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Comparative analysis of motorcycle accident data from OTS and MAIDS

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COMPARATIVE ANALYSIS OF MOTORCYCLE ACCIDENT DATA FROM OTS AND MAIDS

Version: 3

by M G McCarthy, L K Walter, R Hutchins, R Tong, M Keigan (TRL Limited)

Prepared for: Project Record:	**T501G Analysis of OTS Data in comparison with MAIDS Motorcycle Study**
Client:	**Road User Safety Division, Department for Transport (Dr Sofia Marçal-Whittles)**

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Executive summary

The Department for Transport commissioned TRL to compare two motorcycle accident studies: The European Motorcycle Accident In-Depth Study (MAIDS) and the UK On The Spot (OTS) study. The overall aim of the project was to compare the findings of the MAIDS study as reported in the MAIDS final report with UK data from the DfT-funded OTS study.

Using the OTS and MAIDS accident databases, the main objectives of the project were to:

- Conduct a comparative analysis highlighting areas of commonality and difference; and
- Carry out additional analyses of issues of particular relevance to the UK context.

The MAIDS study involved collection of 'on the spot' accident data from five European countries: France, Spain, Germany, Italy and The Netherlands. The data were collected using the OECD common methodology designed for two-wheeled motor vehicle accident investigation. The OECD common methodology is intended to provide a system capable of identifying risk factors affecting motorcyclists. The MAIDS data used in this study comprise 921 accidents involving 921 motorcycles.

The OTS data were collected from two areas of England: the Thames Valley and South Nottinghamshire. Investigators attended accident scenes immediately following accidents. This enabled unstable scene data (e.g. temporary highway factors, weather) and witness statements to be collected. The full OECD common methodology is not used in the collection of OTS data. The OTS data used in this study comprise 302 accidents involving 306 motorcycles.

OTS and MAIDS protocols were compared against one another, and both were compared with the protocols of the OECD common methodology. Despite the different protocols being used in the two databases, both collect compatible basic accident information. In most cases, the data collected for MAIDS have a greater level of detail.

Compared with OTS, MAIDS performs more detailed accident reconstruction and collects more mechanical (e.g. braking system) and human factors (e.g. rider age) information. Unlike OTS, MAIDS includes exposure data and thus enables accident risk factors to be quantified. MAIDS also codes accident information into more detailed categories. OTS data collection is broader, covering all road accidents, not just those involving motorcycles. The differences in protocols are largely attributable to the different purposes for which the OTS and MAIDS data were collected.

There are considerable differences between the accident populations of OTS and MAIDS data:

- Engine sizes: compared with the MAIDS data (57%) the OTS data contained higher proportions (80%) of powered two wheelers with larger engines (L3[1] vehicles). The magnitude of this difference, and its statistical significance, indicates a difference in the distribution of engine sizes of vehicles in accidents which suggest an underlying difference in the fleet make-up between OTS and MAIDS sampling areas. This difference is likely to be linked to many other factors such as journey purpose, length and environment. These factors are, in turn, likely to affect accident types, severity and perhaps also causation within the sampling regions.
- Protective Equipment: the proportions of motorcyclists wearing protective equipment were statistically different, between OTS and MAIDS samples, at the 99% confidence level; the types of equipment worn were also different: higher proportions of leathers and full face helmets were worn in the OTS sample. Protective equipment choices are influenced by factors including climate, bike style, engine capacity, trip purpose and trip length. These differed between sampling region.

[1] **ACEM (2004).** *MAIDS In depth investigations of accidents involving powered two-wheelers Final Report*. Available from http://MAIDS.acembike.org

- Accident factors: accident type (e.g. junction, bend) and accident environment (e.g. rural or urban) data from MAIDS do not reflect UK circumstances. This is not surprising given the different countries sampled and methodologies used. The MAIDS study was based on a case-control methodology and focussed on determining accident causation and accident risk, so the study was not designed to compare with the national statistics of the countries.
- Severity: accident severity data is recorded in MAIDS using the Abbreviated Injury Scale (AIS[2]). PTW injuries recorded in OTS and MAIDS data were compared using this scale and showed that a higher proportion of higher severity injuries (AIS>2) were reported in OTS (49%) compared to MAIDS data (41%). There is a higher proportion of high severity motorcycle accidents recorded in OTS data. This is considered to be a result of the OTS sampling - investigators are called to a higher proportion of more severe accidents in general.
- Injuries: significant differences are found between the accidents in OTS and MAIDS in terms of the injuries recorded. OTS data reports higher proportions of neck, thorax and abdomen injuries than MAIDS. MAIDS data shows significantly higher proportions of head and lower extremity injuries.
- Conspicuity: this is an important consideration with respect to the interaction of motorcycles with other road traffic. OTS data collected at the time of the accident shows that motorcycle headlights were off in 40% of cases whereas for the exposure data this proportion was 23%. This suggests that the use of motorcycle headlights appears to be beneficial in terms of alerting other road users to the presence of a powered two-wheeler. A significantly higher proportion of PTWs had headlights in operation at the time of the accident in the MAIDS study.

Some similarities exist in the accident populations of OTS and MAIDS data:

- Collision partner: both OTS and MAIDS show that the major collision partner in motorcycle accidents are passenger cars, accounting for approximately two-thirds of accidents. This is the case regardless of whether the accident occurred in a rural or urban setting.
- Junction accidents: the proportions of accidents which occur away from a junction are similar between the studies (38% for MAIDS and 42% for OTS).
- Causation: a traffic scan error by the motorcycle rider contributed to the accident in 28% of MAIDS records and 22% of OTS records. Traffic scan errors by other vehicles users in the collision accounted for 64% of accidents in MAIDS and 67% of accidents in OTS. It is recommended that future OTS phases should consider the feasibility and implications of collecting accident reconstruction information in a more OECD-compatible format. This would allow further comparison with European data.

[2] **Association for the Advancement of Automotive Medicine (AAAM) (1990).**
The Abbreviated Injury Scale, 1990 Rev. (pp. 1–75), AAAM, Des Plaines, IL.

CONTENTS

1 Introduction

In 2006, motorcycles accounted for approximately one percent of traffic on UK roads, but accounted for 19% of fatal and serious casualties (DfT, 2007) indicating that they are over-represented in the national casualty statistics. Although the rate of motorcyclists killed and seriously injured per distance travelled has had a general declining trend over recent years, casualty statistics reveal that the rate is around 30 times higher for motorcyclists than car occupants (DfT, 2007). At present, approximately 1 in 5 of serious and fatal road casualties in the UK are motorcyclists (DfT, 2007). In order to address this, the UK government published a motorcycle strategy document (DfT, 2005a) which set out the targets for future research and the strategy to encourage safer motorcycling. Furthermore, the increasing popularity of motorcycles, the encouragement of 'greener' transport modes, and rapid advances in the safety of other vehicle types, suggest that motorcyclists may continue to become a greater percentage of the road traffic fatality distribution in the future.

Motorcycle safety is also an important topic within Europe. The CARE database indicates that in 2004, for the EU 15, there were 32,951 people killed on EU roads; 3,998 of these were riders and passengers of motorcycles and mopeds (CARE database, July 2006). Indeed, the safety of vulnerable road users, including motorcycle and moped riders, is one of the priorities of the European Community as stated in the White Paper on Transport Policy for 2010 (The European Commission, 2001) and underlined by the Council of Ministers in June 2003 in the application of these policies.

The aims of this project were to compare data collected by the UK On-The-Spot (OTS) study with the findings of the Motorcycle Accident In Depth Study (MAIDS), which collected motorcycle accident data from discrete sampling areas within five European countries. A broad range of motorcycle issues important to UK motorcycle safety were identified from existing literature. As an integral part of this comparison process, the MAIDS and OTS data collection methodologies were examined to identify similarities and differences which influence the collection and interpretation of the data.

Once protocols were compared, differences between data from compatible variables could be investigated. Fundamental differences in 'known' variables in the motorcycling populations were found, for example, rider age and engine size. A procedure for weighting the data was adopted in order to make them compatible.

In order to account for differences between countries, the OTS data were compared with MAIDS both in terms of raw and weighted data. The raw data were presented in order to indicate any fundamental differences due to sampling or population differences. The weighted data were presented to better reflect the underlying parameters of the motorcycle and motorcyclist population of the MAIDS study. The weighted data allowed for comparisons between the European and UK data to be made with a better understanding of the context of the data, allowing judgements on the agreement between MAIDS and OTS data to be made, as well as some interpretation and explanations for apparent differences.

2 Project objectives

The overall aim of this project was to compare the findings of the European Motorcycle Accident In-Depth Study (MAIDS) as reported in the MAIDS final report, with UK data from the (DfT-funded) On-The-Spot (OTS) study. The purpose of this activity was to determine whether the findings of the MAIDS study were applicable to motorcycle accidents in the UK, and to identify how the MAIDS and OTS data could be used to investigate motorcycle safety issues pertinent to the UK.

This comparison required completion of the following tasks:

- Initially areas of motorcycle safety which are considered particularly relevant in the UK context were identified by reviewing previous research and published accident statistics. This task is reported in Section 3 of this report.
- The OTS and MAIDS databases and their protocols were examined in order to ascertain the extent of the differences and similarities between their methodologies (the data collection protocols) and any country-specific differences. The compatibility between the two sets of data was considered, and the extent to which the findings from the MAIDS data could be applied to the UK - whether the MAIDS data were representative of the UK situation - was explored. This task involved identifying areas of analyses performed by MAIDS which could be applied to the UK situation. This was crucial for understanding the degree to which data from these two sources may be compared and to understand any differences and similarities which affect the interpretation of the data in the UK context. This is reported in Section 4 of this report.
- The OTS database was analysed to extract data which corresponded to that presented in the MAIDS final report in order to allow a comparison of the accident data taking into account, as far as practical, any differences between the datasets. These data were then used to allow an analysis of motorcycle safety issues considered of particular relevance to the UK to be made, using the OTS database and those areas of the MAIDS database which were deemed representative of the UK data. This is reported in Section 5 of this report.

These data comparison activities provided information on the extent to which the OTS data are compatible with the MAIDS data to aid comparison on a Europe-wide level, and also identify similarities and differences in the accident data trends between European countries and the UK.

3 Motorcycling accidents in the UK

For the years up to 2003, the number of fatal and serious Two-Wheeled Motor Vehicle (TWMV) casualties in Great Britain had been increasing year on year. Since then, the total number of casualties has decreased year on year, however the number of fatal injured motorcycle riders increased in 2006. Table 3.1 shows the numbers of motorcycle and car occupant casualties in the UK for the years 2004-2006. Note that the KSI[3] rate per 100 million vehicle kilometres is still over 30 times higher for motorcyclists than for car occupants (DfT, 2007).

Table 3.1: Motorcycle and car occupant casualties GB 2005 (DfT, 2007)

	Number					
Year	**2004**		**2005**		**2006**	
Class of road user	**motorcyclists**	**car occupants**	**motorcyclists**	**car occupants**	**motorcyclists**	**car occupants**
Fatal	585	1,671	569	1,675	599	1,612
Serious	6,063	14,473	5,939	12,942	5,885	12,642
Slight	18,993	167,714	18,316	163,685	16,842	156,746
Total	25,641	183,858	24,824	178,302	23,326	171,000
Motorcycle Traffic*	52	3,981	54	3,972	52	4,024
Casualty Rate**						
KSI	129	4	120	4	126	4
Slight	368	42	337	41	326	39
All	497	46	457	45	452	42

*100 million vehicle kilometres.
** Rate per 100 million vehicle kilometres and rounded to the nearest whole number
Source: Department for Transport, 2006

From reviewing the published motorcycling accident statistics and the relevant literature, the following areas were considered as being important safety issues in the UK:

- 'Looked but failed to see accidents'. These often occur at junctions and involve factors relating to conspicuity, interacting vehicle design (A-pillar obscuration), driver behaviour/experience and highways issues.
- Accidents which occur on bends.
- Accidents in which a motorcyclist is overtaking another vehicle.
- The increasing number of older inexperienced motorcycle riders.
- Indirect visibility. The position of the mandatory mirror on the motorcycle has been questioned by riders.
- Rider and bike conspicuity issues and the interaction of the motorcyclist with other road users.

[3] killed or seriously injured

- Personal Protective Equipment (PPE); the level of protection offered by the helmet (in terms of both protection and retention in accidents) and the use of dedicated motorcycle clothing (injury mitigation).

3.1 Motorcycle accident overview

There is a wealth of research on motorcycle accidents in the United Kingdom. The following research evidence provides a general context of UK motorcycle accidents:

- In 2003, 18% of all motorcycle accidents were single vehicle accidents, whilst 68% involved accidents with cars (DfT, 2005a). In the same year, single vehicle accidents accounted for 28% of motorcycle fatalities; about half of these occurred on rural roads and 82% of these involved the contributory factor ‘loss of control’.
- Excessive speed was a factor in over a quarter of the single vehicle ‘loss of control accidents’, and in over one third of accidents that led to death or serious injury (DfT, 2005a).
- Accidents involving cars in 2003 accounted for almost half of motorcycle fatalities; three-quarters of these fatalities were on urban roads. In 39% of the fatalities, the cause was attributable to the actions of the motorcycle (DfT, 2005a).

These key findings illustrate that two accident types account for the majority of accidents involving motorcycles: three quarters of accidents involve a collision with a car and these accidents account for approximately half of all motorcyclist fatalities. Approximately three-quarters of all car-motorcycle accidents occur on urban roads.

One fifth of motorcycle accidents are single vehicle accidents and these cause over a quarter of motorcyclist fatalities. Hence, motorcyclists involved in single vehicle accidents are more likely to be killed than those involved in accidents involving other vehicles.

3.2 Accident causation factors

Accidents attributable to the motorcycle rider involved a high proportion of ‘loss of control’ accidents. Reviewed reports (see References) found that:

- Approximately equal proportions of ‘Motorcycle only’ accidents and accidents involving another vehicle were contributed to by a ‘loss of control’;
- 44% of accidents involving cars in which the motorcyclist was responsible for the collision involved ‘excessive speed’ by the motorcyclist;
- A large proportion of ‘loss of control’ accidents took place in built-up areas (typically with a 30 miles per hour (mile/h) speed limit);
- Motorcycles of lower engine capacities (i.e. less than 500cc) were more likely to be involved in accidents in built-up areas;
- In non built-up areas - typically single carriageway roads with a speed limit of 60 mph - the accidents were most frequently the fault of the motorcyclist as a result of losing control of the motorcycle;
- Over two-thirds of accidents involved 'sports' bikes, mostly with larger engines (i.e. over 500cc) in non built-up areas, typically on single carriageway roads with a speed limit of 60 mph; and
- There were very few mopeds and scooters involved in accidents on non built up roads with a speed limit of 60 mph.

4 Identification of differences and similarities between the OTS and MAIDS protocols

The purpose of this task was to examine the UK On-The-Spot study (OTS) and the European Motorcycle Accident In-Depth Study (MAIDS) with particular reference to the similarities and differences in the data collection protocols of the two studies. These were identified and the influence of these on the MAIDS/OTS comparison has been highlighted.

Section 4.1 provides a brief overview of the main features of both the OTS and MAIDS studies respectively in a general context. Section 4.2 concentrates on the specific differences and similarities between the two studies, and discusses how these may influence comparisons of important UK motorcycle safety issues.

4.1 OTS and MAIDS: a brief overview

The data available through the OTS project, which has recently completed its second phase, were collected by investigators from two areas of England (the Thames Valley and South Nottinghamshire) who attended accident scenes in the immediate aftermaths. The details of the OTS procedures may be found in the Development and Implementation of the UK On The Spot Accident Study (DfT, 2005b).

The OTS information recorded includes highway and environment factors, vehicle factors, human characteristics, behaviour and causation factors. Although the OTS dataset includes accidents involving all types of road user a subset of the 302 accidents involving motorcycles are reported here, comprising 306 motorcycles.

The main strengths of the OTS approach in comparison with more conventional retrospective studies are:

- Access to unstable scene data including temporary highway factors and climatic conditions, which are particularly important for determining accident circumstances especially when investigating vulnerable road user accidents.
- The opportunity for investigators to interview witnesses at the scene, thus gaining insight into behavioural characteristics and how these may be influenced by transient factors.

OTS has developed over recent years, placing greater emphasis on crash reconstruction activities. However, the relative infancy, and the contractual and resource obligations of the OTS study, prevented full implementation of the OECD methodology as was used by MAIDS. Further details of information recorded in the database may be found in Appendix A.

Collection of the European data by the MAIDS (ACEM, 2003 and 2004) project followed the OECD methodology. The MAIDS study involved ‘on the spot’ accident research teams from five European countries: France, Spain, Germany, Italy and The Netherlands, all of whom used a data collection methodology and standard structure for two-wheeled motor vehicle accident investigation devised by an OECD working group. The ‘OECD common methodology’, as this was named, was developed to provide a data recording scheme capable of identifying risk factors affecting motorcyclists. Analysis of these data was intended to be used to identify and implement measures aimed at ways of reducing the most frequent causes of accidents and injuries, and to assess how effective implemented (or planned) methods may be at improving motorcycle safety.

The OECD common methodology used by the MAIDS study consists of thirteen sections which describe the entire data collection programme, from personnel and sampling requirements to data analysis and reporting. Within the methodology, the basic ‘data collection’ tools are worksheets which are completed at the scene, data summary sheets (DSS) which are written up from the scene data, and the coding manual which provides guidance on the coding process and provides relevant definitions. The worksheets and DSS are subdivided into topics or modules. Of these modules, most are compulsory to ensure the quality of the multi-disciplinary data collected; there are also optional modules which address more specialised topics and could provide important detailed information for specific research programmes.

A full description of the OECD common methodology used by MAIDS can be found in “Motorcycle: Common International Methodology for On-Scene, In-Depth Accident Investigation” (OECD, 2001)

4.2 The similarities and differences between OTS and MAIDS

The range of compatible areas between the two studies is detailed in tables in Appendix B. These tables specify the areas of the study which are compatible with OECD methodology. The methodologies used by the OTS and MAIDS studies are very similar in terms of the scope of data collected and the basic level of data collected about the involved vehicles, injuries and accident causation. The OTS and MAIDS studies are also fairly similar in terms of the sampling requirements – see Section B.1.

In terms of the assessment of motorcycle accidents in the context of importance to the UK, the basic level of detail such as the involved vehicles, accident configurations, road environment, environmental conditions and rider details can be compared since corresponding data exist in the studies. That is, all relevant basic accident information is collected by both studies and at the general accident details level, the studies can be considered compatible, although the OECD methodology generally has more detailed categories for each parameter recorded. Thus, where the OTS and OECD methodology have been compared, the merging of categories for some variables is required.

Where OTS is compatible with the OECD method, the main differences between the OTS and MAIDS are summarised below. These highlight where OTS has a different methodology due to differences in the range of accidents attended or other differences between the purpose and scope of the studies. For example, OTS is designed to collect data from all accidents, while MAIDS collects data only from motorcycle accidents.

- Accident reconstruction – OTS accident reconstruction has developed to become more compatible with the OECD method during Phase 2. However, for the majority of cases reported here the OTS does not reconstruct a full timeline of events, speeds, manoeuvres and the appropriateness of decisions made by the involved parties unless this is provided by the police via reconstruction of fatal accidents. The OECD method performs an in-depth reconstruction which is very involved and which records information in greater detail than routinely collected by OTS.

- Mechanical factors – the scope of OTS does not include any routine motorcycle mechanical factors investigations. Thus, accident causations relating to mechanical failures cannot be deduced from OTS data unless such information is available from a police investigation of a fatal accident.

- Human factors –OTS does not collect as much ‘human’ information as MAIDS. Full witness testimony and history for every crash is routinely obtained via one to one interviews or telephone calls with witnesses or involved parties in MAIDS. OTS questionnaires are sent to survivors, of which approximately 60% are returned, and these do provide some of the data that MAIDS collects. However, detailed information concerning training, career and any conviction details are typically not known in OTS data.

- OTS is larger but less detailed than the OECD method in terms of the scope and number of categories for recording accident information. In general, OTS data can be recorded onto OECD forms, but with less detail. For example, OTS generally describes the condition of the motorcycle or components as ‘Good’, ‘Fair’ or ‘Poor’, whereas OECD requests a text description to describe any unusual conditions which exist, including any vehicle component failures, for example.

- Helmet information – OTS does not collect this to the same level of detail as MAIDS does. Helmet status and condition is, however, recorded in as much depth as required by OECD. It should also be noted that, due to the relatively large sampling regions of OTS and the time taken to reach some accident locations, there are some occasions when the OTS investigation teams do not see the helmet. The reason for this is that the casualty and helmet have frequently left the scene before the investigators arrive.

- Exposure data - OTS has not, to date, analysed any video data. Interviews with motorcyclists observed using the road are not undertaken to determine their characteristics and hence ‘exposure or control’ measures have not been developed: details of their journeys and characteristics compared to the crash casualty are unknown.
- Sampling requirements – OTS does not collect data from every motorcycle accident, but attends accidents on a shift pattern basis such that no one day of the week or month of the year is over-represented in terms of coverage by OTS. This means that, although the sampling of OTS is not compatible with the OECD common methodology and therefore the MAIDS studies, this should not influence any comparison since the samples are representative of those within the sampling region.
- Data recording – OTS does not code accidents onto paper data recording forms (data summary sheets in the OECD method). Instead, data are entered directly into an electronic database. This difference has no significant impact on a comparison between the data studies.
- Definitions – The studies have differing definitions for some aspects of the data which influence the interpretation and analysis of the two studies. For example, definitions of the style of motorcycle differ between the studies. Further details of how this was dealt with in the comparison of the two studies can be found in Section 5.1.1. In addition, definitions such as ‘urban’ and ‘rural’ may be allocated differently since they rely on subjective assessment of the accident investigators. Also, the OECD method is more detailed and, for example, prescribes a more detailed breakdown of environmental conditions.

An account of the differences and similarities between the OTS study and the MAIDS protocols is provided in Appendix B. Details of the differences and the compatibility between the OTS study and the OECD Common Methodology used by the MAIDS study are presented in Appendix B, Tables B.1 to B.10. In depth data comparisons are made in Section 5.

5 Examination of OTS and MAIDS data

The following section displays comparisons of data from MAIDS and OTS. In comparing these data, it has been necessary to be aware of the differences and similarities between MAIDS and OTS with respect to their data collection methodologies (see Section 4), and important to identify other factors which affect the comparison exercise between the two datasets. For example, differences in rider age or motorcycle engine size within different sampling areas may affect the conclusions drawn. These factors could be the cause of differences found between the two studies, or they may hide other factors of interest when comparing the two studies. For this reason, key parameters were examined in both the MAIDS and OTS data in order to understand any differences, and to attempt to account for any known uncontrollable differences (age, engine size etc.) in any subsequent analysis. This section begins with a description of this investigation, including merging inconsistent variables and a weighting procedure, to allow for certain known variables that are different. After this, the results and some analysis are presented and summarised.

5.1 Comparison of MAIDS and OTS: data comparison methodology

The analysis of the OTS data which follows keeps to the format of the MAIDS Final Report (ACEM, 2004). Using the data retrieved from OTS, tables and graphs were produced which are the equivalent of the tables and graphs provided in the MAIDS report. A mixture of figures and tables are presented in the report in order to facilitate easy comparison. Where comparison plots are shown (those with MAIDS and OTS percentages), separate frequency tables of the same data can be found in Appendix C. Percentages, where shown, are of the total recorded number of accidents involving motorcyclists.

5.1.1 Merging Variables

There were several cases where the OTS categories were different from the MAIDS categories; for example, in the ‘roadway alignment’ variable, OTS records the direction of curve (left or right) and the sharpness of the turn (slight or sharp bend), whereas in MAIDS, the only options available are straight or curved. The definitions had to be matched and links established between the OTS and MAIDS variables in order to make meaningful comparisons. Where merging was required, this is discussed in the text or detailed in Appendices D and G.

The variable ‘bike style’ is not consistent across the two studies. The exact definitions of bike styles in OTS are not available to compare with definitions from the OECD methodology pertaining to MAIDS. The links that have been made, presented in Table 5.1, are the result of expert judgement and they compare the two sets of definitions as closely as possible.

Table 5.1: Merging Variables- PTW Style

The report uses the following definition of PTW style:	OTS definitions	MAIDS definitions
Standard Street	Standard Street	Conventional Street Conventional Street with modifications
Road Race Replica	Road Race Replica	Sport, race replica
Tourer	Tourer	Touring Sport touring
Cruiser	Cruiser	Cruiser
Chopper	Chopper	Chop/Semi chop
Scooter	Commuter Moped without pedals Moped with pedals Scooter	Scooter Step-through
Other	Other Multipurpose	Other Off-road / Enduro Dual purpose Motorcycle plus sidecar

5.1.2 Accident causation

Contributory factors summarise events and influences leading directly to an accident. Accident causation variables are reported at several levels in MAIDS and in several different ways in the OTS database. Both databases record the road user(s) to whom the contributory factors are attributed.

MAIDS reports primary contributory factors (human, vehicle, environmental and other), secondary contributory factors for human factors (perception failure, comprehension failure, decision failure, reaction failure and other failure) and tertiary factors. These are listed below.

Human factors:

- Attention failure
- Traffic-scan error
- Visual obstructions neglected
- Temporary traffic hazard detection failure
- Faulty traffic strategy
- Speed compared to surrounding traffic

Environmental factors:

- Roadway design defect
- Roadway maintenance defect
- Traffic hazard
- Traffic controls defect or malfunction
- Weather related problem

Vehicle contributing factors:

- Vehicle failure
- Fuel leakage
- Fire occurrence

OTS registers accident causation in several ways:

- precipitating factors and their associated contributory factors by accident;

This system was proposed by Broughton *et al* (1996) as an additional section to the STATS19 form. The precipitating factor is defined as the critical failure or manoeuvre that led to the accident. One or more contributory factors are selected to define the possible causes of that failure. As this selection is subjective, the investigator is given the option of stating whether the factor was 'definitely', 'probably' or 'possibly' causative.

- contributory factors using the 2005 STATS19 definitions for each accident;

A simplified version of the precipitating/contributory factor system was added onto the STATS19 form from 2005. This contains just one list of factors thought to be contributory to the accident. Within this variable, the investigator is given the option of stating whether the factor was 'very likely' or 'possible'.

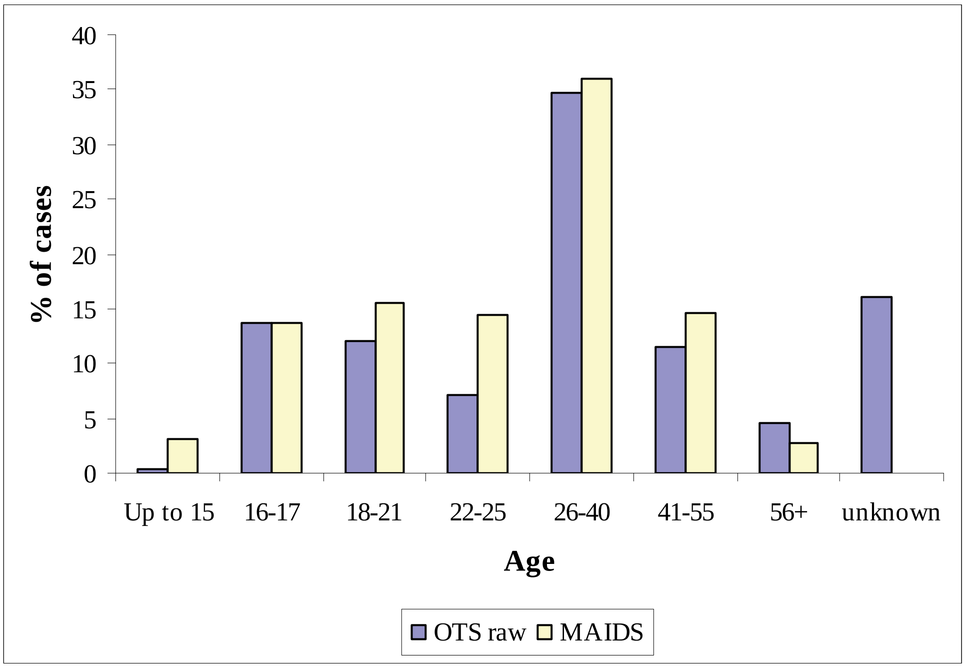
- crash causation codes for vehicles.

These codes are similar to the contributory factor codes, but attributed to each vehicle.

It was deemed appropriate to use the contributory factors from the accident causation approach proposed by Broughton *et al* (1996) which linked most closely with the MAIDS causation codes. Appendix D details the links between OTS contributory factors and primary and tertiary MAIDS contributory factors. Within the tables comparing the contributory factors recorded by OTS and MAIDS, the OTS sum is achieved by adding all accidents where the linked tertiary variable is recorded. For example, attention failure tables are the sum of results from 'Distraction through stress of emotional state of mind', 'Distraction through physical object on or in vehicle', 'Distraction through physical object outside the vehicle' and 'Inattention'.

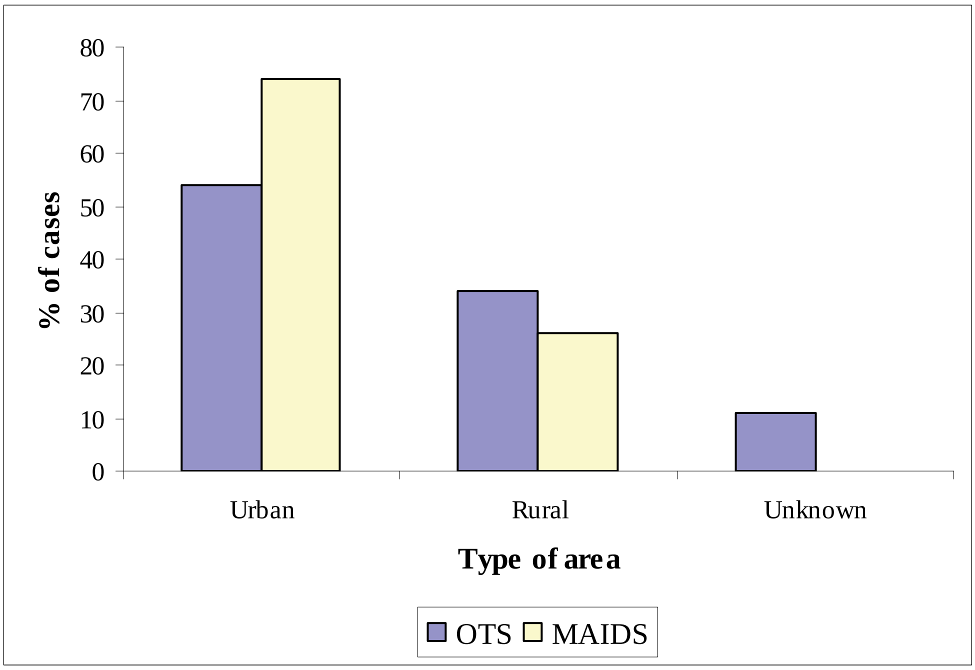
5.1.3 Weighting the OTS data

It is clear that there are some obvious differences between the motorcycling population in England and that in the MAIDS countries. Figure 5.1, Figure 5.2, and Figure 5.3 show rider age, urban/rural split and engine size distributions from both OTS and MAIDS studies. They demonstrate clear differences between OTS and MAIDS distributions for these variables and also an underlying variation in vehicle fleet, rider demographics and riding environment between the two studies. Whilst these factors could be causes of differences in accident mechanisms between the two studies, they may hide other factors of interest when comparing the two studies. The aim of the weighting procedure is to remove variation in the data due to known differences in riding populations (age and vehicle fleet for example), and thus any differences that are found could be due to collision differences.



OTS v. MAIDS Chi-squared test (χ^2=10.7, df=6, $p < 0.05$)[4]

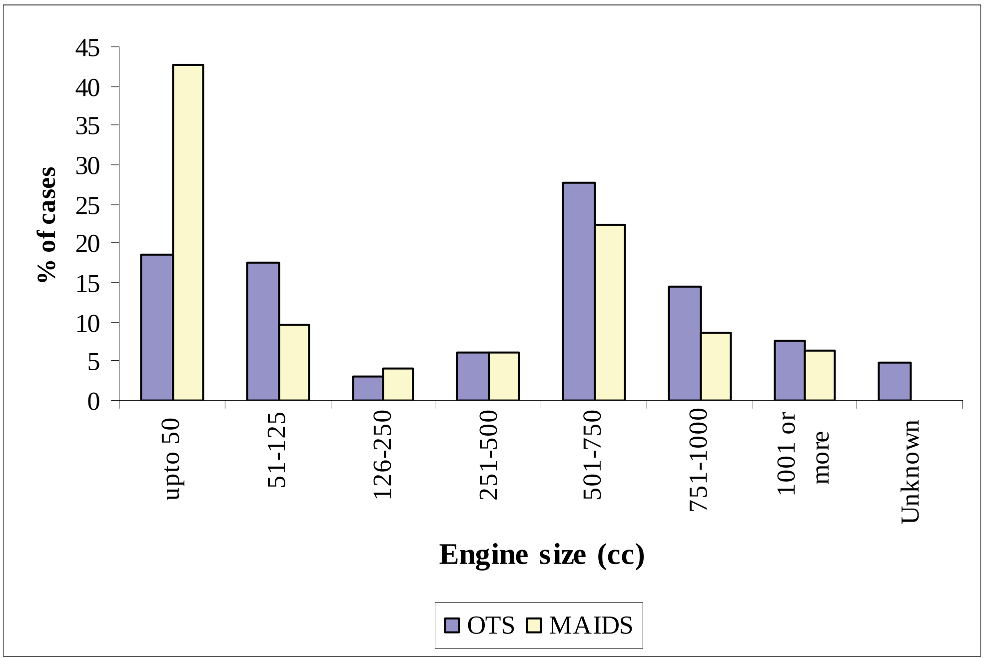
Figure 5.1: Age distribution of PTW riders involved in accidents



OTS v. MAIDS χ^2 test (χ^2=12.6, df=1, $p < 0.01$)

Figure 5.2: Urban / rural distribution of accidents involving a PTW

[4] P-values are stated at several levels: p > 0.10 is a non-significant result, otherwise p < 0.10, p < 0.05, p < 0.01, are significant at 10%, 5% and 1% respectively. All p-values are computed with unknowns excluded.



OTS v. MAIDS χ^2 test (χ^2=70.9, df=6, $p < 0.01$)

Figure 5.3: Distribution of motorcycle engine sizes involved in accidents

The statistical detail of the weighting procedure can be found in Appendix E. The urban/rural and engine size variables were used as the weighting variables. Two sets of weights are defined in Table 5.2 in order to be able to analyse both vehicles (a total of 306) and accidents (a total of 302).

Table 5.2: Weights applied to OTS vehicles and accidents

Urban / rural	Engine size (cc)	Vehicle weights	Accident weights
Rural	≤ 50	1.03	1.01
Rural	51 - 125	0.56	0.55
Rural	126 - 500	0.68	0.68
Rural	501 - 750	0.55	0.54
Rural	751 - 1000	0.59	0.58
Rural	≥ 1001	0.94	0.93
Urban	≤ 50	2.69	2.77
Urban	51 - 125	0.53	0.54
Urban	126 - 500	1.21	1.24
Urban	501 - 750	0.99	0.98
Urban	751 - 1000	0.56	0.55
Urban	≥ 1001	0.66	0.65
Unknown	Unknown	1.00	1.00

5.1.4 Exposure data

Exposure data are collected for the MAIDS and OTS studies in different ways as described in Section 4. The MAIDS methodology identified motorcyclists at a petrol station near the scene of the accident who could be used as a control. OTS collects information from videos of the scene one week after the accident. This means that data are restricted to those visible on a video; for the purposes of this study the OTS video tapes from VSRC and TRL have been analysed. Some results from a survey of approximately 11,000 motorcyclists in Britain in 2002 (Sexton *et al*, 2004a) have been utilised in addition to OTS exposure data. This has enabled estimates from a large sample of the population of motorcyclists, in particular the spread of age and sex of riders, to be gained. Unless otherwise stated, all OTS exposure data were extracted from the video.

Some MAIDS exposure data are presented. These come directly from the MAIDS database and are not reported in the MAIDS report. Of more interest is the comparison between OTS and MAIDS results and how representative the OTS data are relative to the exposure data.

5.2 Comparisons results

5.2.1 OTS data overview

Phase 1 and 2 results from the OTS study were available for analysis. The results from these phases comprise details of 5024 accidents, 302 of which involved motorcycles, accounting for a total of 306 motorcycles. As shown in Table 5.3, four of the 302 accidents involved two motorcycles and 20 of the 306 motorcycles were carrying a passenger. In addition, as Table 5.3 shows, there were 212 accidents involving more than one vehicle; and the other 90 accidents were single vehicle accidents.

Table 5.3: Overview of general frequencies

	Counts
Number of accidents	302
Number of single vehicle accidents	90
Number of accidents involving more than one vehicle	212
Number of motorcycles	306
Number of motorcycle riders	306
Number of passengers	20

Information is gathered by the OTS team when visiting an accident scene which can assist the team in understanding the full story of the accident. This information includes details such as time of day of the accident, weather condition, lighting at the scene and road condition. The OTS team uses these details, together with questionnaires completed by those involved in the accident, to identify the most likely contributory and precipitating factors. Two OTS case studies are described in Appendix F.

5.2.2 Comparing of National data with study data

The MAIDS report does not comment on how representative the data are of National figures. The study was based on a case-control methodology and focussed on determining accident causation and accident risk, so the study was not designed to be representative of the whole area under sample. For comparison purposes, MAIDS data were compared to National data and, for the reasons discussed above, the distribution of cases in the sample and in the whole country for each team are not the same. However, OTS is representative of the STATS19 database with respect to most of the variables tested that are shown below. This is indicative of a substantial difference in study aim and design between MAIDS and OTS.

The distribution of ages of casualties amongst powered two-wheeler (PTW) users was observed across five countries: Spain, France, The Netherlands, Italy and Great Britain. The data are presented in Appendix C, Table C.1. This shows that there are some differences in motorcycle accidents between MAIDS countries and Great Britain**.**

The next four tables[5] investigate the degree to which OTS data are representative of the National data for Britain. Statistical tests show that there are no significant differences ($p > 0.05$) in the distribution of killed and seriously injured casualties in OTS compared to those in STATS19 in relation to rider age, engine size and type of area, though the sample sizes are limited. However, a highly significant difference was found in severity: the proportions of accidents with more severely injured casualties were over-represented in the OTS study. This is because it is reliant on the team being notified by the police and, where there are no casualties, or they are slightly injured only, the police are often not notified until some time later; however, in the case of more serious accidents, it is likely that the scene is still intact when the team arrives.

Table 5.4: Distribution of KSI accidents in STATS19 and OTS by rider age

	STATS19		**OTS**	
KSI	**Count**	**%**	**Count**	**%**
≤15	0	0	0	0
16-17	4853	11	7	8
18-21	5240	12	12	13
22-25	4174	9	9	10
26-40	18854	43	42	47
41-55	8791	20	15	17
≥56	2066	5	4	4
unknown	1531	-	13	-
Total	45509	100	102	100

STATS19 v. OTS χ^2 test (χ^2=1.9, df=5, p>0.10)

[5] In the tables that follow, the STATS19 data include all motorcyclist casualties for the years 2000-2005 inclusive unless otherwise stated.

Table 5.5: Distribution of KSI accidents in STATS19 and OTS by engine size

	STATS19		OTS	
KSI	**Count**	**%**	**Count**	**%**
Up to 50cc	4517	12	10	10
51-125cc	1169	3	3	3
126-250cc	3085	8	9	9
251-500cc	11364	29	37	38
501-750cc	7998	21	13	13
751-1000cc	6733	17	16	16
1001cc or more	3927	10	9	9
Unknown	6716	-	5	-
Total	45509	100	102	100

STATS19 v. OTS χ^2 test (χ^2=5.5, df=6, p>0.10)

Table 5.6: Distribution of KSI accidents in STATS19 and OTS by accident area

	STATS19		OTS	
KSI	**Count**	**%**	**Count**	**%**
Urban	24409	54	45	48
Rural	20976	46	48	52
Unknown	124	-	9	-
Total	45509	100	102	100

STATS19 v. OTS χ^2 test (χ^2=1.1, df=1, p>0.10)

Table 5.7: Distribution of accidents in STATS19 and OTS by accident severity

	STATS19		OTS	
	Count	**%**	**Count**	**%**
Fatal	4123	2	24	9
Serious	41386	24	78	28
Slight	125519	73	178	64
Total	171028	100	280[6]	100

STATS19 v. OTS χ^2 test (χ^2=49.3, df=2, p<0.01)

[6] In the remaining 22 accidents no PTW rider injury was recorded.

5.2.3 Human factors

In this section, the demographics of riders involved in accidents are compared to the general riding population in the UK and comparisons are made between the two databases studied. A difference in human factors between the two studies could be indicative of an overall variation in rider attitudes.

The distribution of male and female riders is displayed in Table 5.8. It is clear that this form of transport attracts predominantly male riders. 93% of riders involved in a collision in the OTS database are male, and this is similar in the exposure data taken from a survey of 11,000 motorcycle riders in UK. The proportion of people involved in accidents in MAIDS that are male is significantly lower than that in OTS. The chi-squared test of difference between raw OTS and exposure data ($p > 0.10$) from Table 5.8 and Table 5.9 detects no difference between the accident and exposure data, showing that male riders are not over- or under-represented in the OTS accident data.

After weighting the OTS data, the proportion of people that are male was more similar to the MAIDS proportion and the differences were less significant.

Table 5.8: Distribution of PTW Riders involved in accidents by sex

	MAIDS		OTS		OTS weighted	
	Count	**%**	**Count**	**%**	**Count**	**%**
Male	798	87	278	93	273.2	91.2
Female	123	13	20	7	26.5	8.8
Unknown	0	-	8	-	6.3	-
Total	921	100	306	100	306.0	100.0

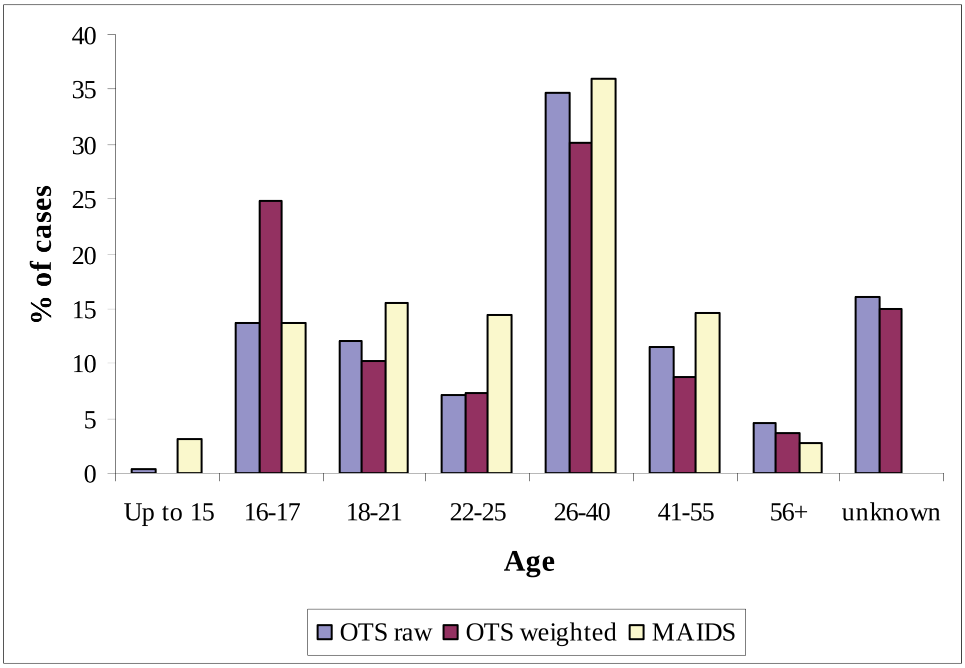
OTS raw v. MAIDS χ^2 test (χ^2=11.4, df=1, p<0.01)
OTS weighted v. MAIDS χ^2 test (χ^2=5.3, df=1, p<0.05)

Table 5.9: Distribution of PTW riders by sex in OTS exposure data

	Count	**%**
Male	10283	91
Female	1025	9

OTS accident v. exposure χ^2 test (χ^2=2.0, df=1, p>0.10)

Figure 5.4 shows the distribution of riders involved in accidents in MAIDS, OTS and weighted OTS by age. The large number of accidents for the 16-17 age group observed in the weighted OTS data is due to the high weighting proportion applied to young people riding small engine capacity vehicles. This is due to the large discrepancy between OTS and MAIDS data in the proportions of young riders riding small engine capacity vehicles.



OTS raw v. MAIDS χ^2 test (χ^2=68.4, df=6, p<0.01)
OTS weighted v. MAIDS χ^2 test (χ^2=67.5, df=6, p<0.01)

Figure 5.4: Distribution of PTW Riders by age

Table 5.10 displays the distribution of OTS accident and survey exposure data by rider age in Great Britain as identified by a survey of 11,000 motorcyclists. A comparison of the exposure data with the raw OTS data shows that younger people are over-represented in the accident database. In fact, 39% of riders involved in accidents in the OTS database are 25 or younger whereas, according to the exposure data, only 8% of the riding population are this age. Comparisons of MAIDS with OTS and with weighted OTS data show significant differences between the age distributions of MAIDS and OTS.

Table 5.10: OTS PTW Rider Age with exposure data

	OTS		Exposure	
	Count	**%**	**Count**	**%**
≤15	0	0	3	0
16-17	42	16	262	2
18-21	37	14	316	3
22-25	22	9	339	3
26-40	106	41	4152	37
41-55	35	14	4280	38
≥56	14	5	1919	17

OTS accident v. exposure χ^2 test (χ^2=426.9, df=6, p<0.01)

Table 5.11 identifies the rider age distribution in terms of the control data collected by the MAIDS teams. A comparison of the exposure data to the raw MAIDS data makes it clear that the distribution in Great Britain is not unique: motorcyclists aged under 26 are over represented in the accident database across Europe (46%) when compared to the exposure data (36%).

Table 5.11: MAIDS PTW Rider Age with exposure data

	MAIDS		Exposure	
	Count	**%**	**Count**	**%**
≤15	12	1	10	1
16-17	143	16	140	15
18-21	142	15	98	11
22-25	132	14	86	9
26-40	331	36	343	37
41-55	134	15	191	21
≥56	25	3	47	5

MAIDS accident v. exposure χ^2 test (χ^2=74.4, df=6, $p<0.01$)

Table 5.12 allows us to look at the effect of a passenger in a collision. Ninety four percent of the motorcyclists involved in accidents in the OTS database were not carrying a passenger. The exposure data showed that 96% of the motorcyclists who travelled on the same road one week after the collision concerned were not carrying a passenger. There was a significant difference between the distributions of passenger presence exposure and accident data for OTS ($p < 0.05$). This means that the presence of a passenger seems to affect the likelihood of collision involvement according to the OTS data. The MAIDS data show that 9% of motorcyclists involved in collisions had passengers present at the time of the collision. This is slightly, but not significantly, different from OTS.

Table 5.12: The presence of passengers on a PTW at the time of an accident

	MAIDS		OTS	
Passengers	**Count**	**%**	**Count**	**%**
None	842	91	286	94
One	79	9	20	6
Total	921	100	306	100

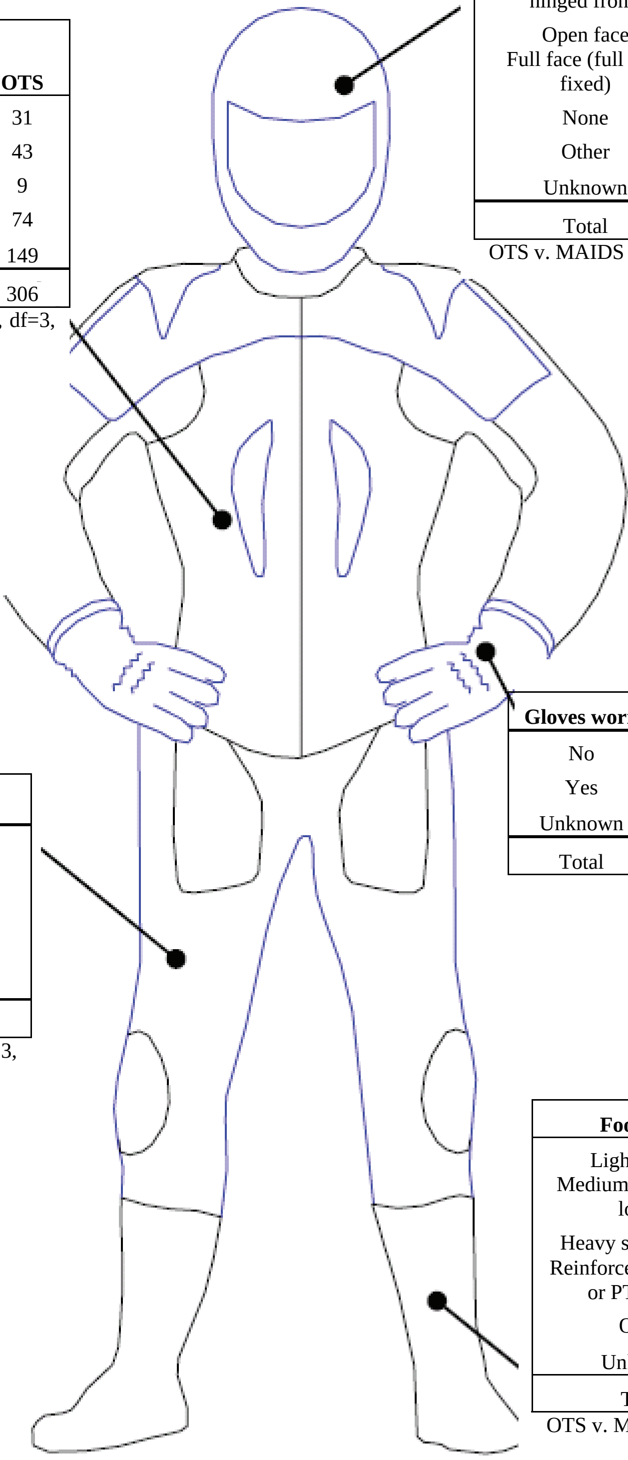
OTS v. MAIDS χ^2 test (χ^2=2.5, df=1, $p>0.10$)

Table 5.13: The presence of passengers on a PTW according to OTS exposure data

Passengers	Count	%
None	410	96
One	17	4
Unknown	18	-
Total PTWs	445	100

OTS accident v. exposure χ^2 test (χ^2=5.2, df=1, $p<0.05$)

Rider clothing will affect the injury of a motorcyclist once involved in an accident, and conspicuity could affect the probability of an accident.



Helmet Type	MAIDS	OTS
Half type (full face hinged front)	81	17
Open face	85	10
Full face (full face fixed)	620	181
None	73	6
Other	7	1
Unknown	55	91
Total	921	306

OTS v. MAIDS χ^2 test (χ^2=71.8, df=3, p<0.01)

Upper body clothing material	MAIDS	OTS
Light	131	31
Medium	334	43
Heavy	192	9
Leather	158	74
Unknown/other	106	149
Total	921	306

OTS v. MAIDS χ^2 test (χ^2=643.3, df=3, p<0.01)

Gloves worn	MAIDS	OTS
No	309	0
Yes	612	109
Unknown	0	197
Total	921	306

Lower body clothing material	MAIDS	OTS
Light	65	45
Medium	466	69
Heavy	151	3
Leather	131	64
Unknown	108	125
Total	921	306

OTS v. MAIDS χ^2 test (χ^2=1660.3, df=3, p<0.01)

Footwear	MAIDS	OTS
Light sandal	18	2
Medium street shoe, loafer	427	60
Heavy shoe or boot	186	24
Reinforced work boot or PTW boot	160	105
Other	1	1
Unknown	129	114
Total	921	306

OTS v. MAIDS χ^2 test (χ^2=388.8, df=3, p<0.01)

Figure 5.5: Distribution of PTW rider clothing recorded in MAIDS and OTS

Figure 5.5 illustrates the presence and types of PTW rider clothing worn including helmet type, gloves, footwear, and upper and lower body clothing material. A higher proportion of riders were recorded as wearing full face helmets in OTS than was the case in the MAIDS study; overall, the OTS rider helmet type data were found to be significantly different to the MAIDS data. The numbers are too small for reliable conclusions to be drawn from the passenger data (see Passenger helmet type Table G.1 in Appendix G).

OTS exposure data regarding rider helmet use and type can be found in Appendix H (Table H.7).

The MAIDS data report that slightly more than two thirds (67%) of the riders were wearing gloves at the time of the accidents. In contrast to MAIDS, OTS data only code if the rider was wearing gloves; if this is not complete then it is unclear whether the rider was not wearing gloves or if the variable is unknown.

Footwear is reported for most riders in OTS (93%) and almost all riders in MAIDS (99%). A higher proportion of riders were wearing medium street shoe/loafer in MAIDS than in the OTS study. Similarly, higher proportions of riders were wearing heavy shoes or boots in MAIDS than in OTS. In contrast, lower proportions were wearing reinforced work boots or PTW boots in MAIDS than in OTS. As before, it is important to note that a third of the PTW riders' footwear in OTS were 'unknown' (33%) compared to only 14% in MAIDS. There were significant differences with regards to footwear between MAIDS and OTS.

A higher proportion of the riders were wearing leather upper body clothing in OTS than was the case in MAIDS and therefore more riders were wearing Medium and Heavy clothing in MAIDS than in OTS. There were significant differences between MAIDS data and OTS data with regards to upper clothing material.

Finally, data for lower body clothing material were found to be very similar to the upper body clothing material: as in upper body material, MAIDS and OTS data were found to be significantly different with regards to lower clothing material. The numbers are too small to draw conclusions from the passenger data.

Table 5.14: Distributions of helmet use amongst PTW riders

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Helmet not worn	73	8	17	6
Helmet worn	833	92	248	94
Unknown	15	-	41	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=1.0, df=1, p>0.10)

The higher proportion of injuries in OTS that were to the head could have been due to a difference in the head protection. Table 5.14 and Table 5.15 count the numbers of riders and passengers wearing helmets at the time of the accident. No significant difference was found in the proportions of riders wearing helmets between MAIDS and OTS: six percent of riders in OTS were not wearing helmets compared to 8% in MAIDS so the differences in rider wearing rate could not have accounted for the differences in the proportion of injuries to the head. However, it is important to note that a much larger proportion of PTW rider helmet usage in OTS was 'unknown', at 13% compared to only 2% in MAIDS. Much higher proportions of passengers were not wearing helmets, although this figure will have been affected by the small sample size. Nearly a quarter of all passengers in MAIDS, and nearly a fifth in OTS, were not wearing a helmet at the time of the accident.

Table 5.15: Distribution of helmet use amongst passengers

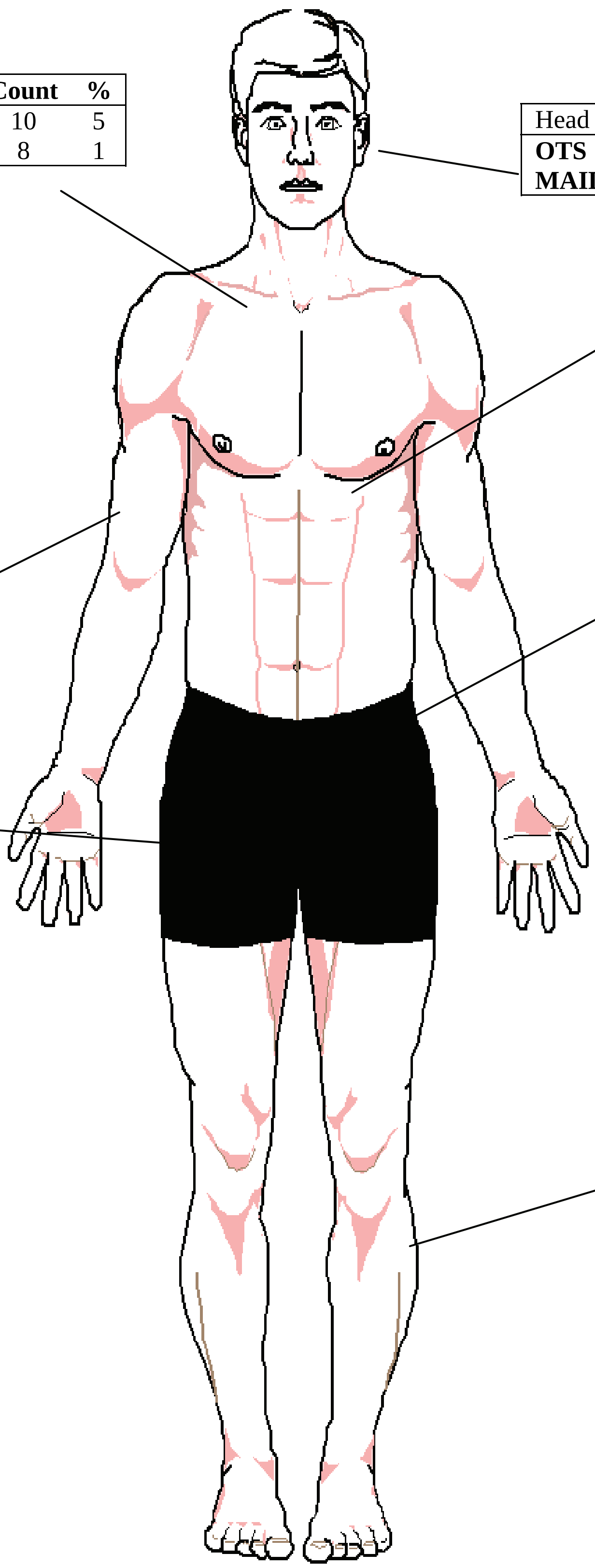
	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Helmet not worn	17	24	3	19
Helmet worn	55	76	13	81
Unknown	7	-	4	-
Total	79	100	20	100

OTS v. MAIDS χ^2 test (χ^2=0.2 df=1, p>0.10)

The helmet wearing rate is fairly similar between the two studies and does not differ significantly from that in the exposure data.

Figure 5.6 details injuries sustained by riders with an AIS[7] (AAAM, 1990) greater than one. Each body region has been assigned a maximum AIS score, or MAIS score, according to the most severe injury for that region. There are 207 MAIS results reported below from the OTS database and 1,057 from MAIDS for eight body regions. The percentages of injuries within the areas “upper extremities” and “pelvis” are fairly similar for the two studies; however, the proportions of injuries to other areas differ significantly between OTS and MAIDS: a higher proportion of head and lower extremity injuries was reported in the MAIDS study, and a higher proportion of neck, thorax and abdomen injuries was reported in OTS.

[7] The abbreviated injury scale (AIS) is an internationally recognised scale for measuring injury severity. A score of 1 indicates minor injuries, 2 = moderate, 3 = serious, 4 = severe, 5 = critical and 6 = maximum.



Neck	Count	%
OTS	10	5
MAIDS	8	1

Head	Count	%
OTS	37	18
MAIDS	261	25

Spine	Count	%
OTS	15	7
MAIDS	54	5

Thorax	Count	%
OTS	28	14
MAIDS	101	10

Upper Extremities	Count	%
OTS	48	23
MAIDS	245	23

Abdomen	Count	%
OTS	17	8
MAIDS	45	4

Pelvis	Count	%
OTS	10	5
MAIDS	37	4

Lower Extremities	Count	%
OTS	42	20
MAIDS	306	29

Figure 5.6: Summary of the distribution of the maximum AIS PTW riders' injuries greater than AIS = 1 within each body region

OTS v. MAIDS χ^2 test (χ^2=19.9, df=6, $p<0.01$)

Table 5.16 compares the MAIS values greater than 1 for PTW riders in OTS and MAIDS. The OTS data contain a higher proportion of more severe injuries (MAIS>3) than MAIDS does which implies that OTS visited more serious PTW accidents on average. This may be caused by the sampling mechanisms within OTS which mean that higher severity accidents are visited in general.

Table 5.16: Distribution of injury MAIS for PTW riders

	MAIDS		OTS	
MAIS	Count	%	Count	%
2	606	59	103	50
3	290	28	52	25
4	46	4	28	14
5	63	6	13	6
6	26	3	8	4
Total	1031	100	204	100

OTS v. MAIDS χ^2 test (χ^2=43.7, df=4, p<0.01)

5.2.4 Vehicle factors

A variation in vehicle fleets is investigated next. Engine size is known to be different across the databases - this was presented in Section 5.1.3 and is due to the large quantities of small capacity motorcycles, for example mopeds and mofas[8], in the MAIDS countries. Unfortunately, exposure data are not available for OTS data in terms of engine size, as this information is not detectable from video data.

PTW legal category (L1, L3) is defined in the MAIDS report (ACEM, 2004) using the OECD methodology as mopeds and mofas are included in L1 and motorcycles in L3. OTS does not have this detail so, for the purpose of this comparison, motorcycles with an engine capacity smaller than 50cc have been included in the L1 category and all others in the L3 category. Table 5.17 shows the number of powered two-wheelers in the L1 and L3 categories for MAIDS and OTS. While 43% of PTWs in the MAIDS data were L1 motorcycles, 80% of the motorcycles in the OTS study were in the L3 category. This might be due to the difference in the characteristics of PTW-usage between the MAIDS countries and the UK.

Table 5.17: PTW Legal Category

	MAIDS Accident		MAIDS Exposure		OTS Accident	
	Count	%	Count	%	Count	%
L1*	398	43	373	40	57	20
L3	523	57	550	60	234	80
Unknown	0	-	0	-	15	-
Total	921	100	923	100	306	100

*Includes Mofas

MAIDS accident v. exposure χ^2 test (χ^2=3.0, df=1, p<0.10)

[8] A mofa is defined to be a moped with a maximum design speed not exceeding 25km/h.

Figure 5.7 illustrates the age distribution of riders with the legal categorisation of the motorcycles involved in accidents in the two studies. Comparing studies, the pattern of L1/L3 categories across the age groups is similar. There is a higher proportion of L1 vehicles in the MAIDS data for all age groups. OTS data show that the majority of riders aged younger than 18 were riding an L1 vehicle and that the majority of riders over the age of 18 were riding an L3 vehicle.

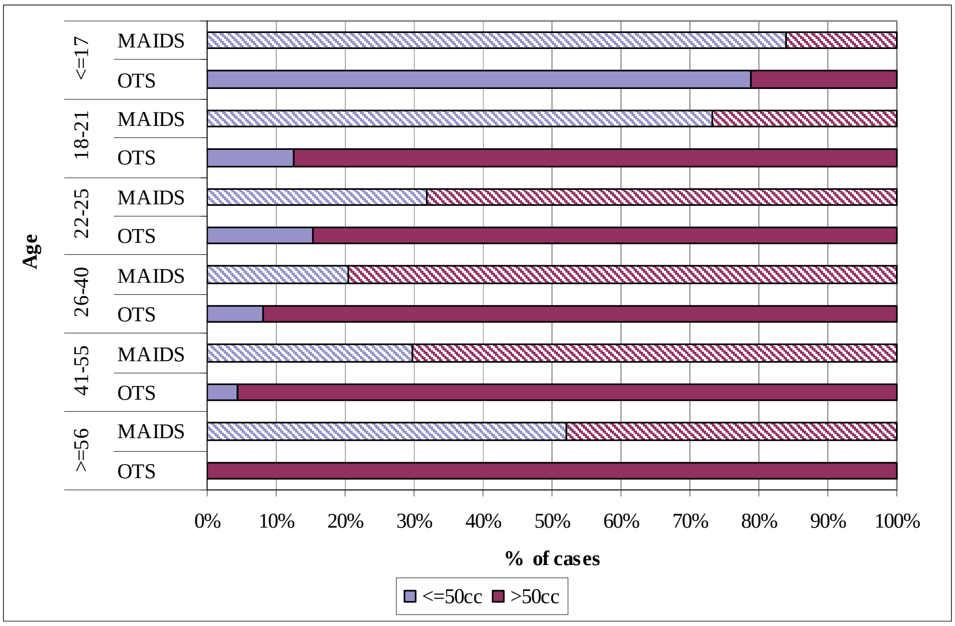


Figure 5.7: PTW rider age by legal category

Table 5.18 shows the engine size, or displacement, of motorcycles in MAIDS and OTS. It can be seen that the highest frequency of engine displacement in MAIDS corresponds to the 'Up to 50cc' category of motorcycles (43%) followed by the '501-750cc' category (22%), whereas the highest frequency in OTS is of the '501-750cc' category of motorcycles (29%) followed by the 'Up to 50cc' category (20%). The data in OTS were found to be significantly different to that in MAIDS in respect of engine size.

Table 5.18: Engine Displacement

	MAIDS		OTS		OTS weighted	
	Count	%	Count	%	Count	%
Up to 50cc	394	43	57	20	119.7	41.1
51-125cc	89	10	54	19	32.6	11.2
126-250cc	37	4	9	3	10.2	3.5
251-500cc	56	6	19	7	17.2	5.9
501-750cc	206	22	85	29	66.5	22.8
751-1000cc	80	9	44	15	26.9	9.2
1001cc or more	58	6	23	8	18.0	6.2
Unknown	1	-	15	-	15.0	-
Total	921	100	306	100	306.0	100.0

OTS v. MAIDS χ^2 test (χ^2=82.2, df=6, p<0.01)
OTS weighted v. MAIDS χ^2 test (χ^2=1.2, df=6, p>0.10)

The weighted OTS data resemble the MAIDS data more closely than does the raw OTS data, specifically in that there are more PTWs in the 'Up to 50cc' category. In general, as designed, the proportions of the OTS weighted data of each engine size are almost identical to those of MAIDS. The weighted (by engine size and urban/rural as defined in Section 5.1.3) proportions of PTW engine sizes in OTS are not significantly different to those in MAIDS.

Bike style, as discussed in Section 5.1.1, is not well defined in OTS, and so was merged into a set of styles consistent with the MAIDS definitions. The results suggest that the distribution of bike styles in the OTS database is significantly different to that of bike styles in the MAIDS database. Specifically, the OTS database contains a higher proportion of motorcycles in the 'Standard Street' and 'Sport' categories and a lower proportion in the 'Scooter' category.

Table 5.19: PTW Style

	MAIDS		**OTS**		**OTS exposure**	
	Count	**%**	**Count**	**%**	**Count**	**%**
Standard Street	156	17	79	26	124	31
Road Race Replica	137	15	96	32	106	26
Tourer	76	8	22	7	32	8
Cruiser	37	4	7	2	11	3
Chopper	36	4	1	<1	11	3
Scooter	354	39	83	27	103	26
Other	120	13	15	5	14	3
Unknown	5	-	3	-	44	-
Total PTWs	921	100	306	100	445	100

OTS v. MAIDS χ^2 test (χ^2=106.4, df=6, p<0.01)
OTS accident v. exposure χ^2 test (χ^2=10.3, df=6, p>0.10)

The OTS exposure data[9] of PTW style closely resembles the OTS data with one exception: the highest frequencies for exposure data are Standard Street bike (31%), closely followed by Road Race Replica (26%) and Scooters; the highest frequencies for OTS accident data are Road Race Replica (32%) closely followed by Scooter (27%) and Standard Street (26%). The OTS exposure data were not significantly different to the OTS accident data. Data for PTW style by legal category can be found in Appendix G (Table G.2).

In order to investigate whether conspicuity is an important issue in accidents, headlight illumination is presented in Table 5.20. For both MAIDS and OTS, the majority of accidents occurred while the motorcycle lights were on. Nevertheless, the proportion of motorcycles with lights switched on was found to be significantly different in the OTS dataset to that in the MAIDS dataset.

A comparison of OTS accident data with exposure data shows a clear difference in terms of headlight usage. 40% of headlights were off at the time of the accident whereas only 23% were off in the exposure data. Reliable conclusions cannot be drawn from these data since the headlight status is unknown in over a third of the accidents; however, there is a significant different between these percentages which indicates that conspicuity issues could be a cause of accidents.

[9] Exposure data is only available for some variables in OTS as described in Section 5.1.4, and only displayed for MAIDS data where appropriate.

Table 5.20: Headlamp illumination

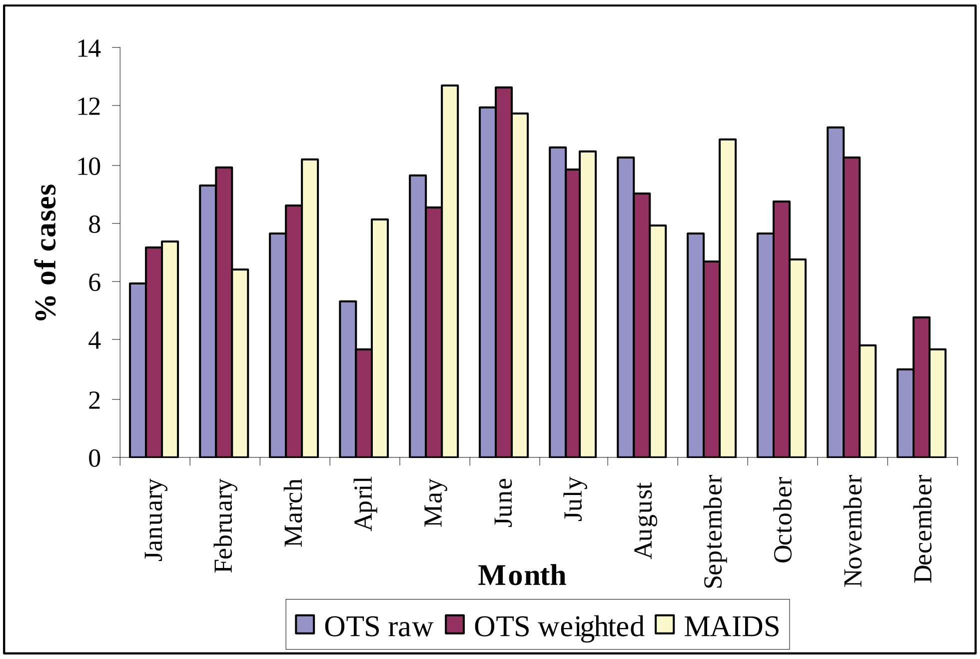
	MAIDS		OTS		OTS exposure	
	Count	%	Count	%	Count	%
Off	223	26	74	40	74	23
On	639	74	111	60	248	77
Unknown	59	-	121	-	123	-
Total PTWs	921	100	306	100	445	100

OTS v. MAIDS χ^2 test (χ^2=19.3, df=1, p<0.01)
OTS accident v. exposure χ^2 test (χ^2=17.47, df=1, p<0.01)

5.2.5 Accident factors

According to the MAIDS data, the highest numbers of accidents occur in May and June. March, July and September also have relatively high numbers of PTW accidents whereas November and December have the fewest accidents.

Figure 5.8 shows that the highest numbers of accidents in OTS occur in June (similar to MAIDS) and November (in contrast to the frequencies in MAIDS). July has a high frequency of PTW accidents in OTS, as it also does in MAIDS. In both MAIDS and OTS, December has the lowest frequency of accidents occurring; contrary to the MAIDS data, April has the second lowest number of accidents in OTS.



OTS raw v. MAIDS χ^2 test (χ^2=62.0, df=11, p<0.01)
OTS weighted v. MAIDS χ^2 test (χ^2=59.9, df=11, p<0.01)

Figure 5.8: Month in which accident occurred

The weighted OTS data more closely resemble the MAIDS data than the raw OTS data do, in terms of there being a higher number of accidents in June. Weighting the data also resulted in increased frequencies in January, February, March, October and December, but reduced frequencies in all of the other months.

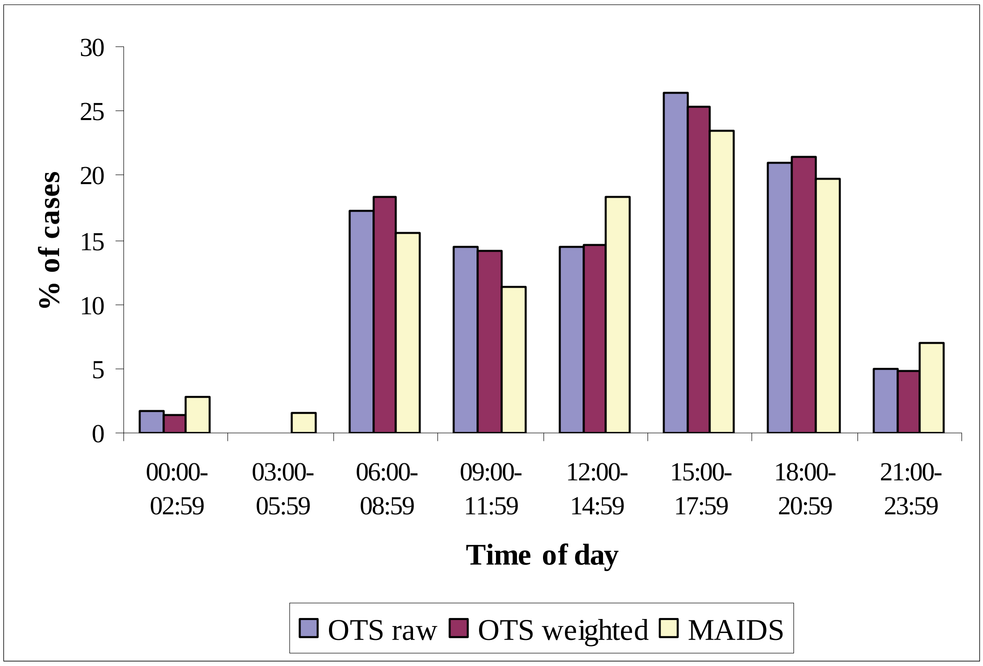
Table 5.21: Distribution of accidents by day of week

	MAIDS		OTS		OTS Weighted	
	Count	%	Count	%	Count	%
Monday	152	17	48	16	50.9	16.9
Tuesday	159	17	33	11	40.7	13.5
Wednesday	134	15	59	20	57.2	18.9
Thursday	140	15	53	18	54.1	17.9
Friday	139	15	36	12	38.1	12.6
Saturday	76	8	35	12	32.3	10.7
Sunday	121	13	38	13	28.7	9.5
Total	921	100	302	100	302.0	100.0

OTS raw v. MAIDS χ^2 test (χ^2=19.5, df=6, p<0.01)
OTS weighted v. MAIDS χ^2 test (χ^2=14.4, df=6, p<0.05)

Table 5.21 indicates the distributions of the days of the week on which each accident occurred. The MAIDS data have the most accidents occurring on Mondays and Tuesdays. Saturdays have the lowest frequencies of accidents.

The highest proportion of accidents in OTS occurs on Wednesday although, like MAIDS, Mondays also have high proportions of accidents. In contrast to MAIDS, Tuesday has the lowest proportion of accidents. The weighted OTS data are similar to the OTS data; however both the OTS data and the OTS weighted distributions were found to be significantly different to MAIDS.



OTS raw v. MAIDS χ^2 test (χ^2=14.1, df=6, p<0.05)
OTS weighted v. MAIDS χ^2 test (χ^2=14.8, df=6, p<0.05)

Figure 5.9: Time of day accident occurred

Figure 5.9 shows the distribution of accidents by time of day in both studies. The OTS raw and weighted data contain few accidents in the early morning. The highest proportion of accidents occurs between 15:00-17:59 – the commuting period. In respect of time of day, MAIDS data and OTS data are similar. The highest proportions of accidents occur between mid afternoon and evening, with accidents being relatively infrequent in the early hours. However, as opposed to OTS, the MAIDS data record a higher proportion of accidents occurring in the early morning period. The MAIDS results clearly contain a higher proportion of accidents that occur in the early afternoon than OTS does, and more than in the 'morning rush hour' according to MAIDS.

Table 5.22: OTS illumination by PTW rider age

Age	≤ 15	16 – 17	18 – 21	22 – 25	26 – 40	41 – 55	56+	Total
Daylight	0%	16%	13%	9%	42%	15%	5%	184
Dusk, sundown	0%	0%	20%	10%	40%	10%	20%	10
Night, lit	0%	21%	24%	11%	34%	11%	0%	38
Night, not lit	0%	57%	14%	0%	14%	0%	14%	7
Night, unknown lighting	0%	11%	11%	11%	56%	11%	0%	9
Dawn, sun-up	0%	0%	0%	0%	25%	25%	50%	4

Table 5.23: MAIDS illumination by PTW rider age

Age	≤ 15	16 - 17	18 - 21	22 - 25	26 - 40	41 - 55	56+	Total
Daylight	1%	15%	13%	13%	39%	15%	3%	636
Dusk, sundown	3%	15%	10%	13%	49%	8%	3%	39
Night, lit	2%	15%	26%	19%	29%	9%	1%	128
Night, not lit	0%	24%	3%	24%	31%	17%	0%	29
Dawn, sunup	0%	14%	21%	17%	14%	31%	3%	29

OTS v. MAIDS daylight χ^2 test (χ^2=4.7, df=5, p>0.10)
OTS v. MAIDS night & lighted χ^2 test (χ^2=3.4, df=4, p>0.10)
OTS v. MAIDS χ^2 tests by age: p > 0.10 for all ages

In order to determine whether PTW riders of different ages are involved in accidents t different times of day, and whether these differences are similar across MAIDS and OTS, Table 5.22 and Table 5.23 depict light conditions and illumination by rider age. No significant differences were found between the two studies in either direction – by age or by light condition. This suggests that riders involved in accidents in the two studies do not vary in riding environment by age; that is, for example, a similar proportion of riders in a particular age group have accidents in the dark in both studies.

The other vehicle in each accident, or 'collision partner' of each PTW recorded in the two studies is presented in Table 5.24. It is clear from the percentages that this is caused by 'Another PTW' and 'Roadway' categories are under-represented in OTS, and the 'Other' category is over-represented. Roadway is not an OTS category so for accidents where the PTW did not hit an object or other vehicle it would be included in 'Other'. The test to determine whether there were significant differences in the MAIDS and OTS distribution of collision partner combined the categories roadway, parked vehicle, animal and other, and showed that there are still significant differences between the two databases even when other and roadway are combined.

Table 5.24: PTW Collision Partner

	MAIDS		OTS	
	Count	%	Count	%
Passenger Car	553	60	197	64
Another PTW	64	7	6	2
Truck/SUV/Bus	77	8	21	7
Bicycle/pedestrian	19	2	6	2
Fixed object	74	8	20	7
Roadway	83	9	0	0
Parked Vehicle	25	3	0	0
Animal	3	<1	2	1
Other	23	2	54	18
Total	921	100	306	100

OTS v. MAIDS χ^2 test – without 'Other' (χ^2=14.2, df=6, $p<0.05$)

Table 5.25: Pre-impact manoeuvres for loss of control accidents

	MAIDS	OTS
Stopping or starting	0	10
Turning or negotiating bend	61	49
Straight road	44	27
Overtaking	7	3
Illegal manoeuvre	1	1
Collision avoidance	1	0
Other	1	7
Total	115	97

OTS v. MAIDS χ^2 test (χ^2=2.3, df=1, $p>0.10$)

There are 73 PTW loss of control accidents reported in the OTS database. Table 5.25 details the pre-impact manoeuvre of these motorcycles and the equivalent numbers for the MAIDS database. There is more than one pre-impact code for each motorcycle, hence the 97 total codes for OTS. The combination of the pre-impact codes is shown in Table G.3 in Appendix G.

A significant difference is not found between the two databases when comparing the two major groups: 'turning or negotiating a bend' and 'straight road'.

Table 5.26: Age distribution in loss of control accidents compared for MAIDS and OTS data compared to OTS data with no loss control

Age group	MAIDS loss of control	OTS loss of control	OTS no loss of control
≤15	0	0	0
16-17	11	5	37
18-21	19	5	32
22-25	15	6	16
26-40	45	29	77
41-55	22	10	25
56+	2	4	10
unknown	1	14	36
Total	115	73	233

OTS v. MAIDS χ^2 test (χ^2=4.5, df=4, p>0.10)
OTS v. OTS no loss of control χ^2 test (χ^2=7.0, df=5, p>0.10)

Loss of control whilst negotiating bends is perceived to be a common cause of accidents in the UK. Table 5.26 shows the age group distribution for three groups of data: MAIDS and OTS loss of control accidents, and OTS accidents that were not categorised as loss of control. The associated tests aimed to detect whether there was a difference in age groups in loss of control accidents between the two studies and whether there was a difference in age distribution between those involved in loss of control accidents and those not involved in these accidents in OTS. These statistical tests showed that there is no significant difference for either comparison and thus no real evidence that loss of control accidents are a more common cause of accidents, proportionally speaking, for younger people, or that there is a difference in age distribution across the studies for loss of control accidents.

Figure 5.10 shows that in both urban and rural areas, the most common collision partner is a passenger car according to the MAIDS data. The second most common collision partner in urban areas is ‘other’, this includes kerbs and ditches, whereas the second most common for rural areas is a fixed object.

As with MAIDS, in both urban and rural areas, the most common collision partner in OTS is a passenger car. However, unlike MAIDS, the second most common collision partner is ‘other’ for both area types. OTS area type categories include ‘unknown’, whereas MAIDS area types are restricted to either ‘rural’ or ‘urban’. Of those accidents in the ‘unknown’ area type category, the majority of motorcycles collided with a passenger car.

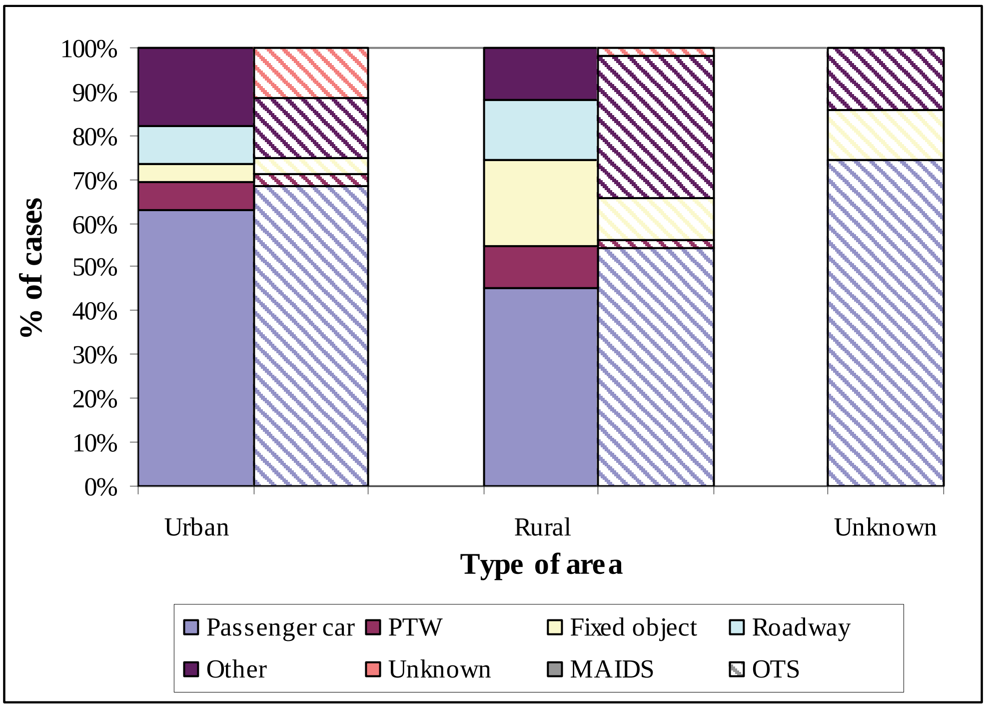


Figure 5.10: OTS and MAIDS PTW collision partner by type of area

Table 5.27 displays the number of accidents at each junction type in MAIDS and OTS. The most common junction type recorded in MAIDS is ‘cross intersection’ closely followed by ‘T-intersection’. The least common types are ‘over or under cross-over’ and ‘other’. In OTS, the most frequent junction type for accidents is ‘T-junction’ whereas the fewest accidents occur at ‘other’ types of junctions. OTS definitions of junction type are different to MAIDS definitions and therefore it is difficult to conduct a direct comparison between the two studies, however the three main junction types are compatible.

Table 5.27: Junction type

MAIDS	Count	%	OTS	Count	%
Round about or traffic circle	25	4	Roundabout	26	16
T-intersection	205	36	T-junction	119	72
Cross intersection	242	42	Crossroad	20	12
Angle intersection	53	9	N/A	-	-
Alley, driveway	15	3	N/A	-	-
Offset intersection	20	3	N/A	-	-
Over or under cross-over	8	1	N/A	-	-
Other	4	1	Other	1	1
No junction	349		No junction	121	
			Unknown	19	-

5.2.6 *Environmental factors*

The road environment is a key factor in motorcycle accidents that is likely to vary by study and country. The following tables include some comparable data relating to the roads on which accidents occurred and their surrounding environments.

Table 5.28: Classification of roads on which accidents occurred

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Motorway	39	4	11	4
A road trunk	192	21	11	4
A road non trunk	475	52	122	43
B/C/Unclassified road	126	14	139	49
Private	7	1	0	0
Dedicated bike/motorcycle path	54	6	2	1
Other (includes roundabouts and over/underpasses)	27	3	1	<1
Unknown	1	-	20	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=305.6, df=5, p<0.01)

Counts of the road classifications on which accidents recorded in each database took place are displayed in Table 5.28. These variables are not reported in the same way for the two studies so some aggregation was necessary. MAIDS reports junctions as a separate road classification whereas OTS combines these within road class. It is not possible to divide these into the subsets defined in the table, so these were categorised as ‘other’ in terms of road classification and not included in the statistical test. The test shows a significant difference in the distribution of road classifications on which accidents took place in the two studies: accidents occurring on class B, C and U roads were over-represented in OTS. These differences are likely to be due to a difference in the distribution of road classifications in the two separate study areas, or an underlying difference in riding habits, or may be caused by the different sampling strategies.

Table 5.29: Traffic controls along PTW pre-crash path

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
None	596	71	257	88
Sign	55	7	13	4
Signal	190	23	17	6
Other	2	<1	4	1
Unknown	78	-	15	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=66.5, df=3, p<0.01)

Counts of the different traffic controls along the motorcyclist's pre-crash path for both MAIDS and OTS are illustrated in Table 5.29. The table shows that, for both MAIDS and OTS, there were no traffic controls along the PTW paths prior to the majority of the accidents. 23% of accidents in MAIDS were reported to have 'Signal' traffic controls compared to only 6% in OTS. Overall, the two databases were significantly different in terms of the proportions of traffic controls of different types on the pre-crash paths.

Similarly, no traffic controls on the pre-crash path of the other vehicle were reported in the majority of the accidents in both the MAIDS and the OTS databases. Nevertheless, whereas traffic controls were reported for less than 15% of the cases in OTS, traffic controls were reported in some 44% of the cases in MAIDS (see Appendix I, Table I.1)

Table 5.30: Roadway Alignment PTW

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Straight	647	70	214	73
Curve/Corner	273	30	78	27
Other/Unknown	1	-	14	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=1.2, df=1, p>0.10)

Table 5.30 identifies counts of the pre-crash roadway alignment for each PTW accident, categorised as either straight or curve/corner. Approximately three quarters of the roadways were found to be 'straight' for both MAIDS and OTS, with only a few roadways recorded as other/unknown. The proportions of PTW roadway alignment of each type in OTS and MAIDS were not found to be significantly different from each other. Similarly, the roadway alignment for the other vehicle recorded in each accident was found to be straight in the majority of cases for both OTS and MAIDS (as shown in Appendix I, Table I.2), though significant differences in the proportions of these were found between OTS and MAIDS.

As shown in Table 5.31, 'No precipitation' was found to be the most prevalent weather condition at accidents recorded in both OTS and MAIDS, almost all of the remaining accidents occurred in the rain. There were no significant differences between the proportions found in MAIDS and those found in OTS.

Table 5.31: Weather conditions at time of accident

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
No precipitation	828	91	270	90
Rain	73	8	30	10
Ice rain/snow	2	<1	0	0
Other	2	<1	0	0
Unknown	16	-	2	-
Total	921	100	302	100

OTS v. MAIDS χ^2 test (χ^2=0.9, df=1, p>0.10)

As Table 5.32 shows, the largest proportion of accidents was recorded on asphalt road in both MAIDS and OTS with no significant difference found between these proportions in to the two studies.

Table 5.32: Roadway Condition

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Asphalt	834	91	263	88
Other than Asphalt	84	9	37	12
Unknown	3	-	6	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=3.7, df=1, p<0.10)

The OTS and MAIDS teams coded the presence of any roadway conditions or defects along the pre-crash path of the PTW (see Table 5.33). Analysis of the data found that the proportion of roadway conditions of different types in the two studies were significantly different although both data sets recorded a roadway condition of 'Normal' with no defects most frequently. The second most prevalent roadway condition was 'Surface Deteriorated'. The differences between the two data sets might be due to OTS and MAIDS using different categories for Roadway condition and defects.

Table 5.33: Roadway condition and defects

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Normal/No Defects	648	70	260	86
Surface Deteriorated*	240	26	33	11
Tram/train rails	9	1	0	0
Other interfering defects	23	3	9	3
Unknown	1	-	4	-
Total	921	100	306	100

*OTS data includes bumps, spalling and cracking
*MAIDS data includes Bitumen (12%)

OTS v. MAIDS χ^2 test (χ^2=40.6, df=3, p<0.01)

The OTS and MAIDS data indicate that over half of the accidents took place at an intersection[10]; the location was unknown in less than 10% of accidents. The two data sets were not significantly different in respect of the proportions of accidents at and not at intersections.

[10] In MAIDS, an intersection is defined as any on-grade crossing or intersection of two public roadways (ACEM 2004).

Table 5.34: Accident Location

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Intersection	500	54	164	54
No intersection	358	39	119	39
Other/Unknown	63	7	19	6
Total	921	100	302	100

OTS v. MAIDS χ^2 test (χ^2=0.04, df=1, p>0.10)

As Table 5.35 indicates, traffic in the PTW direction of travel was light in the majority of cases and moderate for nearly a third of the cases in both MAIDS and OTS. However, in contrast to MAIDS which recorded the traffic as being ‘heavy’ at the time of more than 10% of the accidents, OTS recorded the traffic as ‘heavy’ for only 7% of the accidents and ‘congested’ for 10% of the accidents. MAIDS did not report any accidents for the latter. The statistical analysis found that these percentages in OTS were not significantly different to those in MAIDS. Unsurprisingly, for the other vehicle, the traffic density was found to be almost identical to that relating to the PTW involved in the accident (see Appendix I, Table I.3).

Table 5.35: Traffic density at time of accident (PTW)

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Light	517	57	154	53
Moderate	275	30	89	30
Heavy	119	13	21	7
Congested	0	0	28	10
Unknown	10	-	14	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=3.9, df=3, p>0.10)

The OTS data indicate that three quarters of accidents occur during daylight, almost one fifth occur in darkness and the remainder occur at dusk or dawn (see Table 5.36). For the MAIDS data, the proportions of accidents reported in each of the light conditions were found to be almost identical to those in OTS. When tested statistically, the proportions identified in OTS were not significantly different from those identified in MAIDS.

Table 5.36: Light conditions at time of accident

	MAIDS		OTS	
	Count	%	Count	%
Daylight	672	73	221	75
Dusk/dawn	76	8	19	6
Darkness	173	19	58	19
Unknown	0	-	4	-
Total	921	100	302	100

Chi-squared test (χ^2=1.4, df=2, p>0.10)

5.2.7 Accident causation

In each accident investigation, members of the research team make a judgement as to the primary contributory factor: the factor that they consider to have made the greatest contribution to the accident. For the most compatible OTS Contributory Factor system (see Section 5.1.2), each collision is attributed to one vehicle only; however, MAIDS attributes each contributory factor to both vehicles, and indeed, this is also true for another of the OTS Contributory Factor systems.

Table 5.37 and Table I.4 in Appendix I provide information regarding the number of cases in which ‘attention failure’ was considered to be a contributory factor to accident causation in OTS and MAIDS. MAIDS defines attention failure as *“any activity of the vehicle operator that distracted him or her from the normal operations of the vehicle (PTW or Other Vehicle), including the normal observation of traffic both in front of, and behind the vehicle operator”* (ACEM 2004, pp.31).

In Table 5.37 (and Table I.4), contributory factors that are not attributed to the PTW (or other vehicle) are classified as ‘No attention failure’. Accidents in which PTW riders (other vehicle driver) were deemed as having attention failure which did not contribute to the accident concerned are classified in row one. Accidents in which ‘attention failure’ was not attributed to the PTW rider, along with all accidents where the movement of the other vehicle was deemed to have caused the accident, are presented in the ‘No attention failure’ row.

Table 5.37: Attention failure, including distractions and stress (PTW rider)

	MAIDS		OTS	
	Count	%	Count	%
Attention failure was present, but did not contribute to accident causation	35	4	2	1
Attention failure contributed to accident causation	98	11	61	20
No attention failure	759	85	243	79
Unknown if attention failure was present	29	-	0	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=31.8, df=2, p<0.01)

The data presented in Table 5.37 indicate that the PTW rider attention failure contributed to the accident in just over one tenth of all MAIDS cases and one fifth of all OTS cases. This is the most significant difference between the proportions of this variable in the two studies. The MAIDS data indicate that attention failure was present but not contributory to 4% of accidents whereas it was present but not contributory to 1% of OTS cases. The proportions of accidents in which attention failure (including stress and distractions) was present were significantly different between OTS and MAIDS. The numbers of accidents in which attention failure contributed to the accident for the other vehicle is presented in Appendix I (Table I.4).

In the following tables, contributory factors that were not attributed to the 'lead vehicle', that is, the vehicle specified in the table heading, are classified as 'Not applicable'. Lead vehicles that were associated with the contributory factor in question but where this did not cause the accident, or in which the contributory factor in question was not present are presented in the first row.

Table 5.38 and Table 5.39 report on the number of cases where a traffic scan error contributed to accident causation. Traffic scan errors were defined as *"any situation in which the rider did not observe or perceive oncoming traffic or traffic that may have been entering the roadway from some other direction"* in MAIDS (ACEM 2004, pp32). This was compared to the *"looked but did not see"* contributory factor in OTS.

Table 5.38: Traffic-scan error (PTW Rider)

	MAIDS		**OTS**	
	Count	**%**	**Count**	**%**
Traffic scan made no contribution to accident causation	478	53	86	28
Traffic-scan error was present and contributed to accident causation	255	28	67	22
Not applicable or no other traffic present	176	19	153	50
Unknown	12	-	0	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=187.4, df=2, p<0.01)

The data indicate that PTW rider traffic-scan error was reported in 28% of all MAIDS cases and in 22% of all OTS cases. In both studies, traffic-scan related errors were much more likely to be attributed to drivers of the other vehicles involved than to the PTW riders. As Table 5.39 indicates, a traffic scanning error was attributed to the non-PTW involved and caused 64% of MAIDS accidents and 67% of OTS accidents.

Table 5.39: Traffic-scan error (Other vehicle)

	MAIDS		OTS	
	Count	%	Count	%
Traffic scan made no contribution to accident causation	205	27	12	6
Traffic-scan error was present and contributed to accident causation	489	64	141	67
Not applicable or no other traffic present	69	9	59	28
Unknown	15	-	0	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=118.4, df=2, p<0.01)

Table 5.40 and Table 5.41 contain counts for the contributory factor 'Faulty traffic strategy' for PTW riders and other vehicle drivers respectively. This is defined in the MAIDS report as '*PTW rider or OV driver made a poor decision to perform a manoeuvre or movement…Examples…are failure to provide turning signals or following a vehicle too closely, resulting in a rear end collision*'. (ACEM, 2004, pp34).

Table 5.40: Faulty traffic strategy (PTW)

	MAIDS		OTS	
	Count	%	Count	%
Faulty traffic strategy made no contribution to accident causation	299	33	42	14
Faulty traffic strategy was present and contributed to accident causation	297	32	110	36
Not applicable or no other traffic present	322	35	153	51
Unknown	3	-	1	-
Total	921	100	306	100

OTS v. MAIDS χ^2 test (χ^2=54.2, df=2, p<0.01)

'Faulty traffic strategy' was a contributory factor in about a third of the accidents recorded in MAIDS and OTS for both PTW riders and OV drivers. A smaller proportion of accidents in OTS involved a faulty traffic strategy that was attributable to the PTW rider but did not cause the accident concerned. The proportions of observations of faulty traffic strategies for OV drivers are similar for MAIDS and OTS; in fact, there is no significant difference detected between the two sets of proportions shown in Table 5.41.

Table 5.41: Faulty traffic strategy (OV)

	MAIDS		OTS	
	Count	%	Count	%
Faulty traffic strategy made no contribution to accident causation	299	33	75	36
Faulty traffic strategy was present and contributed to accident causation	297	32	76	36
Not applicable or no other traffic present	322	35	59	28
Unknown	3	-	2	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=4.5, df=2, p>0.10)

Table 5.42 and Table 5.43 detail accidents caused by speed, based on speed data available to the MAIDS and OTS studies. MAIDS and OTS define speed as an accident causation factor in different ways: MAIDS records whether the speed of the vehicle at the time of the accident was different to the rest of the traffic immediately prior to the accident. In 18% of MAIDS cases, the PTW's speed was different to that of the surrounding traffic and this contributed to the accident; this compares to 5% of cases in which the other vehicle's speed was different from the surrounding traffic. Table 5.43 reports on the contributory factors associated with the other vehicle (OV) or PTW – either exceeding the speed limit or travelling too fast for conditions. In 22% of cases, a speed related contributory factor is attributed to the PTW rider (and of these, 76% are single vehicle accidents), whereas in only 2% of cases is a speed related contributory factor attributed to the other vehicle. Due to the difference in the definitions of 'speed' as a contributory factor in the two studies, it was not possible to compare the frequencies with which speed was recorded as a contributory factor.

Table 5.42: Speed compared to surrounding traffic – MAIDS data

	PTW		OV	
	Count	%	Count	%
Speed unusual but no contribution	74	8	61	8
Speed difference contributed to accident	166	18	37	5
Not applicable or no other traffic present	680	74	666	87
Unknown	1	-	14	-
Total	921	100	778	100

Table 5.43: Speed related contributory factors – OTS data

Speed CF	Count	%
PTW caused*	67	22
OV caused	6	2
Not CF	233	76

*51 of these are single vehicle accidents.

6 Discussion

6.1 General

The main priority of this project was to compare the data produced by the European MAIDS project with data from the UK OTS study. This required an understanding of similarities and differences between the sampling regions as well as the data collection protocols.

This project began by examining the protocols used by OTS and MAIDS. It was found that both studies collect comparable and compatible basic accident information. However, the MAIDS study, which used the OECD common methodology for accident data collection, is considerably more detailed, and provides the opportunity to code most accident parameters into a wider range of more detailed responses. Therefore, when comparing these two databases, this necessitated the merging of some MAIDS categories in order to facilitate a comparison with the OTS study.

The assessment of the protocols is presented in Appendix B and discussed in Section 4. This showed that the two studies should have some comparable data. However, they differ in some areas, in particular with respect to the accident reconstruction methodology, which is more detailed in the MAIDS study. MAIDS includes detailed information on mechanical factors (usually missing from OTS), some human factors information (OTS does not routinely involve face to face interviews), and exposure data (MAIDS has comprehensive exposure data, OTS currently has only basic information).

The aims and objectives of the MAIDS and OTS studies are different and this explains some of the differences in the protocols. The MAIDS study was developed to investigate risk factors in motorcycling and is specifically targeted at this road user group. Therefore, a key component of this study is the collection of exposure data, with which the accident sample can be compared. The OTS study, on the other hand, is designed to collect on-scene accident data from all road accidents and therefore has a much broader scope than the MAIDS study. The purpose of OTS study, as well as providing monitoring information on accident causation, is primarily to collect on-scene information for later analysis by other research projects.. Although the OTS study has collected basic level exposure data to the OECD method (collection of video data), this data collection was not within the remit of the OTS study, and these data have not been followed up or analysed by the OTS team. In a similar way, the MAIDS study had a target number of accidents for which to gather data because the OECD methodology specifies this requirement. However, OTS is a time-based accident study and does not have a set requirement for the number of motorcycle accidents for which data must be gathered, its requirements in this respect being limited to the period of the accident data collection activity and an overall target number for all types of accidents.

The OTS study compares both the accident data with the national accident statistics and the population with relevant driving/riding licences in order to assess the accident data collected. This, although not the same methodology as used by MAIDS to assess accident risk, does provide an alternative method to assess the accident data in terms of the population within the area of interest.

There are differences in the protocols between the two studies. However, these are not considered to significantly affect the comparisons made in this report. Therefore the differences shown between the studies are primarily attributable to differences in the sampling regions and rider populations, not due to differences in how the data were collected.

In Section 5, compatible variables in the OTS and MAIDS databases have been compared. This analysis shows that the accident population of MAIDS and OTS are significantly different with respect to rider age, the rural/urban location of accidents, and engine size. In order to compare the data recorded by MAIDS to that collected by OTS, the OTS data were presented in raw and weighted form. Weights were applied in order to make the two accidents populations more comparable.

The accident data collected by the MAIDS study and the OTS study have also been compared to the national accident statistics for the relevant countries. This has shown that the data collected by the OTS team is nationally representative. In contrast, the MAIDS study was designed as a case control study and thus is not expected to be nationally representative. This highlights an important difference between the two studies and has implications for the different ways in which data from these studies should be applied.

6.2 Accident factors

The distribution of accidents recorded by MAIDS and OTS show differences by month, with higher proportions of MAIDS accidents occurring in early spring and autumn; this may be a result of differences in climate between the sampling regions affecting motorcycle use. Other factors, such as the time of day when, and the day of the week on which, the accident occurred are similar between the two studies.

Both MAIDS and OTS show that the most frequent collision partners in motorcycle accidents are passenger cars, both in rural and urban environments, accounting for approximately two-thirds of accidents. This agrees well with previously reported UK accident statistics. However, when OTS and MAIDS were compared with respect to collision partner, the data from the two studies was found to be significantly different. This is considered to be due to the high proportion of ‘other’ collision partner coded by OTS, as well as other coding differences. For example, MAIDS records ‘roadway’ as a collision partner, but OTS does not.

Considering junction type, the MAIDS and OTS show significant differences with respect to the frequency of accidents at different junctions. For example, OTS indicates that 72% of junction accidents occur at T-junctions, whereas the same value for the MAIDS data is 36%. This factor is likely to be influenced by the types of junction within the sampling area, although a genuine difference cannot be discounted based on the data here. The proportions of accidents which occur away from a junction are similar between the studies (38% for MAIDS and 40% for OTS). More detailed analysis of the MAIDS database could be performed to investigate accident causation and specific rider failures for these accident types.

The roadway alignment factor for motorcycle accidents was also found to be similar between the two studies; 70% occurred on a straight road in MAIDS compared to 73% in OTS. This difference was found to be non-significant at the 95% confidence level, indicating less than a one in twenty chance that the difference was due to a genuine difference in the underlying data. This factor is important in the UK context when considering accidents on a bend. Again, a more detailed analysis of the MAIDS data may allow causation of these specific accidents to be determined.

There were no significant differences in the weather conditions between the studies, with 91% of accidents in MAIDS and 90% of accidents in OTS occurring in conditions of no precipitation. Significant differences in road type were not identified either, although lower proportions of OTS accidents occurred on asphalt surfaces. There were significant differences at the 99% level in the roadway defects recorded between MAIDS and OTS, with a higher proportion of OTS accidents occurring on roads with no defects (86% in OTS compared with 70% in MAIDS) and only 11% of accidents occurring on roads with surface defects recorded by OTS. MAIDS has more categories for recording road damage and recorded 12% as having bitumen defects and 14% as having surface deterioration. Thus, although the use of motorcycles as a means of transport is influenced by the weather, the accident environmental conditions are comparable between MAIDS and OTS.

6.3 Accident causation

The results for accident causation are dependent on the way in which the accident teams reconstruct the accident. As stated earlier, the OTS and MAIDS teams have different approaches to accident reconstruction, with the MAIDS teams following the more in-depth and structured OECD common methodology. The OTS team also implements a different mechanism of coding accident causation. However, the compatible OTS and MAIDS categories have been matched to enable some comparisons to be made. These comparisons are considered to be the best approximation that can be achieved bearing in mind the differences in the accident reconstruction methodology and the categorisation of accident causation.

There are statistically significant differences in terms of attention failure of the motorcycle and other involved vehicle (if one was present) in OTS data and the MAIDS data. For accidents where this factor was considered to have contributed to accident causation, MAIDS recorded 11% and OTS 20%. Thus, OTS considered that rider attention failure was nearly twice as common in UK accidents as in MAIDS accidents. This difference may reflect a real difference between MAIDS and OTS, but the manner in which failures are attributed in these studies differs and, without a compatible approach to accident reconstruction, the true magnitude of any difference cannot be objectively quantified. The same factor assessed with respect to the other vehicle (OV) driver showed that in 20% of MAIDS cases and 34% of OTS cases, attention failure contributed to the accident.

For traffic scan errors, the same discrepancy was found as for attention failures with MAIDS recording 28% of accidents and OTS 22% of accidents for which the motorcycle rider was considered to have made a traffic scan error that contributed to the accident. For the other involved vehicle, if applicable, these values were 64% for MAIDS and 67% for OTS. These percentages are substantially higher for OV drivers than PTW riders.

Faulty traffic strategy was a contributory factor in about a third of cases in MAIDS and OTS for both PTW riders and OV drivers.

6.4 Human factors, personal protective equipment and injury

The UK accident population was very heavily biased towards males, with 93% of riders involved in accidents being male. However, exposure data indicated males were not over represented in accidents, since 91% of the exposure sample was also male. The MAIDS accident sample showed a slightly lower proportion of male riders (87%) and this is a statistically significant difference from the OTS sample. This may indicate that more females ride motorcycles in Europe compared to the UK, or be due to differences in the types of motorbike and locations sampled in MAIDS.

Concerning rider age, the OTS accident data and exposure data from an earlier survey of UK riders indicated that younger riders were over represented in the UK accident sample. For example, riders, aged under 25, accounted for 39% of the accidents involving motorcycles but only 8% of the riding population were in this age group. However, detail on the distance travelled by riders of this age group is not available and it is considered that this factor may account for a proportion of this observed difference. MAIDS also found that younger riders were over represented in the accident data, although the age distributions of OTS and MAIDS data were found to exhibit a statistically significant difference.

OTS data indicated that a significant difference at the 95% confidence level was detected between the number of accidents involving motorcycles carrying a passenger and those not doing so: those carrying a passenger were over represented in the accident sample. MAIDS data showed that the percentage of accidents that involved motorcycles carrying a passenger was lower than the corresponding figure in OTS, but this difference was not statistically significant.

Personal protective equipment is important to motorcycle safety due to the vulnerable nature of the rider or passenger should an accident occur, and the likelihood of contact with the ground, other vehicles or roadside furniture. The OTS data were examined and compared to the MAIDS data in terms of helmet use and type, upper and lower body clothing, gloves and footwear. The results of these analyses show that the proportions of protective equipment worn in the UK and Europe are statistically different at the 99% confidence level. The type of clothing worn is likely to be influenced by climatic factors as well as the motorcyclists' trip purpose. These cannot be investigated thoroughly here, but the marked differences between MAIDS and OTS suggest that there are significant differences in these factors between the two studies.

For helmet use, OTS data showed a higher proportion of full-face helmet use (87%) compared with MAIDS (72%). Considering lower and upper body clothing, OTS data showed a higher proportion of riders wearing leather material clothing but higher proportions of MAIDS riders wearing 'heavy' clothing. It is considered that some of the differences in clothing may be due to the way various clothing types were allocated by the teams collecting the data. For footwear use, the MAIDS sample contained higher proportions of non-motorcycle dedicated footwear than OTS, with 55% of the OTS sample wearing a reinforced boot or motorcycle orientated boot, compared with 20% in the MAIDS sample.

Injuries recorded by OTS and MAIDS also showed significant differences, with OTS data reporting higher proportions of neck, thorax and abdomen injuries than MAIDS. The MAIDS data also showed significantly higher proportions of head and lower extremity injuries. Overall, OTS visited a higher proportion of more severe (killed or seriously injured) accidents involving PTWs. This is considered to be a result of the sampling within OTS which means that attendance at higher severity accidents was prioritised.

6.5 Vehicle factors

In terms of vehicle factors, the MAIDS accident and exposure data were not statistically different with respect to legal category and engine size. However, the OTS accident sample was significantly different to MAIDS with respect to the distribution of engine sizes, with UK data including higher proportions of larger engine machines. This indicates significant differences in the types of motorcycle within MAIDS and OTS. This fundamental difference between the types of motorcycle operating in the MAIDS and OTS sampling areas affects many factors such as the types of journey that might have been undertaken, the proportions of motorcycles travelling in urban and rural environment and the types of protective equipment worn. This in turn has an influence over the likely accident types and accident severity.

There were also significant differences in the types of motorcycle in the MAIDS and OTS datasets. In the UK data, there were more standard street and sports machines, whilst the MAIDS data had higher proportions of mopeds and scooters. This factor is correlated with engine size and is another indication of the different mix of motorcycles in the MAIDS sampling area compared to that of the UK.

Conspicuity is an important topic with respect to the interaction of motorcycles with other road traffic. The OTS data showed that in 40% of cases, the headlights were off at the time of the accident, compared with 23% for exposure video data. This indicates that motorcycle conspicuity via the headlight is potentially important.

7 Conclusions

The main conclusions from this study are described below. They are grouped into conclusions about the databases themselves and conclusions about motorcycle safety in the UK.

7.1 Protocols

MAIDS and OTS studies collect compatible basic accident information, but in general the level of detail coded by MAIDS is greater with respect to most accident parameters.

Comparing the two accident databases with National data revealed the differences in their aims and study designs. The MAIDS study is focussed on determining accident *causation* and accident *risk* for a sample of powered two-wheelers within each of the five MAIDS regions. For this reason, a case-control study design was chosen. The OTS study is focussed on recording high quality in-depth data concerning the causes of accidents involving all casualty types. It is known to be slightly biased towards more severe accidents as a result of the sampling strategy used by OTS and detailed exposure data is not collected in the OTS study.

Differences between the data held in the MAIDS and OTS databases appear to arise because of the databases different purposes. MAIDS focuses on motorcycle accidents and quantification of risk factors, whereas OTS covers all road accidents - a broader remit. The key differences are described in more detail below.

- MAIDS contains a more detailed accident reconstruction element and collects more mechanical (e.g. braking system) and human factors (e.g. rider age) information than OTS.
- MAIDS integrates the analysis of exposure data in order to quantify accident risk factors, whereas OTS does not.
- MAIDS codes accident information into more detailed categories than OTS. For example, for accident environment, OTS codes ‘urban’ and ‘rural’, whereas MAIDS has 6 different categories of urban and 4 different categories of rural road environments.

7.2 Data comparisons

The most frequent collision partners in motorcycle accidents are passenger cars, accounting for approximately two-thirds of accidents in both rural and urban environments. This is true for both MAIDS and OTS datasets.

Both MAIDS and OTS data show that around two-fifths of accidents occur away from a junction. More detailed analysis of the MAIDS database to investigate accident causation and specific rider failures for these accident types is recommended.

The accident populations of MAIDS and OTS data exhibit significant differences with respect to location of the accident (urban/rural) and motorcycle engine size. This could be due to differences in sampling procedures, motorcycle populations or their accident involvement.

Rider attention failure contributed to accidents in 11% of MAIDS cases and 20% of OTS cases. This means that in the UK sample rider attention failure contributed to almost twice the proportion of accidents as the non UK sample. This difference may reflect a real difference between MAIDS and OTS, but the manner in which failures are attributed in these studies differed, and without a compatible approach to accident reconstruction, the true magnitude of any difference cannot be objectively quantified.

A traffic scan error by the motorcycle rider contributed to the accident in 28% of MAIDS records and 22% of OTS records. For the other involved vehicle, these values were 64% for MAIDS and 67% for OTS. These values are similar and suggest that for compatible causation data MAIDS conclusions may be applied to UK motorcycle accidents.

MAIDS assessed speed as a contributory factor by comparing speed with surrounding traffic whereas OTS records exceeding speed limit and driving too fast for the conditions. Using these different definitions, speed contributed to accidents in 18% of MAIDS cases and 22% OTS cases. Of this 22%, 76% are involved in single vehicle accidents.

OTS data shows that accidents occurring where a passenger was being carried are over-represented in the sample. Exposure data was not available to determine this for MAIDS, however the percentage of accidents that involved motorcycles carrying a passenger was not statistically significantly different in MAIDS to that recorded by OTS.

The proportions of protective equipment worn in the UK and Europe are statistically different. This is true for helmet use and type, upper and lower body clothing and footwear. Climate, trip purpose, bike style and engine capacity are all likely to be factors in riders' use of protective equipment.

Injuries recorded by OTS and MAIDS also differ. MAIDS' data shows significantly higher proportions of head and lower extremity injuries. OTS data includes a higher proportion of more severe accidents involving PTWs than MAIDS. OTS sampling means that accidents of higher severity are visited more often.

Conspicuity is important with respect to the interaction of motorcycles with other road traffic. The OTS data shows that motorcycles with their headlights off are over-represented in the accident data – in 40% of cases, the headlights were off at the time of the accident, compared with 23% for exposure video data. This suggests that the use of motorcycle headlights appears to be beneficial in terms of alerting other road users to the presence of a powered two-wheeler.

Overall, the accident populations of MAIDS and OTS exhibit considerable differences, in terms of the types of motorcycle involved and the proportions of accidents in rural or urban environments. These differences mean that accident types and causation do not reflect the overall UK situation.

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References

ACEM (2003). *MAIDS Report on the Project Methodology and Process*. Available from http://MAIDS.acembike.org

ACEM (2004). *MAIDS In depth investigations of accidents involving powered two-wheelers Final Report*. Available from http://MAIDS.acembike.org

Association for the Advancement of Automotive Medicine (AAAM) (1990). *The Abbreviated Injury Scale*, 1990 Rev. (pp. 1–75), AAAM, Des Plaines, IL.

Broughton J, Markey KA and Rowe D (1996). *A new system for recording contributory factors in road accidents.* Unpublished TRL Project Report PR/SE/229/96. Crowthorne: Transport Research Laboratory.

Clarke DD, Ward PJ, Truman WA (2002). *Novice drivers' accident mechanisms: Sequences and countermeasures*. In Behavioural Research in Road Safety: Eleventh Seminar. London: Department for Transport, Local Government and the Regions. (pp125-144).

Clarke DD, Ward PJ, Truman WA and Bartle C (2003). *Motorcycle accidents: Preliminary results of an in-depth case-study using police road accident files*. Behavioural Research in Road Safety: Thirteenth Seminar. London: Department for Transport, p 153-164.

Clarke DD, Ward P, Bartle C. and Truman W (2004). *In-depth study of motorcycle accidents.* Road Safety Research Report No 54. Department for Transport: London.

Commission of European Communities (2001). White Paper: European transport policy for 2010: time to decide. *Brussels, COM (2001) 370 final. Retrieved from http://ec.europa.eu/transport/white_paper/documents/doc/lb_com_2001_0370_en.pdf*

Department for Transport (2007). *Road Casualties Great Britain, 2006*. London: Department for Transport.

Department for Transport (2005a). *The Government's Motorcycling Strategy*. London: Department for Transport.

Department for Transport (2005b). *Development and Implementation of the UK On the Spot Accident Study - Phase 1*. Road Safety Research Report No.59. London: Department for Transport.

Department for Transport (2006). *Road Casualties Great Britain 2005*. London: Department for Transport.

Haworth NL and Smith R (1998). *Estimating risk factors for motorcycle crashes.* Road Safety Research, Policing, Education Conference, 1998. Vol 1, pp. 156–160.

Organization for Economic Cooperation and Development (OECD) (2001). *Motorcycles: Common International Methodology for On-Scene, In-Depth Accident Investigation,* OECD/DSTI/RTR/RS9/ICC, International Coordinating Committee of the Expert Group for Motorcycle Accident Investigations, Road Transport Research Programme, Directorate for Science Technology and Industry, OECD. Paris, France

Jamson S, Chorlton K and Connor M (2005). *The Older Motorcyclist*. London: Department for Transport.

Lynam D, Broughton J, Minton R, and Tunbridge RJ (2001). *An analysis of police reports of fatal accidents involving motorcycles.* TRL Report TRL492, Transport Research Laboratory, Crowthorne.

Organization for Economic Cooperation and Development (OECD) (2001). *Motorcycles: Common International Methodology for On-Scene, In-Depth Accident Investigation,* OECD/DSTI/RTR/RS9/ICC, International Coordinating Committee of the Expert Group for Motorcycle Accident Investigations, Road Transport Research Programme, Directorate for Science Technology and Industry, OECD. Paris, France

Sexton B, Baughan C, Elliott M and Maycock G (2004a). *The Accident Risk of Motorcyclists.* TRL Report TRL607, Transport Research Laboratory, Crowthorne.

Sexton B, Fletcher J and Hamilton K. (2004b). *Motorcycle accidents and casualties in Scotland, 1992-2003.* Scottish Executive. http://www.scotland.gov.uk/Publications/2004/10/20130/45608

The Royal Society for the Prevention of Accidents (RoSPA) (2001). *Driver fatigue and road accidents: A literature review and position paper.* Retrieved from http://www.rospa.com/roadsafety/info/fatigue.pdf

Appendix A: Information recorded in the OTS database

The basic OTS methodology focused on all types of vehicles, the highway, human factors and the injuries sustained. The following sections give details of information collected by the crash investigators:

1. *Scene information*
    - Accident location
    - Weather conditions
    - Road environment
    - Traffic density

2. *Approach information (including direction of travel)*
    - Road environment
    - Road type
    - Road condition
    - The view (or lack of view) of the accident site by the participants involved

3. *Human aspects information*

The accident participants present once the crash investigators arrived, as well as those involved in the care and rescue of the injured, supplied some information. Also, postal questionnaires were sent retrospectively to people involved in non-fatal accidents and details requested in this way included:

- the hospital attended;
- whether the injured person was the driver or the passenger; and
- their age, gender, injuries, etc.

Informal interviews were also conducted for the provision of background information regarding the accident. This was used by investigators to enhance their understanding of the causes of accidents.

As each investigation proceeded, the teams collected the required information and made video and photographic recordings of the accident scene. Initial consideration was given to vulnerable road users followed by the collection of volatile data. Vehicles were then investigated (smaller and more mobile vehicles were examined before heavier vehicles). Following this, detailed measurements were taken of the highway environment; all relevant information was recorded on a scene plan. The investigation was concluded by recording all other information of interest. Investigative procedure data types and the information obtained are discussed in the following sections.

4. *Casualty Data*

For all casualties, the data recorded included:

- post-impact positions;
- evidence of injuries; and
- interaction with vehicles or other highway features.

For pedestrians and cyclists, details of clothing were also recorded (i.e. the material properties, body regions covered and conspicuity).

5. Vehicle Data

All vehicles encountered were examined in respect of both primary and secondary safety features, including:

- collision avoidance systems including ABS and speed limiters;
- controls and lights: usage and condition on all vehicle types;
- defects to tyres, brakes, steering and suspension;
- crashworthiness: structures, bumpers, under-run guards (specification and fixings);
- damage assessment: full description, documentation and crash energy calculations;
- restraint systems: seatbelt usage, airbag effectiveness, pre-tensioner presence, child restraint type, mounting and overall effectiveness;
- occupants: injury causation (contacts) ejection/trapping; and
- loads: restraint and movement.

6. Highway data

The investigative procedure data types and the information obtained with regard to highways included:

- highway layout and design;
- traffic density;
- road surface: texture, temperature, friction, contamination;
- views and sight lines;
- signage including visibility and positioning; and
- meteorological conditions: precipitation, light levels, cloud cover, visibility, wind speed, temperature.

7. Witness interviews and follow-up investigation

Whenever possible witnesses were identified while at the scene of the accident and, if they gave their consent, brief interviews were conducted.

The follow-up of the accident investigation took the form of:

- post-accident vehicle examinations;
- sending questionnaires; and
- reconstruction of the events that led to and followed the accident.

8. Human data

The human data collected at the scene was supplemented by data collected from hospital records, HM Coroners' reports and questionnaires sent to accident participants. Injury information was collected at the co-operating hospitals and was made anonymous at source. Where necessary, Coroners are contacted and for provision of post mortem reports for the fatally injured casualties. Details coded for casualties include:

- characteristics: age, gender, mass, stature, predisposing medical conditions;
- selected treatment details;
- injury details: nature, extent, location, and severity according to the Abbreviated Injury Scale (AAAM, 1990);
- anthropometric data suitable for reconstruction of pedestrian kinematics and possible mathematical modelling of interactions between pedestrians and vehicles (only done by VSRC);
- general clothing, including motorcycle clothing; and
- motorcycle and pedal cycle helmet specifications and damage.

In Phases 1 and 2, where human factors were implicated as a cause, an investigation was made to identify the role of sensory, perceptual, cognitive and psychological factors. It was possible to state for each crash whether the key issues were:

- vehicle design, e.g. lighting, mirrors, road worthiness;
- road design, e.g. sight lines, lighting; and/or
- driver experience/skill/judgement/impairment, e.g. training implications, alcohol.

9. Team requirements

- *Procedures*

In Phase 1, each OTS team was made up of at least six investigators including a team manager, senior officer and a serving police officer. In Phase 2, the team compositions changed slightly with VSRC retaining a police officer as a member of their team and TRL relying on local police contacts for this contribution to the team. In addition, each team comprised three investigators, one data manager, one project manager and one technical director. At VSRC and TRL there were personnel employed who provided follow-up support to the investigation team; including a medical specialist, a police liaison officer and a clerical officer. Both centres were further supported by local experts in human, vehicle and highway safety factors.

A shift system was established to ensure efficient working practices, allowing accidents to be sampled representatively from all hours through the day and night for everyday of the week. In general, two teams remained on standby for an eight hour shift period ready to respond immediately to an accident notification from the local police control centre. A rotating shift pattern was used by both teams; this ensured that each part of the day and night was adequately represented.

- *Training*

Accident investigation teams at VSRC and TRL undertook detailed training programmes. Initially, the training was designed to develop the teams’ skill base, it covered:

- Vehicle factors;
- Highway design;
- Accident causation; and
- Real world accident investigation experience.

At TRL, highway design awareness training was made available by means of night visits with experienced highway engineers and an accident investigator to various locations across Berkshire. Simulated accident scenarios were also set up on the TRL test track with vehicles from TRL's testing programme. In addition, all investigators attended a four-day formal police training course in road traffic accident investigation.

As the project progressed, further training was provided by both centres to ensure that the accident investigators possessed the necessary skills to undertake thorough and accurate data collection. Specific areas of further training included:

- Accident reconstruction;
- Drug impairment recognition;
- Fatigue and sleep-related accident recognition; and
- Motorcycle handling characteristics.

In addition to the valuable training exercises above, expert advice was also sought from experienced professionals. Accident investigation training was carried out on an on-going basis.

10. Quality control

A structured expert case review process was used to guide and advise the interpretation of all factors in each case. Reviews were held internally by each team and investigators were also brought together at regular intervals with experts from VSRC, TRL and other participating agencies to assess and draw conclusions in the area of quality control.

11. Co-operative agreements

Co-operative agreements were reached with the police, the Crown Prosecution Service (CPS), hospitals, ambulance, fire and recovery services as well as local authorities and vehicle recovery operators. The nature of these agreements is discussed in this section.

Considerable support and enthusiasm has been provided by the chief constables at Nottinghamshire and Thames Valley Police. They played an essential role in not only providing fully qualified police response drivers, but also in providing crucial links to their control room systems to enable accident notification. Nottinghamshire Police also provide a dedicated team office which houses the on call accident investigation team members. The CPS also agreed to co-operate with the study; they agreed that OTS could work within CPS guidelines and if it is required, a disclosure schedule for the data collection can be produced.

Medical data was an important element in the project to inform the understanding of injury outcome aspects of the accidents. As the VSRC study area was centred about the city of Nottingham, the majority of accident victims attended the Queens Medical Centre (QMC). Acquisition of injury data for all types of casualty as well as supplementary anthropometric data for pedestrian casualties was facilitated by the support staff at the QMC.

The TRL team have developed and implemented injury data collection systems with hospitals within their study area. The hospitals that supported the TRL team were:

- Wexham Park Hospital, Slough;
- Wycombe General Hospital, High Wycombe;
- The Royal Berkshire Hospital, Reading; and
- Frimley Park Hospital, Frimley.

Each of the accident investigation teams met with the fire, rescue and ambulance services to explain the nature of the project; this provided an excellent level of co-operation. Local authorities were also supportive of the project.

In the study, follow-up examinations of accident damaged vehicles and investigation of vehicles at the accident scene required the co-operation of vehicle recovery operators. Both teams visited the main recovery operators in their respective sampling areas to explain the nature of the project. This was hugely successful as it gained the co-operation of the recovery operators involved in accident clearance in the sampling areas.

12. Database

TRL produced a database to hold all of the information collected at accident scenes. The database is capable of accepting data from both TRL and VSRC; this is now a 4,300 record database for research and analysis.

The database is structured into a hierarchy of different levels in order to make use of such a large data set. The main data levels in the OTS database are Scene, Approach, Vehicle, Human and Injury:

- Scene level: this level contains all the data which relates to the whole accident and the whole collision scene. Examples of level 1 data fields include the date of the accident and whether the scene was in daylight or darkness.
- Approach level: this level contains data relating to the various approaches to the actual centre of the accident. This level is necessary in distinguishing environmental factors that are different dependent on the actual path a particular road user took to arrive at the locus.
- Vehicle level: at this level, each vehicle is given a unique identification within those sharing the same approach. At this point, the data can explicitly describe how a vehicle on the first approach collided head-on with a vehicle on the second approach.
- Human and injury level: this level continues with humans linked to each vehicle and injuries linked to each person.

Appendix B: Compatibility of OTS with OECD Common Methodology and MAIDS

B1 Sampling

MAIDS aimed to record within the sampling regions every motorcycle accident where either rider or passenger was transported to the hospital, up to and beyond a target quota, and logged all notifications of accidents which were not attended as required by Part 2 of the OECD Common Methodology. In contrast, OTS investigation teams worked a shift pattern such that each day and time was represented throughout the year. The OTS is incompatible with the requirements of the Common Methodology in that it does not have a specific target number of motorcycle accidents, but is defined by the length of data recording contract and collection of details of 500 accidents, involving all types of vehicle, per year (See Table B.1).

The sampling regions for MAIDS were not of any defined size, but were representative of the motorcycles in the region. It is important to note that the population of motorcycles differs between areas and as such the achieved samples may include different proportions of motorcycles with certain engine sizes. The OTS sampling areas cover a large area including all the road types and urban/rural environments and therefore are considered less likely to be affected by this factor.

Table B.1: Compatibility of OTS with OECD Common Methodology (Part 2: Sampling requirements)

Part 2: Sampling requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Sample size	✓			✓		
4.1.1 Basic study	✓			✓		Minimum of 100 cases in sample period will be required
4.1.2 Other studies			✓			
4.2 Sample area						
Boundaries clearly indicated on a map	✓			✓		
Fully covered by cooperative agreements	✓			✓		
Suitable size in accordance with 4.1.1		✓		✓		
4.3 Sample period	✓				✓	Sampling schedule is not 24 hrs per day, 7 days per week
4.3.1 Basic study	✓			✓		
4.3.2 Other studies			✓			Not applicable
4.4.1 Notified accidents (n = 1)	✓				✓	Number of notified accidents exceeds personnel limits
n is an integer greater than 1	✓			✓		
n is recorded by the data collection team each time n changes	✓				✓	A case data collection log sheet is necessary
n is kept constant for each day		✓			✓	Fluctuation of accidents does not permit n to be constant
4.4.2 Concurrent exposure sampling	✓			✓		
4.4.3 Types of concurrent exposure sampling	✓			✓		Video recording data collection only
4.5 Sampling plan						
Target sample size	✓				✓	Target sample size defined for all accidents
Sample area	✓			✓		
Sampling period	✓			✓		
Sampling method	✓				✓	
Identification of specialized modules that will be collected	✓				✓	
Plan submitted to sponsoring agency and ICC	✓				✓	
	Req = Required, Rec=Recommended, Per = Optional for compliance with OECD Common Methodology					

B2 Accident data collection

The OECD method used by MAIDS is substantially more detailed than the data collection scheme used by the OTS teams. This is demonstrated by the range of variables on the OECD forms which results in the detailed logging of accident parameters. The OECD data collection method also allows for more 'free text' summaries of damage and witness testimony.

Specific differences and compatibility between the OTS study and the OECD Common Methodology used by the MAIDS study are presented in Table B.2. Here it can be noted that the main differences are:

- OTS does not record notifications of all accidents. However, any comparison made at the analysis stage is with national accident statistics and so alternative baseline data are available.
- OTS does not have an on-scene safety plan compatible with OECD requirements. However, the OTS teams have risk assessments in place which essentially fulfil the same purpose and may obtain OECD compliance without significant modification.
- OTS interviews are not conducted face to face after the accident and so interview techniques are not required. OTS uses questionnaires which are written by human factors experts.
- OTS accident data is not transcribed onto paper forms (a requirement of OECD method). Instead, the raw OTS data is input directly into an electronic system
- OTS does not provide a full accident reconstruction at the level of detail required by the OECD method. Specific information recorded by the OECD method is missing from the equivalent OTS data
- OTS collects exposure data, but has not coded or analysed these data.

Table B.2: Compatibility of OTS with OECD Common Methodology (Part 3: Accident data collection)

Part 3: Accident data collection: on-scene, follow-up and concurrent exposure data activities	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Notification	✓				✓	
4.2 Estimation of case qualification	✓			✓		
If response is declined, is case data flow worksheet filed	✓				✓	
4.3 Response assignment	✓			✓		
4.4 On-scene data collection safety plan		✓			✓	
4.4.1 Response to scene and on-scene assignments	✓			✓		
Assignment confirmation	✓			✓		
High visibility garments on scene	✓			✓		
Appropriate identification	✓			✓		
Contact with authorities	✓			✓		
4.4.2 On-scene case qualification	✓			✓		
4.4.3 Observation of on-scene emergency medical treatment	✓			✓		
Photographs of injured regions and verbal descriptions		✓		✓		
Collection of names of involved persons and treating facility	✓			✓		
Notification of team medical consultant	✓			✓		
4.4.4 On-scene interview of witnesses	✓			✓		
Identification of witnesses	✓			✓		
Application of cognitive interview techniques	✓				✓	No face to face interviews – questionnaire based
Tape recording of interview		✓			✓	
Permission to tape (if applicable)	✓			✓		If applicable
Preliminary on-scene evaluation of witness statements	✓			✓		
Comparison, cross-checking		✓		✓		In conjunction with police interview
4.4.5 On-scene vehicle damage analysis	✓			✓		
Photography according to the photographic checklist	✓			✓		

Detailed photographs of collision and injury contact areas	✓			✓		
Recording the storage location of vehicles	✓			✓		
4.4.6 On-scene documentation of environmental physical evidence	✓			✓		
4.4.7 On-scene photography of scene	✓			✓		
4.4.8 On-scene measurements	✓			✓		
4.4.9 On-scene documentation of environmental conditions	✓			✓		
4.4.10 On-scene personal protective equipment investigation	✓			✓		
4.4.11 On-scene collection of samples for laboratory analysis	✓			✓		Samples collected as necessary
4.4.12 Completion of on-scene data collection	✓			✓		
4.4.13 Input administrative data and accident typology data into data summary sheets	✓				✓	Raw OTS data is collected – not put on paper, but inputted directly into electronic database
4.5 Follow-up investigation						
4.5.1 Follow-up team meeting and identification of additional data requirements	✓			✓		
4.5.2 Develop and mount accident photographs	✓			✓		Digital photographs stored on hard disk
Attachment to hardcopy pages		✓		✓		Images printed as necessary
4.5.3 Transcribe tape recorded records	✓			✓		If applicable
4.5.4 Human factors follow-up investigations						
4.5.4.1 Obtain police report	✓			✓		
Obtain Driver's record	✓				✓	Note: driver's record not available due to National laws
4.5.4.2 Follow-up interview of involved persons	✓				✓	
4.5.4.3 Preliminary analysis of rider/passenger kinematics and dynamics	✓				✓	More detailed kinematic analysis is necessary for OECD compliance
4.5.4.4 Input human factors data into data summary sheets	✓				✓	
4.5.5 Vehicle factors follow-up investigations						
4.5.5.1 Follow-up vehicle inspection	✓			✓		Follow-up inspections are conducted if necessary
4.5.5.2 Preliminary analysis of defects, failures and injury related factors	✓				✓	More detailed injury analysis is necessary for OECD compliance (multiple contact codes)
4.5.5.3 Follow-up investigation of fires and special events	✓			✓		
4.5.5.4 Preliminary analysis of vehicle dynamics	✓			✓		Preliminary analysis is performed during team meetings
4.5.5.5 Input vehicle factors into data summary sheets	✓				✓	

4.5.6 Environmental factors follow-up investigations						
4.5.6.1 Follow-up scene inspection	✓			✓		If necessary
4.5.6.2 Input environmental factors into data summary sheets	✓				✓	
4.5.7 Medical follow-up investigations						
4.5.7.1 Collection and analysis of injury data	✓			✓		
4.5.7.2 Correlate injuries and cause factors	✓				✓	Identification of specific contact codes is necessary
4.5.7.3 Input medical data to data summary sheets	✓				✓	
4.5.8 Specialized module follow-up investigations						
4.5.8.2 Moped/mofa inspection	✓				✓	Not part of this study
4.5.8.2.2 Input data into moped/mofa module data summary sheets	✓				✓	Not part of this study
4.6 Concurrent exposure data sampling	✓			✓		
4.6.1 Team assignment	✓			✓		
4.6.2 On-scene case qualification	✓			✓		
4.6.3 On-scene preparation	✓			✓		
4.6.4 Location evaluation and qualification	✓			✓		
4.6.5 Data collection	✓			✓		
4.6.5.1 Motorcycle stops, method 1 only	✓					Not applicable: Method 1 is not used in this study
4.6.5.2 Traffic counts, all methods	✓			✓		
4.6.6 Completion criteria	✓			✓		
4.7 Concurrent exposure follow-up investigations						
4.7.1 Develop and mount concurrent exposure data photographs	✓				✓	Not applicable for this study
4.7.2 Remote photography and video review	✓			✓		
4.7.3 Case review and case qualification	✓			✓		
4.7.4 Input data into data summary sheets	✓				✓	
4.8 Completion of data summary sheets	✓				✓	CED forms and AR forms not completed at this time

B3 Accident data assembly

Table B.3 provides details of the similarities and differences in accident data assembly between the OTS study and the OECD common methodology used by MAIDS. This table shows that the main differences relate to the depth of detail of the accident reconstruction; MAIDS is more in-depth than OTS. OTS and MAIDS exhibit similarities in the assignment and ranking of contributory factors, but the method used to determine these is more in-depth in the case of MAIDS. Here a full accident reconstruction is performed, which determines vehicle speeds, decelerations and point of contact, with precise failures defined for each involved party.

Table B.3: Compatibility of OTS with OECD Common Methodology (Part 4: Data assembly)

Part 4: Data assembly, accident reconstruction, and contributory factor analysis	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Case data assembly						
4.1.1 On-scene and follow-up data review	✓				✓	
4.2 Accident reconstruction calibration	✓				✓	
4.3 Accident reconstruction						
4.3.1 Scaled drawing	✓				✓	OTS team provide scene sketch (fatals have scaled plan)
4.3.2 Reconstruction	✓				✓	
For the motorcycle rider		✓			✓	
For the motorcycle passengers		✓			✓	
For the other vehicles		✓			✓	
4.3.3 Input reconstruction data to data summary sheets	✓				✓	
4.4 Contributing factor analysis						
4.4.1 Identification of contributing factors	✓			✓		Contributing factors defined
4.4.2 Ranking of contributing factors	✓			✓		
4.4.3 Identification of primary contributing factor	✓			✓		
4.4.4 Input contributing factor data to data summary sheets	✓				✓	
4.5 Final case review	✓				✓	QC final review procedures are present for OTS data requirements
4.6 Data entry	✓				✓	Data entry QC procedures are present for OTS data requirements
4.7 Sanitization of data	✓					
4.7.1 Sanitization of data	✓				✓	Sanitization performed according to national guidelines
4.7.2 Final assembly	✓				✓	Final assembly performed according to national guidelines

B4 Personnel requirements

Table B.4 shows that in terms of the training and personnel requirements for the data collection researchers, the two studies are very similar and are compatible in most respects. Thus, the OTS team would comply with the OECD methodology with respect to the experience, qualifications and skills of the researchers participating in collecting the data.

Table B.4: Compatibility of OTS with OECD Common Methodology (Part 5: Personnel requirements)

Part 5: Personnel selection and special training requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Personnel job descriptions, duties and qualifications						
4.1.1 General personnel requirements	✓			✓		
4.1.2 Principal investigator	✓			✓		
4.1.3 Programme manager	✓			✓		
4.1.4 Investigators	✓			✓		
4.1.5 Data analyst	✓			✓		
4.1.6 Office staff	✓			✓		
4.1.7 Consultants	✓			✓		
4.1.8 Advisory Board			✓		✓	No advisory board selected for this team
Advisory board contact		✓				Not applicable
Commission agency is among the advisors		✓				Not applicable
Assistance in providing information and technical support			✓			Not applicable
4.2 Staff training						
4.2.1 Training syllabus depth and detail	✓			✓		
Training duration	✓				✓	Minimum training requirement duration has not been met
4.2.2 Determination and confirmation by principal investigator		✓			✓	
4.2.2.1 Practical team set-up						
Team field relations training completed	✓			✓		

Practice team operations completed	✓				✓	No practice team operations for CM procedures performed prior to data collection – but OTS PTO was performed
4.2.2.2 Fundamental topics						
Principles of motorcycle accident investigation	✓			✓		
Collection and analysis of witness information	✓			✓		
Photographic methods for accident investigation	✓			✓		
Vehicle systems technology	✓			✓		Special training as necessary
Vehicle dynamics technology	✓			✓		
Human factors in motorcycle accidents	✓			✓		
Motorcycle accident injury mechanisms	✓			✓		
Other fundamental topics	✓			✓		
Principal investigator arranges for special training	✓			✓		
4.2.2.3 Specific topics						
Motorcycle accident reconstruction methodology	✓				✓	Training in MC accident reconstruction is continuing
Scientific laboratory methods	✓			✓		
Fires and explosions	✓			✓		
Legal aspects of accident investigation	✓			✓		
Motorcycle traffic proficiency	✓			✓		
Motorcycle helmet evaluation	✓			✓		Consultants contacted as necessary
Any other specialized topics	✓			✓		
4.2.2.4 Confirmation and reporting	✓				✓	Confirmation and reporting of training to ICC is necessary

B5 Quality Control Requirements

The OECD common methodology also has specific quality control requirements which the MAIDS teams complied with. The OTS study does not comply with these requirements, but has its own data checks on the case review and on the data within the electronic database. Thus, as can be seen with reference to Table B.5 the studies are compatible apart from requirements to document and report quality control in a specific manner. OTS currently implements its own procedures. These differences between OTS and MAIDS are not considered likely to affect the robustness of any comparative assessment between the studies.

Table B.5 Compatibility of OTS with OECD Common Methodology (Part 6: Quality control requirements)

Part 6: Quality control requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Principal investigator						
Preparation of quality control plan	✓				✓	OTS has own QC procedures and data checking
Submission of quality control plan to SA and ICC	✓				✓	OTS has own QC procedures and data checking
Receipt of reports regarding quality control performance	✓			✓		
4.1.1 Staffing						
Staff selection	✓			✓		
Staff training	✓				✓	Training is in progress
Staff evaluation	✓			✓		
4.1.2 Coordination with external agencies	✓			✓		
4.1.3 Team operations						
Quality of the data collected	✓			✓		
Quality control evaluation procedures		✓		✓		
Quality of the safety plan	✓				✓	
Review of safety and security of team operations		✓		✓		
Regular meetings to discuss notifications, response and acquisitions	✓			✓		
4.1.4 Data synthesis						
Quality of the analysis of each case	✓			✓		
4.1.5 Data assembly						

Quality of the assembly of the data	✓			*	*	No cases completed to date which comply with OECD CM
Schedule for completion of data collection and assembly		✓		*	*	CM data is not completed at this time.
4.1.6 Final review, data coding and data entry						
Quality control of final review of each case	✓			*	*	CM data is not completed at this time.
Method for ensuring material requirements for hard copy data file	✓			*	*	CM data is not completed at this time.
Method for detection of coding errors and data entry errors	✓			*	*	CM data is not completed at this time.
4.1.7 Reporting						
Quality control of reporting	✓			✓		
Regular reports to sponsoring agency		✓		✓		
Quality control of data sanitization and results distribution	✓			✓		Data sanitization will follow OTS guidelines and requirements
4.2 Programme Manager						
4.2.1 Staffing	✓			*	*	Unable to determine. Quality control plan has not been developed.
4.2.2 coordination and cooperative agreements with external agencies	✓			*	*	Unable to determine. Quality control plan has not been developed.
4.2.3 Team operations	✓			*	*	Unable to determine. Quality control plan has not been developed.
4.2.4 Data synthesis, data assembly, final review and reporting	✓			*	*	Unable to determine. Quality control plan has not been developed. No cases completed to date,
4.3 Team members	✓			*	*	Unable to determine. Quality control plan has not been developed.
4.4 Consultants	✓			*	*	Unable to determine. Quality control plan has not been developed.

* OTS partially complies - see ‘explanation’

B6 Liaison and co-operative agreements

With respect to liaison and co-operative agreements, the MAIDS and OTS studies show good agreement (see Table B.6). However, access to vehicle and personal information in UK is subject to ethical and legal restraints and for this reason, OTS collects data using witness interviews and questionnaires. Both studies are similar in that they have appropriate liaison and co-operative agreements in place to ensure the effective collection of accident data. In terms of the comparison between MAIDS and OTS, and therefore the comparison between the studies will not be affected.

Table B.6: Compatibility of OTS with OECD Common Methodology (Part 7: Liaison and cooperative agreement requirements)

Part 7: Liaison and cooperative agreement requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4 Compliance with all applicable national and other laws	✓			✓		
4.1 Establish liaison and cooperative agreements						
4.1.1 Notification of accidents	✓			✓		
4.1.2 Access to the accident scene	✓			✓		
4.1.3 Access to the involved vehicles	✓			✓		
4.1.4 Access to personal information	✓			✓		Information is collected within the limits of national law
4.1.5 Access to vehicle information and driver information	✓				✓	Unable to obtain information directly due to national laws – equivalent information is obtained during witness interviews

B7 Minimum equipment and facility requirements

The OTS and MAIDS study are fully compatible with regard to part 8 of the OECD method (minimum equipment and facility requirements), as illustrated in Table B.7. Thus, both studies have the required equipment and facilities to conduct on the spot accident data research and there are no compatibility issues which will affect comparisons made between OTS and MAIDS studies.

Table B.7: Compatibility of OTS with OECD Common Methodology (Part 8. Minimum equipment and facility requirements)

Part 8: Minimum equipment and facility requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Equipment						
4.1.1 Vehicles for staff transportation	✓			✓		
Number of vehicles for staff transportation ≥ 2		✓			✓	Not a requirement
4.1.2 Accident scene investigation equipment						
4.1.2.1 Personal equipment	✓			✓		
4.1.2.2 Accident scene measurement equipment	✓			✓		
Electronic survey equipment		✓		✓		
Friction measurement device		✓		✓		
4.1.2.3 Photography, video recording equipment	✓			✓		
Cold and wet weather clothing	✓			✓		
Disposable medical examination gloves	✓			✓		
Eye protection	✓			✓		
Paper and writing implements	✓			✓		
4.2 Research team office						
4.2.1 Location		✓		✓		
4.2.2 Office and garage space		✓		✓		
4.2.3 Storage space, case filing system	✓			✓		
Technical library		✓		✓		

Storage of electronic files	✓			✓		
4.2.4 Conference space		✓		✓		
4.2.5 Office equipment						
4.2.5.1 Computers	✓			✓		
Laptop computer		✓		✓		
4.2.5.2 Communications	✓			✓		
Internet and email communications		✓		✓		
4.2.5.3 Copy, publication equipment	✓			✓		
4.2.6 Authority	✓			✓		
4.2.7 Facility funding, support	✓			✓		
4.2.8 Data security	✓			✓		

B8 Study implementation and schedule, database requirements and minimum statistical analysis

Table B.8 to Table B.10 show the compatibility of the OTS study with respect to the OECD requirements for study implementation and schedule, database requirements and minimum statistical requirements. At present, the OTS study does not comply with the requirements for study implementation since the data collected is not reporting on worksheets and data summary sheets compliant with the common methodology. Furthermore, the data is stored in a database which uses an OTS coding system and is not compliant with the common methodology. In terms of statistical analysis, the OTS study has no requirement to analyse the data collected, the study is the collation of in-depth accident data for use by other research projects. However, these similarities and differences do not affect any comparison between the sources made here, other than those reported earlier which relate to the differences in scope and detail of the data recorded by the OECD methodology.

Table B.8: Compatibility of OTS with OECD Common Methodology (Part 9: Study implementation)

Part 9: Study Implementation	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
4.1 Commissioning agency						
4.1.1 Sequence of activities prior to data collection		✓		✓		
4.1.1.1 Staffing		✓		✓		
4.1.1.2 Specialized modules and case completion criteria		✓		✓		
4.1.1.3 Facilitation of advisory board		✓			✓	No advisory board selected
4.1.1.4 Team operations		✓			✓	Not a requirement
4.1.1.5 Independent monitoring agency			✓		✓	Not a requirement
4.2 Research organization						
Completion of all activities prior to the start of data collection	✓				✓	Staff training is in progress, no CM practice team operations were completed prior to data collection
4.2.1 Sequence of activities prior to data collection		✓			✓	Not a requirement, recommended only
4.2.1.1 Establish research group	✓			✓		
Research group similar to part 9, figure 1		✓		✓		
4.2.1.2 Staffing and facilities	✓			✓		
4.2.1.3 Agreement to participate in international coordination		✓		✓		
4.2.1.4 Research team organization	✓				✓	Team members are currently not able to meet all requirements of Part 3, Part 4 and Part 11 of the Common Methodology
Research team similar to part 9, figure 1		✓		✓		

4.2.1.5 Special training	✓				✓	
4.2.1.6 Practice team operations	✓				✓	No CM practice team operations were performed prior to data collection
4.2.1.7 Quality control integration	✓				✓	QC integration in progress
4.2.1.8 Document submission to ICC	✓				✓	
4.2.1.9 Operation schedule	✓			✓		
4.2.1.10 Reporting schedule	✓					
4.2.1.11 Analysis schedule that meets requirements of part 11	✓					
4.2.1.11 Database system that meets requirements of part 10	✓				✓	Data currently to be entered into OTS database only
4.4 Interaction among research organizations, sponsoring agencies and international coordinating committee and outside agencies		✓		✓		
4.5 Scheduling						
4.5.1 Start/stop calendar	✓			✓		November 2000 start
4.5.2 Element sequencing, oversight sequence	✓			✓		Note: element sequencing plan is included in QC plan
4.5.3 Cost control and objective data milestones		✓		✓		
Continual monitoring of progress of investigations	✓			✓		
4.5.4 Correlation with financial schedule		✓		✓		

Table B.9: Compatibility of OTS with OECD Common Methodology (Part 10: Database requirements)

Part 10: Database requirements	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
Is the research team using a data coding system that meets the requirements of part 10 of the Common Methodology?	✓				✓	Only OTS data coding system is used at this time

Table B.10: Compatibility of OTS with OECD Common Methodology (Part 10: Minimum statistical requirements)

Part 11: Minimum statistical analysis	OECD methodology			OTS Complied with?		Explanation
	Req	Rec	Per	Yes	No	
Does the research team intend to complete the minimum statistical requirements identified in part 11 of the Common Methodology?	✓			*	*	OTS collects data but has no requirements for analysis

* OTS partially complies - see ‘explanation’

Appendix C: Raw data of MAIDS and OTS databases

Table C.1: KSI casualties on PTWs in Spain, France, Italy, Netherlands and Great Britain in 2003 by age of rider

	Spain		France		Italy		Netherlands		Great Britain	
	Count	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
≤15	82	1	106	2	14	1	15	1	0	0
16-17	899	14	986	16	96	7	712	25	858	11
18-21	977	15	825	14	80	6	328	11	904	12
22-25	702	11	663	11	164	11	207	7	693	9
26-40	2580	41	2343	39	716	50	830	29	3275	42
41-55	681	11	921	15	192	13	465	16	1681	21
≥56	421	7	226	4	179	12	302	11	421	5
unknown	253	-	136	-	28	-	5	-	270	-
Total	6595	100	6206	100	1469	100	2864	100	8102	100

Table C.2: Age of PTW rider

	MAIDS		OTS		OTS weighted	
	Count	**%**	**Count**	**%**	**Count**	**%**
≤15	29	3	1	<1	0.0	0.0
16-17	126	14	42	16	76.1	29.2
18-21	142	16	37	14	31.3	12.0
22-25	132	14	22	9	22.5	8.6
26-40	331	36	106	41	92.3	35.5
41-55	134	15	35	14	26.8	10.3
≥56	25	3	14	5	11.2	4.3
unknown	0	-	49	-	45.7	-
Total	919	100	306	100	306	100

Table C.3: Type of area where the accident occurred

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Urban	666	74	166	61
Rural	229	26	105	39
Unknown	26	-	35	-
Total	895	100	306	100

Table C.4: Engine Size (cc) of the motorcycle involved in the accident

	MAIDS		OTS		OTS weighted	
	Count	**%**	**Count**	**%**	**Count**	**%**
Up to 50	394	43	57	20	119.7	41.1
51-125	89	10	54	19	32.6	11.2
126-250	37	4	9	3	10.2	3.5
251-500	56	6	19	7	17.2	5.9
501-750	206	22	85	29	66.5	22.8
751-1000	80	9	44	15	26.9	9.2
1001 or more	58	6	23	8	18.0	6.2
Unknown	1	-	15	-	15.0	-
Total	921	100	306	100	306.0	100.0

Table C.5: PTW rider age by legal category of the motorcycle involved in the accident

	MAIDS				OTS					
	L1		L3		L1		L3		Unknown	
	Count	%	Count	%	Count	%	Count	%	Count	%
≤15	28	7	1	<1	0	0	0	0	0	0
16-17	102	26	24	5	32	63	8	4	2	18
18-21	104	26	38	7	7	14	29	15	1	9
22-25	42	11	90	17	3	6	17	9	2	18
26-40	68	17	263	50	8	16	94	48	4	36
41-55	40	10	94	18	1	2	32	16	2	18
≥56	13	3	12	2	0	0	14	7	0	0
Unknown	1	-	1	-	6	-	40	-	4	-
Total	398	100	523	100	57	100	234	100	15	100

Table C.6: Month in which the accident occurred

	MAIDS		OTS		OTS weighted	
	Count	%	Count	%	Count	%
January	68	7	18	6	21.7	7.2
February	59	6	28	9	30.0	9.9
March	94	10	23	8	26.1	8.6
April	75	8	16	5	11.2	3.7
May	117	13	29	10	25.8	8.5
June	108	12	36	12	38.3	12.7
July	96	10	32	11	29.7	9.8
August	73	8	31	10	27.3	9.0
September	100	11	23	8	20.2	6.7
October	62	7	23	8	26.4	8.8
November	35	4	34	11	30.9	10.2
December	34	4	9	3	14.5	4.8
Total	921	100	302	100	302.0	100.0

Table C.7: Time of day the accident occurred

	MAIDS		OTS		OTS Weighted	
	Count	%	Count	%	Count	%
00:00-02:59	26	3	5	2	4.4	1.4
03:00-05:59	14	2	0	0	0.0	0.0
06:00-08:59	144	16	53	17	55.2	18.3
09:00-11:59	105	11	44	14	42.5	14.1
12:00-14:59	169	18	44	14	44.0	14.6
15:00-17:59	216	23	79	26	76.5	25.3
18:00-20:59	182	20	62	21	64.7	21.4
21:00-23:59	64	7	15	5	14.7	4.9
Total	921	100	302	100	302	100

Table C.8: Type of Area the accident occurred in by collision partner

	Urban				Rural				Other/Unknown			
	MAIDS		OTS		MAIDS		OTS		MAIDS		OTS	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Passenger car	427	64	114	78	107	47	57	55	19	73	26	74
PTW	42	6	4	3	22	10	2	2	0	0	0	0
Fixed object	28	4	6	4	45	20	10	10	1	4	4	11
Roadway	51	8	0	0	28	12	0	0	4	15	0	0
Other	118	18	23	16	27	12	34	33	2	8	5	14
Unknown	0	-	19	-	0	-	2	-	0	-	0	-
Total	666	100	166	100	229	100	105	100	26	100	35	100

Appendix D: OTS contributory factors linked with primary and tertiary MAIDS contributory factors

OTS Contributory Factor	Linked to MAIDS primary CF	Linked to MAIDS tertiary CF
Impairment through alcohol	Human	
Impairment through drugs	Human	
Impairment through fatigue	Human	
Impairment through illness	Human	
Distraction through stress of emotional state of mind	Human	Attention failure
Distraction through physical object on or in vehicle	Human	Attention failure
Distraction through physical object outside the vehicle	Human	Attention failure
Panic behaviour	Human	
Carelessness, reckless or thoughtless	Human	Faulty traffic strategy
Nervous or uncertain	Human	
In a hurry	Human	Faulty traffic strategy
Failure to judge other person's path or speed	Human	Traffic scan error
Disability	Human	
Failed to look	Human	Traffic scan error
Looked but did not see	Human	Traffic scan error
Inattention	Human	Attention failure
Person hit wore dark or inconspicuous clothing	Environmental	Temporary traffic hazard
Other personal-factor	Human	
Cross from behind parked car	Environmental	Visual obstructions
Ignored lights at crossing	Human	Faulty traffic strategy
Excessive speed	Human	Faulty traffic strategy or Speed compared to surrounding traffic
Following too close	Human	Faulty traffic strategy
Inexperience of driving	Human	

Inexperience of vehicle	Human	
Interaction or competition with other road users	Human	Faulty traffic strategy
Aggressive driving	Human	Faulty traffic strategy
Lack of judgement of own path	Human	Faulty traffic strategy
Tyre pressures wrong	Vehicle	Vehicle failure
Tyre deflated before impact	Vehicle	Vehicle failure
Tyre worn or insufficient tread	Vehicle	Vehicle failure
Defective lights or signals	Vehicle	Vehicle failure
Defective brakes	Vehicle	Vehicle failure
Other vehicle-factor	Vehicle	Vehicle failure
Poor surface at site	Environmental	Roadway maintenance defect
Poor or no lighting at site	Environmental	Roadway design defect
Inadequate signing at site	Environmental	Roadway design defect
Steep hill at site	Environmental	
Narrow road at site	Environmental	
Bend or winding road at site	Environmental	Roadway design defect
Road works at site	Environmental	Temporary traffic hazard or Traffic hazard
Slippery road at site	Environmental	Roadway maintenance defect or Weather related
High winds at site	Environmental	Weather related
Earlier accident	Environmental	Traffic hazard
Other local factor	Environmental	
View obscured from window	Environmental	Visual obstructions
Glare from sun	Environmental	Weather related
Glare from headlights	Environmental	Temporary traffic hazard
Surroundings obscured by bend/winding road	Environmental	Visual obstructions
Surroundings obscured by stationary/parked car	Environmental	Visual obstructions
Surroundings obscured by moving vehicle	Environmental	Visual obstructions

Surroundings obscured by buildings, fence, vegetation	Environmental	Visual obstructions
Obscuration due to weather	Environmental	Weather related
Failure to see pedestrian in blind spot	Human	Traffic scan error
Animal out of control	Environmental	Traffic hazard

Appendix E: Statistical details of weighting procedure

A weighting procedure has been implemented to see if the differences in MAIDS and OTS accidents are simply caused by known differences in vehicle fleet and area characteristics or whether there really are differences in the types of accidents occurring.

The variables considered for the weighting procedure were rider age, engine size, bike style and urban/rural split. Tests were carried out on the variables to determine the most important variables with which to weight. Chi-squared tests check whether there is a significant difference between the two studies' distributions for a particular variable. A p-value smaller than 0.01 suggests a probability of 1% that the distributions are the same and therefore we would conclude that there are significant differences between the distributions of those variables in the two studies.

Chi-squared results on the four possible variables comparing MAIDS and OTS are reported below. With the limited sample size, it was necessary to choose just two weighting variables. The Chi-squared tests indicated which variables may provide the best weighting. Unknown categories are not included in the tests as there is a difference in the levels of reporting in OTS and MAIDS (replaced once the weighting procedure was complete), however 'others' remain in the style variable as these are assumed to be comparable in both studies. Engine size and style are related so the option was to choose one or other of these.

Age has the least significant p-value (albeit at the 5% level) so this was not used for weighting purposes. The two remaining weight factors were rural/urban and engine size or rural/urban and bike style.

Table E.1: Chi-squared p-values for testing differences in distribution of OTS and MAIDS data

Variable	p-value
Rider age	<0.05
Bike style	<0.01
Engine size	<0.01
Urban/rural split	<0.01

Weights were calculated by dividing MAIDS count by OTS count for each category and were then scaled by a constant. The scaling ensures that the sum of the weighted frequency is the same as the un-weighted frequency for the OTS data. Unknowns that are removed earlier are replaced with a weight of 1.

Each set of weights (rural/urban and engine size, and rural/urban and bike style) was tested by applying the weights to the one remaining variable to see the effect of the weights. For example, weights, defined by the engine size and rural/urban variables, were applied to each of the cases in OTS and then grouped by bike style.

Urban/rural and engine size were used as the weighting variables because the link between MAIDS and OTS is better defined, and there are no 'others' included in the analysis. The weighting approaches were very similar in terms of the effect on the data.

Appendix F: Examples of OTS Case Studies

Case #1 - multiple vehicle collision

The collision occurred during the early hours of the evening in early summer. It was still daylight but partly cloudy and the visibility was good. Two mopeds and two cars were involved in the collision. The traffic was slow moving on a dual carriageway and all vehicles were travelling at the same direction. A young female driver, who was driving one of the cars that were involved in the accident, failed to stop in time and collided with a moped which then collided with another moped. This moped then hit a second car which was driven by a male driver. Both moped riders were young males. The occupants and riders of the vehicles were slightly injured.

The OTS team concluded that the vehicle drivers failed to avoid object or vehicle on carriageway. This precipitating factor was marked by the OTS team as definitely causative. Moreover, 'Inattention' was found to be a definitely causative contributory factor to the collision.

Case #2 - single motorcycle incident

The accident occurred on an early autumn afternoon. At the time of the incident the sky was mostly cloudy, it was daylight and the visibility was good. The rider of a motorcycle lost control of his bike while turning left onto a carriageway. The motorcycle then slid across the road for a short distance. The rider was uninjured.
The OTS team concluded that the rider lost control of the vehicle. This was noted as a definitely causative precipitating factor. Moreover, the OTS team found several probable, possible and definite causative contributory factors which are specified below:

Inexperience of vehicle__________________	*Definitely* causative
Carelessness, recklessness or thoughtless_	*Probably* causative
Lack of judgment of own path____________	*Possibly* causative
Slippery road at site_____________________	*Possibly* causative
Other personal factors __________________	*Possibly* causative

The questionnaire, completed by the rider of the motorcycle also suggests possible oil/grease contamination just prior to the accident.

Appendix G: Additional information on subjects in the main report

Table G.1: Passenger helmet type

	MAIDS		OTS	
	Count	%	Count	%
Half type (full face hinged front)	5	7	0	0
Open face	6	8	0	0
Full face (full face fixed)	44	61	8	100
None	17	24	0	0
Other	0	0	0	0
Unknown	7	-	12	-
Total	79	100	20	100

Table G.2: Style of the motorcycle involved in the accident by its legal category

	MAIDS L1		MAIDS L3		OTS L1		OTS L3		OTS Unknown	
	Count	%	Count	%	Count	%	Count	%	Count	%
Standard street	33	8	123	24	1	2	74	32	4	33
Road race replica	11	3	126	24	3	5	91	39	2	17
Tourer	0	0	76	15	0	0	21	9	1	8
Cruiser	0	0	37	7	0	0	6	3	1	8
Chopper	0	0	36	7	0	0	1	<1	0	0
Scooter	291	73	63	12	49	86	31	13	3	25
Other	61	15	59	11	4	7	9	4	1	8
Unknown	2	-	3	-	0	-	1	-	3	-
Total	398	100	523	100	57	100	234	100	15	100

Table G.3: Combining pre impact manoeuvre codes

This report uses the following definitions	OTS	MAIDS
Stopping or starting	Stopping on the carriageway (not in a parking bay or before turn) Waiting to go ahead but held up Starting off Stopped waiting to turn right	Stopped in traffic, speed is zero
Straight road	Driving along a straight road Going straight over at crossroads	Moving in a straight line, constant speed Moving in a straight line, throttle off Moving in a straight line, braking Moving in a straight line, accelerating
Turning or negotiating a bend	Going into a junction to turn left Going round a roundabout Turning from side road onto main road Turning from main road into side road Driving round a right hand bend Driving round a left hand bend Driving round a series of bends	Turning right, constant speed Turning right, accelerating Turning left, constant speed Negotiating a bend, constant speed Negotiating a bend, throttle off Negotiating a bend, braking Negotiating a bend, accelerating
Overtaking	Overtaking moving vehicle on the left Overtaking parked vehicle on the left	Passing manoeuvre, passing on left Changing lanes to right
Illegal Manoeuvre	Illegal manoeuvre (e.g. wrong way up one way road, or roundabout)	Travelling wrong way, against opposing traffic
Collision avoidance		Collision avoidance manoeuvre to avoid a different collision
Other	Lost control of vehicle Other	Other

Appendix H: OTS exposure data of riders' and passengers' clothing

Table H.1: OTS exposure data - Dedicated PTW Oversuit

Dedicated PTW oversuit	Rider		Passenger Count	Total Count
	Count	%		
No	177	62	6	183
Yes	110	38	3	113
Unknown	158	-	6	164
Total users	445	100	15	460

Table H.2: OTS exposure data - Dedicated upper body clothing

Dedicated upper body clothing	Rider		Passenger Count	Total Count
	Count	%		
No	115	40	3	118
Yes	171	60	5	176
Unknown	159	-	7	166
Total	445	100	15	460

Table H.3: OTS exposure data - Upper body clothing type

Upper body clothing type	Rider		Passenger Count	Total Count
	Count	%		
T-shirt	2	1	0	2
Shirt or blouse	1	<1	0	1
Jumper or cardigan	12	3	1	13
Kagool	3	1	0	3
Jacket	224	62	9	233
Coat	99	27	2	101
Other	20	6	0	20
Unknown	84	-	3	87
Total	445	100	15	460

Table H.4: OTS exposure data - Upper body clothing material

Upper body clothing material	Rider		Passenger Count	Total Count
	Count	%		
Cotton	8	5	0	8
Waxed cotton	4	3	0	4
Wool	3	2	0	3
Leather	71	45	3	74
Suede	1	1	0	1
Silk or Nylon	25	16	0	25
Plastic	44	28	1	45
Other	1	1	0	1
Unknown	288	-	11	299
Total	445	100	15	460

Table H.5: OTS exposure data - Dedicated lower body clothing

Dedicated lower body clothing	Rider		Passenger Count	Total Count
	Count	%		
No	108	46	4	112
Yes	129	54	4	133
Unknown	208	-	7	215
Total	445	100	15	460

Table H.6: OTS exposure data - Lower body clothing type

Lower body clothing type	Rider		Passenger Count	Total Count
	Count	%		
Trousers	245	76	7	252
Jogging bottoms	9	3	0	9
Jeans	52	16	4	56
Cotton slacks	2	1	0	2
Other	15	5	0	15
Unknown	122	-	4	126
Total	445	100	15	460

Table H.7: OTS exposure data - Rider helmet use and type

Dedicated PTW helmet	Helmet type	Rider Count	Rider %	Passenger Count	Total Count
No	Open face	1	-	0	1
	Unknown	2	-	0	2
Yes	Full face fixed	189	72	5	194
	Full face with hinged front	50	19	2	52
	Open face	21	8	1	22
	Other	1	<1	0	1
	Unknown	153	-	3	156
Unknown	Open face	2	-	0	2
	Unknown	26	-	4	30
Total		445	100	15	460

Appendix I: Accident characteristics of OV

Table I.1: Traffic controls along OV pre-crash path

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
None	411	56	175	89
Sign	134	18	10	5
Signal	173	24	11	6
Other	11	2	0	0
Unknown	49	-	16	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=86.5, df=3, p<0.01)[11]

Table I.2: Roadway Alignment at accident scene (OV)

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Straight	598	78	140	70
Curve/Corner	166	22	61	30
Other/Unknown	14	-	11	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=8.75, df=1, p<0.01)

[11] P-values are stated at several levels: p > 0.10 is a non-significant result, otherwise p < 0.1, p < 0.05, p < 0.01, are significant at 10%, 5% and 1% respectively. All p-values are computed with unknowns excluded.

Table I.3: Traffic density at time of accident (OV)

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Light	423	55	123	61
Moderate	231	30	59	29
Heavy	109	14	10	5
Congested	0	0	10	5
Unknown	15	-	10	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=3.9, df=3, p>0.1)

Table I.4: Attention failure of OV driver, including distractions and stress

	MAIDS		OTS	
	Count	**%**	**Count**	**%**
Attention failure was present, but did not contribute to accident causation	31	4	1	1
Attention failure contributed to accident causation	143	20	73	34
No attention failure	552	76	138	65
Unknown if attention failure was present	52	-	0	-
Total	778	100	212	100

OTS v. MAIDS χ^2 test (χ^2=1303.0, df=2, p<0.01)

Appendix J: OTS accidents Contributory factors tables

Table J.1: Accident Causation of 'Distraction through physical object outside the vehicle' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	5	1
Probably causative	3	1
Possibly causative	3	4
Not causative	0	1
Not applicable	142	146

Table J.2: Accident Causation of 'Panic behaviour' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	2	0
Probably causative	6	1
Possibly causative	7	0
Not causative	0	0
Not applicable	138	152

Table J.3: Accident Causation of 'Carelessness, reckless or thoughtless' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	16	17
Probably causative	21	20
Possibly causative	15	9
Not causative	4	4
Not applicable	97	103

Table J.4: Accident Causation of 'In a hurry' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	3	1
Probably causative	12	7
Possibly causative	20	24
Not causative	6	3
Not applicable	112	118

Table J.5: Accident Causation of 'Failure to judge other person's path or speed' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	19	17
Probably causative	8	13
Possibly causative	8	30
Not causative	2	3
Not applicable	116	90

Table J.6: Accident Causation of 'Failed to look' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	6	8
Probably causative	3	26
Possibly causative	11	33
Not causative	0	2
Not applicable	113	84

Table J.7: Accident Causation of 'Looked but did not see' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	6	28
Probably causative	9	55
Possibly causative	13	27
Not causative	1	0
Not applicable	124	43

Table J.8: Accident Causation of 'Inattention' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	11	12
Probably causative	15	16
Possibly causative	25	39
Not causative	2	0
Not applicable	100	86

Table J.9: Accident Causation of 'Excessive speed' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	13	1
Probably causative	16	3
Possibly causative	18	4
Not causative	3	0
Not applicable	103	145

Table J.10: Accident Causation of 'Following too close' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	6	2
Probably causative	15	7
Possibly causative	5	4
Not causative	0	0
Not applicable	127	140

Table J.11: Accident Causation of 'Inexperience of driving' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	4	1
Probably causative	14	1
Possibly causative	16	5
Not causative	1	0
Not applicable	118	146

Table J.12: Accident Causation of 'Inexperience of vehicle' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	6	0
Probably causative	9	0
Possibly causative	18	2
Not causative	0	1
Not applicable	120	150

Table J.13: Accident Causation of 'Aggressive driving' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	3	0
Probably causative	6	2
Possibly causative	7	2
Not causative	2	0
Not applicable	135	149

Table J.14: Accident Causation of 'Lack of judgement of own path' for motorcyclist and Other Vehicle

	PTW	OV
Definitely causative	19	7
Probably causative	12	3
Possibly causative	21	13
Not causative	2	0
Not applicable	99	130

Abstract

The Department for Transport commissioned TRL to compare the findings of two motorcycle accident studies: The European Motorcycle Accident In-Depth Study (MAIDS) and the UK On The Spot (OTS) study. Both studies involved the collection of 'on-the-spot' accident data, visiting the scene of an accident soon after it had happened to retrieve unstable scene factors (e.g. temporary highway factors, weather) and witness statements. The MAIDS study involved collection of data from five European countries: France, Spain, Germany, Italy and The Netherlands. The data were collected using the OECD common methodology designed for two-wheeled motor vehicle accident investigation. The OTS data were collected from two areas of England: the Thames Valley and South Nottinghamshire.

OTS and MAIDS protocols and databases were compared against one another. In general, the data collected for MAIDS have a greater level of detail. Some similarities were discovered in the accident populations of OTS and MAIDS data including major collision partner and some causation factors. There are also considerable differences in the databases including the wearing of protective equipment, engine sizes and motorcyclist injuries.

Comparative analysis of motorcycle accident data from OTS and MAIDS

The Department for Transport commissioned TRL to compare the findings of two motorcycle accident studies: the European Motorcycle Accident In-Depth Study (MAIDS) and the UK On The Spot (OTS) study. Both studies involved the collection of 'on-the-spot' accident data, visiting the scene of an accident soon after it had happened to retrieve unstable scene factors (e.g. temporary highway factors, weather) and witness statements. The MAIDS study involved collection of data from five European countries: France, Spain, Germany, Italy and The Netherlands. The data were collected using the OECD common methodology designed for two-wheeled motor vehicle accident investigation. The OTS data were collected from two areas of England: the Thames Valley and South Nottinghamshire.

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