CONTRIBUTORY FACTORS IN MOTORCYCLE ACCIDENTS

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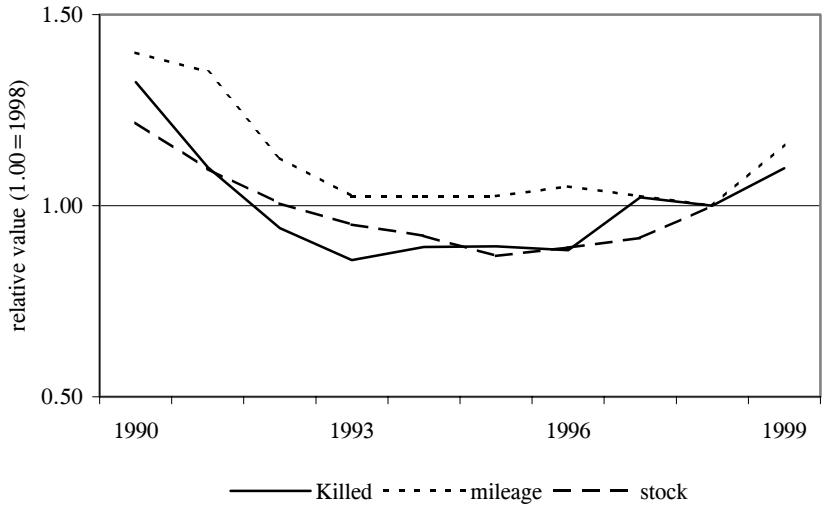
1. INTRODUCTION

National accident statistics show that motorcyclists are a particularly vulnerable group of road users. They are at a greater risk per mile ridden than any other type of road user (DETR, 2000a), and the vehicle involvement rate in accidents resulting in a fatality is over ten times higher for motorcycles than for cars.

From 1980 to 1992 the number of motorcyclists killed and seriously injured fell fairly rapidly. Since then, the number of casualties has begun to increase again, and Figure 1 shows that the number of deaths has risen since 1993. The rise in casualties has been accompanied by a rise in the stock of motorcycles and an increase in the proportion of total motorcycle mileage on non-built-up roads (NBU) in recent years.

Figure 1: Trends in motorcyclist fatalities, motorcycle mileage and stock relative to 1998.



In 1999, sixteen per cent of those killed and seriously injured in Great Britain were two-wheeled motor vehicle users. Compared to 1998, there was a ten per cent increase in the number of two-wheeled motor vehicle fatalities and a seven per cent increase in the number of those seriously injured.

The Government's road safety strategy, published earlier this year, set out a new target of a 40% reduction in the number of people killed or seriously injured in road accidents by 2010, compared with the 1994-1998 average (DETR, 2000b).

Due to the fact that they represent a large proportion of road casualties in proportion to their numbers, improving the safety of motorcyclists is a key factor in achieving this target.

In order to reduce the number of accidents involving two-wheeled motor vehicles and the resulting casualties, a better understanding is needed of the factors that contribute to these accidents.

2. THE DETR PROGRAMME OF BEHAVIOURAL RESEARCH ON MOTORCYCLE SAFETY

In May 1999 the Government set up an advisory group on motorcycling to provide expert advice to inform the development of future policy. The group includes riders, manufacturers, retailers, instructors and other interested bodies. Several task forces were created to study issues such as vehicle safety, traffic management and behavioural research.

The Department of the Environment, Transport and the Regions (DETR) commissioned a scoping study of motorcycle safety (Elliott et al., 2000) in order to review existing literature and identify gaps in knowledge where future research would be needed. The Scoping Study covered a wide variety of topics such as motorcycle accidents, vehicle factors and protective equipment, rider motivations, attitudes and behaviour, rider training, and legislation affecting the riders of two-wheeled motor vehicles (TWMV).

In consultation with the external members of the research task force, and based on recommendations from this study, a new programme of behavioural motorcycle safety research was proposed, to be implemented in the next 3 years.

The programme consists of five projects covering accident causation, rider training, analysis of accident risk, and the older motorcyclist.

The first project in the programme to be commissioned was a project analysing fatal accidents involving two-wheeled motor vehicles from police accident reports (Lowe et al, 2000).

3. ANALYSIS OF POLICE FATAL MOTORCYCLE ACCIDENT REPORTS

Police fatal accident reports are the most comprehensive that are available dealing with road traffic accidents in the United Kingdom. They need to be particularly

detailed as they are prepared for use in evidence given at a Coroners Inquest. Even where no criminal prosecution is envisaged, a detailed accident history is generally required by the police for accident analysis or reconstruction purposes. At their best, they contain photographs of the vehicles and of the scene, sketch plans of the accident, post-mortem report(s), vehicle examiner's reports, the case officer's summary of the circumstances of the accidents, a detailed reconstruction of the accident by police accident investigators, and statements made by the survivors and witnesses (Minton, 2000).

From 1992 onwards, a project commissioned by the DETR began to collect closed fatal report files routinely when these were no longer needed for legal purposes (Minton, 2000). Under this project, around 2200 files are collected, sorted, catalogued and stored each year. In addition, a computer database, known as the IDB, was created including different information from the files. This database includes retrieval/analysis routines which provide a user-friendly interface through which to extract statistics from the files.

The information coded includes: accident details such as number of vehicles involved, the nature of the location where the accident took place, and information on accident causation; vehicle information such as impact details and vehicle defects; and occupant/casualty details including seating position, safety equipment, and injuries sustained.

Although this database provides a valuable source of information about fatal accidents, care must be taken when interpreting the results. The proportion of files received varies between police forces and so some of the areas of the country are under-represented. In addition, the files are usually received several years after the accident has occurred and so the database does not cover the most recent accidents. The accidents examined in this project occurred between 1986 and 1995, with the majority occurring in the later years between 1992-1994 (Lowe et al, 2000).

The remainder of this paper will focus on accident causation. This information is coded using the contributory factor recording system described below.

3.1 The contributory factor reporting system

In 1996, as part of another DETR funded project, the Transport Research Laboratory (TRL) devised and tested a system for coding contributory factors in road accidents (Broughton et al, 1998). The new system contains many of the variables already used by Police Forces, but has one important new feature: it has two types of factors.

- The Precipitating Factor (PF) is the key action or failure that led directly to the actual impact, so it answers the question "What went wrong?". The list of factors includes failures (e.g. *Failure to stop* and *Failure to give way*) and manoeuvres (e.g. *Poor overtaking* or *Following too close*). One PF is recorded for each accident: if the factor had not been present then the accident would *very probably* not have occurred.

- The Contributory Factors (CFs) are the causes for these failures or manoeuvres ("Why did it occur?"). At most four CFs are entered in order of decreasing

significance. They are classified as definite, probable or possible, according to the strength of the available evidence.

The lists of factors include 14 Precipitating Factors and 1 'other'; there are 51 Contributory Factors and 3 'others'. The 'other' codes are included in the system to allow for relatively rare cases whose explicit inclusion would require unmanageably long lists of factors. The 'other' codes will not be included in the analyses.

Since the accident investigator is asked to identify the failure or manoeuvre which led directly to the accident, the data implicitly show who was judged to be principally responsible for the accident. In some accidents, responsibility is actually shared, so this can be an over-simplification.

3.2 Contributory factors in two-wheeled motor vehicles

Table 1 presents the occurrence of the most frequent Precipitating Factors in two-wheeled motor vehicle accidents in non-built-up roads.

The column headed "TWMV" refers to the occurrence of Precipitating Factors where the PF was ascribed to the two-wheeled motor vehicle rider, and the column headed "other" refers to the occurrence of Precipitating Factors where the PF was ascribed to another road user.

The proportion of PFs that are ascribed to TWMV riders shows the proportion of these accidents that were judged to have been caused by TWMV riders.

Accidents on built-up roads are those which occur on roads with speed limits of 40 mph or less. Non-built-up roads refer to speed limits over 40 mph.

Table1: Most Frequent Precipitating Factors in TWMV accidents on non-built-up roads

	All	TWMV	Other
Loss of control of vehicle	50%	**65%**	14%
Failed to avoid vehicle or object in carriageway	12%	12%	14%
Failed to give way	14%	4%	**36%**
Poor turn/manoeuvre	10%	5%	21%
Pedestrian entered carriageway without due care	1%	-	2%
Poor overtaking	7%	7%	8%
Number of Precipitating Factors / Accidents	353	250 (71%)	103 (29%)

The pattern of results for TWMV riders is entirely distinct from that for other road users. 'Loss of control of vehicle' is by far the most frequent of the PFs attributed to TWMV riders; this may relate to the inherent instability of two-wheeled vehicles. 'Failed to give way' is the PF most frequently attributed to other road users in these accidents, which indicates that many of these accidents occurred at or near junctions. This pattern is still true for accidents occurring in built up roads, but in this case the PF more frequently attributed to other road users is "Pedestrian entered carriageway without due care".

Table2: Most Frequent Precipitating Factors in TWMV accidents on built-up roads

	All	TWMV	Other
Loss of control of vehicle	37%	**55%**	1%
Failed to avoid vehicle or object in carriageway	16%	22%	6%
Failed to give way	10%	2%	**27%**
Poor turn/manoeuvre	9%	3%	21%
Pedestrian entered carriageway without due care	14%	-	**42%**
Poor overtaking	4%	5%	2%
Number of Precipitating Factors / accidents	364	239 (66%)	125 (34%)

The previous two tables have shown what factors led to the accidents. The reasons for these failures and manoeuvres will be set out below. Tables 3 and 4 show the incidence of Contributory Factors in TWMV accidents in non-built-up-roads and built-up roads respectively.

Table3: Most Frequent Contributory Factors in TWMV accidents on non-built up roads

	All	TWMV	Other
Behaviour - careless/thoughtless/reckless	17%	14%	27%
Excessive speed	16%	**21%**	5.4%
Failure to judge other person's path or speed	8.5%	5.0%	**17%**
Inattention	6.6%	6.3%	7.5%
Lack of judgement of own path	7.7%	**9.3%**	3.8%
Impairment – alcohol	4.5%	5.8%	1.3%
Inexperience of driving	5.0%	5.8%	2.9%
Number of Contributory Factors / accidents	845	605	240

Again, the pattern of results for TWMV riders differs from that for other road users, both in built-up and non-built-up roads. 'Excessive speed' and 'Lack of judgement of own path' are attributed more frequently to TWMV riders than to other road users, while the reverse is true for 'Failed to judge other person's path or speed '.

Table4: Most Frequent Contributory Factors in TWMV accidents on built-up roads

	All	TWMV	Other
Behaviour - careless/thoughtless/reckless	16%	16%	17%
Excessive speed	15%	**22%**	1.1%
Failure to judge other person's path or speed	11%	5.4%	**21%**
Inattention	5.9%	5.4%	6.7%
Lack of judgement of own path	4.6%	**6.5%**	0.7%
Impairment – alcohol	6.1%	8.0%	2.1%
Inexperience of driving	5.5%	7.0%	2.5%
Number of Contributory Factors / accidents	854	572	282

3.3 ACCIDENT CLUSTERS

An accident is fully characterised by the *combination* of PFs and CFs. An accident cluster comprises all those accidents that share the PF and the *first* definite or probable CF, so the clusters are disjoint. The most common clusters are listed below, again distinguishing between those accidents where a TWMV rider was reportedly responsible and those other accidents where the responsible person does not appear to have been a TWMV rider.

Non-built-up roads

TWMV rider judged to have been principally responsible (237 accident clusters)

Loss of control because of excessive speed (28% of clusters)
Loss of control because of alcohol impairment (7.6%)
Failed to avoid vehicle or object in carriageway because of excessive speed (5.9%)
Loss of control because of inattention (5.5%)

Other road user judged to have been principally responsible (103 accident clusters)

Failed to give way because of careless/thoughtless/reckless behaviour (14%)
Poor turn/manoeuvre because of careless/thoughtless/reckless behaviour (12%)
Failed to give way because driver looked but did not see (9.1%)
Failed to give way because of failure to judge other person's path or speed (7.1%)
Loss of control because of excessive speed (6.1%)

Built-up roads

TWMV rider judged to have been principally responsible (239 accident clusters)

Loss of control because of excessive speed (23% of clusters)
Loss of control because of alcohol impairment (11%)
Failed to avoid vehicle or object in carriageway because of excessive speed (10%)
Loss of control because of careless/thoughtless/reckless behaviour (4.8%)

Other road user judged to have been principally responsible (125 accident clusters)

Pedestrian entered carriageway without due care because of failure to look (14%)
Failed to give way because of careless/thoughtless/reckless behaviour (11%)
Pedestrian entered carriageway without due care because of failure to judge other person's path or speed (10%)
Failed to give way because of failure to judge other person's path or speed (8.0%)
Poor turn/manoeuvre because of careless/thoughtless/reckless behaviour (7.2%)

4. Summary and conclusions

This analysis has shown very clear differences between the Contributory Factors in TWMV accidents judged to have been the responsibility of a TWMV rider and accidents where a non-rider was judged to have been the responsible. Among fatal accidents:

- A high proportion of the former accidents involves 'Loss of Control', the proportion being higher on NBU roads. This Precipitating Factor was often linked with excessive speed, alcohol impairment and careless/thoughtless/reckless behaviour.
- Loss of Control was rarely identified as leading to an accident where the non-rider was judged responsible; instead, 'Failed to give way' and 'Poor turn/manoeuvre' were relatively common. These Precipitating Factors were often linked with failure to observe satisfactorily, careless/thoughtless/reckless behaviour and to judge the rider's path or speed.

A final report with the full results of the project, including an in-depth analysis of the police files, will be published soon.

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