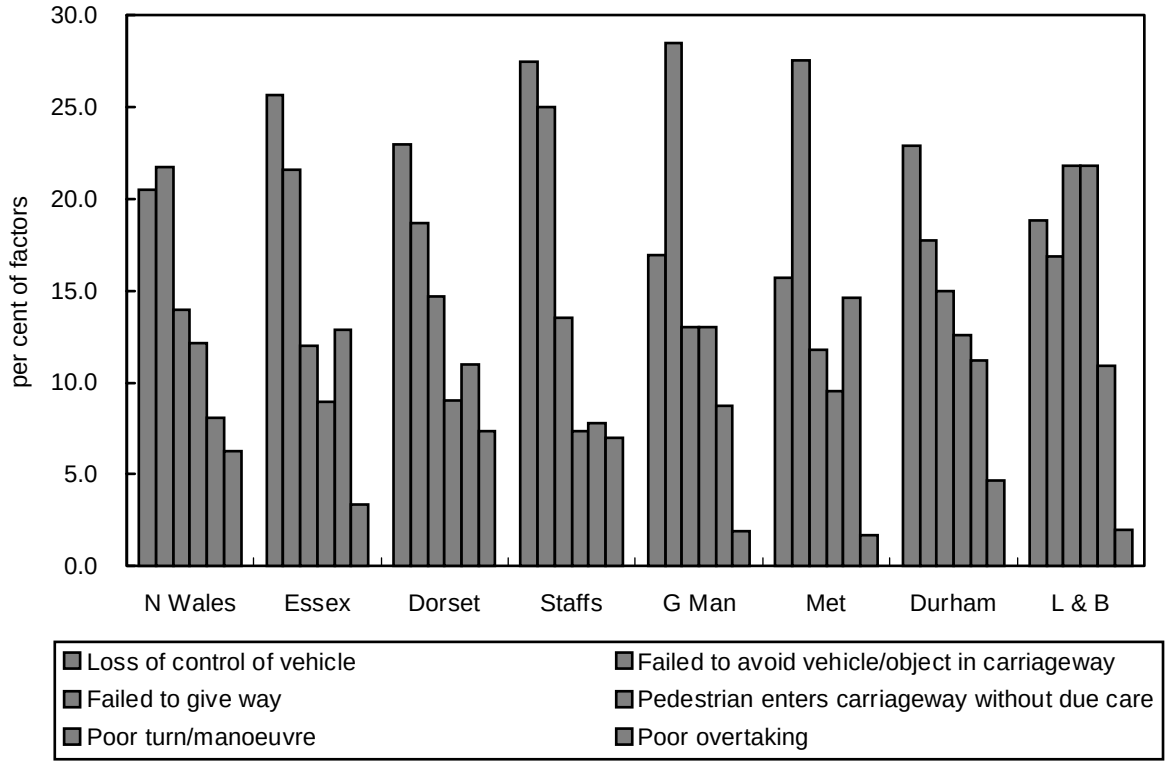

Figure 2 Six commonest Precipitating Factors, by police force

Both the Precipitating and Contributory Factors recorded for an accident need to be studied in combination to fully characterise the accident. Table 3 (on p10) lists the twelve combinations of Precipitating and Primary Contributory Factors which occur more than 50 times in the data collected during the trial.

These twelve combinations account for 1002 of the 2795 accidents (35.8 per cent).

The analysis in Table 3 is only a first step in investigating this aspect of the data, similar tables could be constructed for secondary factors, or Definite factors, for example. Another aspect which can be examined is whether particular Precipitating Factors tend to be associated with particular Contributory Factors. Some are rather predictable, for example 'Crossed from behind parked vehicle' tends to occur with 'Pedestrian entered carriageway without due care' and 'Impairment - alcohol' tends to occur with 'Loss of control of vehicle'. On the other hand, 'Loss of control of vehicle' occurs rather infrequently in conjunction with 'Behaviour - careless/thoughtless/reckless'.

4.2 Consistency between forces

One major reason for advocating a national system for recording Contributory Factors is the degree of inconsistency that has been found between the factors recorded by different forces which use similar reporting systems in similar conditions. For example, a recent TRL study compared the factors recorded over three years by two forces operating in predominantly rural areas, using broadly similar lists of factors. When considering those STATS19 accidents which involved no injured pedestrians, the following major discrepancies were found:

Primary Contributory Factor	*Percentage of accidents recorded:* *by Force A*	*by Force B*
Driver distracted	23	1
Excessive speed	19	5
Emerging from minor road without care	13	3
Wrong course or position	2	15
Slippery road	2	14

Minor differences must be expected because of differing local circumstances, but the existence of such large discrepancies casts doubt upon the data from at least one of the forces. This section will examine the consistency of the data collected during the trial.

Table 1 has already presented the distribution of Precipitating Factors by police force. Table 4 (on p10) presents the corresponding distribution of Contributory Factors, taking only the fifteen commonest and grouping the remainder as 'Other'. This Table does not distinguish between primary factors, secondary factors etc., more detailed tables are presented below. Figure 3 presents the percentages from Table 4 for the six commonest Contributory Factors.

Table 5 (on p11) shows the number of Contributory Factors per accident reported by each police force. Only one factor was recorded for about one third of accidents, and two for another third; there is good consistency between forces, although the North Wales police tended to record more factors per accident than other forces.

Tables 6a, 6b, 6c and 6d (on p11) develop Table 4, taking the same fifteen factors and presenting their incidence when they appear as the first, second, third or fourth factor recorded. Note that each table is sorted according to the overall incidence of the factors, so that

Table 2 Overall incidence of Contributory Factors

		All factors		*Definite factors*	
Code	*Description*	*Number*	*%*	*Number*	*%*
12	Failure to judge other person's path or speed	623	10.7	218	10.3
9	Behaviour - careless/ thoughtless/reckless	513	8.8	210	10.0
16	Inattention	465	8.0	130	6.2
15	Looked but did not see	436	7.5	149	7.1
21	Excessive speed	424	7.3	126	6.0
27	Lack of judgment of own path	369	6.3	101	4.8
14	Failed to look	365	6.2	133	6.3
22	Following too close	238	4.1	74	3.5
1	Impairment - alcohol	222	3.8	118	5.6
41	Slippery road	175	3.0	70	3.3
23	Inexperience - of driving	163	2.8	54	2.6
11	Behaviour - in a hurry	157	2.7	44	2.1
39	Site details - bend/ winding road	131	2.2	59	2.8
49	Surroundings - stationary or parked vehicle	112	1.9	52	2.5
19	Crossed from behind parked vehicle, etc	105	1.8	70	3.3
48	Surroundings - bend/ winding road	104	1.8	52	2.5
8	Behaviour - panic	91	1.6	27	1.3
26	Aggressive driving	80	1.4	18	0.9
10	Behaviour - nervous/uncertain	69	1.2	16	0.8
18	OTHER (Personal)	64	1.1	31	1.5
4	Impairment - illness	58	1.0	29	1.4
7	Distraction - physical outside vehicle	57	1.0	22	1.0
51	Surroundings - buildings, fences, vegetation etc.	56	1.0	25	1.2
53	Failed to see pedestrian or vehicle in blindspot	56	1.0	21	1.0
46	View - glare from the sun	55	0.9	7	0.3
3	Impairment - fatigue	48	0.8	21	1.0
52	Weather (e.g. mist or sleet)	45	0.8	14	0.7
6	Distraction - physical in/on vehicle	45	0.8	21	1.0
38	Site details - narrow road	41	0.7	24	1.1
5	Distraction - stress/ emotional state of mind	39	0.7	14	0.7
24	Inexperience - of vehicle	37	0.6	12	0.6
50	Surroundings - moving vehicle	31	0.5	10	0.5
54	Animal out of control	29	0.5	14	0.7
37	Site details - steep hill	28	0.5	14	0.7
33	OTHER (Vehicle defects)	26	0.4	8	0.4
29	Tyres - deflation before impact	26	0.4	9	0.4
30	Tyres - worn / insufficient tread	26	0.4	11	0.5
44	OTHER (Local conditions)	24	0.4	11	0.5
34	Site details - poor road surface	23	0.4	7	0.3
40	Site details - roadworks	23	0.4	10	0.5
25	Interaction or competition with other road users	23	0.4	5	0.2
32	Defective brakes	22	0.4	8	0.4
36	Site details - inadequate signing	17	0.3	5	0.2
2	Impairment - drugs	17	0.3	6	0.3
20	Ignored lights at crossing	15	0.3	6	0.3
17	Person hit wore dark or inconspicuous clothing	15	0.3	7	0.3
13	Disability	14	0.2	4	0.2
35	Site details - poor/no street lighting	14	0.2	2	0.1
28	Tyres - wrong pressure	9	0.2	1	0.0
45	View - windows obscured	6	0.1	1	0.0
42	High winds	6	0.1	1	0.0
31	Defective lights or signals	5	0.1	3	0.1
43	Earlier accident	4	0.1	2	0.1
47	View - glare from headlights	1	0.0	0	0.0
Number of Factors reported		5847	100.0	2107	100.0

factor 12 is the most common of the first factors (Table 6a) but appears in the second position in the distribution of second factors (Table 6b) and in lower positions in Tables 6c and 6d for the third and fourth factors. The consistency of ranking between forces is surprisingly good.

The tables show a reasonable level of consistency, certainly much better than that found in the comparison of Forces A and B quoted above. There are, however, some significant differences, and one of the most interesting is factor 1 (Alcohol) whose overall incidence (Table 4) varies between 0.5 per cent in Lothian & Borders and 5.6 per cent in Durham. Overall, the level of consistency is probably acceptable, and could only have been improved upon by a much more intensive briefing of the police officers involved in the trial.

4.3 Confidence levels

Reporting officers were asked to indicate their confidence in the Contributory Factors that were selected: either Definite, Probable or Possible. This was not done with Precipitating Factors because it was felt that identifying *what* had gone wrong immediately before an accident was likely to cause fewer problems that understanding *why*, and experience with the trial has tended to confirm this decision.

The intention of this feature is to recognise the subjective nature of the Contributory Factors recorded, and to allow subsequent analysis to concentrate on the more reliable data. This section will check whether the distribution of the Definite, Probable and Possible factors show any differences, for there would be little point in persisting with this feature in any regular reporting system if they did not.

Table 7a (on p12) shows how the level of confidence tends to fall with the secondary factors. Almost one half of the primary factors are Definite, falling to a quarter of the fourth factors; less than one tenth of the primary factors are Possible, rising to one third of the fourth factors. This pattern reflects an intelligent use of the system by reporting officers. The fact that about one fifth of factors have no confidence level suggests that the description of what is required may need to be improved. There was some variation between forces in the recording of confidence levels, ranging from 0 per cent of factors in Dorset with no confidence level to 27 per cent in North Wales.

Table 7b considers the fifteen commonest Contributory Factors. Each row shows the percentage of all factors at a particular confidence level that are code 12, code 9 etc. Thus, 10.3 per cent of Definite factors are code 12, 11.8 per cent of Probable factors and 9.9 per cent of Possible. The Definite factors should be the most reliable, and the **bold** figures identify those percentages for the non-Definite factors which differ significantly from the percentages for these factors (i.e. the probability of the difference arising by chance is less than 1-in-20). There are many such differences, in particular alcohol (factor 1) occurs almost twice as often as a Definite factor as with a lower level of confidence. Table 7c repeats the analysis of Table 7b, but is restricted to Primary Contributory Factors; it differs in detail but confirms that results based on Definite factors will often differ from results based on data which include factors with lower confidence levels.

Table 3 Commonest pairings of Precipitating and Primary Contributory Factors

Number of accidents	*Percent of all accidents*	*Precipitating Factor*	*Primary Contributory Factor*
126	4.50	Failed to avoid vehicle or object	Failure to judge other's path or speed
113	4.04	Loss of control of vehicle	Excessive speed
99	3.54	Failed to give way	Looked but did not see
91	3.25	Loss of control of vehicle	Impairment - alcohol
91	3.25	Failed to avoid vehicle or object	Inattention
82	2.93	Failed to avoid vehicle or object	Careless/thoughtless/reckless
79	2.82	Failed to give way	Failure to judge other's path or speed
76	2.72	Poor turn/manoeuvre	Failure to judge other's path or speed
68	2.43	Failed to give way	Careless/thoughtless/reckless
64	2.29	Pedestrian entered carriageway	Crossed from behind parked vehicle
61	2.18	Pedestrian entered carriageway	Failed to look
52	1.86	Poor turn/manoeuvre	Careless/thoughtless/reckless

Table 4 Overall incidence of 15 commonest Contributory Factors, by police force

Code	*Description*	*N Wales*	*Essex*	*Dorset*	*Staffs*	*G Man*	*Met*	*Durham*	*L & B*	*Total*
12	Failure to judge other person's path or speed	9.5	11.5	11.6	10.1	9.0	11.6	10.9	13.2	10.7
9	Behaviour - careless/thoughtless/reckless	9.2	8.5	6.6	9.7	10.5	10.1	7.4	9.1	8.8
16	Inattention	5.9	10.1	8.3	7.3	6.4	9.3	5.6	11.8	8.0
15	Looked but did not see	6.0	7.6	9.5	6.6	8.7	8.0	8.1	9.1	7.5
21	Excessive speed	8.3	6.5	7.1	9.2	6.2	2.8	8.4	8.6	7.3
27	Lack of judgement of own path	6.9	6.3	6.6	5.7	6.4	5.7	5.6	5.5	6.3
14	Failed to look	6.1	6.3	6.3	5.7	8.2	8.5	4.6	3.6	6.2
22	Following too close	4.3	3.6	3.8	4.0	5.1	6.4	2.3	4.1	4.1
1	Impairment - alcohol	3.2	4.2	3.6	3.1	5.4	3.9	5.6	0.5	3.8
41	Slippery road	2.9	3.3	2.3	2.4	3.8	2.1	3.7	3.2	3.0
23	Inexperience - of driving	2.7	2.6	3.8	3.7	2.1	2.1	3.2	1.4	2.8
11	Behaviour - in a hurry	2.4	2.7	1.9	3.3	2.8	3.4	3.2	2.7	2.7
39	Site details - bend/winding road	3.4	1.2	2.6	3.5	1.8	0.3	1.6	3.2	2.2
49	Surroundings - stationary or parked car	2.2	1.4	1.9	2.0	2.8	2.1	1.9	1.8	1.9
19	Crossed from parked vehicle etc	2.0	1.4	1.2	1.3	2.1	4.1	1.4	2.3	1.8
	Other	25.1	22.8	22.7	22.4	18.7	19.8	26.5	20.0	23.1
Number of factors reported		1595	1703	576	545	390	388	431	220	5848

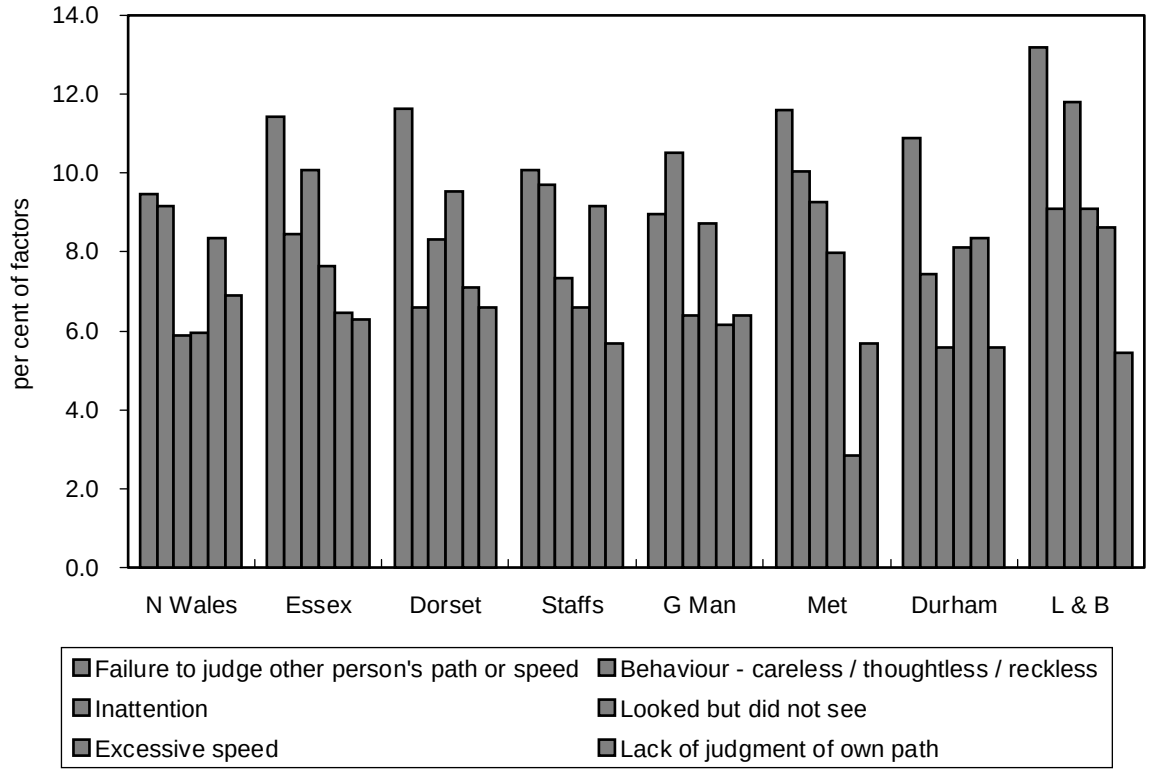

Figure 3 Six commonest Contributory Factors, by police force

Table 5 Number of Contributory Factors per accident

N	Nth. Wales	Essex	Dorset	Staffs	Gtr. Man	Met	Dur-ham	L & B	Total
Number of accidents with N Contributory factors									
0	8	16	1	4	16	6	8	0	59
1	136	349	117	74	68	44	78	27	893
2	224	306	109	68	67	60	66	42	942
3	149	146	51	57	36	48	39	19	545
4	141	76	22	41	20	20	26	13	359
Percent of accidents with N Contributory factors									
0	1	2	0	2	8	3	4	0	2
1	21	39	39	30	33	25	36	27	32
2	34	34	36	28	32	34	30	42	34
3	23	16	17	23	17	27	18	19	19
4	21	9	7	17	10	11	12	13	13
mean	2.4	1.9	1.9	2.2	1.9	2.2	2.0	2.2	2.1

Table 6a Incidence of 15 commonest CFs as FIRST reported factor, by police force

Code	Nth. Wales	Essex	Dorset	Staffs	Gtr. Man	Met	Dur-ham	L & B	Total
12	12.0	15.3	15.7	13.8	9.4	18.0	13.9	19.8	14.2
9	15.7	12.3	11.4	16.3	14.7	14.5	8.6	8.9	13.3
15	6.5	8.1	8.7	7.1	9.4	9.9	9.1	14.9	8.2
1	6.5	7.4	6.4	5.8	11.0	7.0	8.6	1.0	7.0
14	7.1	6.2	8.0	6.7	8.9	8.1	6.7	5.9	7.0
21	8.8	5.4	7.0	9.2	5.8	1.7	9.1	8.9	6.9
16	3.8	8.0	9.4	5.8	8.9	5.2	5.3	10.9	6.8
27	4.9	3.3	4.7	5.0	4.7	2.9	2.9	2.0	4.0
11	3.4	2.5	2.3	3.3	3.1	2.9	4.3	0.0	2.9
22	3.8	2.7	1.0	2.9	3.7	2.3	1.9	2.0	2.8
19	2.9	1.8	1.7	2.1	1.6	5.8	2.4	4.0	2.4
41	1.4	2.2	2.3	0.8	1.6	1.7	0.5	5.0	1.8
23	0.9	2.3	2.0	2.5	2.1	0.0	1.9	1.0	1.7
49	0.5	0.5	0.0	1.3	1.6	0.0	1.9	0.0	0.6
39	1.2	0.2	0.3	0.8	0.0	0.0	0.5	1.0	0.5
Others	20.6	21.9	19.1	16.7	13.6	19.8	22.5	14.9	19.9
Total	650	877	299	240	191	172	209	101	2739

Table 6b Incidence of 15 commonest CFs as SECOND reported factor, by police force

Code	Nth. Wales	Essex	Dorset	Staffs	Gtr. Man	Met	Dur-ham	L & B	Total
16	7.0	13.1	8.2	10.2	4.1	13.3	5.3	15	9.6
12	9.5	8.3	9.3	10.8	12.2	7.0	8.4	11	9.3
15	7.6	8.0	13.2	7.8	9.8	6.3	11.5	7	8.6
21	9.5	8.5	7.7	10.8	7.3	3.9	9.2	3	8.3
27	8.2	8.1	7.1	4.8	6.5	7.0	4.6	8	7.3
14	7.2	6.8	3.8	6.6	9.8	10.2	3.1	3	6.6
22	6.0	5.1	8.8	3.6	8.1	10.2	4.6	7	6.2
9	5.4	4.9	1.6	7.2	5.7	8.6	9.2	8	5.7
41	3.5	4.4	1.6	2.4	3.3	0.8	4.6	3	3.3
23	3.7	1.7	6.6	3.0	3.3	2.3	5.3	1	3.3
11	2.1	3.8	1.6	3.6	2.4	4.7	2.3	5	3.0
49	2.1	2.7	2.7	2.4	3.3	3.9	0.8	1	2.4
39	2.7	1.5	4.4	1.8	3.3	0.0	2.3	5	2.4
1	1.4	0.8	1.1	1.2	0.0	1.6	4.6	0	1.2
19	1.2	0.9	1.1	0.0	3.3	2.3	0.8	1	1.2
Others	22.8	21.4	20.9	23.5	17.9	18.0	23.7	22	21.6
Total	514	528	182	166	123	128	131	74	1846

Table 6c Incidence of 15 commonest CFs as THIRD reported factor, by police force

Code	Nth. Wales	Essex	Dorset	Staffs	Gtr. Man	Met	Dur-ham	L & B	Total
27	9.7	11.3	12	10	13	10	15	9	11.0
16	8.3	9.9	7	9	4	13	6	13	8.7
21	6.9	5.4	5	9	7	4	6	9	6.5
39	7.6	3.6	5	8	5	0	3	6	5.4
15	3.4	7.2	5	6	5	9	2	0	5.1
14	4.1	7.2	5	3	5	9	0	0	4.9
12	4.8	5.9	3	1	4	4	11	3	4.8
23	4.1	5.9	5	6	0	1	3	3	4.3
22	3.1	4.1	3	5	5	12	0	6	4.2
9	4.5	4.1	1	2	9	1	3	13	4.1
41	3.4	5.0	1	4	9	1	8	0	4.1
49	4.5	1.8	7	2	2	3	5	6	3.5
19	2.1	0.9	0	2	2	4	0	0	1.5
11	0.7	1.4	1	3	0	3	2	6	1.5
1	0.3	0.9	0	1	0	1	0	0	0.6
Others	32.4	25.7	37	28	30	22	37	25	29.8
Total	290	222	73	98	56	68	65	32	904

Table 6d Incidence of 15 commonest CFs as FOURTH reported factor, by police force

Code	Nth. Wales	Essex	Dorset	Staffs	Gtr. Man	Met	Dur-ham	L & B	Total
41	7.1	4	9	7	15	15	15	0	7.8
27	5.7	13	9	2	5	5	8	8	7.2
16	6.4	14	0	0	5	5	8	0	6.7
39	7.1	4	9	15	0	5	4	0	6.4
21	5.0	8	9	2	0	0	4	38	6.1
12	7.1	5	5	7	0	10	0	0	5.6
49	5.7	3	5	5	15	5	0	8	5.0
23	4.3	4	0	7	0	20	4	0	4.7
22	2.1	3	5	10	0	0	0	0	2.8
9	2.1	1	0	0	5	10	0	8	2.2
11	2.1	1	0	2	10	0	4	0	2.2
14	2.1	1	5	2	0	0	8	0	2.2
15	2.8	1	5	0	5	0	0	0	1.9
1	0.7	1	0	0	0	0	0	0	0.6
19	0.7	1	0	0	0	0	0	0	0.6
Others	39.0	34	41	39	40	25	46	38	37.9
Total	141	76	22	41	20	20	26	13	359

Table 7a Number of Contributory Factors, by confidence level

	CF1		*CF2*		*CF3*		*CF4*		*any*	
Confidence	*no*	*%*	*no*	*%*	*no*	*%*	*no*	*%*	*no*	*%*
not reported	546	20	339	18	158	17	63	18	1106	19
Definite	1259	46	529	29	231	26	88	25	2107	36
Probable	749	27	730	40	300	33	94	26	1873	32
Possible	185	7	248	13	215	24	114	32	762	13
any	2739	100	1846	100	904	100	359	100	5848	100

Table 7b Number of Contributory Factors, by confidence level

	Contributory Factor																
Confidence	*12*	*9*	*15*	*1*	*14*	*21*	*16*	*27*	*11*	*22*	*19*	*8*	*4*	*41*	*7*	*other*	*all*
not reported	9.9	9.6	6.5	**3.0**	6.9	6.1	7.2	6.2	**3.4**	4.6	**2.1**	1.0	1.2	3.1	1.6	27.6	100.0
Definite	10.3	10.0	7.1	5.6	6.3	6.0	6.2	4.8	2.1	3.5	3.3	1.3	1.4	3.3	1.0	27.8	100.0
Probable	11.8	9.0	**8.8**	**2.8**	6.2	**8.7**	**10.4**	**7.2**	2.6	**5.1**	**0.4**	2.0	**0.5**	2.9	0.5	**20.9**	100.0
Possible	9.8	**3.7**	6.6	**2.5**	5.4	**8.9**	7.7	**8.4**	3.4	2.4	**0.5**	2.0	0.8	2.1	0.9	**34.9**	100.0
any	10.7	8.8	7.4	**3.8**	6.3	**7.3**	**7.9**	**6.3**	2.7	4.1	**1.8**	1.6	1.0	3.0	1.0	26.5	100.0

Table 7c Distribution of Primary Contributory Factors, by confidence level

	Contributory Factor																
Confidence	*12*	*9*	*15*	*1*	*14*	*21*	*16*	*27*	*11*	*22*	*19*	*8*	*4*	*41*	*7*	*other*	*all*
not reported	12.6	15.8	7.1	**5.9**	7.0	5.1	5.5	3.7	**3.8**	3.5	**2.0**	1.3	2.2	1.6	2.6	20.3	100.0
Definite	13.1	12.8	9.0	9.1	7.1	6.3	5.6	3.2	2.1	2.8	4.0	1.6	2.1	2.1	1.7	17.7	100.0
Probable	16.4	13.9	**8.3**	**4.7**	7.6	**9.1**	**9.5**	**4.4**	3.5	**2.9**	**0.4**	2.4	**1.2**	1.9	1.1	**12.7**	100.0
Possible	17.8	**7.6**	5.9	**5.4**	3.8	**7.6**	7.0	**8.6**	3.2	0.0	**1.1**	3.2	2.2	0.0	2.2	**24.3**	100.0
any	14.2	13.3	8.2	**7.0**	7.0	**6.9**	**6.7**	**4.0**	2.9	2.8	**2.4**	1.9	1.9	1.8	1.8	17.3	100.0

These results demonstrate that the recording of confidence in Contributory Factors is a valuable feature of the new system, although improved wording of the form might lead to greater recording of confidence levels.

4.4 Comparison with TRRL studies

This section briefly compares the pattern of factors with the results of the TRRL 'On The Spot' (OTS) study of contributory factors in 1970-74 and the 'At The Scene' (ATS) study of 1978-81, also the TRL study of 1995 for which the forerunner of the new system was developed. Results of the OTS and ATS studies have been influential in developing road safety policy, particularly in respect to the relative influence of human, road/environment and vehicle factors in accident causation. Thus, comparisons of the data from this project with data from these earlier studies (as reported by Sabey, 1983) are of real interest.

The significant technical differences between this study and the earlier studies restrict the range of comparisons which can be made. An overall comparison has been made by classifying the Contributory Factors from the present study as human, road/environment or vehicle factors, according to the grouping used in the OTS and ATS studies. Broughton and Markey (1996) compare the results of the earlier studies, Table 8 expands Table 14 from that

Table 8 Frequency of Contributory Factor combinations

				1995 TRL study		
Number of groups involved	*Group of factors*	*'On The Spot' study, 1970-74*	*'At The Scene' study, 1978-81*	*Fatal accidents*	*Non-fatal accidents*	*Current study*
1	Human	65	76½	69.6	67.2	69.9
	Vehicle	2½	3	1.2	1.3	1.7
	Road/environment	2½	2	2.1	19.3	4.9
2	Human + Vehicle	4½	2	5.5	0.2	1.6
	Human + Road/Env.	24	16	19.6	11.9	21.2
	Vehicle + Road/Env.	¼	0.1	1.2	0.0	0.2
3	Human + Vehicle + Road/Env.	1¼	0.3	0.8	0.1	0.5
any	any	100	100	100	100	100
Number of accidents		2042	1243	1045	1267	2742

Note: figures are based on accidents where at least one Contributory Factor was reported

report to include results from the current study, which are also presented in Figure 4.

The 1995 TRL study included two sets of accidents: fatal accidents with details coming from police reports and non-fatal (predominantly damage-only) accidents with details coming from insurance claims. The latter are self-reported accidents, although details of some accidents were checked by interview. Broughton and Markey concluded that 'some claimants have attributed accidents to the weather or road surface rather than their inappropriate driving behaviour under these conditions', which meant that single road/ environment factors have replaced 'Human+road/ environment' factors to some extent.

Thus, with the exception of a certain bias in the reporting of non-fatal accidents in the 1995 study which may be attributed to drivers' practices when completing claims forms, it seems that the distributions of factors found in the present study are consistent with those found in earlier studies.

It is encouraging to see that the police officers who tested the system have achieved results which are broadly comparable with those achieved previously by scientific research. The new system offers important new opportunities, however; scientific research provides general guidance for improving road safety, but the new system can provide specific guidance throughout a police force area. The information collected will help to identify local road safety problems; police traffic patrols can then be directed in response, as discussed in Section 5, and Local Authority engineers can develop remedial measures.

4.5 'Other' factors

The coding form included a system of recording 'Other' details as a check on the comprehensiveness of the list of factors. These 'Other' factors occurred in four areas of the coding form - one for Precipitating Factors and three for Contributory Factors in the Personal Details, Vehicle Defects and Local Conditions sections. The 'Other' factors reported by the police will be examined to determine whether the lists of factors may need to be extended.

4.5.1 'Other' Precipitating Factors

70 accidents have a Precipitating Factor code 15, 'Other'. Consideration of the details provided about these accidents by the police shows that 45 related to events not covered by the coding form. The remaining cases should not have used this code; 4 should have used one of the existing Precipitating Factors (e.g. 'Vehicle went into wrong lane of two-way road' should have been recorded as Factor 13 - 'Drove wrong way') and 21 are actually Contributory Factors rather than Precipitating Factors. Examples of these are 'Tow rope too long and unmarked', 'Lack of concentration', 'Spectators watching rally in dangerous position' and 'Cattle on road'. These all explain why the accident happened, but do not show what actually occurred. The Contributory Factors relating to some of these details exist on the coding form, while others should have been coded as an 'Other' Contributory Factor.

The genuine 'Other' factors have been grouped into categories and are presented in Table 9; the final row brings together the isolated factors which could not be grouped. One quarter of the 'Other' Precipitating Factors involved cyclists.

Table 9 Incidence of 'Other' Precipitating Factors

Grouping of 'Other' Factors	*Number*
Pedal cyclist cycling on footpath	6
Pedal cyclist cycled off footpath into path of car	5
Conflicting accounts, no witnesses	3
Passenger fell from car	3
Object fell from vehicle in front	3
Driver unable to be interviewed, cause unknown	2
'Stealing a ride'	2
Suicide attempt	2
Remainder	19

Arguably, 'Passenger fell from car' should have been coded as Precipitating Factor 14 'Opening door carelessly'. 'Pedal cyclist cycled off footpath into car' could be accommodated by a minor expansion of Precipitating Factor 7 to 'Pedestrian or cyclist entered carriageway without due care'.

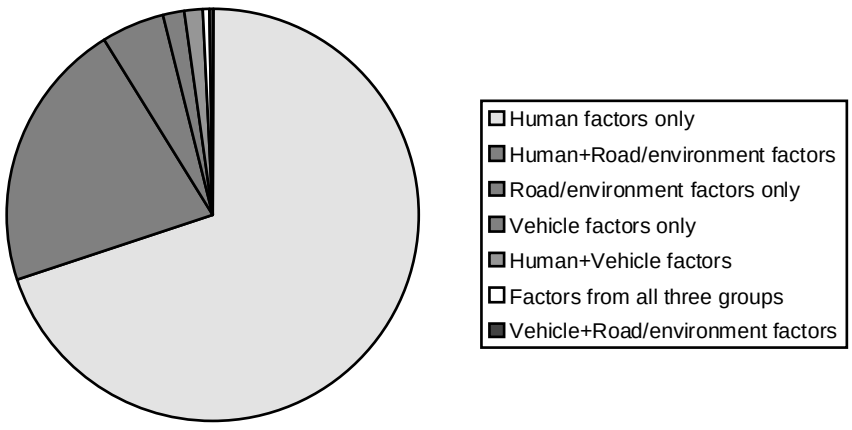

Figure 4 The combinations of Contributory Factors found in the current study

4.5.2 'Other' Contributory Factors

114 'Other' Contributory Factors were recorded - 64 in the Personal Details section, 26 under Vehicle Defects and 24 as Local Conditions. As with the 'Other' Precipitating Factor, some of these were entered in an incorrect section (5 cases), some could have used an existing factor (18 cases) and some should not have been included at all (7 cases). Table 10 groups together the genuine 'Other' factors. Once again, 'Remainder' brings together factors which occurred only once. This was particularly common in the Vehicle Defects section where there were, for example, single instances of the throttle sticking, a trailer hitch becoming detached and the steering lock being activated in a stolen car.

Table 10 Incidence of 'Other' Contributory Factors

'Other' Factor	*Grouping of 'Other' Factors*	*Number*
CF 18 Personal details	Young child pedestrian or pedal cyclist involved	8
	Pressed wrong pedal by mistake	4
	Driver was foreign	4
	Vehicle being pursued by police	4
	Ambulance on emergency call	2
	Remainder	23
	Sub-total	45
CF 33 Vehicle defects	Wheel fell off	3
	Remainder	20
	Sub-total	23
CF 44 Local conditions	Unfamiliar road layout	2
	Heavy traffic	2
	Thick smoke from fire	2
	Caught in slipstream of HGV	2
	Remainder	8
	Sub-total	16

A number of the groups listed above and in Section 4.5.1 have been suggested by some of the police forces involved in the trial as possible additions to the list of factors.

4.6 Analyses of linked data

The contributory factor recording system is designed to complement the existing STATS19 system for accident reporting, and this section presents analyses of the combined data. The STATS19 data used in these analyses have not come directly from the police forces which cooperated in the trial, but instead via the national database maintained by the Department of the Environment, Transport and the Regions. Delays in the preparation and transmission of the STATS19 data meant that only 1490 of the 2795 accidents reported in the trial (53 per cent) could be linked with accidents that had reached the national database in November 1996, at the time when the analyses were carried out. The national database contained most of the accidents in Essex, Dorset, Durham and Manchester but none from North Wales, Staffordshire or Lothian & Borders, while the system used by the Metropolitan Police to allocate reference numbers prevented successful linking. If a police force were to collect contributory factor and STATS19 data using a single reporting system then the linking process would be automatic and analyses could be carried out for all accidents that had been entered into the local accident database.

In view of the relatively small numbers of linked reports, the analyses presented in this section can only illustrate the very wide range of analyses that are possible with the linked data, and may not be nationally representative.

4.6.1 Responsibility for accidents

There is naturally interest in the question of who was responsible for a particular accident. Many accidents are too complex for any one person to be held responsible, and many others do not result from deliberate choices or actions of those involved, so the term 'responsibility' is probably simplistic. Nevertheless, the police officers involved in the trial were asked to identify the most significant failure or manoeuvre which led directly to the accident being investigated, the Precipitating Factor, so their subjective conclusions indicate who they considered to be principally responsible for these accidents.

In order to simplify the analysis of the attribution of Precipitating Factors, attention is restricted to those accidents in which a Precipitating Factor was attributed to one person (the person 'responsible') and there was one other person actively involved in the accident (the 'innocent' party). Two sets of accidents satisfy this restriction: two-vehicle accidents involving no pedestrians, and one-vehicle accidents involving pedestrians. The accidents are grouped according to the types of vehicle involved and the severity of the accident. Those combinations which occurred at least ten times in the linked data are presented in Table 11: all involve one car in collision with another type of vehicle or a pedestrian.

Table 11 Attribution of Precipitating Factors in accidents which involved one car and either a pedestrian or one other vehicle

	Fatal and serious accidents		*Slight accidents*	
Car collides with	*Number of accidents*	*% of accidents where PF attributed to car driver*	*Number of accidents*	*% of accidents where PF attributed to car driver*
pedestrian	50	12	91	19
another car	56	-	381	-
pedal cycle	28	79	79	73
motorcycle	39	90	55	78
PSV			12	25
van			45	24
HGV			38	18

Thus, excluding car-car accidents for the moment, the investigating officers judged that the failures or manoeuvres of car drivers led directly to three quarters or more of the accidents in which cars collided with lighter vehicles, but one quarter or less of the accidents in which cars collided with heavier vehicles - i.e. they tended to

attribute the Precipitating Factor to the driver of the heavier vehicle. By contrast, they attributed the Precipitating Factor to the pedestrian in more than four fifths of pedestrian accidents.

It has sometimes been claimed that police reporting of car accidents involving vulnerable road users (pedestrians, pedal cyclists and motorcyclists) tends to find the vulnerable road user responsible rather than the car driver. Although there is no clear evidence of what the percentages in Table 11 objectively *should* be, they tend to show the reverse for accidents involving pedal cyclists and motorcyclists - i.e. that the police are less likely to find a pedal cyclist or motorcyclist responsible than a car driver. However, they do support the claim in the case of pedestrian accidents - i.e. the police are more likely to find a pedestrian responsible than a driver. The DETR is keen to ensure that these accidents are reported as objectively as possible.

Table 12 now examines the age and sex of the drivers in the car-car accidents, grouping together all accident severities to maximise the sample size. It shows the number of involved drivers, and the percentage to whom the Precipitating Factor was attributed, i.e. the percentage who were judged to be principally responsible for these accidents. These car-car accidents comprise over half of the linked accidents, but even so many of the apparent differences could have arisen by chance because of the limited sample size. For example, the likelihood that the result that male drivers are more likely than female drivers to be considered principally responsible (final row of the table) occurred by chance and would not be repeated in a much larger study, is about 1-in-10. Nevertheless, the pattern of results appears credible, with relatively many young drivers, older drivers and male drivers considered principally responsible.

Table 12 Attribution of Precipitating Factors in car-car accidents, by age and sex of driver

	Number of drivers involved in car-car accidents			*% of drivers to whom the PF was attributed*		
Age of driver	*male*	*female*	*either*[1]	*male*	*female*	*either*[1]
-23	140	71	215	59	56	59
24-33	119	90	209	50	40	45
34-45	102	74	176	46	41	44
46-60	98	56	154	41	43	42
61-99	83	27	110	60	59	60
all[2]	548	321	886	52	46	50

[1]*includes drivers whose sex was not reported*
[2]*includes drivers whose age was not reported*

4.6.2 Further details of Precipitating and Contributory Factors

Table 1 showed the overall incidence of Precipitating Factors, but it is likely that some factors will be common in certain types of accidents and not in others. This section examines one classification of accident where the various classes should have distinctive sets of factors:

Pedestrian accidents — any accident where one or more pedestrians were injured,

Single Vehicle accidents — any accident involving one vehicle and no injured pedestrian,

Multi-Vehicle accidents — any accident involving two or more vehicles and no injured pedestrian.

In addition, accidents on built-up roads (roads with speed limits of 40 mph or less) and non built-up roads (roads with speed limits of more than 40 mph) are considered separately for Single and Multi-Vehicle accidents.

Table 13 (on p16) shows the incidence of the commonest Precipitating Factors (taken to be factors which occurred in at least 5 per cent of fatal and serious or 5 per cent of slight accidents). Table 14 (on p17) presents corresponding results for Contributory Factors, including only those that have been recorded by reporting officers as definite or probable. Both tables consist of percentages, the total number of Precipitating Factors and definite or probable Contributory Factors for the various groups of accidents are as follows:

	Precipitating Factors		*Contributory Factors*	
Accident type	*Fat+Ser accs*	*Slight accs*	*Fat+Ser accs*	*Slight accs*
Pedestrian	69	118	101	141
Single vehicle, built-up roads	31	73	52	92
Single vehicle, non built-up roads	41	115	62	144
Multi-vehicle, built-up roads	97	553	142	749
Multi-vehicle, non built-up roads	101	292	151	416

Precipitating Factors 3 and 7 naturally predominate in Pedestrian accidents, but the predominance of factor 6 in single vehicle accidents, especially on non built-up roads, may be less predictable. Multi-vehicle accidents are more variable, but factor 4 is the commonest.

Table 14 also shows some interesting differences between accident types, for example the varying involvement of alcohol. Many of the factors in multi-vehicle accidents reflect a failure of road users to interact safely.

5 A police perspective

The Association of Chief Police Officers (ACPO) of England, Wales and Northern Ireland has developed a National Road Policing Strategy for police forces to formulate into their local policing plans. Three of the key elements of the strategy involve intelligence-led targeted enforcement, high visibility policing and targeting vulnerable road users.

For the strategy to be effective, it is necessary to ensure that police resources are deployed at the correct time, in the correct location, undertaking the appropriate form of enforcement relevant to the ‘site’. A ‘site’ could be a stretch of road extending over several kilometres, along which there may be a number of different road safety problems to be treated, such as speed-related accidents, congestion or parked vehicles causing obstructions and obscuring view, movements of pedestrians, drink-related accident patterns, poor junction control and poor driver behaviour. ‘Appropriate enforcement’ could range from a

Table 13 Incidence of commonest Precipitating Factors, by type of accident

Accident type	*Precipitating Factor*	*Percentage of factors in: Fat+Ser accs*	*Slight accs*
Pedestrian	7 - Pedestrian entered carriageway without due care	84	75
	3 - Failed to avoid pedestrian (pedestrian not to blame)	12	13
Single vehicle, built-up roads	6 - Loss of control of vehicle	77	67
	11 - Poor turn/manoeuvre	3	7
	9 - Swerved to avoid object in carriageway	3	5
	10 - Sudden braking	0	8
Single vehicle, non built-up roads	6 - Loss of control of vehicle	85	76
	11 - Poor turn/manoeuvre	5	3
	9 - Swerved to avoid object in carriageway	0	7
	10 - Sudden braking	0	6
Multi-vehicle, built-up roads	11 - Poor turn/manoeuvre	23	16
	2 - Failed to give way	21	23
	4 - Failed to avoid vehicle or object in carriageway	20	32
	6 - Loss of control of vehicle	15	10
	12 - Poor overtaking	9	3
Multi-vehicle, non built-up roads	4 - Failed to avoid vehicle or object in carriageway	26	30
	6 - Loss of control of vehicle	22	18
	11 - Poor turn/manoeuvre	16	14
	12 - Poor overtaking	13	7
	2 - Failed to give way	8	12

police ‘presence’, through advice and cautionary measures, to reporting and arresting offenders - whatever is appropriate to the problem to be treated.

The data provided by the local accident-reporting system, including the new contributory factors, will enable police to undertake accident and casualty analyses and thereby identify accident and casualty patterns and devise remedial measures. A programme could be developed for a whole series of ‘site’ treatments within a police command area or on a force-wide basis. Programmes could be tailored for individual patrol officers such that, when they are not responding to emergency calls, there would always be a ‘site’ to which they could deploy and carry out appropriate enforcement measures.

The data collected by police can be effectively assembled and analysed using MAAP5 (Microcomputer Accident Analysis Package, version 5), a geographically-based computer system which has been developed by TRL (TRL, 1994) and is currently being used by three police forces (South Wales Police, West Mercia Constabulary and Cleveland Constabulary). The MAAP5 system is available to all police forces at a modest cost and operates on a stand-alone computer. A Windows version of MAAP, which can be networked, was introduced during 1997.

From January 1997, Cleveland Constabulary has collected contributory factors using the system described in this report, entering the factors directly into a database using a modified version of MAAP5 running on computers in the force HQ. This is the natural development of the trial described above, in that this police force is carrying out all aspects of the collection, entry and utilisation of the data. Analyses of the contributory factors will be used to update their traffic policing plans, and their experience will provide an important guide to the value of this information for police operations.

The data that the police obtain from this system could also have considerable benefits for the local highway authority. The introduction of Unitary Authorities and Private Finance Initiatives provides police with the opportunity to supply the data to the appropriate highway authority or their agent.

In summary, the system for recording contributory factors in road accidents can provide police with information which is essential to the prevention and reduction of accidents and casualties. It also enables police managers to ensure the effective deployment of their resources in response to their road policing strategy.

5.1 Police force responses to the trial

Feedback was received from each of the eight forces used in the original trial of the coding system during the summer of 1996. Most forces agreed that, with a little practice, the officers completing the forms found them straightforward and relatively easy to understand.

One force commented on the limited category for animals in the system and suggested separate contributory factors for wild, farm and domestic animals. Another force was interested in accidents involving excessive speed as a factor, and suggested expanding this factor to show whether the speed was above the speed limit or legal but too fast for the conditions.

Some forces found that officers were forgetting to complete a coding form since it was a separate sheet and not part of their usual accident report form. This is a general problem with piloting new systems, and there are various ways of counteracting it once a police force has decided to collect these data routinely. The necessary boxes would be added to the normal accident report form

Table 14 Incidence of commonest definite or definite Contributory Factors, by type of accident

Accident type	*Contributory Factor*	*Percentage of factors in: Fat+Ser accs*	*Slight accs*
Pedestrian	14 - Failed to look	18	21
	9 - Behaviour, careless/thoughtless/reckless	13	9
	19 - Crossed from behind parked vehicle	12	16
	1 - Impairment, alcohol	9	3
	16 - Inattention	8	9
	12 - Failure to judge other person's path or speed	7	7
	11 - Behaviour, in a hurry	7	4
	15 - Looked but did not see	4	10
Single vehicle, built-up roads	21 - Excessive speed	19	14
	1 - Impairment, alcohol	17	13
	27 - Lack of judgement of own path	13	8
	9 - Behaviour, careless/thoughtless/reckless	8	8
	8 - Behaviour, panic	6	3
	4 - Impairment, illness	6	1
	41 - Slippery road	2	11
	16 - Inattention	0	10
Single vehicle, non built-up roads	21 - Excessive speed	15	13
	27 - Lack of judgement of own path	13	7
	41 - Slippery road	11	10
	1 - Impairment, alcohol	8	9
	23 - Inexperience of driving	8	9
	8 - Behaviour, panic	6	3
	24 - Inexperience of vehicle	5	3
	6 - Distraction in/on vehicle	5	1
Multi-vehicle, built-up roads	15 - Looked but did not see	15	13
	12 - Failure to judge other person's path or speed	13	13
	14 - Failed to look	13	6
	9 - Behaviour, careless/thoughtless/reckless	9	10
	16 - Inattention	5	12
	21 - Excessive speed	5	5
	27 - Lack of judgement of own path	5	5
	1 - Impairment, alcohol	5	4
	23 - Inexperience of driving	5	2
	22 - Following too close	1	5
Multi-vehicle, non built-up roads	12 - Failure to judge other person's path or speed	18	18
	9 - Behaviour, careless/thoughtless/reckless	14	7
	21 - Excessive speed	9	6
	27 - Lack of judgement of own path	9	6
	16 - Inattention	6	11
	15 - Looked but did not see	5	7
	22 - Following too close	3	8
	41 - Slippery road	1	5

with accompanying notes as appropriate. The notes could include full lists of factors, but alternatively each officer could be issued with a laminated card listing the factors.

6 Conclusions

When the present national system for reporting information about road accidents was established in 1949, it recorded not only the objective circumstances of an accident such as time of day and speed limit but also the 'contributory factors' - the factors which the reporting officer considered to have contributed to the causation of the accident. Several forces ceased to record contributory factors when this ceased to be a national requirement in 1959, but in 1994 a TRL survey of the 43 police forces in England and Wales found that over one half were still collecting these data using a variety of systems.

This fact indicates the local value of this information at a time when road safety has assumed greater prominence, and its value would be greatly enhanced if it could be recorded in a consistent way by all forces and assembled into a database closely linked to the national STATS19 database. This report has described the results of research by the Transport Research Laboratory which has developed a new recording system and tested it 'in the field' with eight police forces.

The new system was designed to be sufficiently comprehensive to accommodate the great majority of road accidents within a standard set of codes, while being simple to use: it should not require extensive training or documentation but it should encourage the collection of high quality data.

Experience in a previous TRL project suggested that the following approach to accident investigation could improve the overall quality of the data collected:

1 ascertain the critical failure or manoeuvre which led up to the accident and record it using the appropriate code,
2 identify the causes for this failure or manoeuvre from the evidence available (there may be more than one) and record them using the appropriate codes.

The critical failure or manoeuvre is referred to as the Precipitating Factor ('What went wrong?') while its causes are referred to as the Contributory Factors ('Why?'). Two lists were drawn up, one consisting of 15 Precipitating Factors and the other of 54 Contributory Factors. As the identification of the Contributory Factors in an accident tends to be relatively subjective, depending upon the experience of the investigator and the strength of the evidence, the investigator is asked to code each factor as either Definite, Probable or Possible.

Eight police forces agreed to cooperate in a trial in the summer of 1996. The entire force in North Wales took part, as did the full traffic divisions in four others and other divisions in the remaining three forces. The eight forces represented all parts of Great Britain and all types of roads: two forces had not been recording contributory factors routinely. TRL staff made a single visit to each force to brief key personnel about the new system, were then responsible for briefing the officers who would be attending accidents during the period of the trial.

The use of the new system presented few problems, according to responses received from the police officers who participated in the trial. 2795 forms which had been satisfactorily completed were returned to TRL, and various analyses of these data have been reported. A good degree of consistency was found between the results from the individual forces, in terms of the distributions of factors recorded, which indicates that most of the officers involved in the trial were able to use the system effectively.

The Precipitating Factors most frequently recorded were 'Loss of control of vehicle' and 'Failed to avoid vehicle or object in carriageway' (22 per cent of accidents each), followed by 'Failed to give way' (14 per cent), 'Pedestrian enters carriageway without due cars' and 'Poor turn/ manoeuvre' (11 per cent each). The most frequent Contributory Factors were 'Failure to judge other person's path or speed', (11 per cent of factors), followed by 'Behaviour - careless/thoughtless/reckless' (9 per cent), 'Inattention' (8 per cent), 'Looked but did not see' and 'Excessive speed' (7 per cent each). Only 20 of the 54 factors account for more than 1 per cent of the factors recorded.

Once these factors had been linked with the STATS19 data for the accidents, it became possible to investigate how the patterns of factors vary with type of accident. Preliminary results have shown, for example, that 'Loss of control of vehicle' is the predominant Precipitating Factor in single vehicle accidents where no pedestrian is injured, with 'Excessive speed' and 'Impairment, alcohol' the commonest Contributory Factors. The pattern of factors in multi-vehicle accidents is more varied. 'Failed to avoid vehicle or object in carriageway' is the commonest Precipitating Factor, but 'Failed to give way' and 'Loss of control' also occur frequently. The commonest Contributory Factors reflect failures to interact safely: 'Looked but did not see', 'Failure to judge other person's path or speed', 'Behaviour, careless/thoughtless/reckless' and 'Inattention'.

The commonest Precipitating Factor in accidents where a pedestrian is injured is 'Pedestrian entered carriageway without due care', i.e. the police were more likely to consider that the pedestrian than the driver or rider involved was principally responsible. The commonest Contributory Factors are 'Failed to look', 'Behaviour, careless/thoughtless/reckless' and 'Crossed from behind parked vehicle'.

The recording of confidence in the Contributory Factors by investigating officers was generally successful, although 27 per cent of factors reported by one force had no confidence marking. The ranking of factors varies with the confidence marking, so this does appear to be a useful way of recognising the subjective nature of the information and of identifying the more reliable data.

A system capable of recording the contributory factors for every conceivable type of accident would probably be unmanageably large. In order to judge whether the new system provides a satisfactory compromise between completeness and ease-of use, investigating officers who were unable to choose an appropriate code were asked to enter 'other' and supply full details. Analysis of these details suggests that only a few minor adjustments to the factor lists are required. This 'other' facility also provided a means of recording valuable non-standard information, such as that two of the accidents resulted from suicide attempts, so the facility could be a useful feature of any future implementation of the new system.

The value of accident information from the STATS19 system to Local Authorities and the Department of Transport (now DETR) in attempting to improve road safety has been widely recognised for many years, but its potential contribution to the effective management of traffic policing has received less attention. This report has shown that STATS19 information augmented with information about contributory factors can be entered and stored by the police using the MAAP5 software mounted on a PC, and that it can be analysed to guide deployment of police resources in support of the National Road Policing Strategy adopted by ACPO. This approach was adopted by the Cleveland Constabulary in January 1997 in a further trial of the new system, but it is too early to evaluate the results achieved.

In summary, the system developed at TRL to record contributory factors has proved successful in a three-month trial: police officers attending accidents used the system with relatively little difficulty and analyses of the information collected have already yielded interesting results. The potential value of the information in managing traffic policing has been described, and is currently being tested by the Cleveland Constabulary. The adoption of the new system nationally in conjunction with the existing STATS19 accident reporting system could provide considerable assistance to all who are involved in efforts to improve road safety.

7 Acknowledgements

The work described in this report was carried out in the Safety and Environment Resource Centre of TRL. The contribution of the many police officers who participated in the trial of the new system is gratefully acknowledged.

8 References

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Abstract

Knowledge about the factors which contribute to the occurrence of road accidents can make a vital contribution to devising methods for improving road safety. The STATS19 national database of police injury accident reports holds objective details such as age and sex of casualties, and in its early years it also held the more subjective contributory factors which were recorded by police officers. There has been no national system for collecting these details for many years: consequently, a number of forces have ceased to collect these factors and the systems used by the remainder have diverged.

A new system has been developed at TRL which could be used in a new national system. It was tested in a three month trial in the summer of 1996 in which eight police forces cooperated. This report summarises the development of the new system, describes the trial and presents analyses of the data collected to demonstrate the type of results that can be achieved. It also presents a summary written by a senior police officer of the benefits to the Police Service of collecting such information.

Related publications

TRL198 *In-car equipment to help drivers avoid accidents* by J Broughton and K A Markey. 1996 (price code H, £30)

MAAP5 *Microcomputer Accident Analysis Package, version 5.0 1994.* (for details apply to the TRL Traffic & Transport Resource Centre, 01344 770144

RR379 *Police and hospital recording of non-fatal road accident casualties: a study in Greater Manchester* by J M Hopkin, P A Murray, M Pitcher and C S B Galasko. 1992 (price code H, £30)

RR365 *Injury accidents on rural single-carriageway roads — an analysis of STATS19 data* by M C Taylor and J K Barker. 1992 (price code H, £30)

LR762 *Methodology of an in-depth accident investigation survey* by G C Staughton and V J Storie. 1977 (price code AA, £10)

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